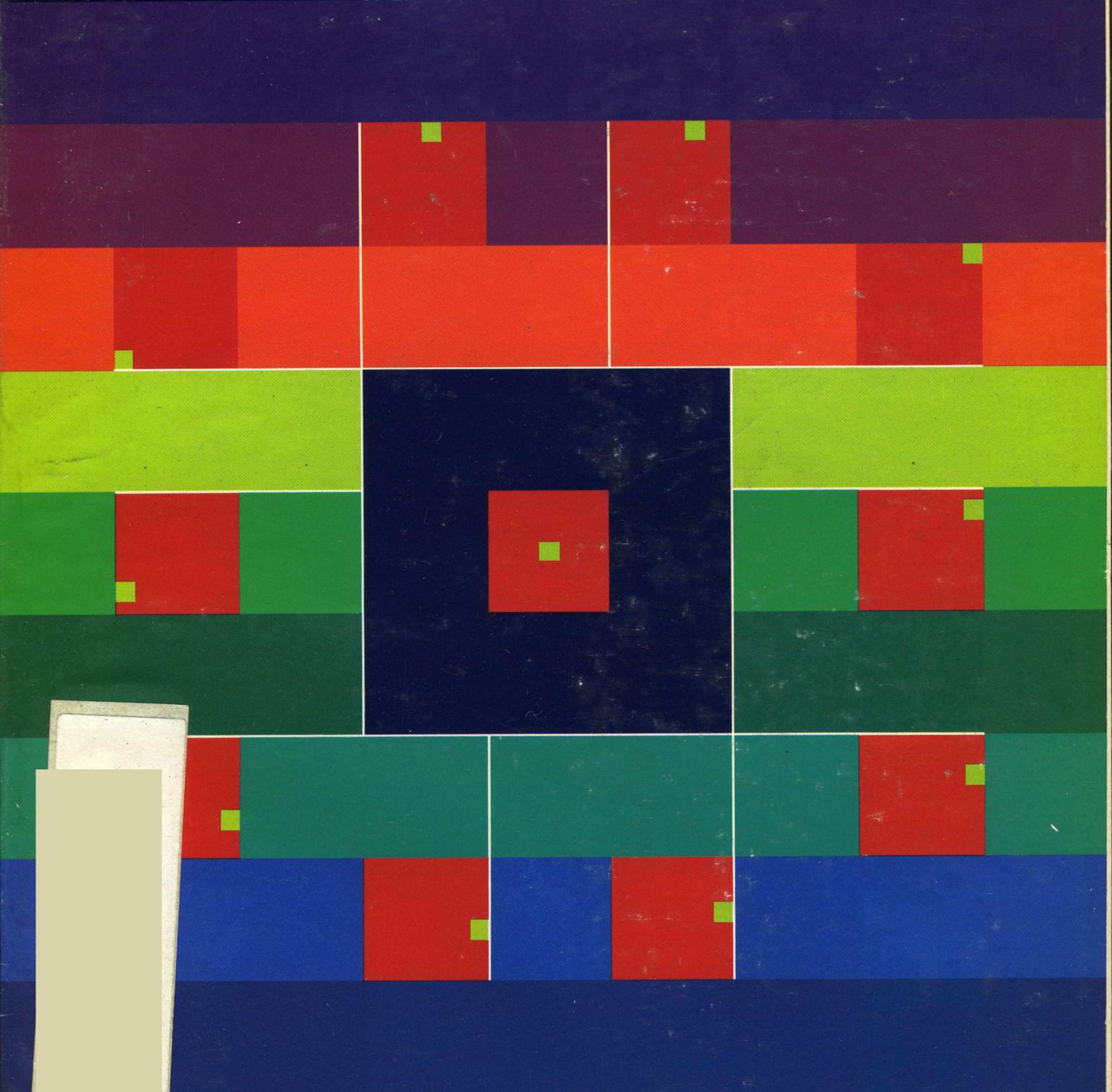


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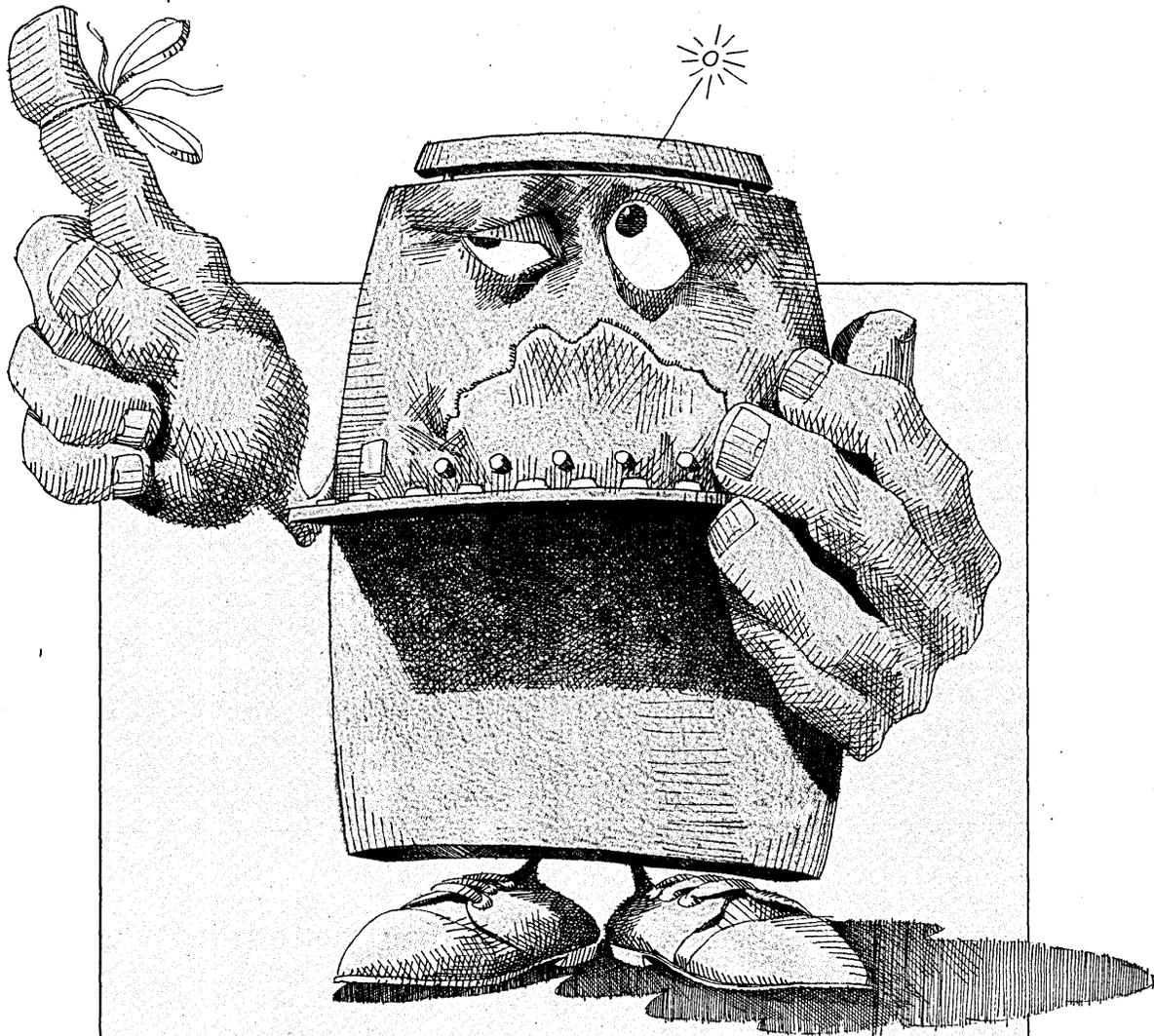
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July, 1975

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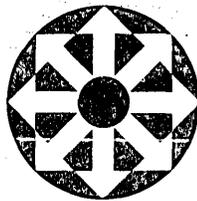
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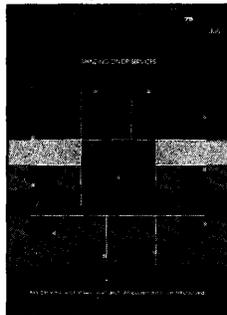
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The problems and possibilities in cost cutting for computer services are symbolized by our cover this month — expanding with economy. Design is by Barbara Benson.

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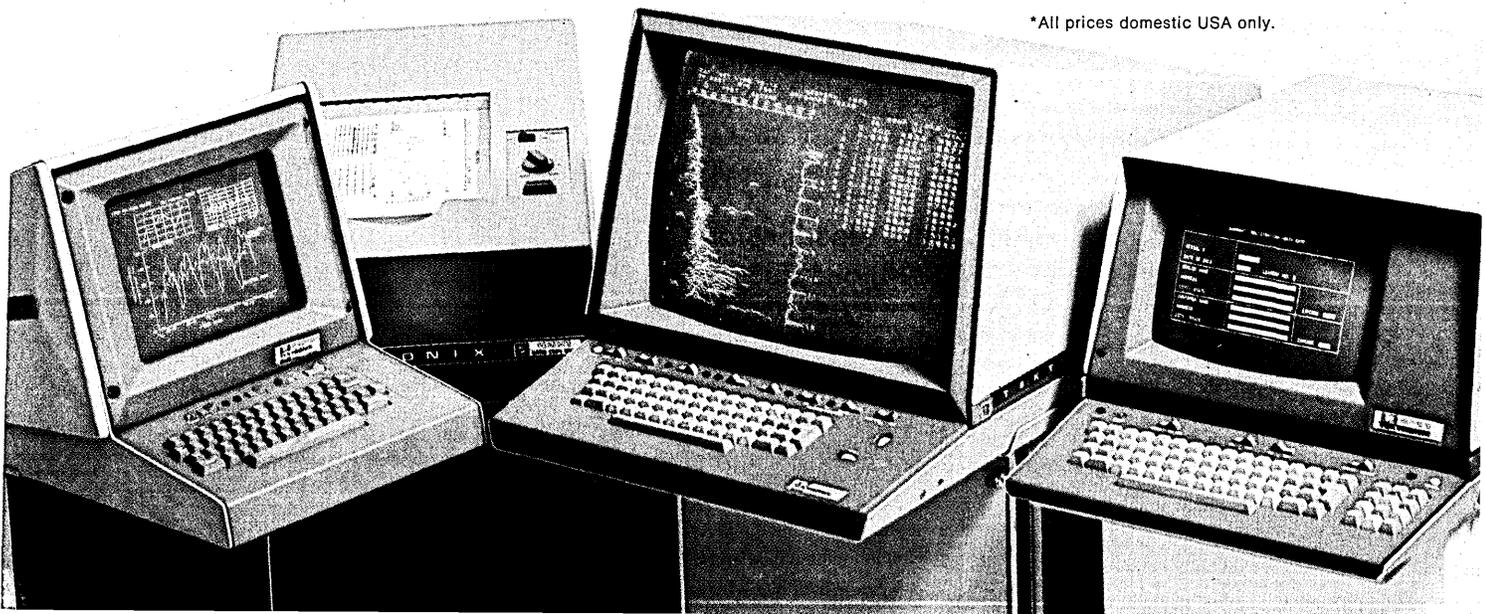
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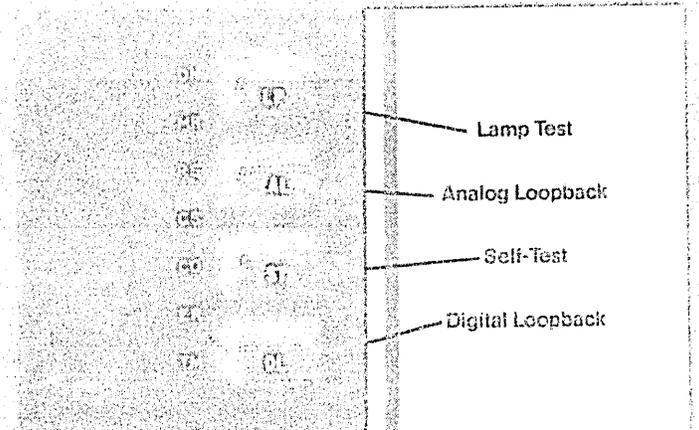
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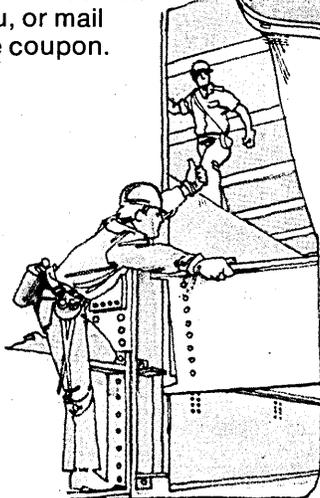
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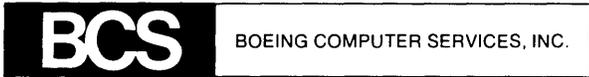
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letters

Letters on restructuring IBM can be found in the feature, "IBM and the Structure of the Industry," elsewhere in this issue.

Privacy: Time to act

Your report of the National Bureau of Standards—Mitre Symposium on Privacy (May, p. 166) was read here with great interest, particularly where it referred to the issue of whether further study of the problem (such as the question of costs) is necessary before proceeding to positive action. It seems to me that this aspect of the discussion reflects the policy-makers' dilemma of never really feeling assured of the necessary understanding or grip on all possible elements of a problem when confronting the moment for action. In privacy, however, I line up squarely behind Dr. Ruth Davis in believing that we can proceed to implementing positive measures even while we continue to learn more than we currently know about the problem.

Even by 1973, the dossier of accumulated knowledge in the field of privacy and computers was substantial. Privacy had been the subject of Congressional hearings in the U.S., a Parliamentary inquiry in Britain, comprehensive studies in half a dozen countries, numerous reports of the OECF (Organization of Economic Cooperation and Development) and the Council of Europe, not to mention many excellent articles in learned journals and trade publications, all of which concluded that what was needed was the enactment of a few well-defined measures that would provide protection for individuals that was lacking in the existing laws of all countries concerned. We have studied this problem; if we now begin to act on these universal recommendations, no one need fear of being accused of behaving in-temperately.

KENNETH KATZ
*Department of Communications
Ottawa, Canada*

Time-sharing is alive and well

The May issue included an article by Drs. Horn and Winston ("Personal Computers," p. 111) who wrote:

"Time-sharing is an idea which has dominated interactive computing for more than a decade. Its end may now be in sight."

Perhaps these authors addressed their attention to highly specialized technical or education needs. Our experience using a PDP-10 in a scientific time-sharing environment within our

company refutes the premise that economics is the only or main reason for using time-sharing. We also use outside time-sharing service bureaus though we have plenty of computer power in-house. The reasons have nothing to do with economics.

Perhaps you've read some recent releases of a new organization—the Association of Computer Time-Sharing Users (ACTSU)—that is just trying to get started. Time-sharing is in its infancy even though there are reputed to be some 15-20,000 users scattered throughout the U.S. I'd hate to think that the parade has already passed us by.

A. K. KNEITEL
*Manager
Commercial Information
E. I. du Pont de Nemours & Company
Wilmington, Delaware*

IBM and the Industry

Amid much controversy and many idealistic "solutions," the simple economic constraint proposed by James Benton—that IBM be restrained from offering its equipment for lease—stands out as simple, directed at the real restraint to competition, and effective.

May the Justice Dept. so realize.

STEPHEN L. KURTIN
*President
Lexitron Corporation
Chatsworth, California*

"Computers don't give a damn" I would like to comment on Mr. Palmer's remarks in the April Forum ("Programming: The Profession That Isn't").

Computer professionals will not solve their problems until they better understand themselves and what they are doing.

I find the often made analogy between computer professionals and medical, legal, or accounting professionals misleading. I do see a resemblance between computer professionals and engineering professionals. They are certainly closer in pay and status.

Computer programming, and also to an extent business system design, can be regarded as a form of engineering. However it is an inferior and defective form for the following reason. Engineering is the practical application of a well established theoretical science (chemistry, optics, mechanics) to real design problems. There is no corresponding established science for computer professionals to apply. . . .

Salary and status are inversely proportional to the distance from the computer. There are two related reasons for this:

1. The programmer is tied to his machine. He has one solution to every problem. If it can not be done with his

computer, it is of no interest.

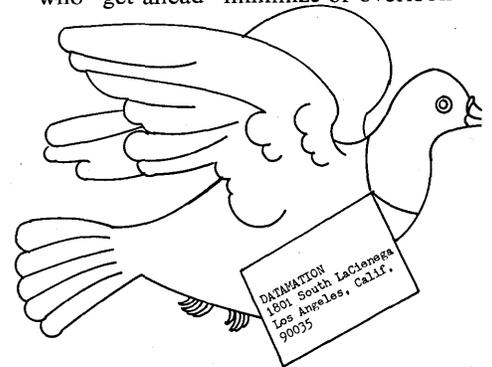
2. The computer programmer is a natural bag holder. If the system doesn't work, the last guy to work on it is obviously responsible. The system analyst is obviously not responsible since his system worked fine on paper. Programmers realize this and (if they don't quit to get a job as a system analyst somewhere else) work very hard to make poorly designed systems work. The computer of course doesn't give a damn.

A good portion of a computer professional's time is spent trying to save his employer money. Since he rarely sees the results of his efforts but is usually intensely aware of the costs of these efforts, he feels guilty about not having done a better job. As a result, he may be very timid about demanding higher salaries and better working conditions.

This explains one of the most puzzling things about the computer professional: the highest paid people are often the most unproductive and irresponsible.

MDs are highly paid because patients do not shop for price. Programmers are poorly paid because employers shop for price, often at the expense of quality. Programmers as a group do not demand higher pay.

The mental attitude of programmers is all wrong for getting ahead. People who "get ahead" minimize or overlook



difficulties, ignore details, and are often careless with the truth. A programmer who minimizes or overlooks difficulties or ignores details in the early stages of a program maximizes difficulties in later stages and may end up looking at the details at 3 a.m. Sunday morning.

A good programmer must be a dedicated seeker of the truth. What really caused the problem? Guessing doesn't count. Superficial impressions, generalities, and sweet talk which may be useful in handling salesmen and "managers" just don't hack it with computers.

Computers don't give a damn. Programmers do.

BOB TAYLOR
*Taylor Computer Services
Chamblee, Georgia*

letters

Old templates never die

As a dp teacher and the inventor of a flowcharting device (U.S. Pat. 3-665-612), I am glad to see Dr. Holton and Mr. Bryan ("Structured Top-down Flowcharting," May p. 80) attempting to resurrect the art of flowcharting.

Although their SCAT technique has merit as a logical system, I disagree with two conclusions in the article.

(1) "The old templates still work . . ." They never have worked very well because of their inherent problems of symbol alignment and limited sizes of symbols.

(2) "The minimum number of different programming symbols used further heighten its simplicity in concept and presentation." Perhaps from a philosophical standpoint "fewer symbols" means greater simplicity. However, such a system seems to me to be less effective as an aid to understanding. I think the old-timers showed wisdom in devising different and easily recognizable symbols for the computer functions.

DANIEL M. ALBRIGHT
Brazosport Schools DP
Freeport, Texas

"The old templates still work" was an editorial addition to the table of contents and not the authors' words.

Short-term memory

Your article "Psychology and Program Design" (May, p. 137) was a first attempt by an outsider to describe the relevance of psychology to the problem of human computer communication. The article makes a feeble scratch on a very complex surface.

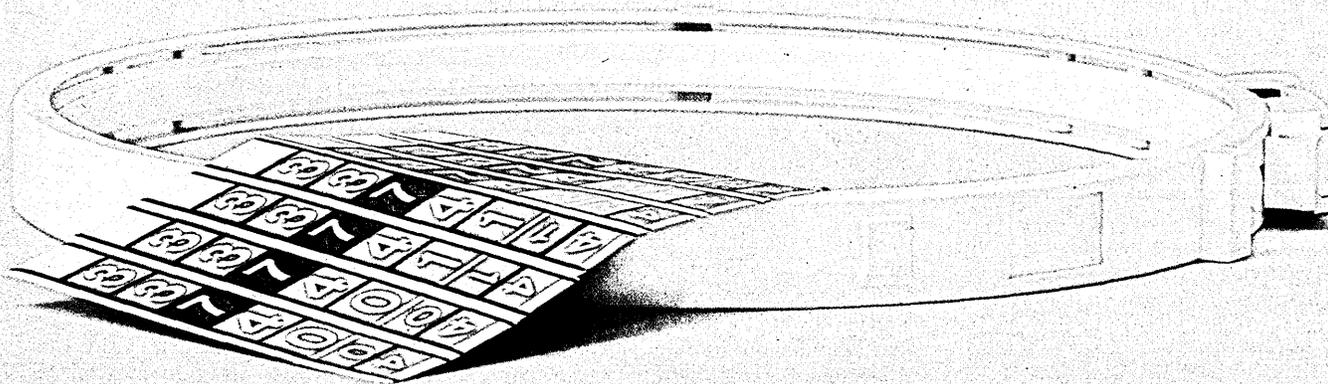
Programming is a sophisticated intellectual activity of immense importance to our society, which the computer industry has been content to view as an art form. Unfortunately, psychologists don't know quite enough about cognition, problem solving, language, creativity, group processes, and computing to immediately prescribe a solution to the problem. But we have been studying these topics for about 100 years and have learned many things that could be very relevant to the problem of human-computer communication. By systematically applying our experimental technology, we can certainly improve the crude and inefficient process by which we communicate with computers today.

As an outsider looking at the computer industry, I am amazed at its reluctance to adopt the scientific method to help solve its most complex and important problem. Structured programming has been adopted in programming shops throughout the world without a single experimental study

performed to demonstrate its superiority. Just think how much time and money we have wasted if we find out that structured programming is really no improvement. The scientific method is our most reliable method for understanding complex events in the world. Introspection or observation is no substitute. . . .

There is at least one major inaccuracy in Mr. Frost's article which must be pointed out. Human beings cannot think about 7 ± 2 things at a time. Psychologist George Miller has shown that most people can remember 7 ± 2 chunks of information in short-term memory. But people vary considerably in the amount of information they can pack into a chunk in a fixed amount of time. For example, some people can remember only four randomly presented digits while others have been known to recall as many as 25 with a little training.

If short-term memory overflow is a cause of programmer errors, maybe we should select only those programmers with large short-term memory buffers rather than teaching structured programming, or train people to improve their memories rather than delete their GOTO's? Or what if we taught programmers with good memories to improve their memories *and* to use structured programming? A great deal of



Do it yourself.

exciting experimental work remains to be done.

TOM LOVE
Special Projects Section
Battelle Human Affairs
Research Centers
Seattle, Washington

Terminal estimate

We refer to the News in Perspective piece on pp. 117-120 of your April issue concerning Singer Co. Whilst we are naturally pleased that references to SWIFT are included in the article we regret that certain points are rather misleading.

In particular, the concentrators to be installed in the 15 participating countries will be supplied by Burroughs Corp. and not Singer.

We are also rather surprised at the estimate of terminals to be attached to SWIFT. As your article indicates, there are currently 260 member banks and their plans indicate that the total number of connections to SWIFT will be approximately 800. Therefore, this is the absolute total market for the S.I.D. (SWIFT Interface Device), for which Singer is one of the three approved vendors.

Some members may attach several terminals to their S.I.D. but many are planning to use a S.I.D. to link their own cpu's to SWIFT. Other members

will connect via Teleprinter and Telex. The estimate of 6,000 terminals would appear to be very excessive according to our current information.

B. N. ZABELL
Service Information &
Security Manager
Society for Worldwide Interbank
Financial Telecommunication s. c.
Brussels, Belgium

Mr. Zabell is quite correct regarding the selection of Burroughs as supplier of the country concentrators and we apologize to Burroughs for our error. As the article stated, the estimate of 6,000 terminals was suggested by Singer, not by DATAMATION. Perhaps they are planning to replace many existing teletypewriters with S.I.D. devices.

Only a keystroke away

I want to thank you for the "News in Perspective" report on "The Automated Office: Only a Keystroke Away" (April, p. 128). The dp community has too long neglected the revolution in the office taking place under its very nose, and your report will help awaken it to this giant new baby.

Many companies already are using a single machine to type ordinary office correspondence; to communicate electronically to other offices, to computers for access to data bases and computer power, to TWX/Telex networks; and to

interface with computerized photo-composers without ever having to rekey.

MORT SIEGELBAUM
Communications Marketing Manager
Redactron Corporation
Hauppauge, New York

Dat(e)—amation!

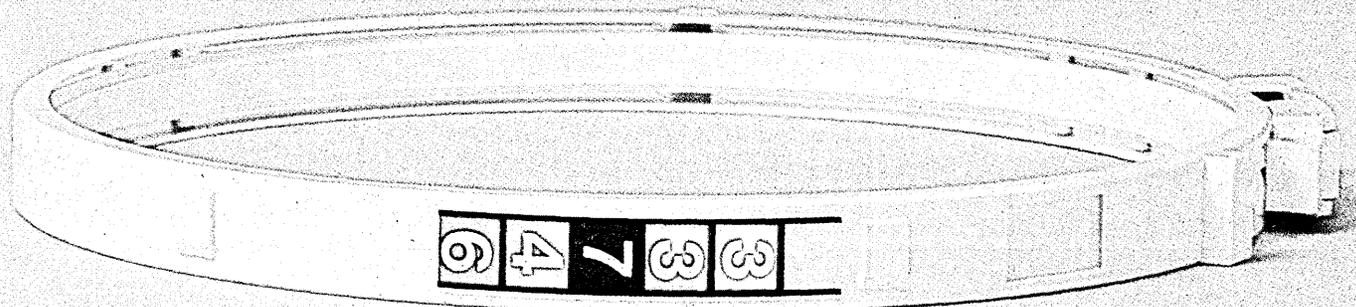
The enclosed reference to DATAMATION is in *Double-speak in America* by Mario Pei (Hawthorn Books, Inc., 1973):

"'Zodiatronics' is the 'science' of casting horoscopes by computer, and *Datamation* is the title of a magazine devoted to computer dating."

I thought you would enjoy the opinion of a linguist of your magazine and, by implication, the real function of the computer industry.

E. J. TAVAROZZI
Sperry-Univac Computer Systems
Roseville, Minnesota

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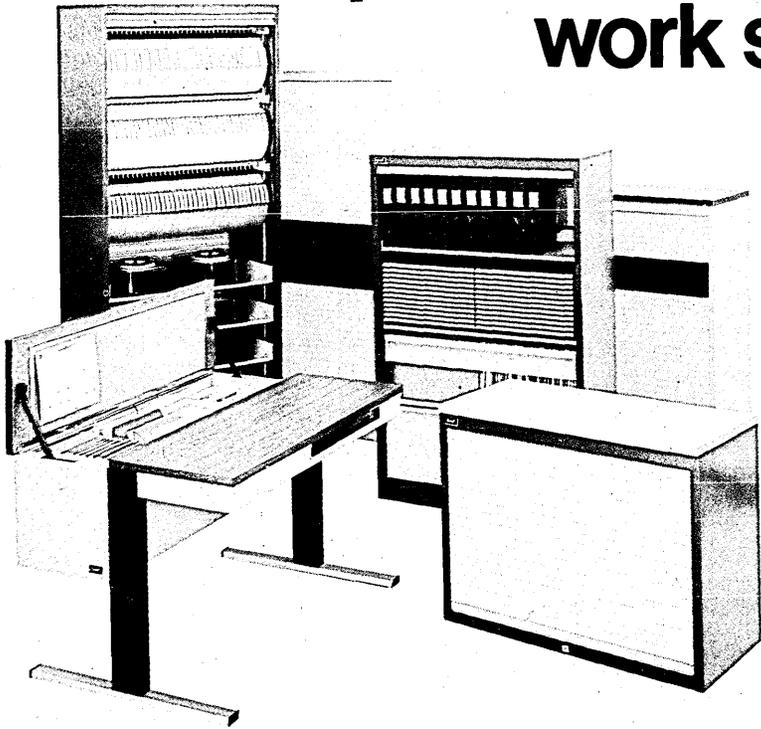
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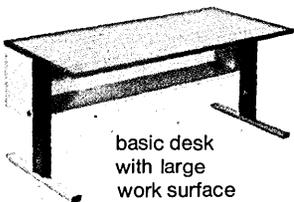


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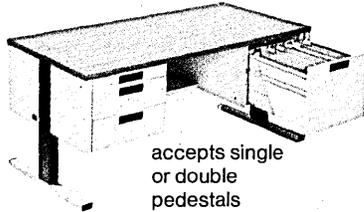


can be changed or reconfigured to meet future needs

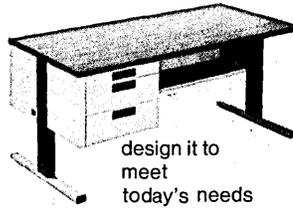
PEDESTAL DESKS



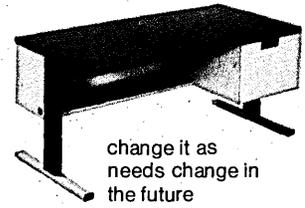
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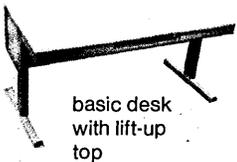


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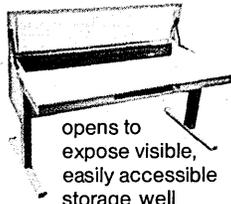


change it as needs change in the future

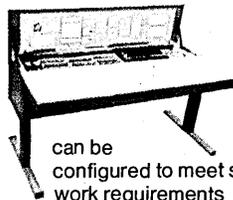
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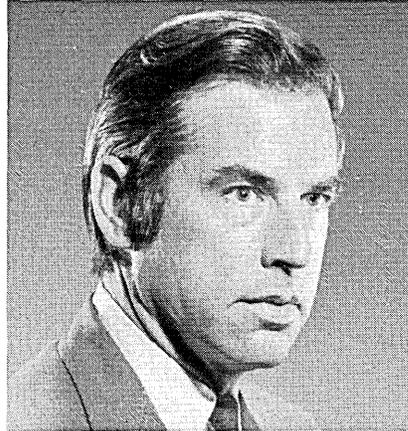
The Hardest Route to Travel

Back in computing pre-history, 1959, three young men in Ann Arbor sat down to write a compiler. They adopted a pragmatic approach aiming for a very fast compiler whose language would be easy to use, have few arbitrary restrictions, include some primitive extensibility and could be easily taught. MAD was a success, both for its users and its implementors. The trio are now departmental chairmen—Bernie Galler at the Univ. of Michigan, Bruce Arden at Princeton and Bob Graham at the Univ. of Massachusetts.

Of the three, Robert M. Graham, now 45, had the hardest route to travel since his appointment required the academic world to realize that computing success is not measurable solely in terms of degrees granted. Graham, who has a master's degree from the Univ. of Michigan, one of the few non-Ph.D.s to head a department in a major university, is a doer as well as teacher and author. His recent *Principles of Systems Programming* (Wiley, New York, 1975) clearly sets down what he has learned about building systems and compilers. In the long struggle to get Multics up and running, the MIT team was contending with a level of complexity just not found in

most systems. Graham mused that they ran into all the problems now grouped under the general heading of structured programming and reliable software without having the words to name them. The Multics system is 95% coded in PL/I. It should have settled any questions remaining about the feasibility of building operating systems in higher level languages. However, the argument still rages even as Graham remembers that some parts of the system originally coded in assembly language got so complex and tortuous that they had to be redone in PL/I for readability and maintainability.

The Univ. of Massachusetts has no



ROBERT M. GRAHAM

“... be a designer, not a repairman”
undergraduate computing science program at present but Graham's ideas on teaching would seem to require, budget permitting, early access to students. He feels it is the role of the university to train people to think about algorithms and representation. If they have the

technique and the tools of the trade, he said, programming languages are not a problem. The basic attributes of all languages, control, data representation, iteration, conditionals, etc. are the same, said Graham. “Learning a new language should be only a weekend's work for the student who has mastered the basic approaches.”

Programmers, Graham feels, must learn to represent the objects with which they are dealing, whether items in an inventory or names in a file, and then, assuming a machine in which those objects exist, state the algorithm in terms of that machine. One iterates on the process representing objects and operations in an abstract machine, he said, until eventually the real language level is reached. “This is the essence of the top-down programming philosophy, often espoused but rarely practiced.”

Graham continues to emphasize higher level languages, those that put the stress on *what* you want to do rather than *how* to do it. “In engineering terms, be a designer not a repairman.” He admits ruefully that most programmers have never been trained this way and are uneasy and unsure of themselves when away from the real machine.

The Univ. of Massachusetts is almost unique in having selected ability rather than degree status to head its program. Graham hopes to reward them by replacing the traditional approaches to computer science education by sequences designed to teach the high art of data representation and algorithmic thinking. The traditional FORTRAN beginning course is a long way from this approach.

Back With What He Helped to Start

When George Harmon left IBM in 1969 to form Comma Corp. he visualized “by the end of the century, the world's two biggest businesses will be (1) computers and (2) servicing of computers.”

Now he's back in the industry he helped start (Comma, he says, was the first data processing third party maintenance firm), after a 3½ year absence and he's even more optimistic than he was in '69. “There's a greater growth today than when we formed Comma,” he says. “New applications, the proliferation of minis and data communications equipment have created a market that wasn't there in 1969 and it looks super-healthy.”

Last January Harmon, 52, became president of Sorbus Inc., the third party maintenance subsidiary of MAI Inc. Sorbus got into the third party maintenance business as Sorbus in November 1970. Prior to that it had been the

service division of MAI Equipment Corp. Today Sorbus has 1,266 people in 160 locations in 49 states. It has contracts with 35 oem manufacturers and its end user customer base includes more than 52,000 different pieces of equipment at 15,000 end user locations. The company services “everything from a keypunch to a 370.” Its services range from “training people to stocking spare parts.”

Harmon went to Sorbus from NCR Corp. where he had been vice president, field engineering and, earlier, special assistant to then-president, R. Stanley Laing. He left NCR, he said, “because I wanted to get back into the industry I helped start.”

He left that industry and Comma Corp. in October 1971 because of “difference of opinion” with his co-founders, Dick Puder and Art Eichoff. All three had been IBM field engineering executives. Asked how it feels to be



GEORGE O. HARMON

“... a market that wasn't there”

competing with a company he helped form, Harmon replied: “It feels great.”

Harmon attended George Washington Univ. in Washington, D.C. and Bakersfield College in Bakersfield, Calif. In 17 years with IBM Corp. he attended all of that company's executive schools. All that was valuable, he

people

said, "but the experience of forming a company was the greatest education on God's earth."

The affable Harmon, who punctuates his conversation with his ever-present pipe, has a great respect for the IBM Corp. where "I held every job in

the customer engineering and field engineering divisions except that of vice president and president. He talks of working with Cary and with "Johnnie" Opel as "a pleasurable experience." He said both were "great guys to work for" and that Cary was the more outgoing of the two. "I don't know what it would have been like working at the same level . . . where everybody's in

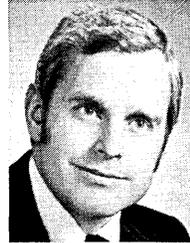
competition for the next rung of the ladder."

IBM is still part of Harmon's life. "Equipment in a 360 environment" is the heaviest portion of Sorbus' maintenance business. Second heaviest is core memories. Harmon says Sorbus' biggest problem today is "controlling our growth."

In New Posts

FREDERICK M. HOAR, vice president of communications for Fairchild Camera and Instrument Corp. was appointed chairman of the National Computer Conference Industry Advisory Panel . . . DAVID M. CARLSON, formerly vice president, information systems at Chatham Supermarkets, joined Allied Supermarkets, Inc., as vice president, management information systems . . . ALEXANDER J. TACHMINDJI joined The Mitre Corp. as chief scientist . . . DR. MATHEW M. SHAPIRO is the new director of product and business development for TRW Datacom International . . . Inforex named JOSEPH R. LEONARDI as vice president, System 5000 program manager and acting director of engineering . . . ROBERT E. HILCHEY was appointed vice president and general manager of Rockwell International's Microelectronic Product Division.

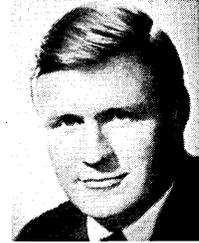
T. DAVID MC FARLAND, formerly membership director, was named acting executive director of Data Processing Management Assn. . . . THOMAS L. RINGER resigned as president and chief executive officer of Computer Machinery Corp. . . . JOHN E. FRENCH joined National Sharedata Corp. as vice president of systems . . . CHRIS G. PETROW



MC FARLAND



GREENMAN



HOAR

was named vice president and managing director for TRW Europe Inc. . . . WARREN WEINBERG was elected executive vice president of Advanced Technology Group International, Inc. and its subsidiary, Mathematical Applications Group . . . MRI Systems Corp. elected THEODORE W. ZIEHE a vice president, information systems . . . JOHN F. GABRIEL was appointed general counsel of California Computer Products, Inc.

ROGER GREENMAN was named by New York state assemblyman Edward Abramson to serve as a "Task Force Advisor" in the computer field . . . NORMAN R. WILLIAMS was appointed vice president, production for Proprietary Computer Systems, Inc., Van Nuys, Calif. *

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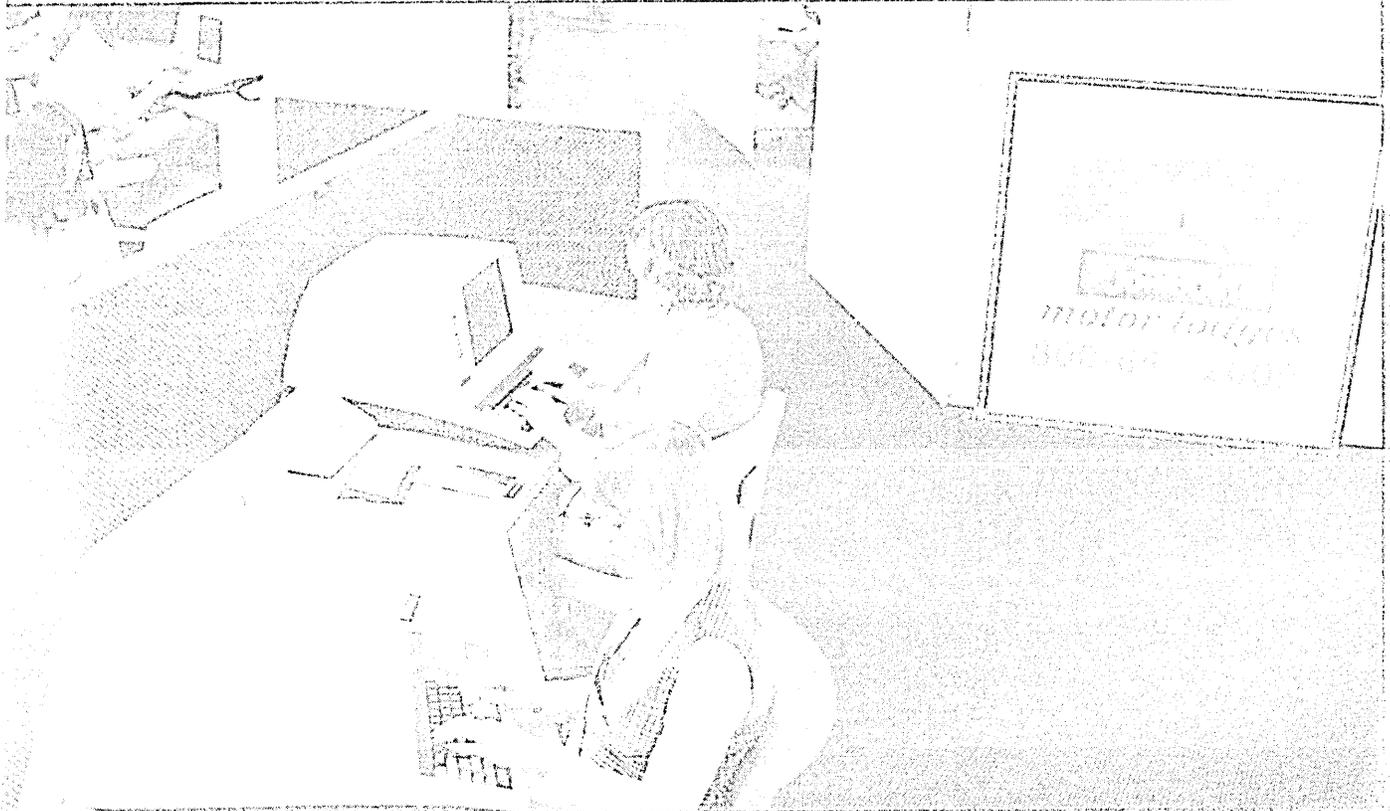
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Because all double-density disk packs conform to certain industry standards, you might think they're all equal. They aren't. The important difference is the extent to which a manufacturer is willing to go in order to exceed industry standards. Because there may be times when your disk pack will have to survive excessive head loading, temperature variations, extended use, and other unexpected trials, we make a pack that will go the extra distance for you. Let's look at a few superior points of the BASF 1246 double-density pack.

The binder that won't quit

As you probably know, magnetic coating doesn't stick to the aluminum disk all by itself. We use a special binding agent to produce an incredibly strong bond. The disk is sealed to prevent oxidation, so you can be sure that the coating won't peel or flake off.

Our own coating process

At this high level of packing density, it is even more important to monitor the thickness of coating deposited on the disk. The problem is compounded by the necessity for progressively varying the coating thickness from the outside toward the inside of the disk, because packing density is greater as the circumference de-

creases. In addition, unlike conventional disk packs, double-density disks must be magnetically oriented, which calls for even more sophisticated technology. For these reasons, we've discarded conventional coating methods in favor of an exclusive process using our own BASF-designed equipment.

A polished performance

Following the coating operation, we use our own exclusive polishing process to achieve optimum surface regularity. Here again, we're dealing with a double-density medium in which the heads fly much closer to the disk surface than in conventional disk packs. With our new polishing process, we've been able to achieve a surface measurably smoother than the industry norm . . . so flat that the possibility of a head crash being caused by uneven disks is completely eliminated. We might mention here that the coating and binder formulation, combined with coating and polishing techniques, all are important factors in achieving surface hardness, which is the ability of the coated surface to survive excessive or extended head loading.

Achieving balance

Like any rapidly rotating object, a disk pack will behave strangely if not perfectly balanced. In our precision balancing operation, any weighting

required is screwed into place, which eliminates the potential for shifting inherent in a conventional adhesive weighting system.

And to make sure . . .

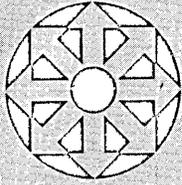
We test our 1246 disk packs to standards much tighter than those of the leading equipment supplier. If anything unpleasant should happen, we'd much prefer it happen here than on your drive. As a regular procedure, we do scratch tests to check coating thickness, impact tests to determine head crash resistance, detergent tests to check resistance to wear and temperature variations, and drop tests to make sure balance and alignment don't shift during shipment. We test to make sure our 1246 disk packs are error-free.

Finally

Our 1246 costs no more than other double-density disk packs. You're already paying for BASF quality . . . you might as well have it. For more information on the 1246 or other BASF disk packs or cartridges, write to BASF Systems, Crosby Drive, Bedford, MA 01730 . . . or call our nearest regional office: in Los Angeles, (213) 386-7023; in Chicago, (312) 343-6618; and in Clifton, NJ, (201) 473-8424.

You're already paying for BASF quality, you might as well have it.





LOOK AHEAD

PACKET SWITCHED NETWORK FROM A COMMON CARRIER

A contract for a packet switched network has been awarded by the State of California to Pacific Telephone and Telegraph Co. Initially, the network will connect 19 state university campuses through approximately 700 terminals, and is planned to be operational early next year. Later, other state agencies would be added. The state Dept. of Transportation already has told Pacific Tel it will join, and the network has been expanded to include another 72 terminals.

Before the system can go into operation, it must be authorized by the California Public Utilities Commission. A proposed tariff probably will be submitted this month, and the commission probably will invite public comments next month. Meanwhile, a state committee headed by assemblyman Mike Cullen also plans to look at the system. "We are concerned about the possibility of a 'sweetheart arrangement'," said a spokesman. The contract, as it stands now, permits participation by Pacific Tel and the other long established carriers in the state, but excludes specialized telecommunications suppliers.

A knowledgeable source says AT&T headquarters is "very interested" in the proposed network. And, it's been learned, meanwhile, that Bell has expressed written interest in bidding on an upcoming Defense Dept. RFP which would convert DOD's Autodin network into a packet switched system.

HONEYWELL: PICKING UP THE BALL IN MINIS

Honeywell Information Systems is forming a dedicated oem minicomputer sales force, a move that raises an intriguing question: where there's an oem mini sales force, can there be an oem mini far behind? The oem product, we hear, is being developed at Honeywell's Billerica, Mass., plant. The machine is a 16-bitter that would be at least partially software compatible with Honeywell's existing mini line. In addition, Honeywell is said to be working on a bigger end user mini at Billerica. The company once was bigger than DEC in minis, yet Honeywell dropped the ball somewhere along the way. The firm is trying to pick it up again. Honeywell's recent mini efforts have been concentrated in the end user market, in support of its own large edp base and, more recently, in networking applications.

AND IN THIS CORNER...INTERSIL

The celebrated vendetta between minicomputer manufacturers Digital Equipment Corp. and Data General Corp. -- the latter a late 1960s DEC spinoff -- continues to smoulder. DEC is said to be unhappy about the latest Chinese copy in the minicomputer arena -- a C/MOS mini that is software compatible with DEC's workhorse machine, the 12-bit PDP-8. The new entry is being offered by Intersil, a California semiconductor house that shares a directorship with Data General in the person of New York lawyer and financier Frederick R. Adler. Intersil is also said to be working on a 16-bit mini and the betting is that it will be software compatible with DEC's PDP-11.

FIRST AND MAYBE LAST

The computer center at Tulane Univ., New Orleans, this month takes delivery of the first Interdata 8/32, billed by its manufacturer as a "megamini" (April, p. 142). Eventually, said Daniel B. Killeen, director of computing, the 8/32 will handle administrative, education related, scientific and outside (remote job entry) computing -- a tall job for a mini, but this is a year away. In the meantime the new machine will be sharing these chores with what may be one of the last of IBM's 7044s. Tulane has had its 7044 for 10 years and "it's still going strong." The university was told by IBM last summer it could only expect support for the 7044 for five more years. Tulane expects to phase it out in three years. And then maybe dual 8/32s. Killeen said the one megabyte 8/32 replaces a half-megabyte 7/32 and he has "every confidence" it will meet his needs for quite awhile. Does he consider the 8/32 a mini? "Hell no."

LOOK AHEAD

MAKE OR BUY

Many have tried it--including IBM--but a small Torrance, Calif., software company apparently is the most successful in developing an easy-to-use language to converse with IBM's IMS data base management system. So easy, says Don Sundeen of Applications Software, Inc., that users of his company's ASI/Inquiry language need only know four verbs and three words to sit at a crt terminal and pluck information in one to two seconds from a data base under IMS data base/data communications(DB/DC). It takes a half hour for a user to learn how to make it work as if he were a trained programmer.

Petroleum giant Exxon sponsored a rush-rush, nine-month development at the 22-person file management company to get the ASI/Inquiry message processing program working. By this month it had installed the system at two Exxon installations with options for a dozen more. ASI won't confirm, but among its soon-to-sign customers is IBM, which announced--but then dropped--an Interactive Query Facility (IQF) with IMS DB/DC.

THE TERMINAL ISN'T A WASHOUT

Contrary to recent rumors within the banking community that IBM's model 3600 financial terminal is a washout, Drydock Savings Bank--an IBM beta test site--says it now has terminals operational at its 10 branches. "They're doing better than expected," says a spokesman. Drydock's implementation schedule had slipped some, but for very normal reasons: user spec changes and pioneering with new hardware and software--VTAM, Network Control Program (NCP) and the new line control, SDLC.

But the New York bank says that VTAM and NCP bugs were cleared up sooner than expected and the 3600s were installed ahead of the July deadline. (We hear IBM rushed in the troops.) The 3600 will run in tandem with the old teller terminals while some sophisticated new applications are phased in.

THE WEATHER IS FINE FOR CDC

A storm of weather forecasting orders rains on the fashionable talk that Control Data Corp. deemphasizes the computer mainframe business. Early this summer, the Minneapolis computer company had received orders from weather forecasting stations in six nations for 11 mainframes worth \$20 million to be installed before the end of '76. One is a \$4.5 million order for a Cyber 175 at the Navy's weather service command at Monterey, Calif.--the ninth CDC system to be installed there. That's where CDC's first sale was made in 1960--a 1604 which the Navy still uses.

Although CDC doesn't have a corner on the weather computational market, it holds a strong position in a market in which it envisions a lucrative future. Its market planners think that the \$150 million worth of computer equipment that has been installed in weather forecasting stations in the past 20 years will double within the next five years to \$300 million.

THE ALL IS FORGIVEN DEPT.

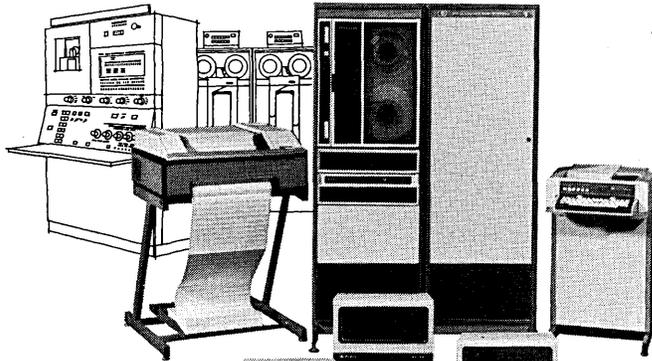
IBM's Thomas J. Watson, Jr. has received an honorary Doctor of Laws degree from Harvard Univ. Watson and IBM's top management caused a fuss at the university in 1971 when IBM withdrew its funding of Harvard's program on technology and society, causing the program to fold. IBM, however, has continued to contribute to the university. Watson's citation read: "Farsighted industrial leader of the computer revolution, ever concerned for humane values in a technological age."

NAME YOUR OFFSET, MATE

Foreign computer vendors bidding in Australia for government business are encouraged to "offset" the drain on that country's balance of payments with evidence of some local activity in the manufacture of hardware or software. The term is so often used--and yet so misunderstood--that "offset" has degenerated into usage as a noun. IBM's "offset," we understand, will be a new typewriter plant down under. The Sydney-based trade paper, Computer Weekly, late this spring announced a "name your offset" contest in which an entry would be judged "for the confusion it causes...and its complete and utter irrelevancy to what offsets are all about."

(Continued on page 96)

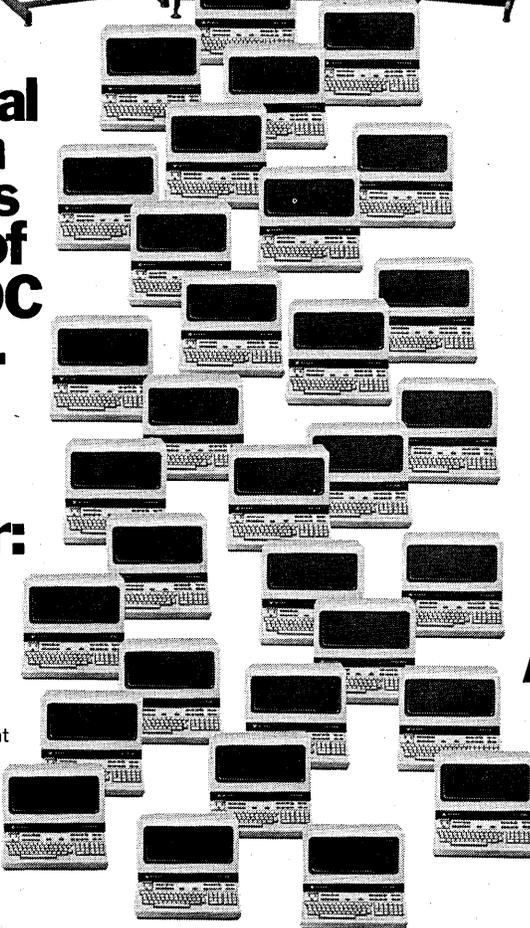
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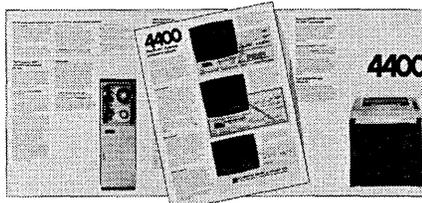
No document to study. No field to search. As the 4400 System scanner encounters a document with a non-machine readable character, the video image of that character, and *only* that character is displayed at the CRT/keystation. The operator merely keys whatever character(s) is displayed, instantly correcting and releasing the record as the document passes through the scanner. This Video Correct mode of operation prevents all but a few documents from being rejected and eliminates the costly re-entry procedures that have long plagued OCR and particularly MICR processing operations.

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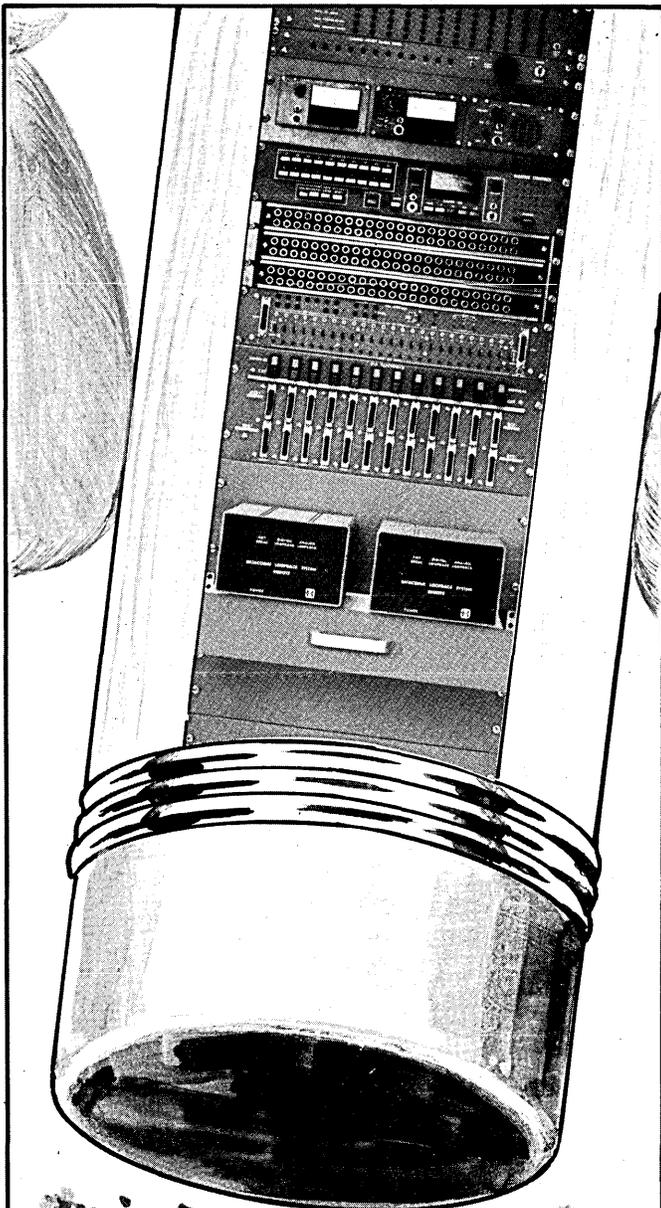
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CIRCLE 79 ON READER CARD

calendar

AUGUST

Computer Monitoring Workshop, Aug. 12-13, Provo. Brigham Young Univ. sponsors this workshop covering major aspects of computer performance measurement, including hardware and software monitors. Workshop fee is \$95. Contact: Glen McClure, Brigham Young Univ., 242 HRCB, Provo, Utah 84602, (801) 374-1211, ext. 3817.

IFAC/75, 6th Triennial World Congress, Aug. 24-30, Boston. Theme for this congress of the Int'l. Federation of Automatic Control, to be held in the U.S. for the first time, is "Control Technology in the Service of Man." Discussions will concentrate on automatic control and related computer technology, with 63 sessions, and 330 papers presented. The \$95 fee, if registered before Aug. 11, will include luncheons Aug. 25-29. Contact: Philip Meade, IFAC/75, 400 Stanwix St., Pittsburgh, Pa. 15222, (412) 281-3171.

SEPTEMBER

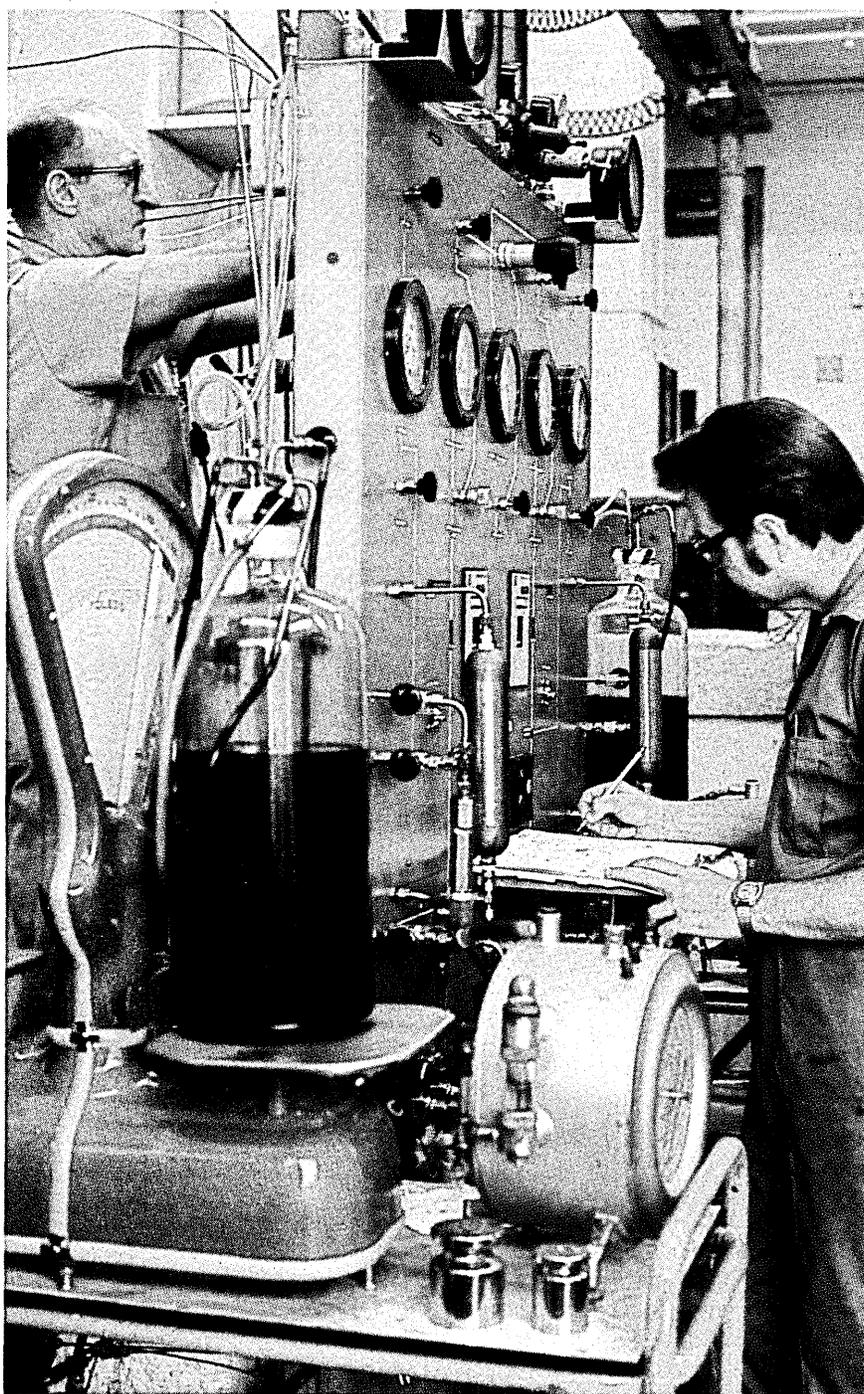
INFO 75, Sept. 8-11, New York. More than 100 sessions will accent the theory, practice and application of information systems, for both the executives who use the systems and the professionals who design and operate them. Tutorials, case studies, and panel discussions will cover manufacturing, retailing, banking, insurance, utilities, hospitals, and transportation; other sessions are on dp and minicomputers, communications, and office systems. The conference will also feature exhibits and displays of hardware, software, and services. Fees: \$120, full conference; \$45 and \$70, one or two days, respectively. An independent concurrent conference will be held at the same time by the Society for Management Information Systems, with some joint activities planned. Reciprocal discounts will be available to attendees of both conferences, and SMIS members will be admitted to the INFO 75 exposition without further charge. For information on both conferences contact: Clapp & Poliak, Inc., 245 Park Ave., New York, N.Y. 10017, (212) 661-8410.

IFIP 2nd World Conference, Sept. 1-5, Marseilles. The role of "Computers in Education" is the main topic, and discussions will cover nearly all levels, techniques, and disciplines. Major computer companies will be exhibiting. Official languages are English and French, with simultaneous translation available. Fee: approx. \$125. Conference information and charter flight plans are available from Garber Travel Svc., 1406 Beacon St., Brookline, Mass. 02146, (617) 566-2100.

COMPCON Fall '75, Sept. 9-11, Washington, D.C. Eighty papers and 26 sessions will be devoted to the theme "How To Make Computers Easy to Use." In addition to presentations on intelligent terminals, displays, problem-oriented languages, and "idiot proof" systems, dollar and performance tradeoffs will be discussed. The expected COMPCON audience of about 1,000 will include hardware and software designers and users. The conference is sponsored by IEEE Computer Society. Fees: \$50, members; \$65, nonmembers; add \$10 after Aug. 29. Prior to the conference, on Sept. 8, two all day tutorials will be offered: "Structured Programming" and "Protection of Information in Computer Systems," with member and nonmember fees of \$50 and \$65 respectively for each tutorial. On Sept. 11-12, the IEEE and National Bureau of Standards cosponsor a conference on Software Engineering (June, p. 22). Contact: COMPCON, P.O. Box 639, Silver Spring, Md. 20901. *

DP Dialogue

Notes and observations from IBM which may prove of interest to data processing professionals.



In the shale oil processing laboratory at Atlantic Richfield's Production Research Center in Plano, Texas, technicians gather data for later analysis by the System/370 Model 168 in Dallas.

Atlantic Richfield builds with MVS

The search for petroleum may occur offshore in the Gulf of Mexico... or in Alaska, one of the last frontiers of North American oil exploration. Soundings are made. Seismic graphs are plotted. Geophysicists determine if the structure can be associated with hydrocarbon deposits. After discovery, reservoir engineers estimate how much oil might be there, and decide what recovery procedures should be taken.

"Now that easy oil discovery is a thing of the past, the technology of exploration is far more complex," says Howard Woods, Jr., Manager of Data Processing for Atlantic Richfield Company's North American Producing Division in Dallas. "Our scientists, planners and administrators need to analyze a rapidly increasing wealth of data."

Last year the company decided it had outgrown its traditional OS/MVT multiprogramming operation, which was mainly batch. "We knew we had to enlarge the scope of our system," says Woods. "We not only needed virtual storage capability, but also a sophisticated data communications network."

To help reach these goals, Atlantic Richfield installed a System/370 Model 168 in June of 1974 to replace a Model 165 with OS/MVT. By November, the new computer was running totally under control of MVS (Multiple Virtual Storage).

MVS is the general term for OS/VS2 releases, starting with Release 2. As its name implies, MVS provides each individual user with several million bytes of virtual storage.

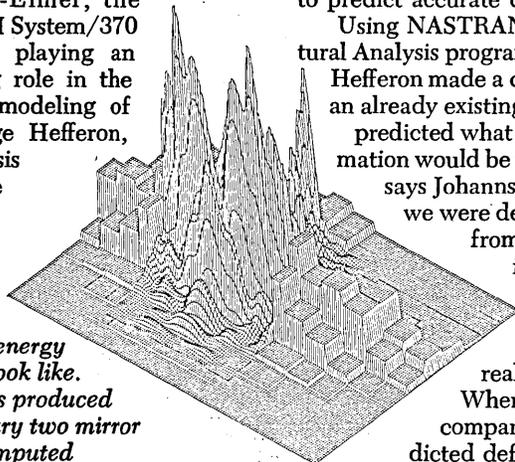
Equally important, MVS has helped improve response time for a growing number of interactive users at Atlantic Richfield. About 80 percent of the jobs are now remotely entered. "Under MVT," explains Woods, "TSO, the Time Sharing Option, was merely peripheral to the system. In MVS, TSO is

(Continued on 4th page)

A New Tool for Telescopic Mirror Designers

Predicting the stresses that a telescope mirror undergoes when it swivels about in an observatory has long been a challenge for optical designers. Today the problem of stress and the resulting deformation is more crucial than ever before in the design of mirrors for large-scale earth-orbiting telescopes. These mirrors must be able to sustain incredible structural and thermal demands. They operate under extreme space conditions, they must survive severe launch forces, yet their weight must be kept to a minimum.

At Perkin-Elmer, the company's IBM System/370 Model 158 is playing an ever-increasing role in the mathematical modeling of mirrors. George Hefferon, Systems Analysis Manager at the company's



What an uncorrected star energy system might look like. This image was produced by an elementary two mirror system and computed on an IBM System/370 Model 158.

Optical Technology Division explains: "With our new computer modeling capability we can tackle more design problems than ever before, especially in the critical area of deformation prediction."

The company has been using the computer extensively in preliminary design for optical, structural and thermal analysis. But modeling of large space telescope mirrors is a relatively new computer application.

Recently Hefferon and structural analyst Peter Johannsen set out to verify the capability of computer models to predict accurate deformation.

Using NASTRAN (a NASA Structural Analysis program) Johannsen and Hefferon made a computer model of an already existing mirror. "We then predicted what the mirror's deformation would be when under load," says Johannsen, "just as though we were designing the mirror from scratch. Using an

interferometer, we later measured the actual deformation of the real mirror."

When both results were compared, computer-predicted deformation matched actual deformation within a millionth



George Hefferon evaluates mirror optical quality. The honeycomb-like coring greatly reduces mirror weight by eliminating unnecessary glass.

of an inch. "This proved conclusively the remarkable accuracy of computer modeling," says Johannsen.

Now Perkin-Elmer is using computer models in the design of large-scale telescope mirrors. Says Hefferon, "It is no exaggeration to say the computer has become a new design tool that has expanded our whole capability."

Dating Slides of Pre-Columbian Art by Computer

When art historian Luraine Tansey received a bequest of slides depicting Pre-Columbian art a few years ago, she knew she had a difficult classification problem to solve.

"We were given documentation on the exact sites at which the original objects were found along the southern coast of Mexico. But we had no idea how to date them," explains Mrs. Tansey. "The job was enormous because the Pre-Columbian period refers to the time before the mid-15th and 16th Century Spanish conquest of the Americas. We needed some established guidelines to arrange the material chronologically and stylistically."

Mrs. Tansey and several of her students at San Jose City College in California have recently developed four computer data bases which contain information on other Pre-Columbian slides already in the college's collection. These are arranged by author, chronology, site and period. The data is coded on punched cards and entered into a System/370 Model 135.

"From various printouts, we can

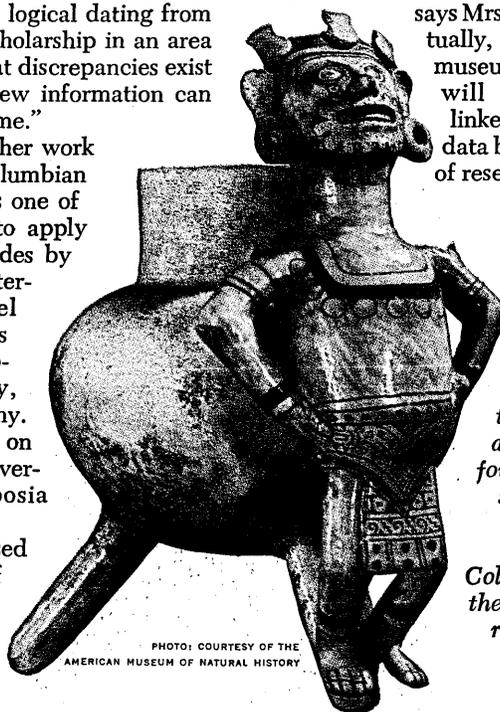
locate the slides closest in characteristic to any new slide we want to date," notes Mrs. Tansey. "Furthermore, we can establish more logical dating from a wide range of scholarship in an area and determine what discrepancies exist among authors. New information can be added at any time."

In addition to her work in dating Pre-Columbian art, Mrs. Tansey is one of the first scholars to apply classification of slides by computer on an interdisciplinary level spanning such fields as architecture, geology, archeology, medicine and botany. She has lectured on the subject at universities and symposia around the world.

"Computer-based cross-indexing of slides is the most efficient and economical means

for museums and libraries to share their knowledge and reduce the need to duplicate expensive cataloging efforts,"

says Mrs. Tansey. "Eventually, I believe, many museums and libraries will use terminals linked to a central data base for this type of research."



This Mixtec pottery vessel, with a painted figure believed to represent the god of games and feasting, was found in Oaxaca, a state of southern Mexico. It is an example of Pre-Columbian art from the Post Classic period between 900 and 1500 A.D.

PHOTO: COURTESY OF THE AMERICAN MUSEUM OF NATURAL HISTORY

"We Need a Special Report This Afternoon..."

The request is urgent. It could spell the difference between a good and bad decision. But can the necessary information be organized in time?

That's the kind of situation Lloyd Dutches, an assistant vice president in the corporate customer systems section at the Mellon Bank in Pittsburgh, must be able to respond to quickly. He recalls a request posed by the commercial loan department: "They wanted to know what effect changing the prime lending rate by 1% would have on Mellon's corporate loan customers. That meant identifying which loans were tied into the prime rate, calculating new accruals for each to reflect the new prime, and, finally, indicating how that would affect the bank's earnings."

Gathering those particular facts would have taken several weeks if traditional programming methods and languages had been used. But Lloyd Dutches was able to get the relevant information to the loan department within one day.

He did it by using the IBM Generalized Information System (GIS) to write a simple program for one of Mellon's System/370 Model 168s. GIS is a programming language written in statements similar to English. It allows the user to formulate "what if" queries with many fewer instructions than would be needed in conventional programming languages.

The simplicity of GIS is based on its powerful query language and its Data Description Tables. The query language provides many automatic functions that enable the user to manipulate or modify his data and present it in well-organized formats. Prepared by data processing professionals and accessed by GIS, the Data Description Tables contain detailed information about each file. The user merely specifies the field needed and format desired.

Using GIS, queries can be formulated under batch mode, or they can be made online through display terminals running under the Time Sharing Option (TSO) or with the data communications feature of the Information Management System (IMS).

"The commercial loan department keeps extensive data files on receivables, loan maturity dates, identification numbers of officers associated with each transaction, cash flow expectations and different kinds of collateral fields," notes Dutches. "For example, a loan officer may come to us with a general idea of the data he or she wants, but with no specific guidelines as to format. GIS gives us the flexibility to select an initial format which can be changed very quickly if the officer decides to present the material in a different way."

Other Mellon departments have also used GIS successfully. In the per-

sonnel area, for example, policies relating to profit-sharing eligibility, compliance with the Equal Employment Opportunity Act and determining comparative costs of various retirement plans have been explored with GIS.

In financial planning, Thomas Mosimann uses GIS to weigh alternatives: "Most of our work involves analyzing dynamic situations. What is critical today may not be relevant tomorrow. GIS gives us the flexibility and speed to deal with changing priorities."

Within Information Processing, GIS has been used heavily as an analysis tool. Thomas Ericsson, assistant vice president of systems programming, reports: "We are particularly pleased with GIS' versatility. It is an important component of the set of tools we use to analyze systems performance characteristics on a daily basis. Through GIS, we can access System Management Facility [SMF] data and quickly provide our management with 'snapshots' of any or all of our cpus over a specified period of time."

"Many end-users now handle their own information retrieval requests with GIS," reports Edward Williams, vice president of data processing and systems programming. "And when they do come to Information Processing for help with more complex queries, our programmers may use GIS themselves, resulting in greater productivity."



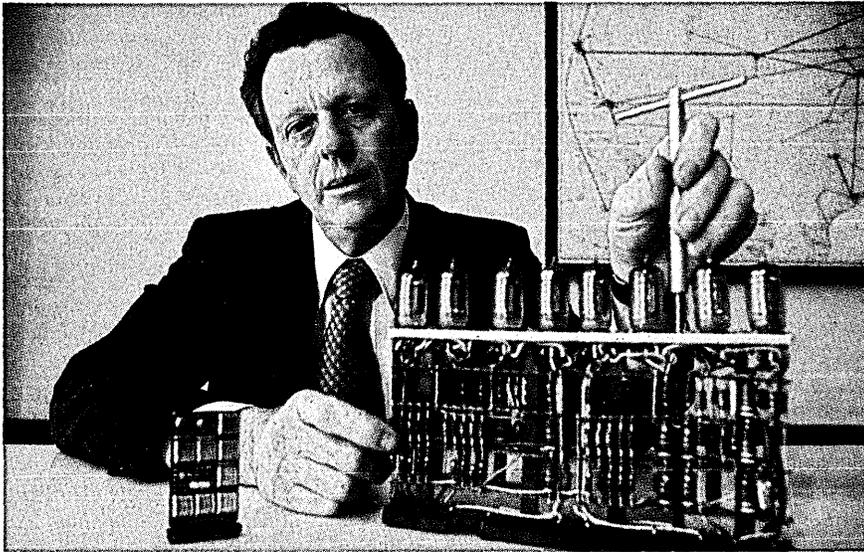
At Mellon Bank's corporate headquarters in Pittsburgh, bank managers get a big assist from the IBM Generalized Information System in the formulation of their information retrieval requests.

The way things were...

Remember 1953? The beginnings of the "Silent Generation"? General Eisenhower had recently been elected President in a landslide victory over Adlai E. Stevenson. Americans were reading Ernest Hemingway's *The Old Man and the Sea*. And teenagers in bobby-sox and saddle shoes were listening to songs like "How Much Is That Doggie in the Window?"

That spring, IBM announced its

Sometimes unique problems developed. "During the first few weeks, the tape in the drives became tangled. We worked around the clock checking all the electronics, but found nothing," relates Stringfellow, who is now manager of advanced maintenance development for the IBM Field Engineering Division. "Finally, we realized that the extremely low humidity in the desert caused the tapes to build up huge static



Bill Stringfellow explains how, through the use of a special tool, an eight-tube pluggable unit was set into a 701 computer. Alongside is an integrated circuit many times smaller, which performs comparable logic functions thousands of times faster in today's System/370.

first production computer—the 701. The new computer included features then considered to be technological breakthroughs—capabilities such as memory and stored programs.

For those who have come of age during the era of micro-electronics, the interior of the 701 would seem like a Model T Ford—thousands of vacuum tubes, which performed logic functions, and scores of cathode ray tubes which stored up to 2,000 words of information.

"Fixing that computer required constant surveillance," recalls Bill Stringfellow, the IBM field manager who supervised the installation of the first 701 at the Atomic Energy Commission's facility in Los Alamos, New Mexico. "The vacuum tubes and cathode ray tubes [CRTs] had limited life expectancies. Filaments would burn out, or the phosphorous coating on the CRTs might degrade and cause errors. You could actually see a tiny matrix on the surface of the CRTs where the electrostatic charges representing zeros or ones were stored."

charges which made them cling to the reels. A simple humidifier solved the problem."

Programming the 701 was all done in machine language. Higher-level languages like Fortran or Cobol didn't exist, and the mathematicians and physicists at Los Alamos wrote all their own programs, which required detailed instructions for every calculation.

"At first, when results weren't what they expected, I would hear, 'the computer must have made a mistake,'" recalls Dura Sweeney, then assistant group leader in theoretical physics at Los Alamos and now director of strategy development for the IBM Field Engineering Division. "But as they became used to the computer, that soon changed to 'I wonder where I goofed.'"

"We were all amazed at the 701's speed. It wouldn't seem like much today, but 14,000 calculations per second represented a real achievement then," adds Sweeney. "It meant that we could solve the complex equations of fluid dynamics faster than we had ever dreamed possible."

Atlantic Richfield...

(Continued from first page)

an integral part of the system, and terminal response times are more consistent and less impacted by other jobs being processed. We can set up a level of service and be sure it will be met. And with our enlarged online storage facilities, more interactive users can tackle more program development work."

Reliability has also been improved. Before MVS, if a control program failure occurred in the system, every program had to be started again from scratch or from its restart point. "Now," says Woods, "the system can recover from many of its own failures and normal processing can continue."

One of the company's greatest benefits to date with the virtual storage capability of MVS is in scheduling large jobs. "Formerly," says Woods, "a setup problem in a long-running program might require a complete rerun, taking several hours over several days before we could get a correct run. Today, with the virtual storage capability of MVS, we can take a subset of the data and do a ten-minute run during prime shift to validate the job parameters in an application such as reservoir modeling. Then we can run the entire job with confidence during non-prime shifts. Besides saving machine time, we save two days in turnaround time."

For the future, Woods points out that MVS will support a Multiprocessor 168 installation at Atlantic Richfield in Dallas. And with VTAM (Virtual Telecommunications Access Method) and NCP/VS (Network Control Program/Virtual Storage), MVS will serve as a base for further enhancements in remote data entry and job entry.

"Our goal," says Woods, "is to give our users in remote district and field offices, as well as our Dallas staff groups, direct access to the full virtual storage resources of our central computer at a price they can afford. MVS is instrumental in helping us do just that."

DP Dialogue appears regularly in these pages. As its name suggests, we hope DP Dialogue will be a two-way medium for DP professionals. We'd like to hear from you. Just write: Editor, DP Dialogue, IBM Data Processing Division, White Plains, N.Y. 10604.

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DATAMATION

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Standards Catalog

Close to 6,000 American National Standards, approved through Oct. 31, 1974 by ANSI, are listed in a 192-page catalog. Included also are 3,500 standards and recommendations from several international organizations. The standards deal with dimensions, ratings, terminology and symbols, test methods, and performance and safety specifications for products in a number of fields, such as information systems, electrical and electronics, materials handling, chemical, mechanical, nuclear, photography and motion pictures, etc. AMERICAN NATIONAL STANDARDS INSTITUTE, New York, N.Y.

FOR COPY CIRCLE 200 ON READER CARD

MIS and I/O

The latest in the Infotech State of the Art series are reports number 21, *Management Information Systems*, and number 22, *Input/Output*. These oversize volumes continue the standard format of extensive analysis of all the report material (for up to one-third the volume), followed by many presentations and invited papers by experts in the field. The annotated bibliography and indexes, including a cumulative index, appear to be useful.

The 661-page volume on MIS examines the scope of MIS, design strategies and criteria, management's information needs, integrations, cost/benefit, systems technology, etc. Case studies are presented and possibilities for the future discussed.

The 524-page report on I/O discusses problems related to I/O, I/O and the human interface, I/O and system performance—including operating systems, machine architecture, and mass storage. Users' experiences, advances in hardware, and the particular advantages of COM, ocr graphic displays, etc., are treated.

Each volume is \$125, or \$700 for eight reports on a subscription basis. INFOTECH INFORMATION LTD., Berkshire, England.

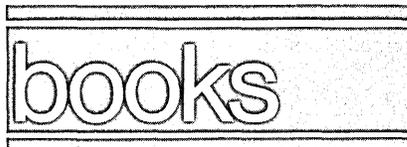
FOR DATA CIRCLE 201 ON READER CARD

Communications Processing

The *Auerbach Guide to Communications Processing Equipment* presents facts to help the user determine his needs and to acquaint him with equipment available. Three categories of devices are covered: front-end processors, remote concentrators, and message switchers. The Guide features a product class report which introduces the user to this equipment, a specification chart of 81 pieces of equipment, reports on 20 of the products, and a supplier directory. Price: \$19.95. AUERBACH PUBLISHERS INC., 121 N. Broad St., Philadelphia, Pa. 19107.

Compatible Tape Drives

Overall performance and ease of operation of IBM-compatible magnetic tape drives satisfy most users; reliability and the associated maintenance service get lower ratings. The results of a user survey are found in *All About Plug-Compatible Tape Drives*, the 21-page May supplement to *DATAPRO 70*. A total of 1,328 IBM-compatible tape drives were rated by 126 users. Prices and specifications of 72 tape drives from



An Introduction to Database Systems

by C. J. Date
Addison-Wesley, 1975
366 pp. \$14.95

This book, part of the publisher's IBM-sponsored systems programming series, presents a basic introduction to data base systems; the relational, hierarchical, and network approaches to data bases; and chapters on security and integrity. The author is frankly an exponent of Codd's relational approach, feeling that it encompasses the capabilities of the others and more certainly makes the structure of the physical data store more transparent to the user. For each of the three approaches, Date discusses the system architecture, data models, data sublanguage, and storage structures. (Data structures themselves are considered too low a level to be of concern to data base system designers.)

The book has many excellent features, and obviously much of it was produced carefully and painstakingly. The wealth of practical details in the IMS and DBTG proposal descriptions in Parts III and IV, conveys a breadth of

nine vendors are provided. Price: \$10. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075.

WEMA Directory

WEMA, "the association serving the electronics and information technology industries," has published its 1975 directory listing member firms alphabetically. Information on each company includes names of company officers, date of founding, number of employees, type of products, etc. Price: \$25. WEMA, 2600 El Camino Real, Palo Alto, Calif. 94306.

Disc Packs

Product reliability is the most important factor in selecting disc packs, according to a survey of 259 users presented in the market research report, *User Rated Brands of Disc Packs*. Price, however, is important when reliability between two brands is roughly equal; IBM, for example, rates first in reliability but eighth in price, in a comparison of the eight most popular disc packs. Quality of vendor staff, delivery time, product availability, customer engineer support, and vendor service are other factors rated in the report. Price: \$15. Marketing Research Dept., DATAMATION, 35 Mason St., Greenwich, Conn. 06830.

understanding rarely obtained from books, and are probably the best explanations available for their respective subjects. Similarly, Part II contains sufficient explanation and examples to make the relational theory more accessible and easier to appreciate. Interesting and informative discussions of security and integrity, generally thought-prodding exercises throughout, and a bibliography that is alone worth the price of the book all combine to produce a fairly impressive and positive total.

Along with these excellent features, however, the book has some flaws. The simplest and most obvious problem, ironically, is the structure and organization of the book's data. For example, distributing the bibliography throughout the chapters instead of at the end may facilitate assigning outside reading, but it makes retrieving a specific reference extremely difficult. The difficulty is compounded by the short and choppy early chapters, and by the numbers of interchapter references.

Nonbibliographic references in early chapters to information in later chapters are symptomatic of the most disappointing characteristic of the book—its lack of a firm conceptual foundation for its myriad of details. Sixteen pages of basic concepts cannot support 300 plus pages of specifics, but the

source data

insufficiency is not just in volume. The whole of Part I not only fails to provide a foundation for Parts II and following, but is itself liberally sprinkled with underdeveloped lines of reasoning. For example, a division of functions between access method and data base management system, which will almost certainly result in duplication of effort, was presented as fact, with no rationalization whatever.

The several examples of this type combine to give an impression that Part I was a hastily added afterthought, reflecting a late decision to superimpose a unifying theme of comparing relational, hierarchical, and network approaches. Compounding the problem is that nowhere are the terms hierarchical, network, and relational defined. If it is now considered good pedagogical technique to introduce a subject by means of a book that depends on outside references for definitions and basic concepts, it is still disconcerting to the ordinary reader.

—Nora Bosak

Ms. Bosak, with more than 15 years of dp experience (the last seven in data management oriented systems), helped develop System Development Corp.'s TDMS and Xerox's EDMS. She is currently engaged in research into advanced techniques for building data management systems at SDC.

BOOK BRIEFS . . .

Introduction to FORTRAN

by John B. Vinturella
Petrocelli Books, 1975
266 pp. \$7.50

FORTRAN IV For Business and General Applications

by Harice L. Seeds
Wiley & Sons, 1975
422 pp. \$8.95

FORTRAN IV

by Jehosua Friedmann, Philip Greenberg, and Alan M. Hoffberg
Wiley & Sons, 1975
452 pp. \$5.95

These recent paperbacks deal with teaching FORTRAN to the inexperienced. The FORTRAN used in the first book, *Introduction to FORTRAN*, is the American National Standards Institute version, departing from the ANSI standard only in the early chapters by using freeform input and output statements. The text is illustrated extensively with flowcharts and detailed examples, and each chapter concludes with questions and problems.

The growing use of FORTRAN in a business environment prompted publication of Mr. Seeds' book, which aims to teach the student how to write effective programs in FORTRAN. The book is designed so that the student sees results quickly and is encouraged to continue the study into more complicated for-

ats. Technical terms and concepts are explained and defined, and chapter objectives and review questions are used as study checkpoints.

FORTRAN IV, one of the Wiley Self-Teaching Guides, is reassuring at the outset with its Chapter Zero introduction to the world of data processing. What follows is a step-by-step, seemingly thorough self-study course which presents the fundamentals of USA Standard FORTRAN (which includes the BASIC FORTRAN). The remainder of the book describes advanced options and techniques for using FORTRAN in both scientific and commercial applications. Appendices, summaries within each chapter, and an index are designed for later reference.

Computers & Management for Business

by Douglas A. Colbert
Petrocelli Books, 1974
423 pp. \$13.95

In attempting to cover all of data processing—history, concepts, technology, management, security, etc.—in 400-plus pages, the author has produced a mixed bag. Rather nicely presented, in clear language with voluminous illustrations and photos, the book tells what data processing is all about and how the business student and manager can use it. Each chapter has review questions, key terms to remember, and cross references to related reading in other chapters.

On the other hand, the glossary presented is skimpy, much of the text seems overly IBM-oriented, and the old is mixed with the new without explanation (for instance, core memory is well explained, but not semiconductors, and IBM 407s are described as viable current solutions for some low-volume jobs).

Strategic Planning of Management Information Systems

by Paul Siegel
Petrocelli Books, 1975
354 pp. \$16.95

Reasoning that top business executives rather than dp technologists should be responsible for planning a company's MIS, this book offers practical guidance to management. Technical terminology is held to a minimum while useful illustrations and examples provide "how-to-do-it" help.

Learning Alternatives in U.S. Education: Where Student and Computer Meet

by Robert J. Seidel, et al.
Educational Technology Publications, Inc., Englewood Cliffs, N.J., 1975
398 pp. \$14.95

The purposes, benefits, costs, and methodology associated with computer-assisted learning materials are explored in this book which will be of primary interest to educators, curriculum designers and computer special-

ists. The authors attempt to show the promise and the pitfalls of applying computer technology to the learning environment.

Why Information Systems Fail

by Henry C. Lucas, Jr.
Columbia Univ. Press, 1975
130 pp. \$11

Believing that many information systems fail because the user is not taken into consideration, this author studied user opinion in 16 organizations to produce a "model" describing design considerations. The book will appeal most to psychological researchers.

WATFIV: FORTRAN Programming with the WATFIV Compiler

by John B. Moore
Reston Publishing Co., Reston, Va., 1975
492 pp. \$8.50 (paperback)

WATFIV (pronounced "watfour"—read IV as Roman numerals) is the second of two FORTRAN-based compilers produced at the Univ. of Waterloo. According to this book's preface, it is now in use in more than 200 educational and commercial installations, and is particularly suited for processing large numbers of small jobs. The book takes a "here's what we want to do and here's how to do it" approach to the subject, and works from the simplest form of a statement to more complex levels. An appendix for WATFIV-S extensions is included.

Assembly Language Basics

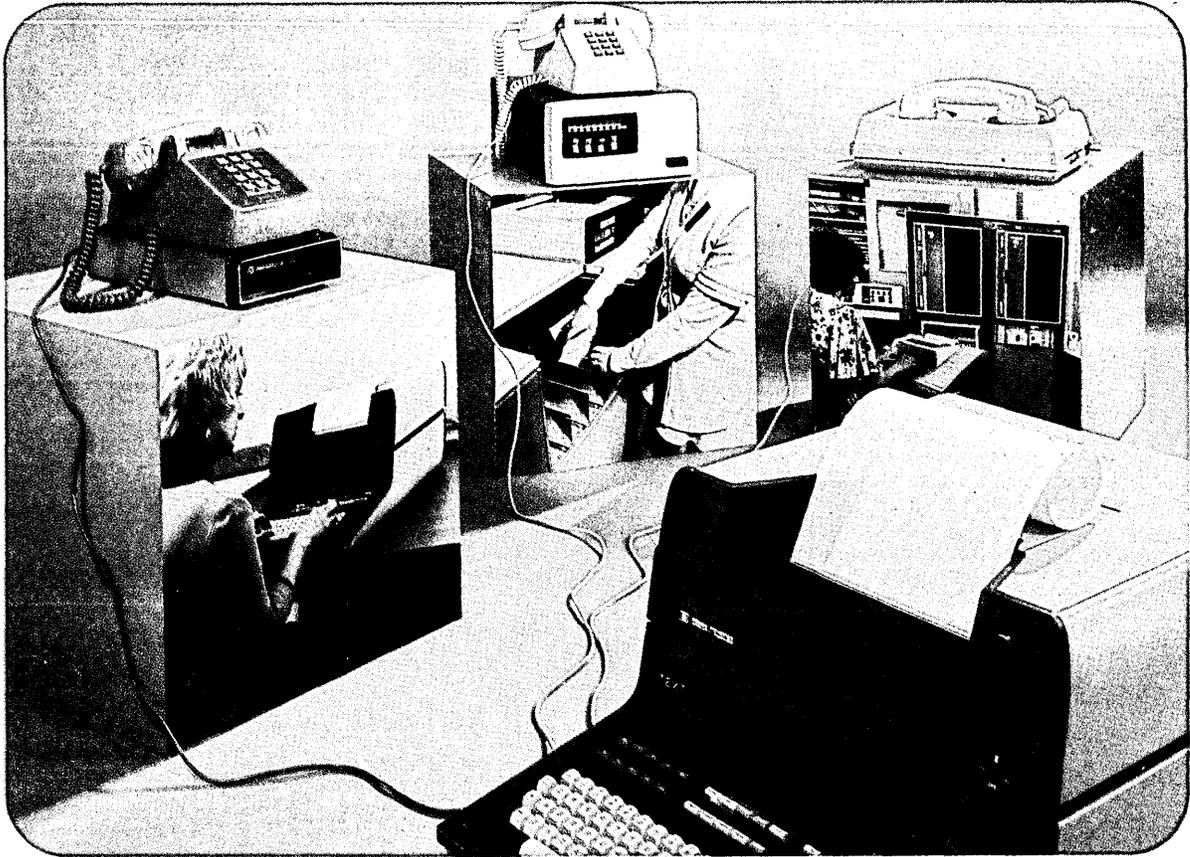
by Irving A. Dodes
Hayden Book Co., Inc., 1975
102 pp. \$6.25 (paperback)

This book's subtitle, "An Annotated Program Book," is its best description. After a very brief discussion of the purpose of the program and statements to be used, each chapter shows the IBM 370 JCL statements, source code, symbol dictionary, relocation dictionary, cross references, and system messages—each item with complete handwritten annotations explaining what it is and what it means. Fourteen programs are illustrated. An appendix defines the 99 instructions used. With this text and not much help, a novice could learn the language rather painlessly.

Computer Techniques in Environmental Science

by R. P. Ouellette, R. S. Greeley, and J. W. Overbey, II
Petrocelli Books, 1975
248 pp. \$14.95

This should be a valuable guidebook for scientists and managers concerned with pollution measurement and control (air, water, land, noise, solid waste, pesticides, radiation, etc.). Specific system descriptions and numerous examples illustrate how the computer can be used in environmental studies and monitoring procedures.



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838-D

Hello, IBM.

ADDS introduces the first truly low cost CRT terminal for the IBM user.

We've been waiting a long time to say this:

Hello, IBM!

There, we finally said it.

You see, IBM (we almost feel like we should call you "sir") Applied Digital Data Systems (that's us) now has a terminal for IBM users. Wait'll you see it.

It's called the 980A. And, it's packed with the features that helped ADDS carve a reputation in the Teletype[®] compatible market. Sharp, readable screen with upper and lower case character display. Line as well as character insert/delete. Not to mention blinking, formatting, and patented graphics.

Compatibility?

The 980A looks just like a 3270 to the telecommunications access method (BTAM, TCAM, etc.) and to such real time monitors as CICS. It can even operate on the same phone line as 3270's.

However, since your 3270's don't have blinking, lower case, graphics (or most other special 980A features, we might add), applications software developed to support the 3270 won't support our 980A. So we don't think we'll be replacing many of your 3270's.

But, the IBM user can develop new applications around the 980A. And the reason we think he should (here's where you get

nervous again) is quite simple. The 980A offers unmatched features at an extremely low cost. Namely, \$3200.00 to purchase, \$90.00* a month to lease.

And all of our units are serviced by NCR.

That's pretty much why we think if our shoe fits, the IBM user's going to wear it.

Because even though you're very, very good, IBM, there's always room for a little improvement.

Sir.

Hello, ADDS.

I may have a new application for your 980A.
Please send additional information.

Name _____

Company _____

Address _____

Zip _____

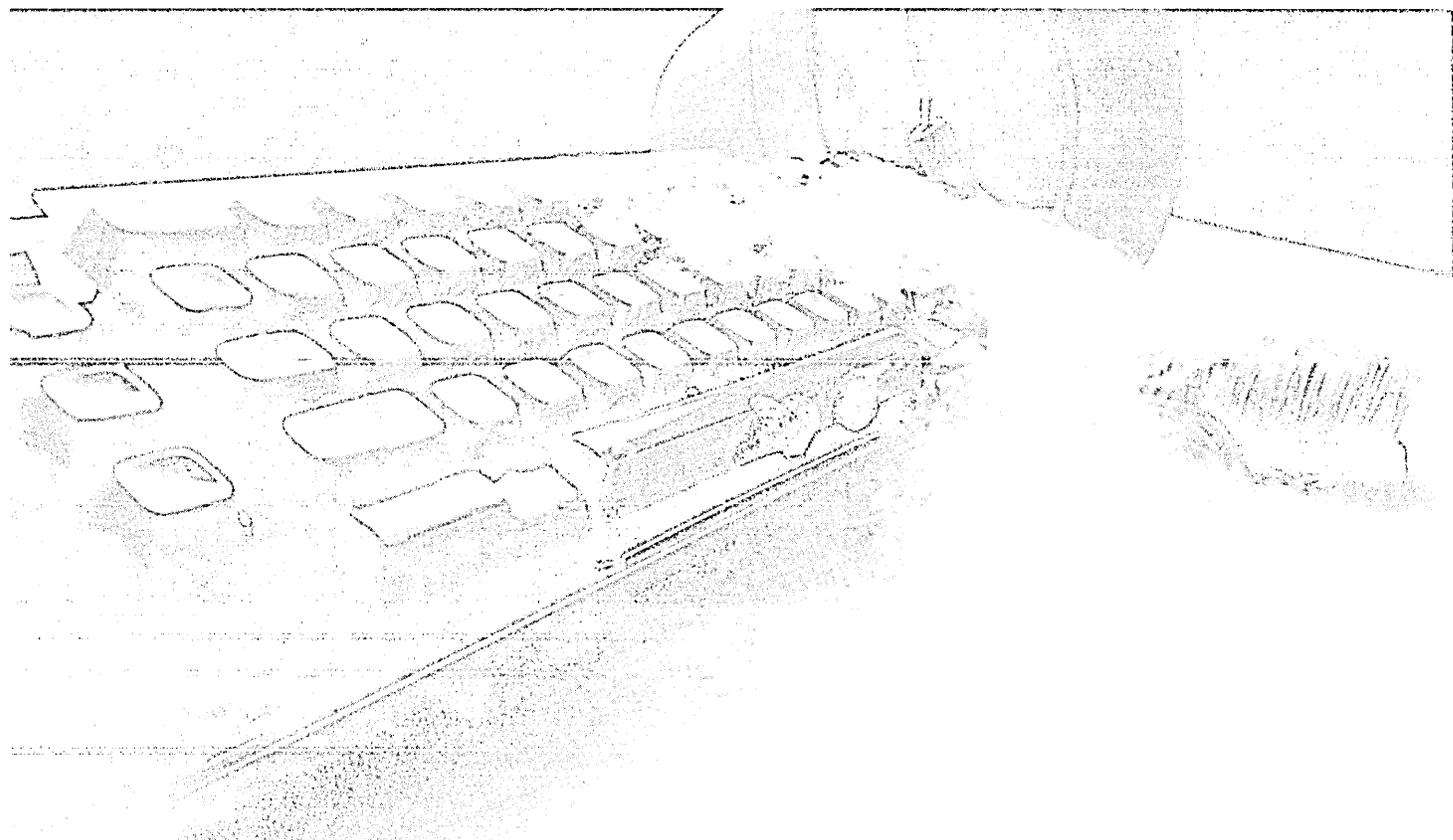
Applied Digital Data Systems Inc.
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ADDS

*3 year lease-purchase not incl. maint.

CIRCLE 11 ON READER CARD





You already have everything you need to keep your keyboards clean.

Getting any keyboard dirty is easy.

From that point on, things become more difficult. Because the contacts on mechanical keyboards are very sensitive to contamination. And, if the dirt hasn't already gotten to them, the cleaning process isn't.

MICRO SWITCH makes the cleaning process easy. All it takes is a bucket of hot, soapy water. And maybe a brush.

Because MICRO SWITCH has solid-state keyboards. Designed around ball effect chips that are completely encapsulated, they're impervious to just about any contamination you can name.

So things like dirt and coffee can't get in. And neither can a bath in hot, soapy water.

It makes your equipment maintenance a lot easier. And, in the long run, can substantially reduce service costs. Besides giving you a keyboard with all the built-in reliability of a solid-state design in the process.

If you'd like more information on MICRO SWITCH keyboards, call toll-free, 800/645-9200 (in N.Y., call 516/294-0990, collect) for the location and telephone number of your nearest MICRO SWITCH Branch Office.

You'll see a line of keyboards that work like a dream. And wash like a coffee cup.

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source data

vendor literature

Metric Conversion

A brochure, "Computer Program Package for Metric Conversion," explains the details of a computer program package which converts to and from metric and customary U. S. systems of measurement. The package includes programs written in FORTRAN, documentation, and test problems. Price: \$500 (to cover National Bureau of Standard's verification and duplication costs). INST. FOR COMPUTER SCIENCES AND TECHNOLOGY, Washington, D. C.

FOR DATA CIRCLE 202 ON READER CARD

PACE Microprocessor

An illustrated brochure describes the PACE (Processing And Control Element) single-chip, 16-bit microprocessor, which replaces complex, hard-wired device systems for sequential logic operations. The programmable microprocessor is proposed as a replacement for all but very high-speed minicomputers in large systems. The chip measures one-quarter inch on a side, and contains control logic, four working registers, a 10-word stack, and interrupt control circuitry. NATIONAL SEMICONDUCTOR CORP., Santa Clara, Calif.

FOR COPY CIRCLE 203 ON READER CARD

Plotting System

A technical bulletin describes this vendor's magnetic tape incremental plotting system, designed for high speed operation with 9-track PE 1600 bpi tape inputs. The product employs a soft controller and a 45-ips tape drive; it interfaces with this vendor's Model 2000 which plots up to 2,000 steps/second. Technical data, specifications, applications, features, and other information are provided. BROOMALL INDUSTRIES, INC., Philadelphia, Pa.

FOR COPY CIRCLE 209 ON READER CARD

Data Conversion

A 40-page illustrated handbook of this company's product line of data conversion products—modules, systems, digital panel instruments, industrial digitizing systems—is available. It presents the hardware designer with monographs, data sheets, and application notes for each of the products, as well as prices. A designer reference guide section covers design considerations such as definitions and terminology, error sources in converters, dy-

amic parameters of amplifiers, multiplexors, etc. ANALOGIC, Wakefield, Mass.

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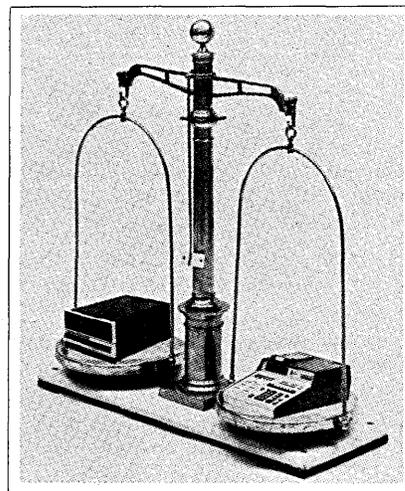
UPS

"A Computer Does Not Live by Utility Power Alone," an 18-page booklet, explains why uninterruptible power supply systems are needed in real-time computer installations. The effects of power problems and day-to-day variations in utility voltage and frequency are discussed. EXIDE POWER SYSTEMS DIV., Philadelphia, Pa.

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Calculator Catalog

A 16-page catalog presents product information and prices for the Tektronix 21 and 31 programmable calculators, and associated interfaces and peripherals. Because of the reported ease of



operation and lower price, the catalog claims the 31 calculator is replacing minicomputers. TEKTRONIX, Beaverton, Ore.

FOR COPY CIRCLE 204 ON READER CARD

Graphic Display Systems

This vendor's range of graphic display systems using digital tv techniques are described in an 8-page, illustrated brochure. [The products are either single components or "full-capability" systems.] Pictures of the equipment and typical graphic displays are represented. DATA DISC, INC., Sunnyvale, Calif.

FOR COPY CIRCLE 206 ON READER CARD

Dual Density Transports

This vendor's synchronous tape transports are described in an illustrated brochure. The 9000 series dual-density transports come in NRZI, PE or NRZI/PE formats. Available are 7- or 9-track read-after-write with 10½ inch, 8½ inch, and 7 inch reels. KENNEDY CO., Altadena, Calif.

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courses

Microcomputers

Programmed Learning Course on Microcomputers is a six volume self-learning and self-testing course on microcomputer technology. There is a seventh volume on microcomputer applications, and programming pads and simplified design aids are included. Titles of the volumes are *Binary Arithmetic, Microcomputer Architecture, The 4-Bit Microcomputer, The 8-Bit Microcomputer, Assemblers and Prototyping Systems, and 8-Bit Assemblers and Compilers*. Price: \$124.50. IASIS, INC., 770 Welch Rd., Palo Alto, Calif. 94304.

Management Self-study

A number of AMA self-study courses are listed in a catalog, including "The Management of Technological Change," "Communication for Results," "Computer Basics for Management," "The EDP Feasibility Study," "Managing the Human Element in EDP," and "Management Information Systems." There are 26 such courses listed, each requiring 20 hours of self-paced study. Price: \$55 (\$50 for AMA members), and 20% discount for five or more courses. AMERICAN MANAGEMENT ASSOCIATIONS EXTENSION INST., 135 W. 50 St., New York, N. Y. 10020.

Microcomputer Congress

Several intensive one- and three-day short courses on microcomputers will be held in Boston, Dallas, and Philadelphia during July and August. One-day courses are "A Manager-level Overview of Microprocessors, Microcomputers, and Minicomputers," "Programmable Logic Arrays," and "Microprogramming Techniques." Three-day courses are "Microprocessors and Microcomputers," "Software Development for Microcomputers," and "Microcomputer Applications Techniques." Fees, including texts, materials, lunches: \$175 for one-day courses; \$425, three-day courses (discounts offered for groups). INTEGRATED COMPUTER SYSTEMS, P. O. Box 2842, Culver City, Calif. 90230.

Teaching in Latin America

In response to requests from Latin American universities for teaching assistance in Computer Science and in Business Administration, suitable candidates (Ph.D. or MBA) are requested to apply for teaching assignments. LATIN AMERICAN TEACHING FELLOWSHIPS, Fletcher School of Law & Diplomacy, Medford, Mass. 02155. *

A UPS is your computer's best insurance policy.

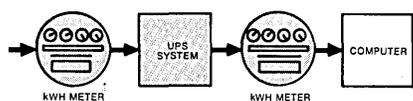
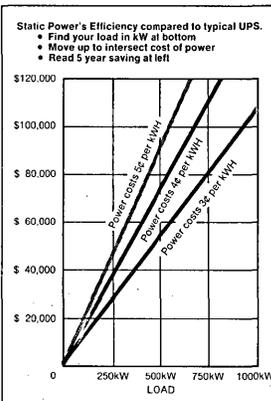
Ours pays the highest dividends.

All Uninterruptible Power Systems (UPS) provide great savings by increasing your computer's uptime and reducing output errors. Static Power's UPS also offers a number of important dividends.

1 Ours is a real meter miser

UPS systems cost about the same, initially. Ours, however, has the highest efficiency — 88%. This will save thousands in utility costs.

Calculate your savings using the chart. We measure our efficiency with kilowatt hour meters like the utilities. Specify



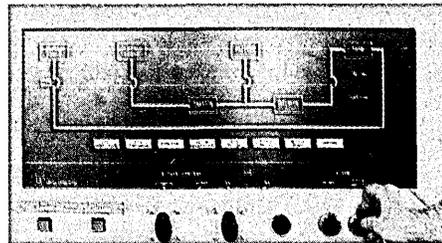
this simple, fool-proof test before you buy. Also, an efficient, cool running UPS requires less air conditioning — 11 tons less for a 500kW system. No doubt about it. Our UPS saves you more money.

2 Costs less to install

Since our input power factor is near unity we can use smaller wiring and switchgear, which materially reduces installation costs. Also, lagging power factor wastes electricity. Another important cost saving from Static Power.

3 Easy to operate and understand

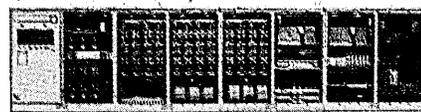
Some UPS systems are incredibly complex to operate. Ours is incredibly simple. A back lighted graphic display



continuously monitors the system. Visual alarms provide instant alert or switchover. Two simple error-proof controls operate the system. No chance of inadvertently crashing your computer.

4 Obvious high quality — inside and out

Don't buy a UPS without carefully checking the construction. People who see ours comment on the exceptional quality. We planned it that way. After all, the UPS you purchase should save you money for many, many years.



5 Around the clock service

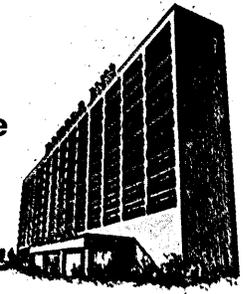
Our system seldom fails. But if it should, we'll get you back on the air fast. Our 24 hour red alert phone



assures prompt response from a skilled regional service engineer. Also, plug-in modularity makes servicing simple and fast.

6 Proven experience

Ask our customers. They include First National Bank of Arizona, Washington — Moscow Hotline, Intel, Bechtel Corp., Boeing Computer Services, New England Mutual Life, Atomic Energy Commission, Ramada Inns, Ralph M. Parsons, National Bureau of Standards, Control Data, Union Carbide, the FBI, National Cash Register... to name a few.

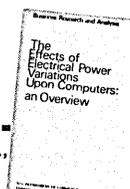


Find out how much it's costing you not to have a UPS. This Dept. of Commerce book will help.

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Advise and Consent

Summer is a-coming in and with it a fresh batch of consent decree rumors in the IBM/Justice Dept. trial. Who knows where they originate; perhaps from that much quoted pundit, "a usually reliable source."

But whatever the origin, the possibility of a consent decree cannot be ignored. And if it happens, the Tunney bill will go into effect.

The Tunney bill requires that the settlement be announced 60 days before it becomes final. Motivating this provision of the bill is the idea that persons other than those directly involved in the case should have time to review the settlement and protest if they find the terms inadequate.

It's a good law. But in this case, 60 days is not enough, particularly if the agreement is complex and occurs early in the course of the trial.

So much is at stake, and so many interests are involved, that Judge Edelstein, the presiding judge, should extend the period before the settlement becomes final.

He has the power and he even set the precedent. In a 1972 antitrust trial the judge extended the then normal 30 day waiting period to 60 days and ordered the terms of the settlement to be widely publicized.

In this present complex and far reaching trial 60 days is almost a "rush to justice." We urge a four to six month stay—enough time for all concerned to react with deliberation and thoughtfulness. *

Can Software be Certified?

What do you do when a thick report hits your desk?

I flinch. Then, unless it has (a) immediate relevance to a problem I'm working on or (b) guarantees a devastating topspin backhand in 10 easy lessons and is written by Rod Laver, I put it aside to read later. Sometimes a lot later. While cleaning off a shelf the other day I found a report titled "EDP 1978, a tentative forecast." It was written in 1968; three more years left to read it before it automatically self-destructs.

But there is a report just now coming out that deserves better. At this writing (late June) editors at the Stanford Research Institute are massaging it prior to shipment to the sponsoring agency, the National Science Foundation.

Ralph Keirstead, the senior research engineer at SRI who shepherded the two year effort, has named the report "On the Feasibility of Software Certification." "A fairly mundane title," said he.

But the insides sound far from mundane. A short summary and a packed set of appendices examine concerns far more fundamental than simply assuring the basic correctness of a program. The focus is on business data processing, the workaday arena where people ask pragmatic questions like "Can I make this algorithm work within my time and budget constraints?" or "Is this really relevant to my problems," or "Just what the hell are the specifications anyway?"

Keirstead places a great stress on the utility of the program—can the user really apply it to his problem; is it reliable, is there the right amount and quality of documentation?

Some of their work builds on efforts begun by the American Society of Mechanical Engineers in 1971. ASME's concern was to certify software used in the design and construction of boilers for nuclear reactors. They concentrated not only on the relevance and correctness of the algorithms, but the skills of the person making use of the software as well. After all, they reasoned, the penalties for error are a lot more severe than the crash of a payroll program.

But the SRI report, while not addressing the more exotic applications, treats the need for certification of payroll and billing routines, software for POS and reservation systems . . . the many routine and often humdrum places where chaos still exists.

And, in a move not calculated to endear them to the hearts of the bureaucratically-minded in Washington, SRI chose *not* to recommend the creation of a centralized bureau. Instead it recommends that the work be done by teams who exist in "pockets of interest;" in other words, certification, within the guidelines laid down in the report, should come from a jury of peers actively involved in the field addressed by the software under consideration.

We've been promised a copy of the report and we'll review it in DATAMATION. And Keirstead will circulate copies to "50 or 75 guys we know are interested"—rather like the way hand written manuscripts were distributed to a select group of literate intelligentsia during the 17th century. However, the report will be generally available through the National Technical Information Service.

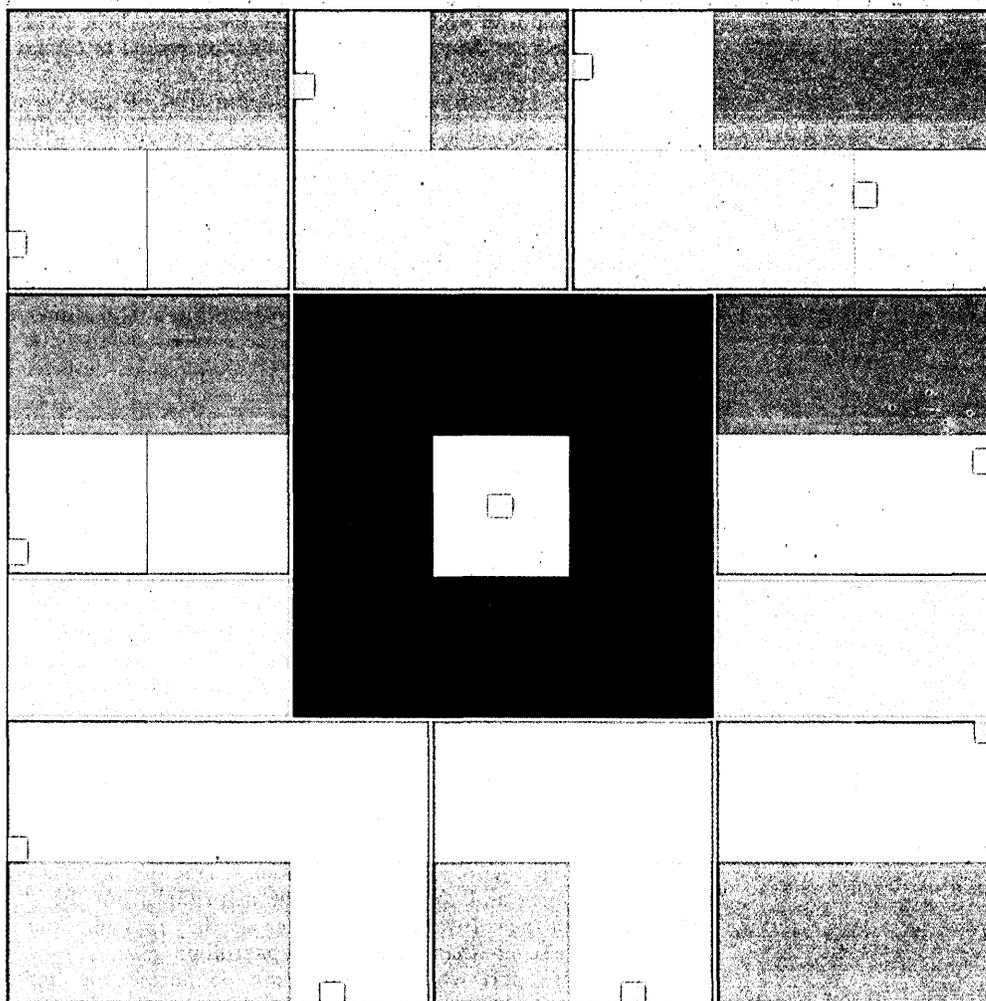
When it's published, we recommend you order a copy. And further, make sure that the key people within your own "pocket of interest"—your user group, your trade association, your company—receive and read a copy.

Software certification is an important issue; this is one thick report that should not be left to moulder in that pile of reading put aside for a rainy day. *

Cutting Time-Sharing Costs

by Glenn B. Hammer

Most firms can cut dp expenditures 10% to 20% simply by paying attention to their spending. A few tricks can help save much more.



THERE IS OFTEN A GREAT DEAL OF FAT in budgets for computer services, just as there may be in budgets for any other continuing dp operation. Almost any firm can save something in service costs just by paying attention to the problem. Some, as this case history shows, can save a great deal.

The firm in question is an electronic products manufacturer located in California. At the time it started its cost reduction program, the company was in financial difficulty, and was therefore willing to take a very hard look at its expenditures. Lest anyone be tempted to write off the effort as applicable only to ailing companies, how-

ever, the problems discovered at that firm are typical of most computer service users to some degree, and typical of in-house operations too. The same methods applied to this company have since been used to good effect on others.

In 1971, the company embarked on a two and one-half year project to reduce expenditures for outside computer services, primarily time-sharing services. By acquiring a better understanding of the expenses, converting applications to more efficient processing means, consolidating the workload with fewer vendors, converting the forms of our contracts, and some other techniques, the firm was able to save in

excess of \$1 million by the end of the project.

Many of the techniques used are simply good management procedures that everyone "knows" but often "forgets." These can be used for any kind of data processing. A few other techniques are tricks unique to time-sharing

Who knows the costs?

The primary reason for excesses in spending was found to be the limited visibility of the expenditures. Often a department or division had its own contracts with one or two of the numerous vendors supplying the company's services. In some cases the ex-

penditures were charged to an account which had nothing to do with time-sharing or even with data processing. The charges simply weren't seen by the right people.

A contributing factor was that users usually had an inadequate understanding of time-sharing costs. As a worst case example, there was an engineer doing statistical analysis of performance data who used \$10,000 of computer time but thought the service was free since it was being used off-shift.

Terminal operators, as did most users, had little idea of the costs of what they were doing. They were unable to relate the 'cpu seconds, I/O's, connect time, etc., to dollars. If there were several possible approaches to the solution of a problem, the most cost effective method was unknown.

Users might spend \$50 for services to do a task which would have taken them 15 minutes to do manually. Or do something manually that took all day but would have cost only \$20 on the computer. Summary reports are typical examples of the decisions they faced. Some summaries involve simply pulling totals off several reports and reformatting them; these may well be done best by a clerk with a typewriter. Other summaries require counts, percentage calculations, subtotalling, etc. that may take all day to do by hand but only a few minutes with the machine.

Related to the lack of understanding of costs was a lack of communication about the costs versus the benefits of the work. The people who actually ran a system, the technicians or the terminal operators, often were two or three levels of management below those who okayed the bills.

In addition, time-sharing unit costs tend to add up particularly quickly, so even a small number of billing units wasted can mean a significant dollar amount. A good example of this is in on-line storage. Most users did not realize the cost of the wasted storage, and often had only a vague idea of what files were being kept.

One user doing financial modelling had a programmer working on a new model at the time the programmer quit. The work files he created were still being stored a year later—at a cost of \$150/month.

The company assembled a small task force to attack the problems and gave it the responsibility for coordinating all time-sharing use. It was necessary to form a centralized group for this because most service users were not primarily concerned with cutting time-

sharing costs. Their primary concern was to get their job done, plot graphs, come up with the time value of money, or whatever. The learning curve on controlling costs was quite long, and it would have been counterproductive to make the users learn how to do it.

The task force, held to five persons or less through the life of the project, was charged with: administering vendor contracts, reviewing applications for new projects, reviewing vendor bills, converting work to more efficient processing means, training and educating, reviewing requests for additional service, maintaining a directory of users, providing support for programmers and analysts, and regularly changing the log-on passwords.

Reviewing

The task force reviewed all time-sharing applications at least once. A first pass was made to determine the nature of the application, the monthly expenditure, who was responsible for it, who provided technical support, and what special packages were used. A second, more detailed pass was made in which the applications were taken in order of expense.

The second pass began with a review of the requirement for timely reports. Was the requirement for fast response a regular need or an intermediate one? What part of the application needed to be on-line—input/edit? update? reporting? At this stage of the review, many file updates and weekly/monthly reports were identified which were later converted to batch or remote batch processing.

The second part of the detailed review was a cost/benefit analysis, conducted through interviews with the users, their managements, and any associated departments. The costs of alternative processing methods were considered. Could a clerk be hired to do the job at a lower cost? Could the same time constraints be met with less expensive RJE services?

In fact, in one case a clerk was hired to report on engineering changes. There were several cases where the terminal was being used to balance totals; calculators were acquired for that purpose. RJE was used, in another case, to print invoices for international customers.

In considering converting to other means of processing, payback on conversion costs was studied, too. Because of the volatile nature of time-sharing applications, a conversion must pay for itself in 10-12 months. For instance, if a user was spending \$100/month with

Vendor A for services which would have cost \$50 with Vendor B, the conversion generally was not considered worthwhile unless it cost less than \$600. As a matter of fact, most of the accounts remaining on outside time-sharing services at the end of our project represented that situation.

The final step in our detailed evaluation was a study of the application's interface requirements. Was the application linked to another which had to be on-line? Did it require a particular on-line system or package?

Terminations and conversions

The review resulted in terminations (of applications), conversions, and cleanups. First, 30-40 applications were simply terminated. Applications costing a total of \$17,000/month were cancelled or phased out over the life of the project.

Jobs costing a total of \$30,000/month were converted to batch or remote batch. Included were the job invoicing international customers, a system for accounting for leased equipment (cut from \$25,000/month to \$3,000), another doing reduction of statistical test data (converted to overnight batch), and one cross assembler for a communication controller (converted to hands-on operation during third shift, the only time the test equipment was available anyway).

In considering conversions the staff looked for monthly or weekly processing cycles, off-line printing, card or tape input, and a heavy preponderance of cost associated with data entry. Each of these indicates that on-line time may not be needed.

Cleanups

The firm realized only \$5,000/month, small compared to the total savings, on cleaning up the dozen applications which were still running on outside vendors' machines in early 1974. A rule of thumb for the cost reduction potential on cleanup activity would be 10% to 50% for any group of applications. There's no rule at all for individual applications—the range may be from 0% to 95%. Some applications were very well managed, others very sloppily. Most fell between mediocre and poor in terms of cost effectiveness.

When cleaning up an application, special attention was given to the use of on-line storage, as mentioned. The group looked for old files which hadn't been used for some time, infrequently used files, and those which should have been read in from tape, cards, or even

CUTTING COSTS

the terminal. It looked closely at the type of files being saved on-line: daily data kept for monthly reporting, monthly data kept for quarterly or yearly reporting, backup programs or files, source program copies when an object is in use or could be used, and tables used in monthly reports.

At one point all applications were reviewed for excess temporary storage only—and \$4,000/month was knocked off the bill. This is a good illustration of how savings which might not have been profitable for individual users to find can add up; only a few accounts saved more than \$50, and none saved much over \$100.

After looking at the program's basic design and its use of on-line storage, the task force hunted for excessive I/O's, unused reports, excessive calculation, or bad algorithms. For example, one application for quality control data collection and reporting searched the master file for each transaction; it was modified to read in all the transactions, sort, and process sequentially. The cost of processing a single transaction was cut from \$2 to 2 cents.

Another job costing \$4,000/month generated a box of paper per day. By interviewing the recipients it was learned that only the summary page was actually used.

Converting a forecasting program to another algorithm and another language dropped the cost per forecast from \$200 to \$7.

Program design considerations included the use of languages and packaged software. A program written in one vendor's BASIC proved 10 times more expensive than the same program in FORTRAN. Some jobs were found to be using generalized packages in heavy production when they could have been coded in FORTRAN or COBOL for greater efficiency.

Looking at the bills

After the jobs were cleaned up, other cost aspects were attacked. For instance, the company was able to negotiate contracts at a 10-20% discount from commercial rates. This required commitments on its part, typically that it accept a fixed minimum billing for six months or a year, or that it limit the number of users logged on to one vendor at any one time.

Since the firm was getting these discounts, it became necessary to reallocate the savings among eligible departments. In doing this, many errors in vendor charges were found. In fact, the refunds on billing errors and reruns often covered the salary of the project manager.

One of the most effective procedures

implemented by the task force was to require all users to change log-on passwords every month or two. This did two things. One, it allowed the task force to keep track of who the users were. If they weren't heard from by a deadline, they were given a new password. The users could not use their ID until they called in for a password.

Two, changing passwords helped the managers control their own accounts. The only person who was allowed to change the password of an ID was the manager being charged for the usage. Therefore, it was reasonably certain that those who had the password were the proper users of that ID. In several cases the manager had cancelled a project but the work was still going on.

In one case, there were several ID's whose passwords had not been changed for three years. When the passwords were changed, the bill dropped in half. It seems that over the years many people had borrowed the ID's with permission from the manager at the time, but the current manager was not aware of their continued use. Several other "borrowers" were just taking advantage of the situation.

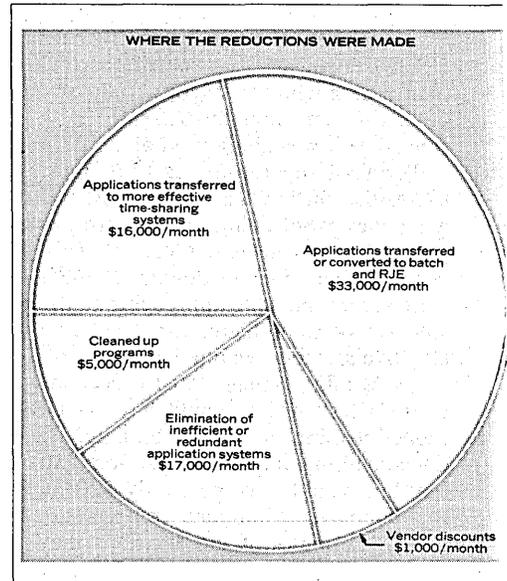
Feedback

Another key to controlling continuing expenses, in addition to the password changes, is to have an alert user community. Various feedback mechanisms were implemented to keep that user community aware of costs. An important one was a log-off message including the approximate cost of the session; the company required all vendors to supply one. The terminal user

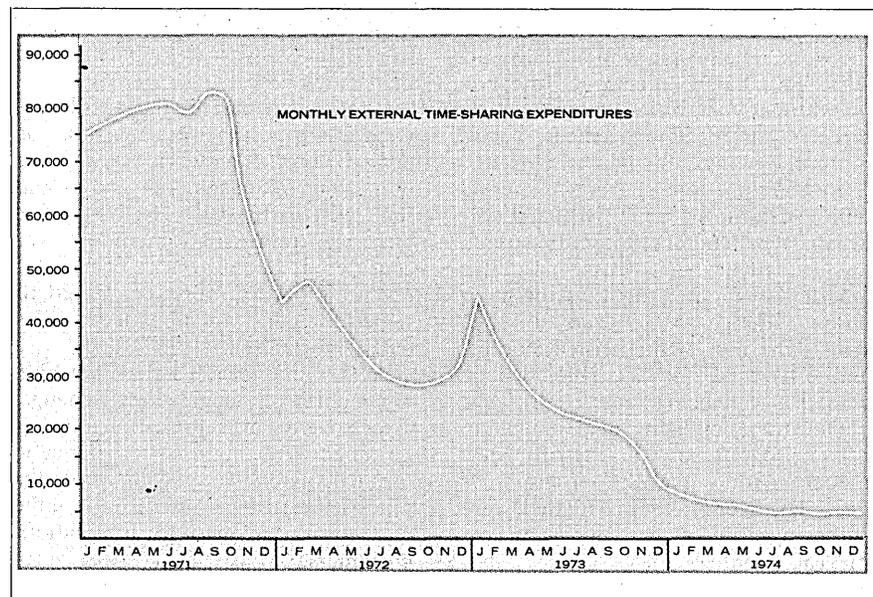
was able to see what was done and how much it cost; if there was a choice, that person could make a better judgment about what should be done manually. The bills dropped immediately when the log-off messages were implemented.

The log-offs also helped flag where costs were out of hand, and pointed out questionable programs or systems.

The second type of feedback was to the department manager, who received



By early 1974, external expenditures for time-sharing had been reduced by \$72,000. Not all of this was a direct saving, however, as some of the work was shifted in-house and some capabilities, such as rapid turnaround, were sacrificed. After the "official" conclusion of the project, costs fell even more.



During the course of the project, external time-sharing expenditures were cut over 90%. Most shops would be able to realize only part of that savings, though very likely a significant part. (The spike in early 1973 was due to a conversion, and the diversion of the attention of task force personnel. By 1974 the cost reduction techniques and feedback mechanisms were self-maintaining, and special task force attention was no longer required.)

a monthly detailed bill plus personal follow-up on problems brought to the attention of the task force.

A third feedback was a monthly project report to the executive management.

But most important, the company required all time-sharing expenditures to be placed into standardized budgets and accounts, forcing visibility and allowing management to control t-s expenditures with the rest of the operation.

Final feedback was to the task force itself, in the form of detail and summary reports of all charges—for example, the total of surcharges by packages and who used them, total storage and who used it, total connect time and who used it, etc. It was possible to spot very quickly any problems or shifts in usage which might require changes in contracts, follow-up calls, etc.

These feedback procedures made it possible for the savings to continue even after the completion of the cost reduction project. Without them the expenditures would soon have gotten out of control again.

What were the problems?

The big problem early in the project was underestimating the task. It was relatively easy to cut 10-20% off the monthly bill, but the reduction was only temporary and would come right back without good controls. In addition, though many of the solutions, like budgeting, were of the standard textbook variety, implementing textbook fixes was tougher than it looked—due to people's resistance to change, the learning or awareness curve, etc.

Of course the users did not want to be controlled by anyone, particularly if that control was coming from the central dp organization. Many users, typically engineers or technical people, had gone outside in the first place because of lack of support from—or an argument with—the central dp organization. Generally these users had a low priority for corporate dp resource allocation. They were small users, often unsure of their own requirements, who needed much hand-holding and made many changes in their processing requests. In short, they were a pain to the central dp organization.

The task force tried to follow the policy of speaking softly and carrying a big stick. It is very important to have top management backing, but much resistance was avoided by using the approach that the task force was there to help the user do a better job. The basic assumption was that the user wanted to be cost effective.

Another big problem was manpower. It was difficult to find good people for the task force who had an under-

standing of time-sharing, were good administrators, had the overall concept of costs versus benefits to the company, were systems analysts that could understand the user's problem, and finally were congenial enough to get along with some difficult people in some strange situations.

The next big area of problems was conversions. Several times users were converted from one system to another because of contract changes or cost advantages. Like most conversions these were usually difficult. Then there were the usual problems with planning, schedules, standards controls, etc. Also, the company had to settle the sticky questions of who was to pay for the cost of the conversion, not only the direct cost of programmer's and computer time, but the indirect costs of missed schedules, fouled up reports, misbillings, and so forth. These questions were settled through negotiations with vendor, user, and task force. Some of the savings earned by contract discounts were used to cover indirect costs.

Providing support to the small, low budget application was a related problem. The vendors did not want to support them, the people who wrote or designed them were often no longer with the company, and the task force did not have the manpower to support them. So there was always the question of who was to take care of them, especially in conversions.

Finally, there was the interesting problem of the task force's learning curve. As the project personnel became experts at cost reduction, they were working themselves out of the cost reduction job. They probably could have completed a second project in one-third to one-half the time, but there was no second project to turn to.

The costs

The effort cost the company about \$220,000 and 60 man-months, most of which was spent on conversions (perhaps \$100,000 for computer time and programmer time).

The second major cost was administrative overhead. A first-level manager and a technical aid were assigned for the duration of the project, at a cost of about \$70,000.

A third cost was for additional hardware needed to support the applications being brought in house. Communications gear and a dedicated disc ran \$50,000. By the end of the project, the additional hardware was costing about \$8,000/month.

A final cost that is difficult to put a value on is reduced capability. In many applications the company could not afford the luxury of the extra speed or some other capability the users were sacrificing.

The results

By the second quarter of 1974, the accumulated savings were over \$1,500,000, with a net savings of over \$1,280,000 after accounting for the \$220K in project costs.

By far the greatest reduction was realized from converting applications to batch processing. On-line work running \$33,000/month cost only \$4,000/month in batch form.

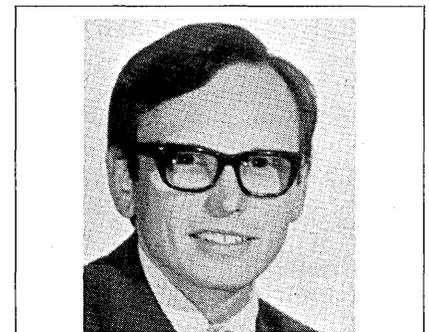
The second greatest savings contribution came from eliminating \$17,000/month of applications that could not justify the use of a computer at all; \$16,000/month more was saved by converting to less expensive time-sharing systems, mainly the in-house system; \$5,000/month more was saved from cleaning up the bad algorithms, wasted storage, etc. Finally, \$1,000/month more came from renegotiated contracts.

Overall, approximately 20 applications were converted to batch or RJE. Another 50 were eliminated and 20 converted to in-house t-s processing. In cutting back from 13 vendors' services to two, 50 applications had to be converted.

After the conclusion of the project costs continued to drop, pushing the monthly savings to about \$75,000.

The project proved that the savings can be realized by a company willing to review seriously its time-sharing applications. The problems in finding the savings are also very real; for example, one might even find himself converting the same poor user three or four times over a several year period.

There are costs associated with the savings, too, and often businessmen who would be willing to spend money to make more money are unwilling to spend money to save more money. But the savings, as the project has shown, can far outweigh both the problems and the costs. *



Mr. Hammer is a systems analyst at Optimum Systems, Inc., where he manages the custom systems department, tailoring the company's service offerings to fit specialized applications. Prior to joining Optimum, he was manager of financial and on-line systems at the firm mentioned in the article.

Changes in Computer Services

by H. A. Seidman

User's needs will cause a shift from supplying machine time to supplying tailored application offerings.

THE LINE BETWEEN computer services vendors and computer equipment vendors is beginning to blur. By 1980, most users will be buying solutions to problems instead of buying hardware and/or services. In order to deal with the rapidly increasing competition at both the high and low revenue ends of the spectrum, computer services vendors will evolve into Multi-Service Vendors (MSV's), selling solutions to users' problems. This will include, as required, the provision of hardware, software, and facilities management (FM), in addition to the traditional remote computing and batch services currently offered. To the dp user, this will mean a greater opportunity to get the most efficient and most economical solution to his problem with a minimum of comparison studies and installation and integration problems.

In addition, users will be buying more specialized services from leading edge dp users having large, in-house computer systems with remote computing capability. These dedicated information systems (DIS) users will appear in all industries, and will market specialized industry applications software, batch services, network information services (NIS), and in some cases, hardware. An example of the latter is the insurance industry, where some companies provide NIS terminals to independent insurance agents.

The concept of a user marketing specialized industry services is not a new one. Large banks have for many years provided correspondent banking services to smaller banks who did not have the resources, or the interest, to develop and install their own data processing centers.

In a fashion similar to that of the banks, DIS firms will offer general business applications to their customers, in addition to other specialized services. Thus, a small manufacturer of widgets who contracts with a major widget manufacturer for an esoteric manufacturing process control program, available only from that manufacturer, may also have inventory control, accounts receivable, accounts payable, payroll—which may be unique to that industry as a result of a

special union contract—and other general business programs and services available to him. Clearly, the questions of security and competitive risk are present, as they are in the banking industry. Nevertheless, the option will still be available.

Those DIS firms which are most serious about offering services in the commercial marketplace will also offer specialized services, and general business services, to their suppliers and customers. Thus, it will be possible for all parties concerned with some process of converting raw materials into an item sold in a department store to use a terminal to enter data and retrieve information on any relevant portion of that process. For example, many automobile dealers are connected to on-line terminal systems which enable them to locate and request a spare part from the manufacturer's warehouse or any other dealership in the country, and to report inventory status, thus automatically reordering, on the same system those smaller dp users who prefer to remain autonomous, the breadth of low cost solutions will continue to widen. Currently, the reduced cost of terminals and communications has brought NIS into effective price competition with batch services. The dp user who is spending less than \$1,000 per month for batch services will find he can get a remote batch or time-sharing NIS terminal and do the same job he is now doing at a batch service bureau without a perceptible increase in cost. By 1980, most terminals will be intelligent, user programmable, and capable of being used either on-line or in a remote batch mode.

Small business systems and minicomputers will offer the user the opportunity to do a substantial portion of his work in-house, and to connect his system to a larger, more powerful remote computer facility for long term storage, high speed printing, time consuming calculation, or specialized applications, on a pay-as-you-use basis. Service bureaus will shift to a transaction pricing structure, or fixed rate-per-hour structure. This pricing structure will eliminate one of the most popular

reasons expressed by dp users who, disenchanted with unpredictable NIS services costs, prefer to acquire in-house computing capability. Now a user with a simple minicomputer terminal like the NCR 399 or a relatively sophisticated computer like the IBM System/32 can have a base cost for hardware, plus some special services from a remote computing center, for less than \$1,000 per month.

Many of the traditional competitive issues between equipment and services vendors are being resolved via the MSV approach. In addition, the intensity of the competition is causing greater attention to be paid to the needs of the user. One of these important needs is to reduce the in-house—sometimes hidden—cost of data processing. For every dollar spent on equipment for a dp installation, roughly one more dollar is spent on personnel costs. One of the objectives of small business systems vendors and terminal suppliers is to eliminate that second dollar. Thus, in an environment where computer programmers and other dp specialists are becoming scarcer and more expensive, equipment vendors are working toward eliminating the need for such personnel in the small business environment, and reducing the need in larger systems environments. Bundled software, available with intelligent terminals, and increased commitments from service companies toward customer education, training, and installation support combine to make the user's entry into dp less treacherous.

IBM's System/32 leads another thrust into client support by providing auto-instructional programs which teach the naive computer operator how to load and run the system. Everyone's goal seems to be to decrease the labor portion of a user's dp budget. As a consequence of transferring labor into equipment, by 1980 there will be a 10% reduction in the share of dp budgets allocated for personnel, in spite of rapidly increasing salaries and decreasing hardware prices. Small business systems (SBS) users may require no dp staff and no prior dp experience whatsoever. By connecting their SBS to a telephone

line, they will be able to access all the resources of a large, well staged, industry specialized computer center.

The impact of the recession on planned dp expenditures for 1975 has been slight. The results of a dp user interview program in October 1974, indicated an average planned budget increase in 1975 of 11.7% over 1974. A new survey of the same respondents in February 1975, yielded an average budget increase of 10.3%. It appears that dp expenditures may no longer be as discretionary as they once were, and that dp is an integral part of the process of doing business.

In spite of the heavy competition from small business systems, minicomputers, and batch service bureaus at the low revenue end of the spectrum, and the withdrawal of many large DIS computer using firms and their satellite clients from the services marketplace, the computer services industry will continue to experience healthy growth during the next five years.

Table 1 shows commercially available computer revenues growing at an average annual growth rate of 14% per year, from a level of \$4.7 billion in 1974, to \$10.3 billion in 1980. Revenues from the sale of software products will show the most rapid growth, at 26% per year. Part of the incentive for this growth lies in the reduced cost and increased availability of national networks, which will enable small specialty software firms, traditionally operating on a local or regional basis, to make their programs available on a national basis.

In addition, manufacturers of minicomputers and small business systems are selectively addressing specific industries, and providing complete software product packages for those industries. The newly announced IBM System/32 is provided with software packages specifically tailored for construction and wholesale industries, small hospitals, and membership organizations. This is no panacea, however, as the programs are so highly specialized that there is little room for change, and IBM is resistant to making specific customer modifications. As a result, a new software services subindustry is developing, to provide non-standard software programs for System/32 users.

Batch services revenues will grow at the slowest rate of all data services, increasing an average of 5% per year, in current dollars. Thus, real growth will be negative. The ready availability of hardware and NIS solutions will seriously impact batch service bureaus. This expectation is clearly reflected by services vendors of all sizes, as seen in Fig. 1 which reports the results of a 1974 survey by Quantum Science

Corp. of ADAPSO (Association of Data Processing Service Organizations, Inc.) members.

As Fig. 1 shows, 1973 batch revenues represented over 80% of the revenues of respondents with less than \$800,000 in annual revenues. These firms expect to reduce their level of batch revenues by 11 to 29 percentage points by 1976. The dependency by larger firms upon batch revenues is ordinarily less than that of small firms, and is expected to be similarly reduced. By 1980, some \$300 million per year in batch service bureau revenues will have been diverted to NIS.

Within the NIS environment there is a clear shift away from traditional time-sharing toward remote batch operations. In 1974, users spent 35% of their remote computing dollars for remote batch, with the balance for on-line inquiry and conversational applications. By 1980 the situation will be dramatically reversed, with 63% of expenditures going toward remote batch.

The largest industry user of remote

batch in 1980 will be Finance and Banking, spurred on by the rapid spread of EFTS (Electronic Funds Transfer Systems) and POS (Point-of-Sale) systems. Automatic tellers, cash dispensers, and money transfer machines will be located in department stores, supermarkets, post offices, and airline and bus terminals, heralding the imminent arrival of the "cashless/checkless society." While progress toward a national, or international, integrated system may be slowed by federal regulation and concern regarding antitrust, consumer privacy, and indeed, consumer preference, local and regional systems are in operation today.

In Georgia, the Atlanta Payments Project has progressed to direct deposit and authorized bill payment systems, under the sponsorship of the Federal Reserve and a group of Atlanta banks. In Wilmington, Delaware, the Wilmington Savings Fund Society, a mutual savings bank, provides account holders with plastic cards which permit transfers, deposits, and cash with-

TYPE OF SERVICE	1974	1980	ANNUAL GROWTH
DATA SERVICES			
BATCH SERVICES	\$ 750M	\$1,025M	5%
INTERACTIVE & RJE SERVICES	894	2,409	18
*FACILITIES MANAGEMENT	458	1,071	15
SOFTWARE PRODUCTS	331	1,351	26
SOFTWARE SERVICES	473	732	8
SUBTOTAL	\$2,906M	\$6,588M	14%
SUPPORT SERVICES	\$1,830M	\$3,743M	13%
TOTAL SERVICES	\$4,736M	\$10,331M	14%

*Revenues for batch, interactive, remote batch, and software services performed under FM contract are included in respective categories. Source: Quantum Science Corp.

Table 1. The forecast for the average annual growth rate of total available computer services is 14% per year, and the market is expected to reach \$10.3 billion in 1980.

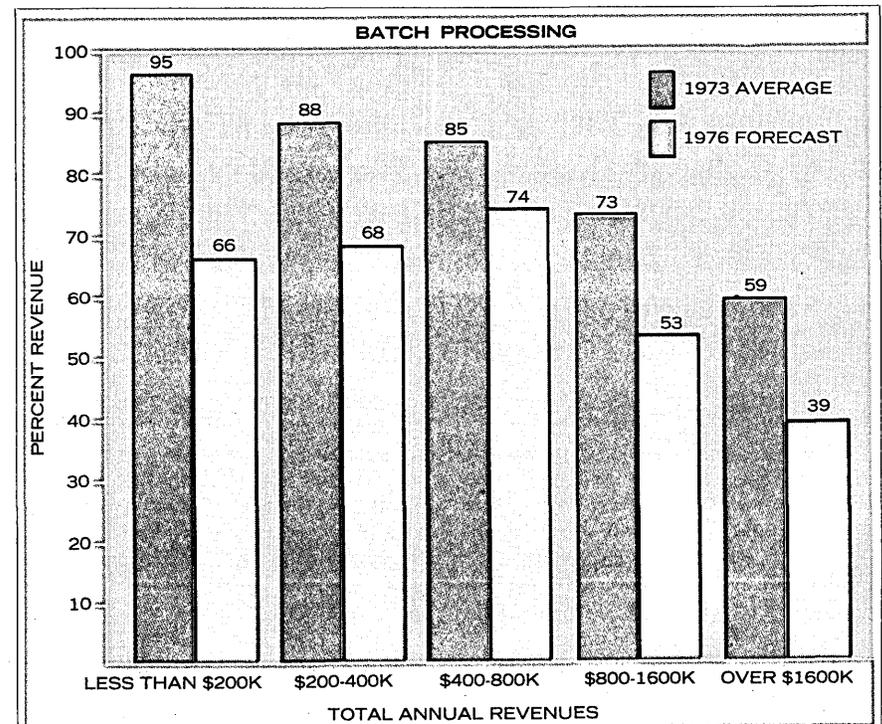
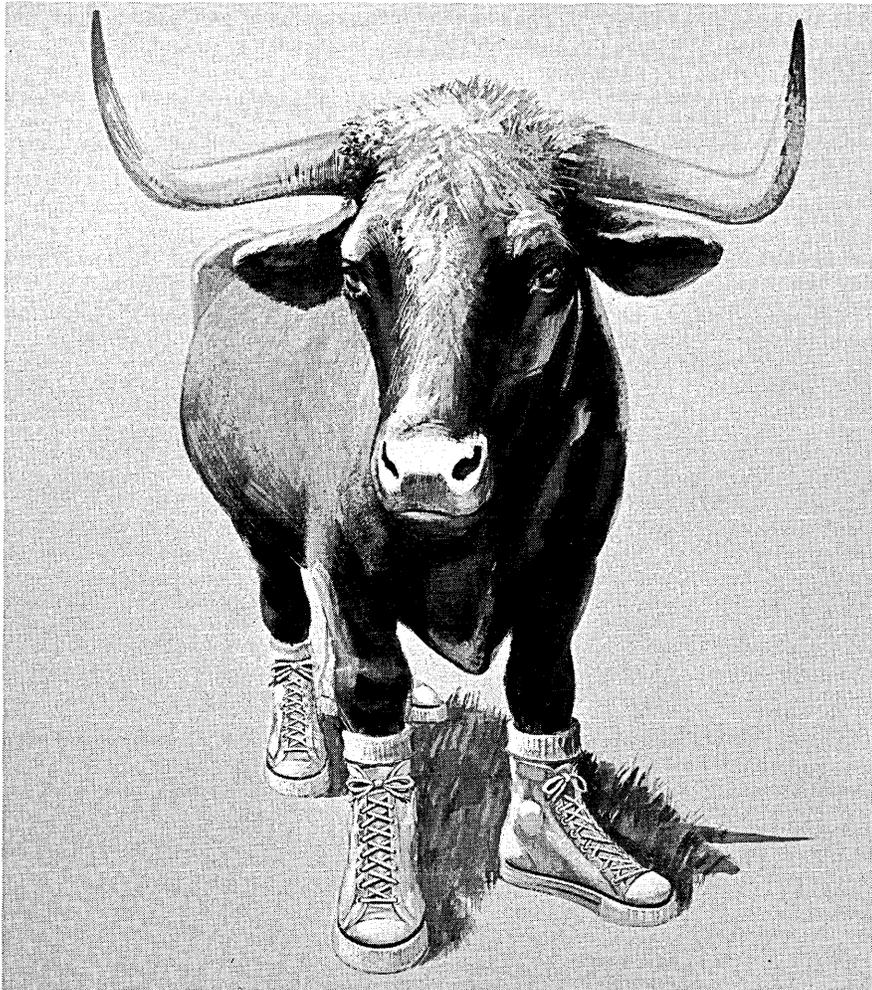


Fig. 1. ADAPSO members surveyed forecast a reduction in batch services, with a concurrent rise in Network Information Services.

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CHANGES

drawals there and at Delaware Trust Co., a commercial bank. In California, Bank of America's Business Services Div. is seeking up to 100 retailers, each with annual revenues between \$500,000 and \$2 million, to test a pos package it will initially offer in Los Angeles or San Francisco. By the end of 1977, the system is expected to be widespread in the state.

The migration from batch to remote batch is being encouraged by services vendors. In December 1974, Tymshare, Inc., a \$33 million NIS company, completed the acquisition of United Data Centers, Inc., an \$11 million group of batch service bureaus. In April 1975, Automatic Data Processing Inc. (ADP), the largest and most successful batch processing firm, specializing in payroll applications and with revenues of \$112 million in 1974, announced plans for the acquisition of Cyphernetics Corp., a \$14 million NIS firm. Thus, both NIS and batch firms, aware of the trend to remote batch, are moving rapidly to secure the market.

Overall, services vendors have certainly been experiencing a healthy, growing revenue base. Twenty-five U.S. firms, accounting for over \$1 billion in services revenues in 1973, experienced an 11% average revenue increase in 1974. Even though total dp budgets will increase this year, many users are deferring expenditures for new equipment and for system expansion until the economic outlook improves, and are continuing to use outside dp services to take care of their growing needs.

The future looks bright for those services vendors who are willing to become MSV's, and provide solutions to client problems. *



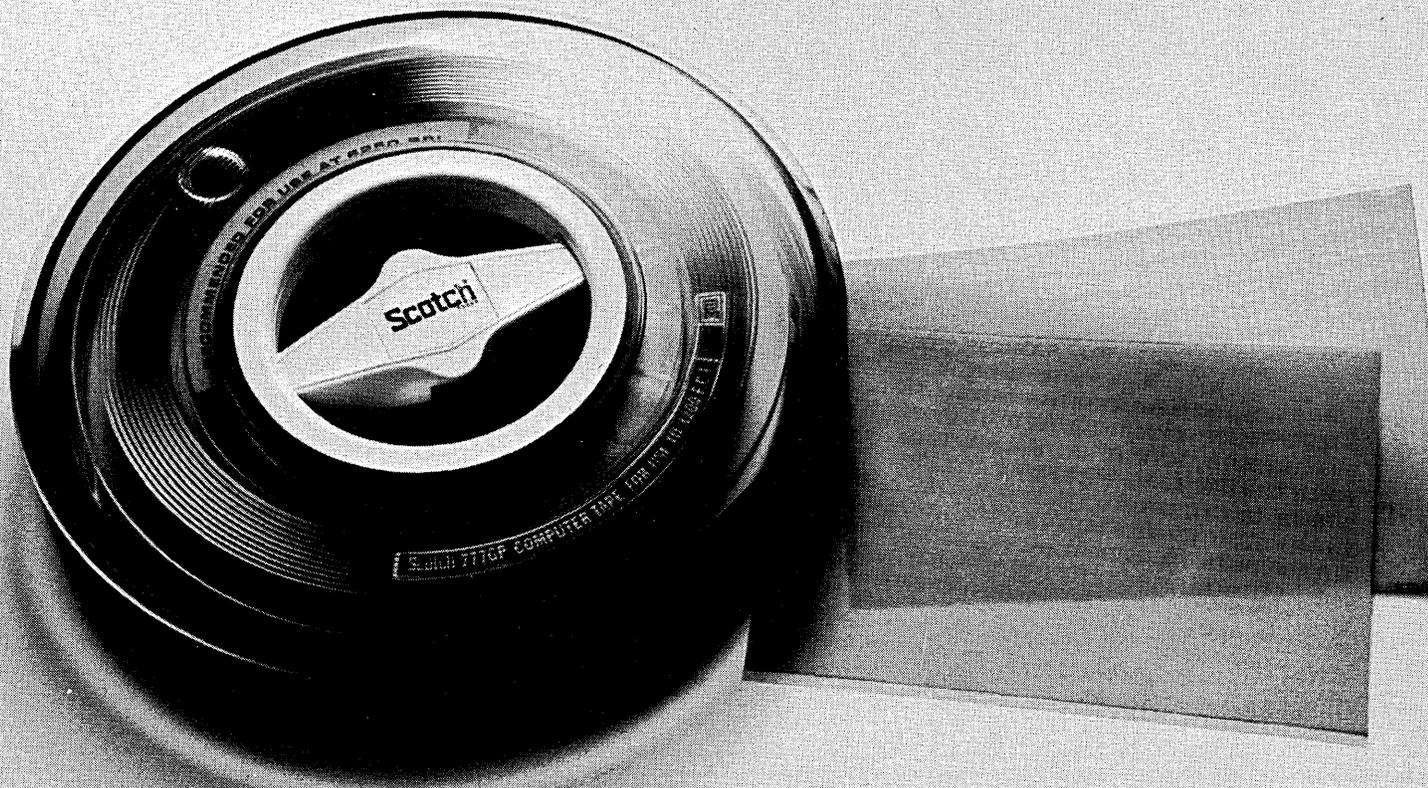
As a senior staff member of Quantum Science Corp., Mr. Seidman has recently had the responsibility of preparing the 9th Annual Report to ADAPSO on the Computer Services Industry as well as a major multi-client study on networked information services. He has also been a vice president for the Electronics Group of Rockwell International and a manager of industrial systems and products development at Philco-Ford.

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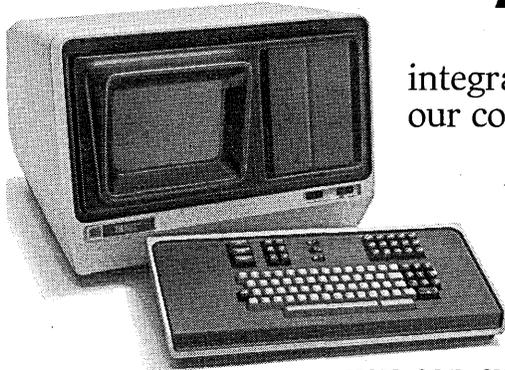
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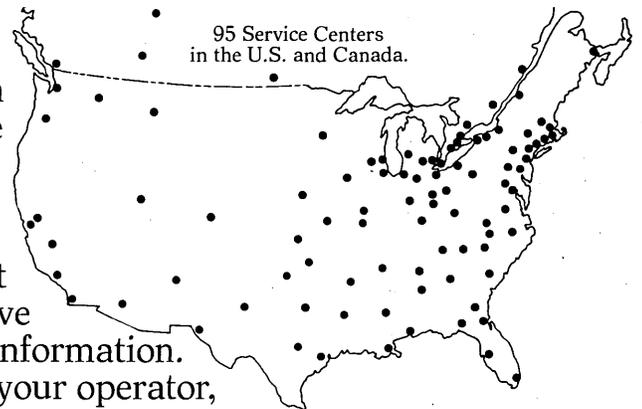
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On-Line Support for Manufacturing

by Jerome P. Rickert

For about a penny on the sales dollar, this 200 terminal system supports production and inventory control, shop floor control, order entry, shipping, accounting, and engineering.

The Allen-Bradley Company made the move from manual filing systems to a 200-terminal manufacturing oriented network in what amounts to one giant step. Five years ago the company had its payroll, accounting, and sales analysis running on an IBM 360/30, plus some engineering running on a 360/44. But none of the functions that support production and inventory control or manufacturing had been computerized.

The highest level of mechanization of manufacturing applications was for inventory, where the "control system" was composed of 17 Kardex rotary card files, 17 phones, operators, and calculators. Further, even the manual systems operated in the production departments were not always designed to help improve shop operation. For instance, the shop activity reporting, though potentially very valuable for production control, was actually oriented to financial accounting.

Company background

Today, thankfully, things are different. For background, Allen-Bradley manufactures electrical items like motor controls, resistors, potentiometers, and magnetic components, as well as some large control centers. The company currently employs 12,000 people, some 8,500 of whom are in the main Milwaukee plant. The plant itself is an eight story facility taking up several city blocks.

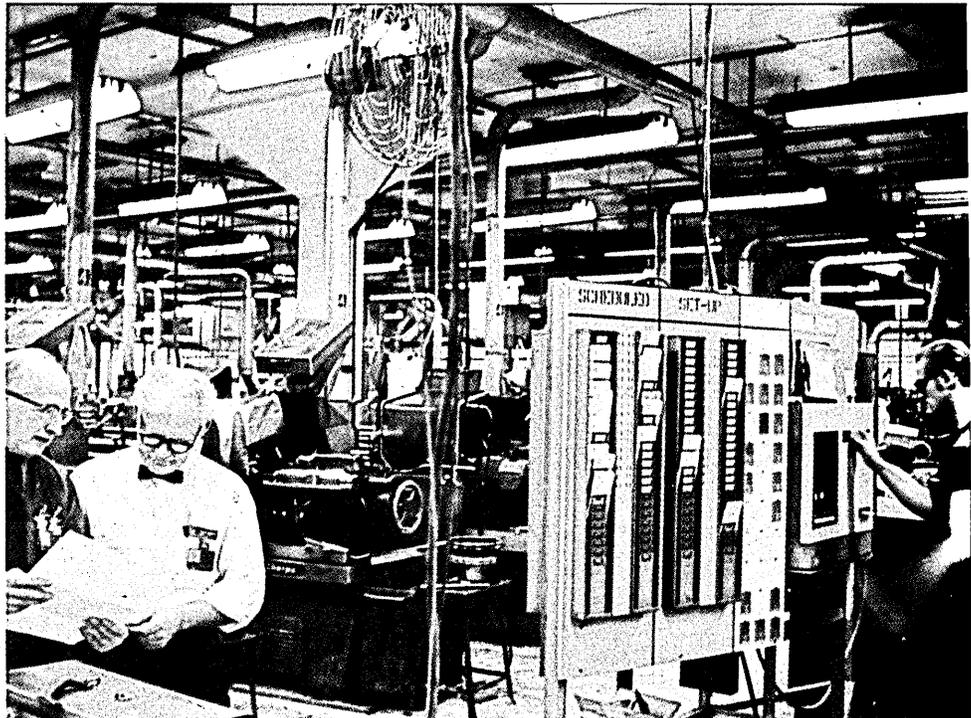
In effect, Allen-Bradley has three separate manufacturing operations going on simultaneously under the same roof. One is a parts manufacturing operation for components like stampings, shafts, or even screws. Another is an assembly line operation for building catalog items like motor starters, limit

switches, and pilot lights. The third operation is a job shop for custom items like control centers for pumping stations. The same computer system supports all three.

The current manufacturing workload supported by the terminal network runs to 1.8 million transactions per month. The hardware used includes 128 crt's, 75 other terminals, one IBM 370/155 mod II, a 370/145, 22 model 3330 discs, and a System/7 which drives remote printers and data collection terminals.

The system operates in a shared DASD environment under vs2 release 1.6. All in all, it's a pretty big jump from a card file.

That amount of hardware accounts for a good deal of money, but the firm has actually *saved* \$750,000 per year because of the transition to on-line operation. And that savings is made up of the hard kind of dollars one would show to his management, not the intangible benefits derived from better customer satisfaction or faster inventory turnover. In fact, much of it



Punched cards follow the progress of each part being assembled in Allen-Bradley's Milwaukee plant. As each major step in assembly is completed, an employee inserts the part card and his badge into a data collection unit (right), and depresses a sequence of buttons to indicate the operation completed.

comes directly from eliminating paperwork and duplicated paper handling facilities.

More, while realizing that savings over the old operation, Allen-Bradley has been able to maintain or reduce its overhead costs during a period of double-digit inflation. Dp costs have been held to one and a quarter cents per sales dollar. Something must have been done right.

The information systems and control systems installed are more revolutionary than evolutionary, but they do not represent a wrenching of old into new. The systems were designed to be used by the same people who operated the old ones; the terminal procedures were designed to be second nature to employees who may have used the old procedures for as many as 35 years.

There are six basic systems installed, some of which overlap each other and all of which interact in some way or another: a Sales Order Entry System, a Shipping Order System (which tracks the status of customer orders), a Shop Order System (which tracks the manufacturing of parts built for customer orders or for stock), a Production/Materials Control System (which includes inventory control, purchasing, etc.), a Shop Floor Control System (which tracks the work done on parts as opposed to the flow of materials), and a Financial System.

The systems employ two kinds of on-line data entry and file updating. One kind uses a conventional crt terminal, in our case the IBM 3270. The crt's are used to initiate orders, to update files on-line, and for inquiries regarding the status of orders, parts, etc.

The other form of data collection uses the IBM 2791 data collection terminal, a device with a six-digit display, a limited number of keys, a card reader for 80-col cards, and a badge reader. These terminals are used to record transactions involving physical items—materials shipped to another department, work done on a part, etc.

Sales order entry system

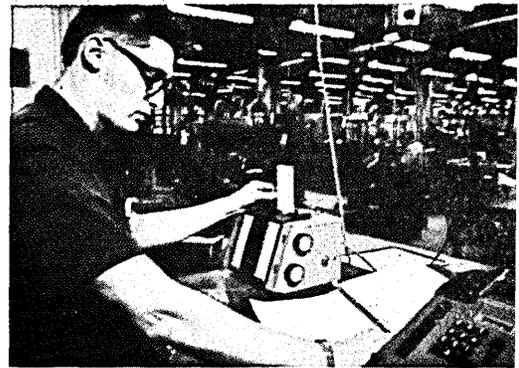
The Sales Order Entry System, for instance, uses the crt's, which may be located in the headquarters sales office, at customer locations (11 customers are tied into the network), or at one pilot field office. The Sales system checks each item in the order to determine whether it is a stock catalog item, such as a motor starter, or a standard catalog item, which has only to be assembled from stock catalog item pieces, or an engineered device such as a process control center to be made to customer specifications. Then it batches the orders for processing by other systems.

If the item is a regularly stocked device, the Sales Order Entry System

prints a shipping order which is sent to the warehouse. In the warehouse parts are pulled and transferred to the Shipping department. At the same time, the number of parts pulled, the order number, etc. are entered into the system through the 3270 so that the inventory files and order status files can be updated.

Shipping order system

In the case of an item to be assembled, an order and an 80-col card is produced by the Shipping Order System. The system determines whether the materials must be drawn from the warehouse or are already available in the assembly area, and directs the generated materials to the appropriate department. A catalog explanation sheet containing a bill of material listing and



Auxiliary card readers, called "toasters" by their users, attach to the data collection terminals, extending access to the system while keeping the costs down.



Variable length messages and inquiries are entered into the system at crt terminals such as this one in the stockroom. Such messages most often concern the flow of materials or orders rather than the status of a part being assembled.

assembly specifications accompanies each order. (Before this system was installed, these catalog explanation sheets were maintained within the specific assembly departments. Using a centralized data base allowed removing the function from the assembly areas at a savings of \$100,000 per year.)

When the order is to be worked on in a department, a transaction is reported through a 2791 data collection terminal or through one of the satellite card readers. The prepunched card accompanying the order contains all the information necessary to identify the order for a file update—the order number, catalog item number, quantity, due date, and a file access code which is an 8-digit file address. An employee using the 2791 feeds the appropriate card into the throat of the card reader, inserts his employee badge, and depresses a function key to indicate the kind of transaction to be processed, such as "job set up." Backlit displayed messages direct him, step by step, through a sequence of data

ON-LINE SUPPORT

entries. The process is repeated at each major stage in the assembly of a product.

The 2791s and their smaller, auxiliary readers, are used to enter fixed format data. Variable messages such as trouble reports or shortages are entered through the crt's, so it is not unusual to find both types of terminal side by side. When trouble messages are entered, affected production and inventory control departments are notified directly through the system.

On those orders which are for special engineered items, the computer generated orders are sent to Engineering. The engineering department enters the product specifications and any purchase requisitions into the system through a crt, and sends the printed specifications to the Production Control Department. Once the product has been detailed, the item becomes part of the normal Shipping Order System flow.

During any of an order's processing, Sales, Production Control, Inventory Control, and the various shop departments can check on its status by order number, or customer name, can check requirements by part number, or learn about the status of parts.

Production/materials control and planning system

Two functions of the materials requirements planning system are to schedule purchase requisitions for vendors and to schedule manufacturing orders for the shop. Purchase requisitions are reviewed through on-line access to decision making data such as vendor performance and lead time changes. The resulting purchase order is then initiated through the crt, printed in batch mode, and mailed to the vendor.

The system allows for a purchase order follow up and for expediting. When the materials are received from the vendor or subcontractor, the packing slip is removed from them and a manual count or weight verification is performed. The validity of the purchase order is checked through a crt and the count or weight is receipted. The Shop Order Move subsystem then generates the appropriate punched stock action cards based on whether these parts need additional work or are to go directly into stock. In either case, materials and cards are sent to receiving inspection or test areas, where inspectors indicate rework, return to vendor, or parts okayed decisions, again through data collection units and using the prepunched stock action cards.

Shop floor control system

If the parts require additional work, the Shop Floor Control System is flagged to issue a shop order, which is generated in a batch run and distributed in a manner similar to the assembly shipping order. If no additional work is required, parts are sent to the stock area and the stock action card is used as a "move ticket," the document which must always accompany the movement of material through the factory. In the stock area, the part number and quantity received are reported, through a crt.

If parts shortages exist for orders currently in process, the computer generates stock disposition cards which are used to divert the parts from stock to the department or departments with the shortage, based on the priority of the order. As priorities are filled, the movement of stock from the stock room is reported through the data collection units. All receipts into or disbursements from the stock room are also reported through the crts.

Manufacturing orders to replenish stock are issued in batch mode and then reviewed by the Inventory Control staff. Then orders are scheduled for production. At that time, the system generates requisition cards which are distributed by the Production Control department.

The material is pulled, and when ready, the transaction is recorded on the stockroom's crt, reporting the transaction and decrementing the stock record in the inventory file. The requisition card then becomes the move ticket (which is entered into the data collection unit recording movement out of the stockroom), and the material is delivered to the manufacturing area.

The manufacturing area records the receipt of the materials in the same way, using the same card.

At that time, the manufacturing staff decides the best sequence for processing the jobs and requests job tickets, another set of punched cards. The job tickets are used to report job operations, again through the data collection units. These tickets are produced in the shop office and placed in the departments job control rack just as time cards for employees might be. As various operations are performed on the parts, the job tickets are used to report the job status (through the data collection devices again) and moved to new positions on the job control rack.

Once all the processes are completed, the parts are inspected, notice of job completion is made, and the job ticket becomes the move ticket again and accompanies the parts to the next operation or area.

At the next area, the parts are counted and the move ticket becomes

the stock receipt ticket. The receipt of parts is recorded and the inventory file updated.

Overall, the Shop Floor Control System provides the following facilities: (1) on-line order status and control, (2) on-line production planning, (3) job status inquiry response, (4) production control on-line inventory status inquiry response, and (5) an environment for on-line decision making.

Where to next?

In moving so quickly from manual procedures, some aspects of the implementation were slighted. Allen-Bradley's next step will be to convert from its home-grown data base handler and home-grown teleprocessing driver to IMS. At the same time, the existing systems will be enhanced to accommodate a change in their environment, from single-plant support to multiple facilities in several divisions.

The implementation was not inexpensive. The firm assigned 30 persons to systems development for the five and a half years it took to come on-line. Well over \$75,000 was spent on education and travel alone—an expenditure which has contributed greatly to shortening the time of development, especially since the travel was to study other firms who had already made some of the steps Allen-Bradley contemplated; reinvention has been minimized.

The return on the investment has been quite high. Fifty manual files have been eliminated, and now all of the company's basic files are on-line, including 50,000 inventory records, 200,000 part master records, 800,000 product structure records, 20,000 sales order records, and 200,000 order item records. Inventory has been kept to a minimum, orders can now be found more easily, timekeeping and labor errors have been reduced. And all at a savings of \$750,000/year. *



Mr. Rickert is Allen-Bradley's manager of administrative systems. He was previously a dp project supervisor at Rexnord. A member of the board of directors of DPMA's Milwaukee chapter, his dp experience spans 13 years.

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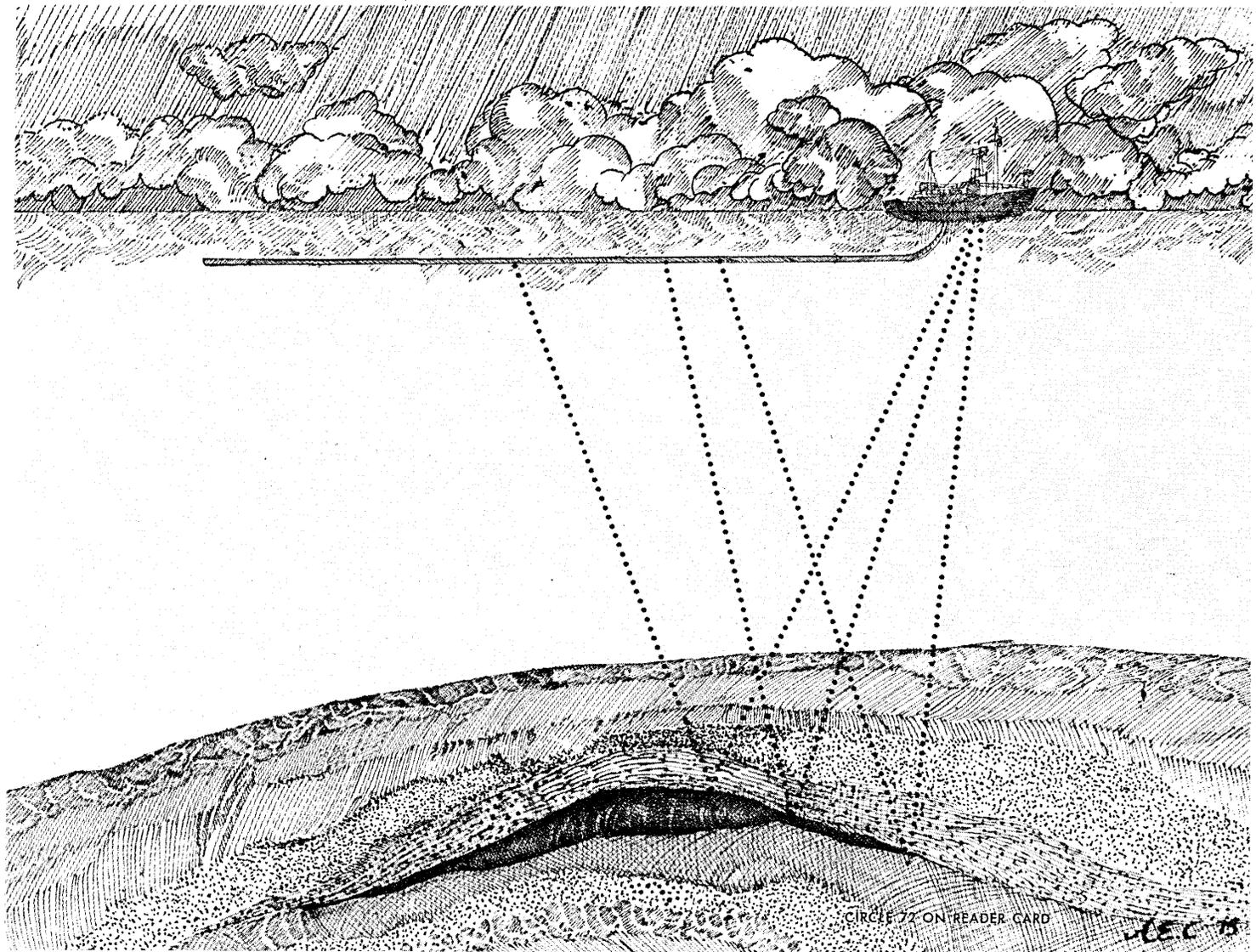
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The Real Meaning of Telex

by Milton R. Wessel, Contributing Editor

The question of relevant markets must be resolved somehow before anti-trust policy can be further developed. Was the court decision a positive step?

The day following disclosure of the Tenth Federal Court of Appeals' reversal of the Telex \$259.5 million anti-trust victory over IBM, volume of trading on the New York Stock Exchange soared to a record 32,130,000 shares and the Dow Jones industrial average jumped over 26 points. The item was featured on most television and radio broadcasts that night and was front page news the next morning. The public impact was greater than the original even larger Telex victory, although the latter was far more unusual and unanticipated.

Certainly Telex is not a large or important enough company to warrant all this attention; nor even is IBM. Moreover, sophisticated financial reporters know that corporations come and go in American history—remember the Packard Motor Car Co., once the premier automobile manufacturer? What then was so significant and encouraging (at least to Wall Street) about the *Telex* decision?

The answer requires some understanding of economic history and the relevance of the "market" concept.

Telex came at a very special point in our economic history, when government, business, and the financial community were coming to appreciate that we may be at a major point of decision as to future antitrust policy regarding burgeoning multiproduct activities. The generally favorable commercial reaction was because most people interpreted the Court's somewhat broadened definition of "market" as suggesting lessened restrictions on all multiproduct activities (although that is *not* necessarily the case), with a good possibility that a currently more conservative and business-oriented Supreme Court would ultimately sustain such an interpretation.

Although historical trends are rarely as clean-cut and precise as one would

like, World War II marked roughly the beginning of the giant multimarket vendor, the enterprise dealing in unrelated products in different lines of commerce or "markets:" the conglomerate.

Older large commercial organizations had operated to a much greater degree in single lines of endeavor, such as steel or petroleum or paper, or in closely related activities, such as "chemicals" or "communications."

These structural changes led in turn to important changes in competitive activity which are only now coming to be recognized and appreciated, and with respect to which our economic and antitrust laws have not yet developed more than the most rudimentary rules. Essentially these changes involved the *transfer* of economic power over one product, to another product in a different market, influencing the competitive balance in the second market.

Philosophy of antitrust

It is difficult to express the philosophy of our economic and antitrust laws in one sentence—perhaps impossible. But if there is one, it is to encourage competition among as large a number of separate and independent entities as possible, in the belief that such competition maximizes freedom of economic opportunity and is therefore good for its own sake, and also that competition benefits the consumer and society at large by rewarding those who improve quality and reduce cost and price.

Our early economic and antitrust laws, going back to their origins even before the 1890 Sherman Act, focused attention largely on the problems of their day. These were created by organizations operating primarily in a single market and thus with only limited

cross-marketing activities. They included such single product actions as price fixing, restrictions on resale, and boycotts. The new conglomerate, however, posed a whole different set of concerns.

Reciprocal trade practices

Related to the rise of the multimarket vendor in both time and novelty of issue, were increasing reciprocal trade practices between independent organizations in different markets—"You buy my product and I'll buy yours." Here the essential concern involves the *use* of power in one market to achieve advantage in a second, this time influencing the competitive balance in the first as well.

Here again the rules were lacking—and still are. There were, of course, exceptions, such as with respect to the "tie-in sale" between two products (in which a customer is required to purchase an unwanted product in order to obtain a desired one in short supply). But much of the latter were the typical kinds of restraint, the "tie-in," for example, often being characterized by overt coercion and other rather obvious misconduct. (Remember World War II—"You buy three bottles of my unbranded whiskey and I'll sell you one bottle of Johnny Walker Black at the ceiling price!")

It is only relatively recently that terms such as "reciprocity," "reverse reciprocity," and "tying effect" have come into our economic language. In consequence there was then, and still is today, precious little law to guide the company marketing products in different markets, or seeking to use its own market power to influence activity in a market separate from its own.

What restrictions, for example, if any, are there on the sale of paper by the paper manufacturing affiliate of a

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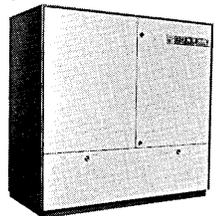
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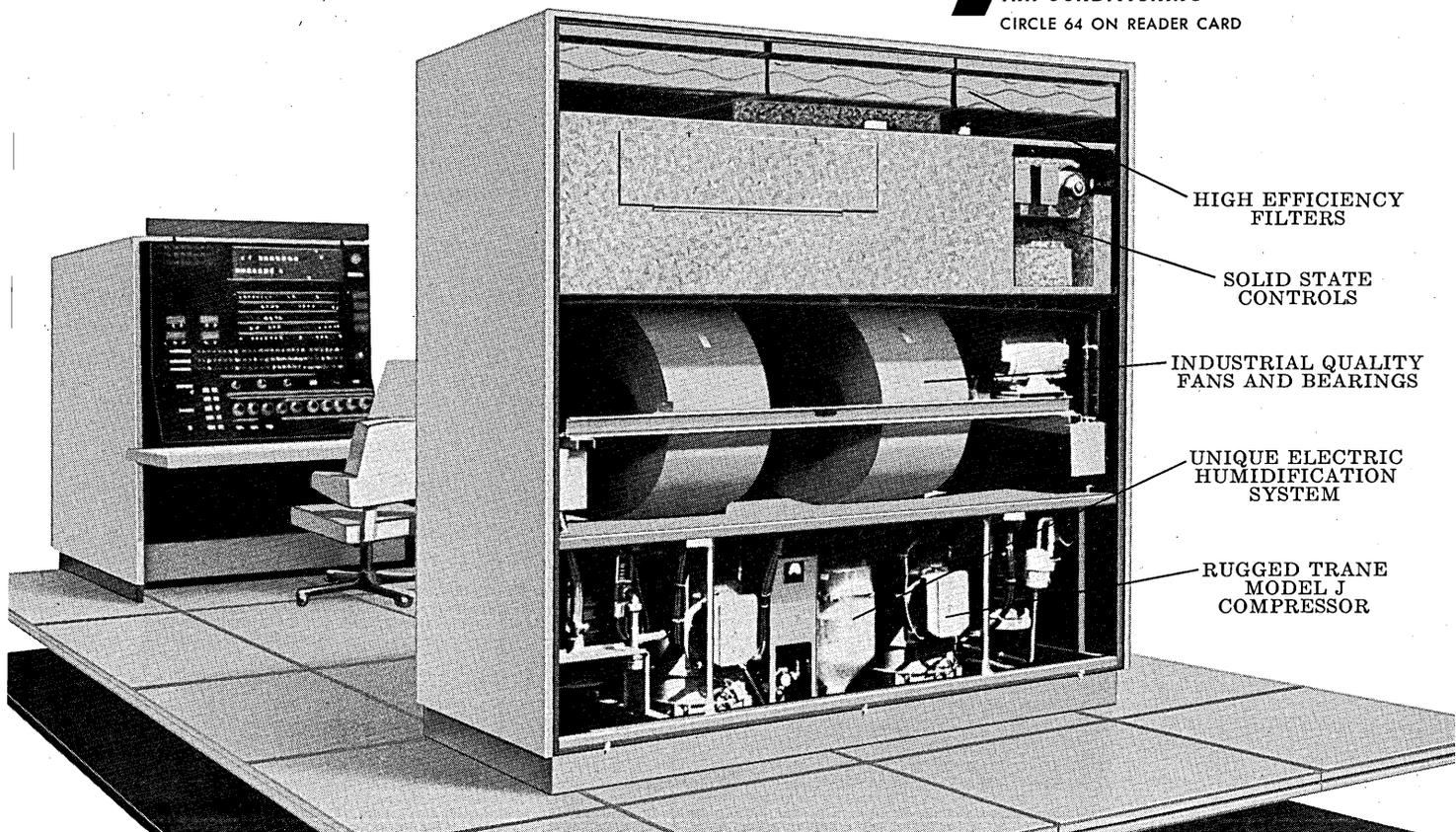


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conglomerate, to its soap manufacturing affiliate? In a period of shortage, can a scarce metal producing affiliate favor without restraint its metal fabricating affiliate over a stranger? Can an independent paper company in any way condition its purchase of soap from a soap manufacturer on the latter's purchase of paper in the same dollar amount ("reciprocity")?

When steel and oil are both in tight supply, can an independent steel company ration its steel pipe to petroleum producers which in turn will supply it with much needed oil ("reverse reciprocity")? Can a bank during a period of tight money ration its limited credit to those who give it trust business?—or dp services business ("tying effect")?

As with the unregulated conglomer-

ate, enterprises subject to government regulation similarly sought to expand beyond their historical confines, and were faced with additional issues created by regulatory statutes and commissions—can banks break out of "banking" as that term is defined by the national banking act? How far may they go in affiliating with nonbanking enterprises under the bank holding company act? To what extent will communications carriers be limited when they expand their horizons beyond the strict business of communications? The list of these issues could go on and on.

It seems clear enough that the reciprocal practice and government regulation issues discussed above involve similar questions of market definition. If the same product (here equated somewhat simplistically to "market") is involved, for example, two transactions *cannot* involve the necessary "ty-

ing" of two separate products; if an activity constitutes "banking," a restriction on "nonbanking activities" is obviously inapplicable. Although perhaps not as readily apparent, the underlying "conglomerate" issue is no different. This is because the very question of whether an entity is a "conglomerate" depends upon whether or not it is operating in multiple markets. Even separate companies joined under a holding company umbrella do not constitute a "conglomerate" if they are all operating in the same marketplace.

Underlying the conceptual legal "market" issue is the ultimate question whether economic restraints are to be placed on activities which would be entirely permissible if related to a single primary product, or market, or line of commerce. To what extent will such activities be confined, thereby limiting any "spill-over" of competitive advantage from one activity to another? Just

Telex and Computer Services

The computer services industry furnishes almost a textbook example of cross-marketing activities. It has in fact become a key arena for testing their economic impact and significance. This is because more and more companies whose principal products are in unrelated, noncomputer services lines of commerce, are marketing the "idle" or "excess" computer capability created by the in-house capacity considered necessary to handle peak loads.

Profit is possible even if the off-peak reservoir is sold at only slightly above the variable cost associated with the service rendered—termed by the industry "incremental marketing." Moreover, such companies can frequently expand over a given base quite cheaply, and are tempted to do so and market the over-capacity as well.

The computer services marketplace therefore has been an obvious and attractive target for cross-market expansion. This of course creates problems for computer services companies. Sometimes the mere threat of cross-market competition can be sufficient to discourage a budding computer services enterprise. At the inception of operations, for example, the ordinary dp services vendor has only a single product line over which to spread its fixed costs. It does not possess a ready and relatively "captive" market nor the marketing leverage resulting from the cross-market relationship to cover its break-even costs.

In certain types of offerings (such as time-sharing services), the new enterprise must recoup huge startup costs. Potentially large profits are needed to offset the inherent risks and attract capital. Obviously, these kinds of dp services operators cannot expect to meet the competition of the cross-market operator by pricing their services on an incremental cost basis.

Because of this perceived adverse competitive impact, the computer services industry—especially the Assn. of Data Processing Organizations, ADAPSO—has for some time been seeking to isolate the competition in what it considers to be its separate markets, from external market advantages. Some of its more significant efforts are the following:

Banks

- a nationwide publicity campaign, begun in 1963, against allegedly improper bank marketing of dp services
- federal litigation, under the National Banking Act, against the Comptroller and the American Bankers Assn. to prevent national banks from marketing computer services (the case went all the way to the United States Supreme Court)
- lobbying efforts in the House and Senate to enact an amended bank holding company act preventing banks from offering computer services
- participation in hearings be-

fore the Federal Reserve Board regarding the regulation of banks offering computer services

- attempts to force the Comptroller to adhere to the FRB's guidelines
- litigation in Ohio to prevent the Federal Home Loan Bank Board member banks from marketing computer services

Communications Carriers

- participation in the five year Federal Communications Commission inquiry regarding the extent to which communications carriers may market computer services
- participation in the appeal proceedings resulting from the FCC's ruling on the question
- interactions with the FCC and many state regulatory commissions in attempts to further limit the marketing of computer services by communications carriers

Tax-sheltered Organizations

- direct negotiations with tax-sheltered organizations and appeals to the Internal Revenue Service, the Dept. of Justice, and other administrative agencies to prevent universities, chambers of commerce, and other nonprofit organizations (such as Blue Cross) from unfairly using their tax advantages in the sale of computer services

Accountants

- direct negotiations with organizations representing accountants and appeals to the Federal Trade

how "clean" will each line of commerce be kept?

Defining a market

A single issue is thus common to all of the above concerns—the question of just what is the relevant "market." The possibilities run all the way from the market being defined at one extreme as the trademarked or patented product of a single producer, such as a Chevrolet Vega, to the other extreme of all products which perform a similar function from the consumer's point of view, such as transportation generally, or highway passenger transportation (including buses and taxis), or at least passenger vehicles.

These market definition problems are all around us. They are the concern in the ongoing struggle between the Federal Reserve Board of Governors and the Comptroller of the Currency as to what nontraditional banking activities banks may undertake. They are

Commission, Dept. of Justice, and the Securities Exchange Commission to stop accounting firms from unfairly using their licensed audit and certification positions to gain advantage in the sale of dp services

Conglomerates

- publication of position papers, letters to manufacturers, and attempts to obtain the assistance of Congress and administrative agencies (as well as court testimony) to prevent industrial organizations, including hardware manufacturers, from improperly using entrenched positions in their main lines of activity to compete in computer services

- assistance in litigation on the part of an ADAPSO member trying to recover damages from a distributor allegedly forcing its dealers to use its computer services

- publication of position papers, and recommendations to the Department of Justice proposing that the six-year limitation on IBM's entry into the computer services business be made permanent

Electronic Funds Transfer

- formal response to an FRB proposed regulation regarding EFTS urging a long range full inquiry into EFTS and its blurring of market lines

- publication of position papers and letters urging a moratorium on unnecessary implementation of EFTS by federal agencies prior to the publication of the findings of the EFTS Commission *

an issue in the AT&T-Western Electric relationship, now under attack in the courts. They are involved in the current spate of litigations regarding the FTC's "line-of-business" reporting requirements and similar disclosure issues being dealt with by the SEC, the IRS, and the accounting profession. They are central to the great majority of other government and private antitrust litigations pending in the courts and the administrative agencies.

The market definition problems are also at the heart of the government's case against IBM, which turns on the question of IBM's share of the relevant "market." Is the market just general purpose digital computers, where IBM's share may be high enough to constitute "monopoly" in the legal sense? Or does it extend on out to include even software, services, and certain other office equipment, all of which in some respects represent alternatives to more hardware insofar as the user is concerned? If the latter, then IBM's market share is undoubtedly far below that needed to constitute monopoly under present law.

Now perhaps the major significance of *Telex* is apparent. It was not limited to Telex Corp., or IBM, or even computer hardware, or the entire computer industry as such. Industry as a whole and the financial community, took the decision as a favorable sign to the expansion of economic horizons generally in all these many pending contested areas.

The senior *Telex* Court held that IBM plug-compatible peripheral equipment was *not* the relevant market, that the capability of other suppliers must be included, and that the market included additional peripheral equipment compatible with other manufacturer's cpu's. (The Court also dealt with many other significant matters. Most important generally is what many regard to be its conclusion that "normal" business conduct does not become unlawful simply because accompanied by monopoly power.)

Without considering all the implications, most business and financial observers generally interpreted this decision as liberalizing the rules and thereby encouraging multiproduct activities.

A step away from uncertainty

Uncertainty is a terrible problem for industry. Despite some popular misconceptions, partly foisted on the public by a small group of extremists, business people are made up of humans like you and me, trying to do what's right in a most uncertain world. Of course, they also want to do what's best for their own companies—that's our free enterprise system—but most want to live within the rules and are

visibly concerned during periods such as this one when even the general guidelines are undefined or in only the earliest stages of formation.

The fact that an experienced senior trial judge could write a 221-page opinion which, on its face at least, seemed well researched and learned, and could then be reversed by a three judge appellate court, in a 94-page *per curiam* opinion (that is one without sufficient difference of view among the judges to require identification of an author), suggests the extent of the differences of view. *Telex* is important in its contribution to the development of guidelines and rules in this difficult area.

But *Telex* is most certainly *not* the panacea so many consider it to be. For every winner there is a loser; IBM is a giant compared to Telex; but Telex is a New York Stock Exchange corporation and no midget. And the same issue is involved in other cases in which even industry giants have sought the protection of a narrow market definition.

Moreover, a broadened definition of "market" is not necessarily less restrictive to industry, even from the antitrust enforcement point of view. It does limit monopoly problems to some extent (as in the main IBM case), but at the very same time it can *increase* merger and restraint of trade concern—an acquisition of another company or a marketing restriction which might be acceptable in a separate market, can become questionable if it takes place in the same one. In antitrust, what one says and does in one forum at one time, has a way of coming back and haunting one at another time and place.

It's time to get down to fundamentals. What is the optimum solution to this issue in the interest of society at large? Freedom of the individual's competitive activity is desirable in our system, so that restrictions should be imposed only where necessary. Certainly it is also generally desirable to encourage activity where real economies of scale can be achieved, with resulting better product, lower cost, and lower price. Computer hardware used in banking should not remain idle, for example, simply because its employment in the marketing of computer services outside banking might upset a competitive equilibrium. Accordingly, limitations on growth achieved through fair competitive effort should not be lightly imposed.

Growth in a single market resulting from economies of scale or from proper aggressive competitive effort is one thing; growth gained in several different markets, however, may well be another, posing quite different issues. Activities relating to several products *can* result in the use of power once

TELEX

limited to a single product, to restrain and interfere with the previously existing freedom of competitive activity in another market without accompanying social or economic benefit.

When huge enterprises with established trade names and reputations and credit positions expand beyond the marketplace in which they have achieved that strength—presumably lawfully and properly—they may endanger the economic climate in the fashion of the elephant stepping on the ant; legal principles relating to unlawful extension of a patent and trademark monopoly are in recognition of this reality.

In addition, continued and unrestricted growth under such circumstances can result in increasing aggregations of capital also not justified by any social or economic benefit, thereby creating unnecessary barriers to the entry of others into the marketplace.

Where multimarket activities are concerned, and where there is danger of impairing free competition in one of the lines involved, there may be a benefit to be achieved in isolating "markets" to logical areas of competitive activity, measured by history, by the concerns of the producer and the con-

sumer, and by the realities of the marketplace.

Maximum separation

Expansion is certainly desirable where multiproduct activities involve true economies of scale and thereby result in lower cost and price. Otherwise expansion into unrelated markets under these circumstances should be limited by the principle of "maximum separation." That doctrine seeks to prevent the spillover of market power from one line of commerce to a second when not justified by scale or other substantial benefit of some kind, by insulating the separate activities of the multiproduct or service vendor from each other through the use of separate facilities and equipment, a different name, different personnel and the like. It would apply irrespective of whether the multimarket activity was the result of the merger or acquisition of independent entities, or achieved solely through internal growth.

A number of recent legal developments indicate that in one form or another "maximum separation" is coming of age. Of course, its precise configuration depends on the special facts of the competitive situation—what is the minimum restriction required to prevent improper spillover of power from one market to another:

Separate corporate name? Separate marketing or executive personnel? Separate geographic territory? Separate facilities? Restricted intermarket transactions or none at all?

All at one time or another have been considered and applied, in the computer industry itself beginning with the 1956 antitrust consent decree between the government and IBM, and continuing with the FCC decision in the computer/communications inquiry, the GT&E appellate court decision and the Federal Reserve Board's Regulation Y and subsequent rulings. There is at least a possibility that some application of the doctrine will ultimately be the resolution of the present government suits against IBM and AT&T.

The end brings us back to the beginning. *Telex* means that we are at a major point of reevaluation and perhaps change in our traditional economic and antitrust concepts. Whichever way it takes us can be of enormous significance, socially as well as economically. Common sense requires that industry in general as well as the computer industry continue to monitor developments, and participate as appropriate.

The broad general response to *Telex* shows that others now are beginning to appreciate the importance of the issues. However one views the particular *Telex* rulings, such understanding has long been needed. It is essential to the development of a sound and enlightened antitrust policy to deal with these new economic concerns. Viewed in this light, *Telex* can be considered a positive step toward ultimate resolution of cross-marketing issues in a manner favorable to the maintenance of effective competition in *all* parts of industry. *

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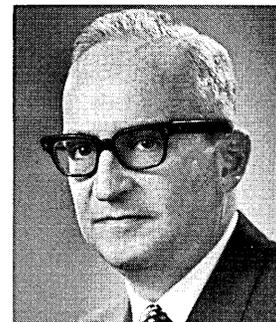
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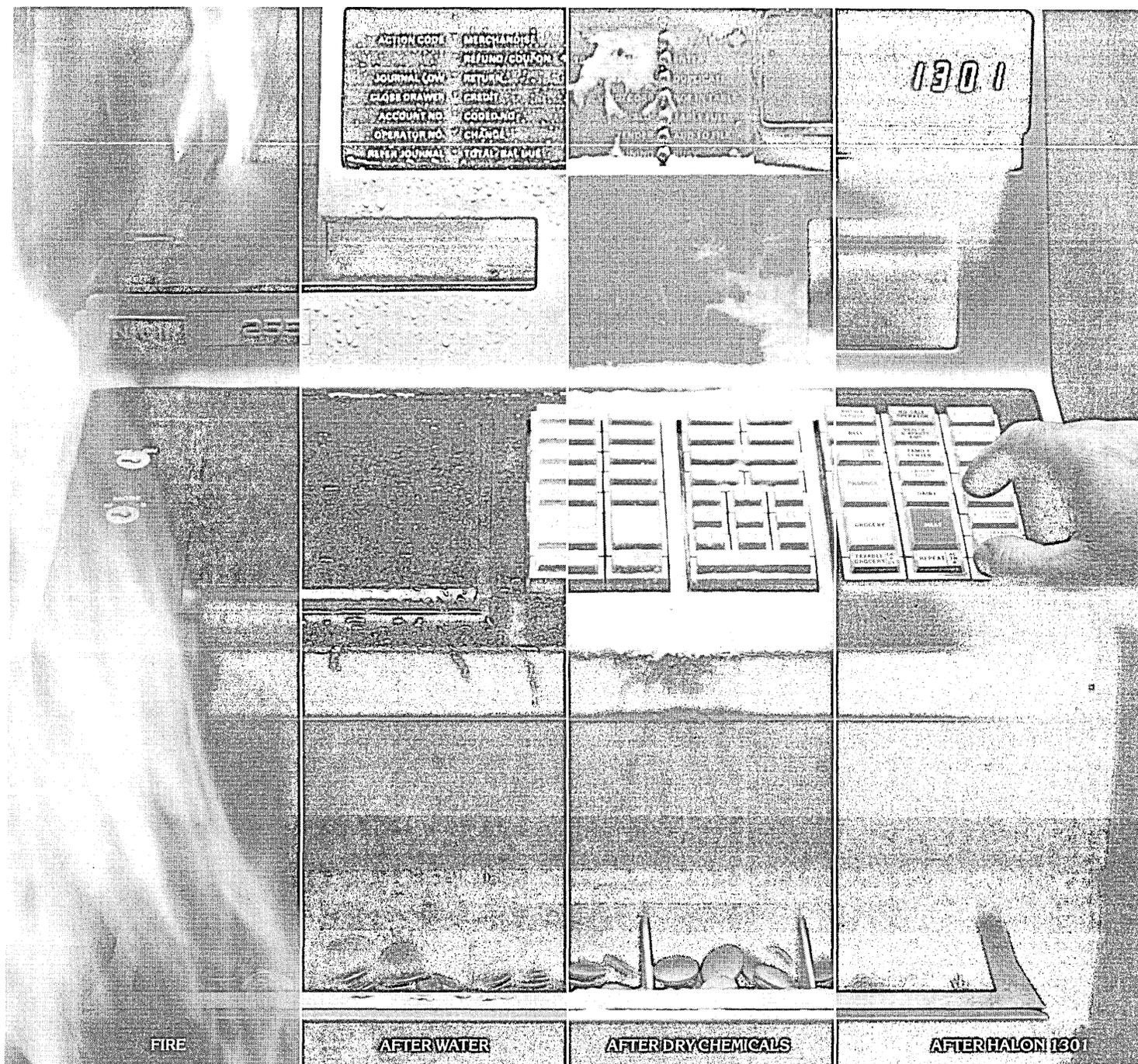
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Mr. Wessel is one of Datamation's contributing editors, an Adjunct professor of law at NYU Law School, a lecturer of law at Columbia Law School, and a respected author ("Government Regulation of the Computer Industry" and "Freedom's Edge: the Computer Threat to Society"). This article is based on remarks originally prepared for presentation to ADAPSO, which Mr. Wessel serves as legal counsel.



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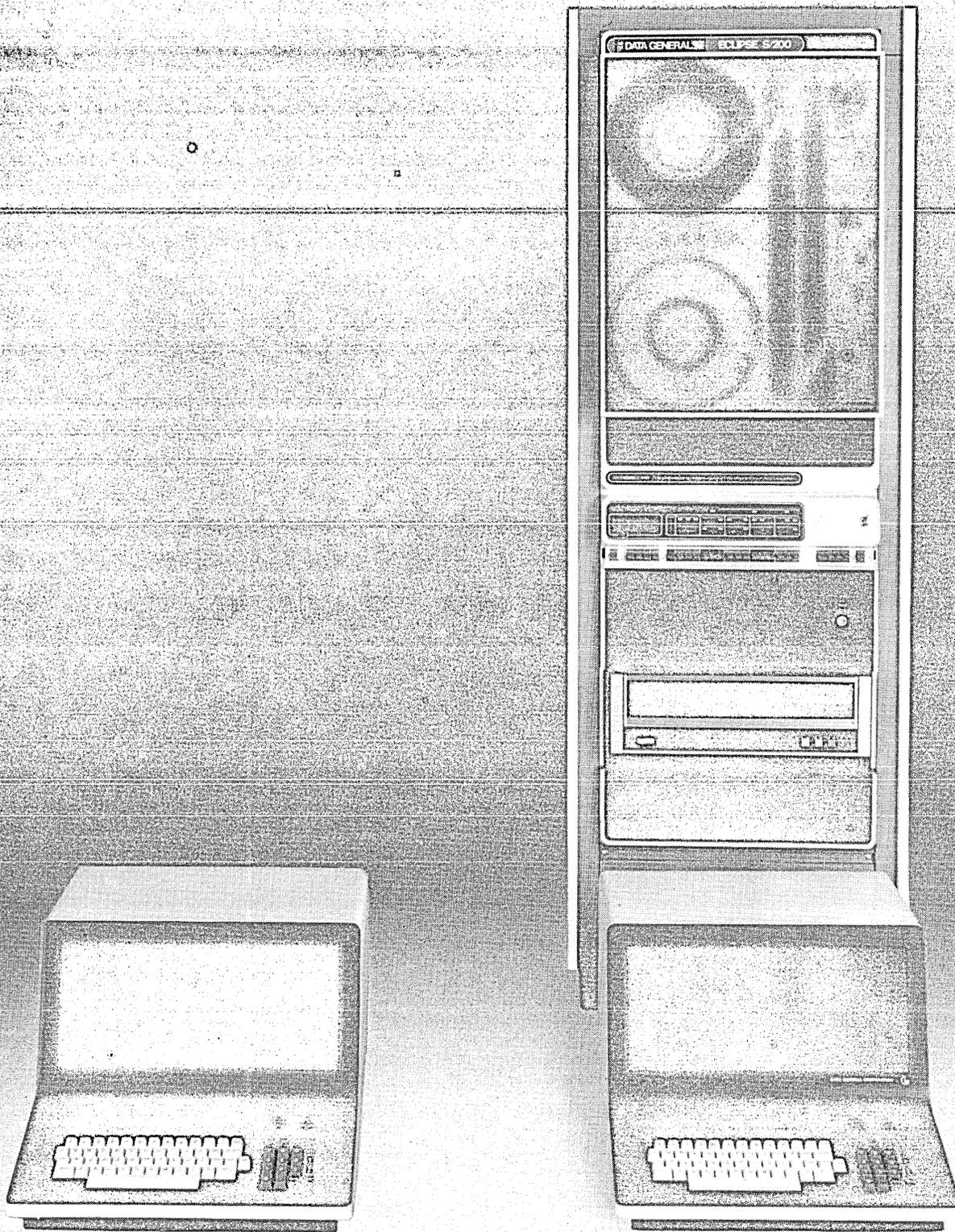
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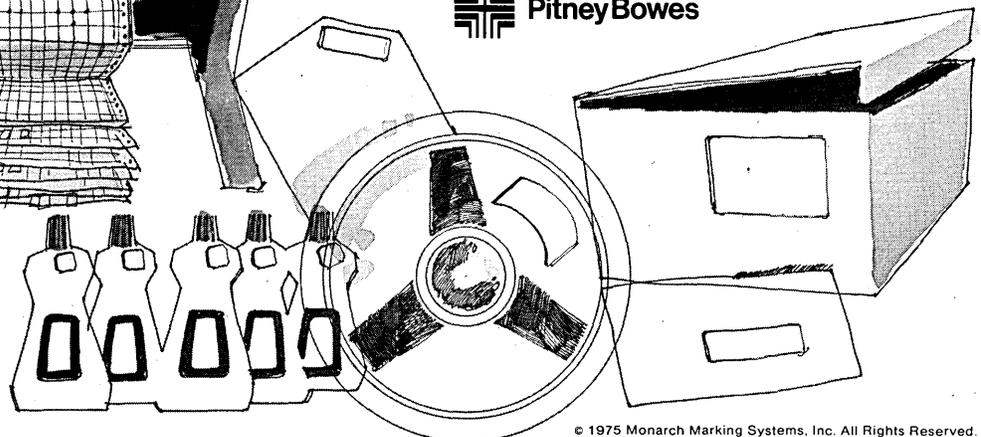
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DP People—Who Do They Think They Are?

by D. W. Croisdale

Dp professionals will increasingly turn to specialization as the "users" take more control over computer-based systems

The roles and responsibilities of dp people are unmistakably changing. After some 20 years of domination by dp people there are signs that "users" are moving into positions of influence.

The question the title poses is an important one not only for data processing professionals but for those who train and educate both dp people and "users," and for personnel managers who are concerned with their career development.

Even without the transfer of roles from dp people to "users," there are discernible and desirable changes taking place among dp people—noticeably the demise of the generalist and the emergence of the specialist.

The greatest generalist of all time is the "analyst." Although this is one of the commonest dp staff titles, it is probably the most ill-defined or least understood. The systems analyst is expected to have the fact-finding and deductive skills of a Holmes, the imaginative creative brilliance of a Le Corbusier, and the leadership qualities of a Churchill. He is expected to be able to sell a system as ably as your neighborhood computer salesman sells hardware, and if necessary, to take in his stride the management of a project.

His knowledge must embrace accounting, mathematics, sociology, ergonomics, economics, and cybernetics. His experience must encompass business, and it almost goes without saying that he must have a thorough knowledge of the particular application with which he is expected to perform miracles.

Hopefully there are signs that many organizations are recognizing that analysis is different from design, that

investigation is different from analysis, that the performance of a computer-based system is very much dependent upon the design of its "host" environment—which suggests that designing for people is at least as important as designing for computers.

Given then that dp people are on the move, where are they going? Who is filling their places? Are they heading for a promised land or into exile?

Answering these questions is not an academic exercise. Dp careers cannot be developed without signposts to the future; training schemes cannot be designed without clear definitions of tasks, roles, staff relationships, and responsibilities.

The management of the design and implementation of a computer-based system is still a high-risk venture. It ought not to be so. There is a need for increased professionalism and specialism in dp to reduce the risks involved.

Changing dp world

We already have many signposts pointing to the dp world of the next decade. Those competent to project current advanced technological developments into future operational realities lead one to conclude that the dp environment in the next decade will have the following characteristics:

- extinction of low level languages
- formalization of program design
- automatic program production
- semiformalization of computer system design
- continued presence of large centralized computer systems
- data base systems well established
- large number of free-standing minicomputer systems

- hierarchical networks
- topological networks

In these circumstances it seems reasonable to assume that success or failure in implementing computer-based systems will be determined as much by sociological and organizational considerations as by technical computing considerations. In the coming decade the resolution of the conflict between centralization and decentralization will become more difficult if only because the freedom of choice of supporting computer systems is widening. But there are sociological factors to take into account. What price security in an age of urban unrest and violence?

Clearly the choice of organizational structure and associated hardware/software system architecture is not something one leaves to an "analyst." It invokes decision-making at the highest levels of management. What roles should managers at these levels play in the design, development, and implementation of computer-based systems? How should they be trained and educated? Can career paths be defined?

Many questions have been posed to which some answers must be sought. The systems model which best suits the purpose of this exercise is a simple one, a small circle at the center of a considerably larger one.

The small circle is the computer system. This is the system of hardware and software associated with a processor or combination of processors. It is the system seen and experienced by data processing specialists.

The larger circle is the host system. This encompasses the computer system and in a conceptual sense is superior to it in that it is the host system which

DP PEOPLE

should define the characteristics of the computer system. (The converse often occurs on many of today's systems!) The host system is the system seen and experienced by:

- providers of data to the computer system

Project stage	Primary	Secondary
Preliminary study	user	dp staff
Detailed investigation and analysis	user	dp staff
System design	equal	
Procurement of hardware	dp staff	user
Implementation:		
• creation of systems	equal	
• system testing	user	dp staff
• turnover	user	dp staff
Maintenance and review	user	

Table 1.

- recipients of information from the computer system
- managers and staff outside the computer system who have a responsibility for, or an interest in, total system performance, efficiency, cost, security, etc.

Collectively these three groups of people are commonly referred to as "users," or sometimes "end users." The term "host system" emphasizes the

proper relationship that should exist between the two systems in the model. It also avoids confusion with another meaning of "users," namely the collection of organizations which buy or rent computer equipment from hardware manufacturers.

Assumptions about people

Some assumptions must be made

about dp people: an increasing number of employers will recognize that vocational and professional dp qualifications are desirable goals for dp people. An increasing number of dp people will recognize that these qualifications enhance their value in the job market.

The rising cost of software (application and system) relative to hardware suggests that increasing attention will be paid to methodologies and tech-

niques which reduce the overall cost.

The growth of large dedicated systems implies that more host system people will be involved in the design, development, and implementation of computer-based systems.

Both networks and free-standing mini-systems will have a big impact on organizations.

These assumptions, plus other factors, lead to the conclusion that there will be increasing specialization in dp skills and increasing participation by host system people in systems design.

The problem which therefore faces us is to decide who does what in the various stages associated with the development of a computer-based system. In the past 10 to 15 years, many organizations have managed to "muddle through" without really facing up to the problem. They often succeeded—particularly where the scale of operations was small, or where there was, in fact, specialization and participation by host-system people (although this was not formally recognized).

Specialization

There appears to be little arguable about the following list of specialties which are grouped for convenience into three classes: management, systems, and software.

Management

- project management
- computer operations management
- communication system management
- data base administration
- information management

Systems

- systems analysis (host system and computer system)
- systems design (host system and computer system)

Software (design and production)

- system software
- application software
- communications software
- data base management software

Analysis and design ought to be clearly recognized as separate specialties. Information management will be accepted as a management specialty when an organization recognizes information as a valuable asset in its own right.

Where should a particular specialty reside—host system or computer system? As a generalization the following allocation is suggested:

Host system

- project management
- data base administration
- information management
- systems analysis (host system)
- systems design (host system)

Computer system

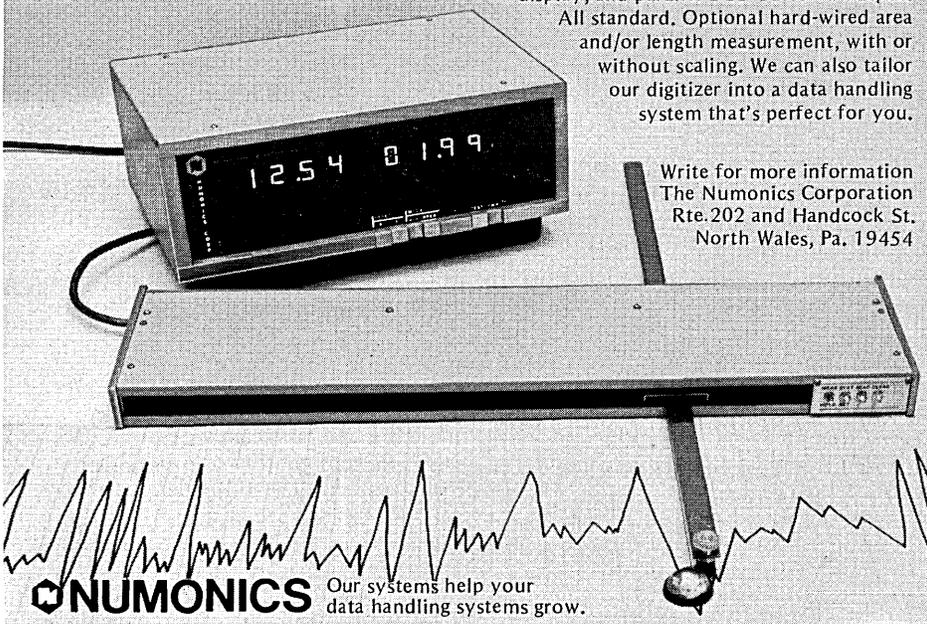
- computer operations management
- communication systems management

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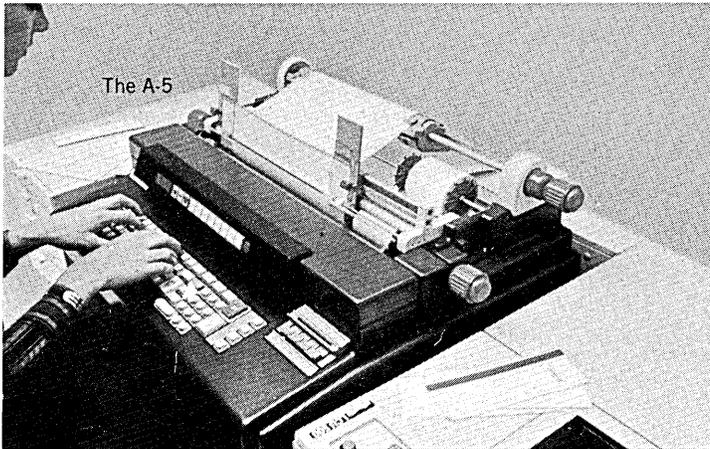
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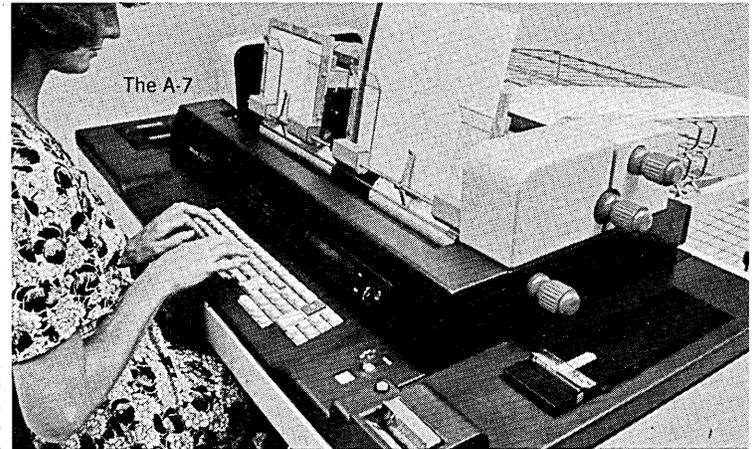
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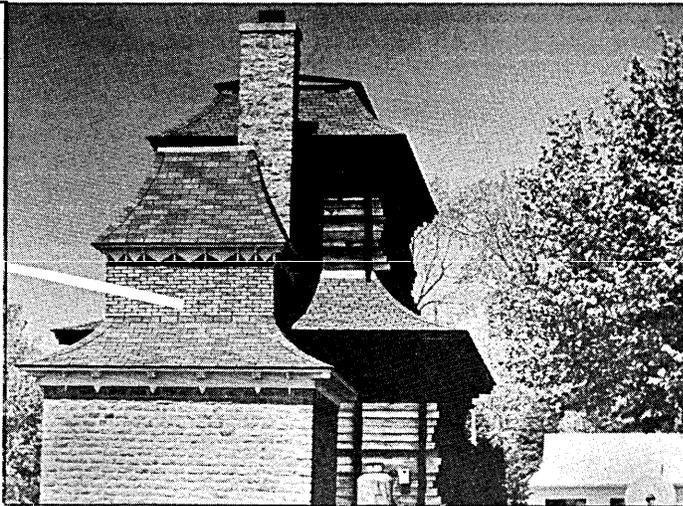
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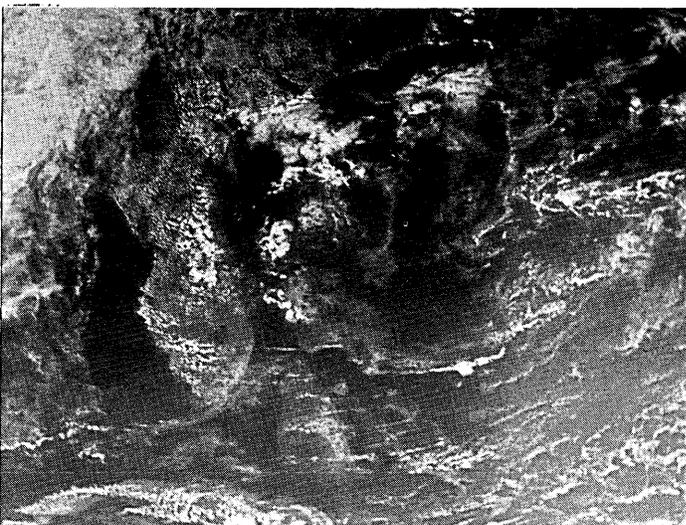
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CIRCLE 89 ON READER CARD

DP PEOPLE

- systems analysis (computer system)
- systems design (computer system)
- all software design and production

Who does what?

Assigning responsibilities is another dimension of the same problem. In simple terms we must decide where the buck stops. The methodology of project development is now well defined, although not always adopted as rigorously as one would like. Primary and secondary responsibilities based upon a consideration of the objectives of each stage should be assigned as in Table 1. What clearly emerges is that the design, development and implementation of computer-based systems are matters far too serious to leave solely in the hands of dp people!

Dp people will increasingly become highly-trained, highly-qualified experts working *within* the boundaries of computer systems. There will be no shortage of challenging jobs and there seems to be ample scope for rewarding careers without going outside the computer-system specialties.

But they will have to accept that their world is changing. The host-system users must be the *dominant* system; and the managers and other specialists in the host system will become as highly-trained and professional as their colleagues in the computer system, but with different roles to play.

Of course there is no reason why managers and staff should not migrate between systems in the course of their careers; this is a matter of ability, aptitude, experience, training, and opportunity. But the days of the dominant dp generalist are numbered. *



Mr. Croisdale is a member of the British Computer Society and head of dp training in the United Kingdom Civil Service College. Since 1960 he has been involved in programming, system design, and project management for administrative applications.

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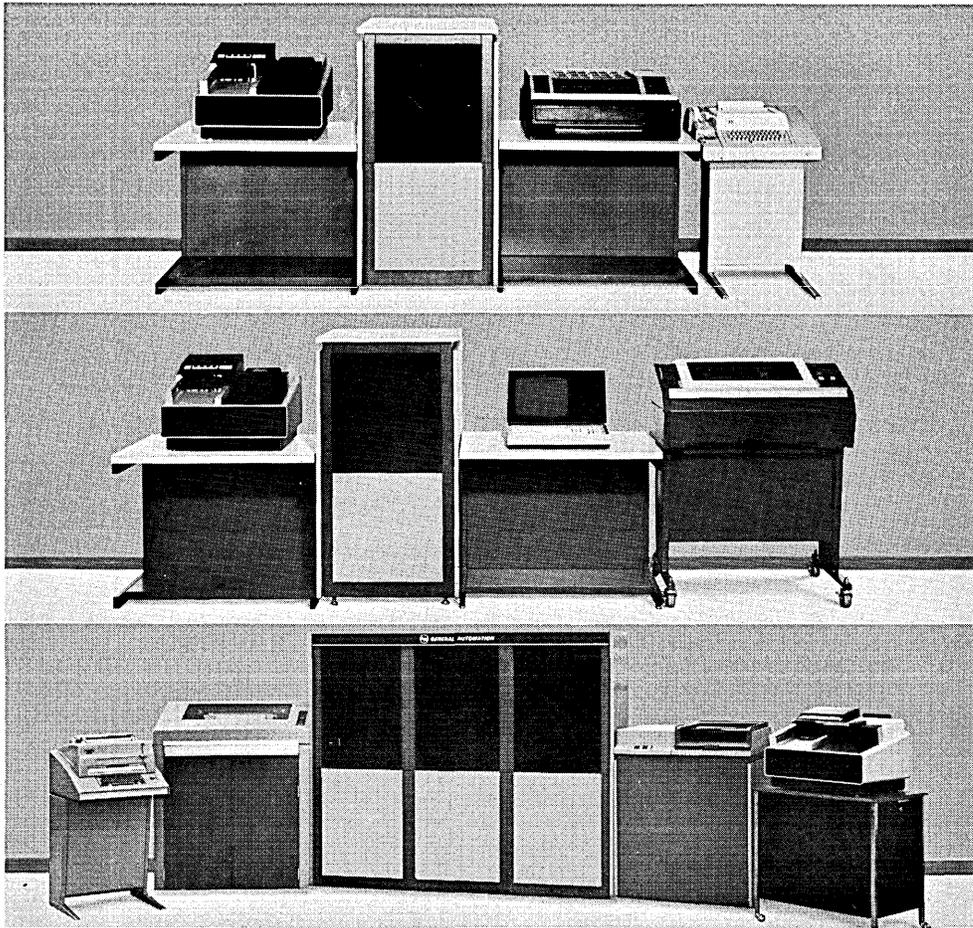


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IBM and the structure of the industry

Leading off this month's column is some critical comment from Herb Grosch . . . and a reply from two of his fans.

The Sun Never Sets...

It was not Bob Fawcett, but you, who were "bemused" to print a comment about IBM's position in Europe (May, p. 143) without a corrective remark from Angie Pantages (DATAMATION's International Editor) or Nancy Foy (DATAMATION's European Editor). West Germany, a much larger market than U.K., is 70% IBM; France, a slightly larger one, 65%; Italy, Switzerland, the Scandinavian and Low Countries all run over 60%. The little pocket of British resistance, largely due to direct government intervention on behalf of poor, dumb ICL, is pretty unimportant in the total European context. Japan, at 40%, and the U.S. Federal Government, at 25%, count for more worldwide.

—Herb Grosch

We would have said it Herb, but we knew you'd do it for us.
Love, Angie and Nancy
Dr. H.R.J. Grosch is the executive director of Computerworld.

IBM—Your Financial Partner

As a general partner of a venture capital company which has specialized in investing in small computer related companies, I would like to add a viewpoint regarding IBM's domination and possible remedial action.

Our smallest investment in the computer industry is now operating at approximately \$20,000 of revenue per month and our largest had sales of over \$6 million, with six other investments in between. From a smaller company point of view, two of IBM's policies are most predatory and troublesome:

1. The technical changes made by IBM to exclude competitive peripheral equipment is a continuing problem. For example, moving controllers inside the mainframe to prevent access by other peripheral manufacturers or changing communications routines to specialized, nonstandard codes. IBM alleges it has technical reasons for wanting to use some nonstandard form of communications; we believe the intent is otherwise.

2. The market power of the short-term, easily cancelled equipment lease which IBM offers is another extremely dangerous weapon in its arsenal. Small computer companies such as ours, which are less strong financially, are forced to seek long-term, noncancellable leases to obtain third party financing. IBM operates as its own bank within a company, much like a Japanese zaibatsu where money is lent freely on a long-term basis at low interest rates without fear of the loan being called. This "bank within IBM" is the most fearsome economic weapon of all. IBM has \$4 billion dedicated to serving IBM's needs exclusively and this financial strength allows short-term, attractive leases to be offered to potential customers, and IBM has the time and cash flow to wait for the lease revenues to build up.

Both of these problems are well understood, but a creative remedial course of action could restore free competition within the data processing industry.

First, IBM should stop the capricious changing to non-standard communications codes. It should be enjoined from throwing curve balls and road blocks in the way of other peripheral equipment suppliers. Second, it should be required to set up a separate Computer Equipment Acceptance Corporation which would finance competitive equipment as well as IBM equipment on similar terms. This corporation would be ordered by the consent decree to offer financial terms to companies other than IBM, thereby helping the entire computer peripherals industry grow and be more competitive. It would probably take \$1 billion of IBM's money to set up this acceptance corporation and the rest of the money could be obtained from bank financing on conventional leverage ratios of three to one. The IBM shareholders would receive a pro rata share of the stock of this acceptance corporation. The key element is that there would be a requirement to finance competitors on a similar ratio of short-term versus long-term leases. This would allow competitors of IBM to compete on an equal basis.

—John T. Neises

Mr. Neises is associated with The Charles River Partnership in Cambridge, Mass.

A Small User Speaks Up

What has the past unbundling and the future restructuring of IBM done for the small computer user?

I am not too concerned about the government and/or the large corporations with their staffs of experts, analysts, programmers and multicomputers. I, being one of them, am mainly concerned with the small single computer operations (of which they are many) where the dp manager is also the system analyst and programmer, and cannot afford to carry additional manpower.

Already, unbundling has increased the cost of his computer operation and will further increase this cost by restructuring the industry. I presently don't care what hardware is superior.

All I want is complete support and competent help from my supplier to cover my equipment, software support and service maintenance at the lowest possible price to me.

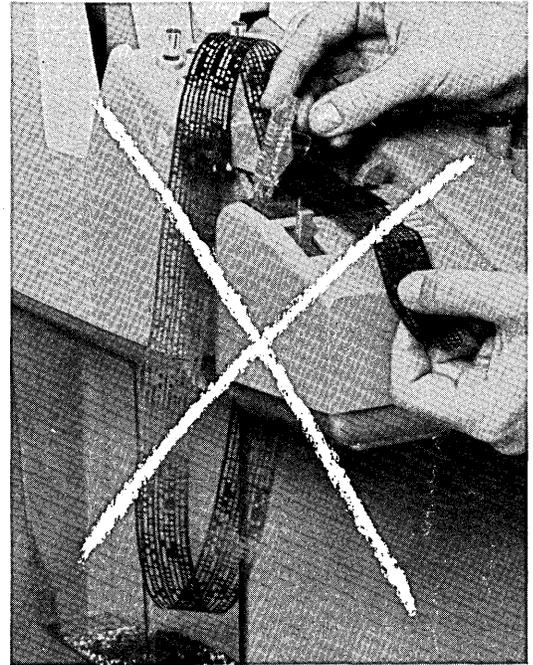
This has not in the past and will not in the future happen by restructuring IBM which will have them charge me for each service rendered.

I think the small and medium size businesses are the backbone of our business community, but unfortunately have no one presenting their position, both among the so-called experts and in government.

—Abe Greenberg

Mr. Greenberg is the dp manager of the Flagstaff Liquor Co. in Perth Amboy, N.J.

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69

Antitrust

Paradoxes Emerge as the Trial Starts

Many Justice Dept. Lawyers are First Timers in Court

Officially the U. S. Justice Dept.'s antitrust trial against IBM has begun, but unofficially the question is whether the contest is for real.

On the opening day of the trial on May 19, the lead attorney for the Justice Dept.—which has shown evidence of being swamped by the magnitude of the case—felt obliged to note that some of the department's staff is "relatively young and inexperienced" and "appearing in this court for the first time."

Previously, the Justice Dept. had been granted two delays in the start of the case and had been seeking another, citing a monumental snafu with the handling of the massive documentation in the case. Yet in this context of being unable to cope effectively with the largest antitrust trial in history, assistant Atty. Gen. Thomas Kauper would go to the U.S. Senate three weeks after the trial began to be recorded against a bill that would beef up the Justice Dept.'s antitrust effort by increasing funds available to the antitrust division from its present \$18 million a year to \$45 million in 1978.

There were other paradoxes:

- There has been no agreement on the specific issues that should be submitted to Judge David N. Edelstein, chief judge of the Southern Federal District Court of New York. Judge Edelstein is presiding over the non-jury trial.

- IBM was seeking a partial summary judgment on the issue of bundling, citing no less an authority than the Justice Dept.'s solicitor general Robert H. Bork, who, before he joined the Justice Dept., wrote in *Fortune* magazine that "The government's suit (against IBM) stands revealed as an attack on outstanding commercial success. . . ."

- The case was less than a week old when Judge Edelstein, who had been attempting to accelerate the case, recessed the trial for a week to give a speech in Portugal. Later, as the trial moved along into June, valuable time was taken up by reading depositions

into the record—a measure that, if continued, could bog the case down indefinitely.

Issue of "misconduct"

Moreover, as the trial began, the severely strained relationship between the opposing attorneys—both IBM and the Justice Dept. have accused the other side of "professional misconduct"—bubbled up to the surface and the pressure on the attorneys was intensified when the judge severely rebuked both teams of attorneys during their opening statements.

IBM is represented by its house counsel and vice president Nicholas deB. Katzenbach who was U.S. attorney general when the Justice Dept. instituted

The Justice Dept.'s legal team is led by two career Antitrust Div. attorneys, Raymond M. Carlson and Joseph H. Widmar.

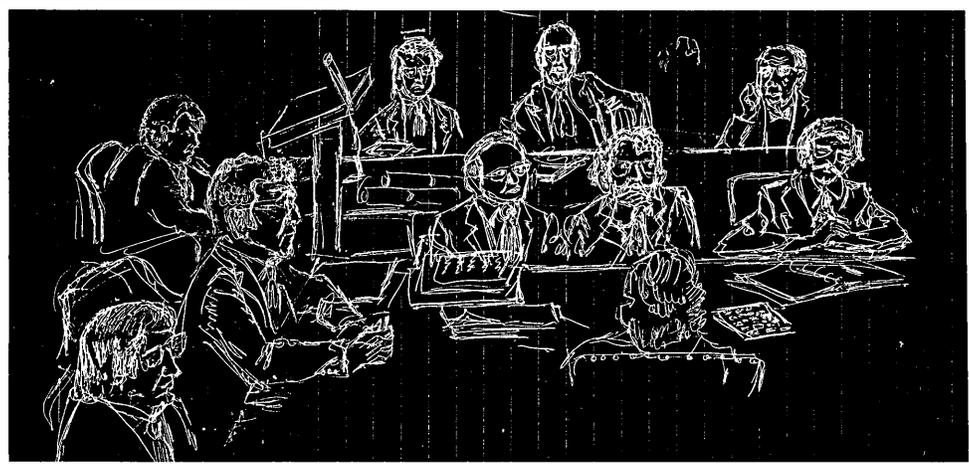
Omission noted

The first days of the trial were marked by an interesting omission when Dr. J. Presper Eckert, a Univac vice president, took the stand. As one of the co-developers of the famous ENIAC computer, Eckert is one of the established pioneers of the computer industry.

The ENIAC patents were a key issue in a federal court decision in 1973 in which both IBM and Univac were found to have entered into a secret "technological merger" after the 1956 consent decree was signed by IBM and the Justice Dept. (January 1974, p. 78).

The court decision, which directly involved Honeywell and Univac, was made by Judge Earl Larson of Minnesota, who issued a 300-page document in the case. Among other damning statements against IBM, Judge Larson referred to IBM as "the monopolist" of the industry and stated: "IBM was then, and should be now, apprehensive about IBM lawsuits."

However, the Justice Dept. did not pursue the issues uncovered in the Univac-Honeywell suit while Eckert was on the stand. During the trial of the Univac-Honeywell case, it was revealed that the Justice Dept. had approved the "technological merger" between IBM and Univac and, according to Judge Larson, the Justice Dept. treated the whole matter as "confidential." The



Angeline Pantages

the antitrust investigation against IBM. The computer company is being represented in the courtroom by the new York law firm of Cravath, Swaine and Moore. Cravath's lead trial attorney is Thomas D. Barr, who has received his baptism of fire representing IBM in private antitrust suits involving Greyhound Computer and Telex. In each of these cases Barr has won stunning victories for IBM, although the initial Telex decision went against IBM. Both cases have been appealed to higher courts.

feeling now is that, if the Justice Dept. were to introduce the issue in the case, the department itself could be criticized for being involved in the affair. At any rate, Judge Larson's decision has been ignored in pretrial proceedings and, now that Eckert and the story of the ENIAC have been heard from, it appears likely that the issue will not be introduced in the Justice Dept.'s case.

In another development, IBM's attorney Barr asked the court to "vacate" the press gag order that Barr had initially

asked for in the case. The gag order forbids both the Justice Dept. and IBM from discussing any aspect of the case with the press.

Barr initially pushed through the gag order over the reluctance of the Justice Dept.'s Carlson. Now Barr wants it rescinded, but Carlson has indicated that he wants it to remain in force, since he believes it serves a "useful purpose."

—W. David Gardner

Telex Takes its Case to the Supreme Court

In its petition asking the U.S. Supreme Court to review the IBM-Telex case, Telex argues that the status of the case, as it now stands, permits IBM to "destroy" all peripheral companies, and not just those supplying equipment to IBM cpu's.

"... IBM, at a wink from its chief executive, can make peripherals plug compatible with the cpu's of any other system," the Telex brief states. "Then, by the same practices by which it has ruined the manufacturers of peripherals plug compatible with its own cpu's, it can destroy those manufacturing all other peripherals and have 100% of the market for all."

A Federal Appeals Court ruled earlier this year—reversing an earlier Federal Court decision—that the key issue of market definition in the case applied not to peripherals compatible only with IBM cpu's, as had been accepted in the first decision, but that the applicable market share was *all* peripheral products, including those "compatible with non-IBM systems."

Thus, the Telex brief argued, if IBM's actions against Telex and other IBM pcm's were legal, then the same actions are permissible against other independent plug compatible firms supplying to other systems and mainframe manufacturers.

When it wants to

"The fact that it (IBM) has not yet made peripherals plug compatible with other cpu's is irrelevant," the Telex brief stated. "The same activities as will give IBM 100% of the market for peripherals plug compatible with its own cpu's will give it well on the way to 100% of all peripherals. It need only turn to them when it is desired to do so."

The Telex brief, dated May 30, was filed after a Denver Federal Appeals Court reversed an earlier federal court decision that had favored Telex. At this writing, IBM had not filed its answer to the most recent Telex brief, but IBM was expected to do so this summer.

Should the Supreme Court decide to review the IBM-Telex case, then the two firms will be in the position of appearing before a Court that has turned

sharply in favor of big business since former President Richard Nixon's appointees have changed the philosophical balance of the court. The so-called "Nixon Court" has put a stop to the string of antitrust defeats suffered by business in cases involving the U.S. Justice Dept. and has generally adopted a pro-big business stance. That, of course, bodes well for IBM.

In another area, the Telex brief criticized the Appeals Court argument that all peripheral manufacturers including those not currently making IBM-compatible equipment can easily manufacture IBM-compatible peripherals. The argument here, based on the so-called DuPont cellophane decision, is essentially that products—whether wrapping materials or computer peripherals—are "reasonably interchangeable."

No multiplicity

But the Telex brief stressed that the DuPont case applied to *consumers* and *buyers* who had a variety of wrapping materials available to them, but that the peripherals market applied solely to *manufacturers* who ostensibly would have an easy time interfacing peripherals to various manufacturers' mainframes. The Telex brief pointed out that the consumer, or computer user, does not have a multiplicity of peripherals available to him, although it is technologically possible for a manufacturer to produce them.

Technology

Seymour Cray's Cray-I Super Computer: Almost Five Times Faster than a 7600

The designer of the Control Data 6600 and 7600 computers, who later left to form his own company, says his first super-scale computer will be ready for delivery at the end of this year. Seymour R. Cray, granting one of his rare interviews in rural Chippewa Falls, Wisc., says the Cray-I, a 64-bit vector machine designed for such applications as hydrodynamic and weather simulations, will run four to five times faster than a 7600.

Cray, who joined CDC a few weeks after that company's formation in 1957, established Cray Research, Inc. in 1972. That was a period, he said, when Control Data was "shifting gears," when the construction and delivery of large computers gave way to its becoming a service company. "It was a real opportunity for me to go off and do my own thing," he explained. "I'd certainly been doing it anyway."

Ten years earlier, he had left the Minneapolis-St. Paul area and moved the 100 miles back to his home town of Chippewa Falls, population 12,000. There he built his home on 40 acres of wooded land, then built the CDC lab on an adjoining 40 acres. At that facility,

"The testing question," said the Telex brief, "is whether the users of cpu's made by IBM—who constitute 65% of all users of computers—can use peripherals that are not compatible with their cpu's. The answer is obvious. They cannot. Those products are as useless to their needs as if they were a volume of Sappho's poetry. To the consumer there is no interchangeability at all. It is of no interest to the user of an IBM cpu that Telex could, if it wishes, make peripherals compatible with a Univac computer. A user of an IBM computer does not have a Univac computer."

In another argument, the Telex attorneys, Floyd L. Walker of Tulsa and Moses Lasky of San Francisco, observed that IBM claimed it expected to make at least a 20% profit on the 2319A disc drive, which, since the peripheral was essentially a price cut of existing equipment, meant that "IBM had been making the monopolist's profit of 130% before peripheral competition became serious."

The Telex brief also stressed that the Appeals Court decision should be reviewed because it went counter to a "landmark" decision on monopolization—Judge Learned Hand's famous opinion in the Alcoa case: "A major reason why the writ should be granted is that . . . (the Appeals Court decision) . . . is in conflict with Judge Hand's opinion. It doubts it, emasculates it, and quite reverses the direction of the law on the subject." —W.D.G.

Cray was joined by 35 others from the corporate plant who developed and built seven of the 6600s, then went on to design and build eleven 7600s. Cray Research, an 8,000 sq. ft. laboratory, is on the other side of his home. CDC recently vacated its 30,000 sq. ft. plant which now is occupied by Thorpe Finance, an ITT subsidiary. The home and two plants are accessible by a narrow quarter-mile country road called Data Drive.

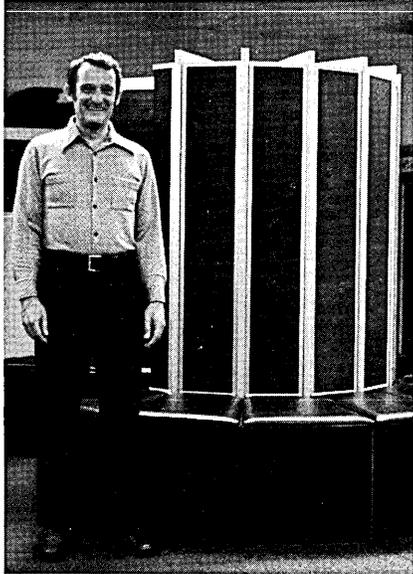
CDC alumni

The 32-person company is staffed by many of the engineers who worked with Cray on the CDC machines and its original financing was provided by investors with ties to CDC, including CDC itself. Frank Mullaney, a founder of Control Data and a vice president of that company until he left in 1965, is chairman of Cray Research. Cray is the president. In three rounds of financing, the company has raised about \$7.5 million which turns out to be the price it is asking for a million word model of the Cray-I.

In a recent talk to an overflow audi-

news in perspective

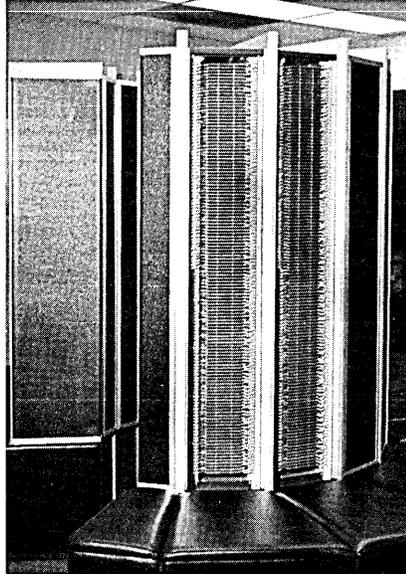
ence at a computer colloquium at Stanford Univ. in Palo Alto, Cray noted that the original 6600 was priced at \$7.5 million. The follow-on 7600 also was priced at that figure, so he figured he would follow suit. He added, "I asked myself



THE CRAY-1: Super computer designer Seymour Cray with Cray-1, a 64-bit machine that will sell for \$7.5 million with one million words of 50 nanosecond bipolar memory. Twelve columns hold 1,500 modules of memory and logic. Panels at right are removed to display how modules are arranged in two of the 12 columns.

why would anyone want to buy a big, expensive computer" when there are minicomputers available for only a few thousand dollars. "If you figure out the cost of computation on those (minis), it really is very remarkable, particularly in the last few years." In a larger computer,

he said, "there has to be something there. And that something is the memory. With a small computer, you can't solve some of the large scientific problems that people like to solve, because you don't have enough memory to work



in." Thus it's the memory that dominates. "The arithmetic part is not all that complicated."

In contrast to CDC machines, Cray said he finally switched to two's complement arithmetic. But he said he is still using octal. "I really like octal," he told

his Stanford audience amidst much cheering and applause. "I understand it. Hexadecimal . . . well, I realize it works but esthetically it doesn't appeal to me." In answer to a question, he said, "Virtual memory is really nice for a machine one level down from this. . . . You can't fake something you don't really have."

U-Shaped

Humming away at the Chippewa laboratory last month was a 500,000 word machine, which takes up eight square feet of floor space, including the area taken up by power supplies stored at the base in vinyl covered containers. It is shaped somewhat like a six-foot high letter "U." It holds 1,500 printed circuit modules that are housed in 12 columns, four for the cpu and eight for memory. The columns are separated by cast aluminum that is laced with stainless steel plumbing that carries a freon coolant. The modules dissipate up to 120,000 watts, thus requiring much cooling, perhaps three or four times more than any CDC computer. The opening in the "U" allows access to the rear of the columns.

The computer has both scalar and vector processing capabilities, the latter providing result rates "greatly exceeding the result rates of conventional scalar processing." The design wizard, who says he was fortunate to have graduated from the Univ. of Minnesota in 1950, "at just the right time to be an instant pioneer in the computer business," explained that the CDC 7600 tradition is still apparent in his new machine. "The only real changes have to do with the physical problem of size." He said the bigger the machine, the smaller it must be. This is to minimize the amount of

Cray the President: Somewhat of a Change in Style

"I knew what I was getting into," says Seymour R. Cray, the 47-year-old computer genius who has gained as much fame for his penchant for seclusion as for the super computers he has built for Control Data Corp. Cray talked last June of his three-year-old company, Cray Research, Inc., and how it has somewhat changed the style he's maintained in the 13 years since he left Minneapolis to build computers in a lab in the woods of Chippewa Falls, Wisc.

Cray, who for years turned down innumerable requests to speak to business and scientific groups, has made two speaking appearances in recent months. His aloofness from CDC's corporate headquarters was legendary—chairman William Norris used to have to make appointments to see him. But now he travels twice a week to Minneapolis where his company administers its operational and marketing affairs in a four-room

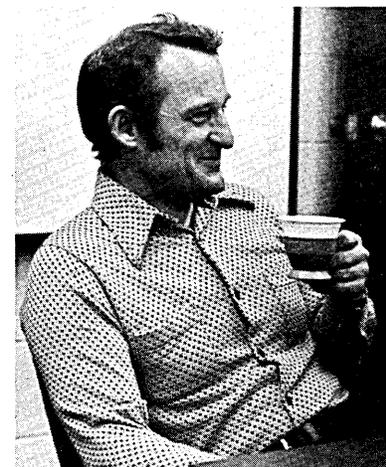
office a quarter mile from CDC's headquarters. Recently he purchased a home close to where the company intends to build a plant in South St. Paul next year when the Cray-I goes into production.

Charming and articulate, Cray fills his new role well. His conversation reflects the confidence and sharp business sense of a successful entrepreneur. His machine is his first to use semiconductor memory, yet the circuitry is 10 years old. "It's not a revolutionary machine in the hardware sense," Cray comments. "You don't try to do so much in one step; we're saving a lot of that for the next model."

The machine's circuitry is made up of one type of 16-pin flat pack integrated circuits supplied by semiconductor makers Fairchild and Motorola. It reflects Cray's traditional approach to computer design—going with what is proven and "presumably

with less risk," says Cray who takes credit for convincing CDC when it was being formed in 1957, "that it was feasible for a little company to

(Continued bottom of page 76)



SEYMOUR R. CRAY
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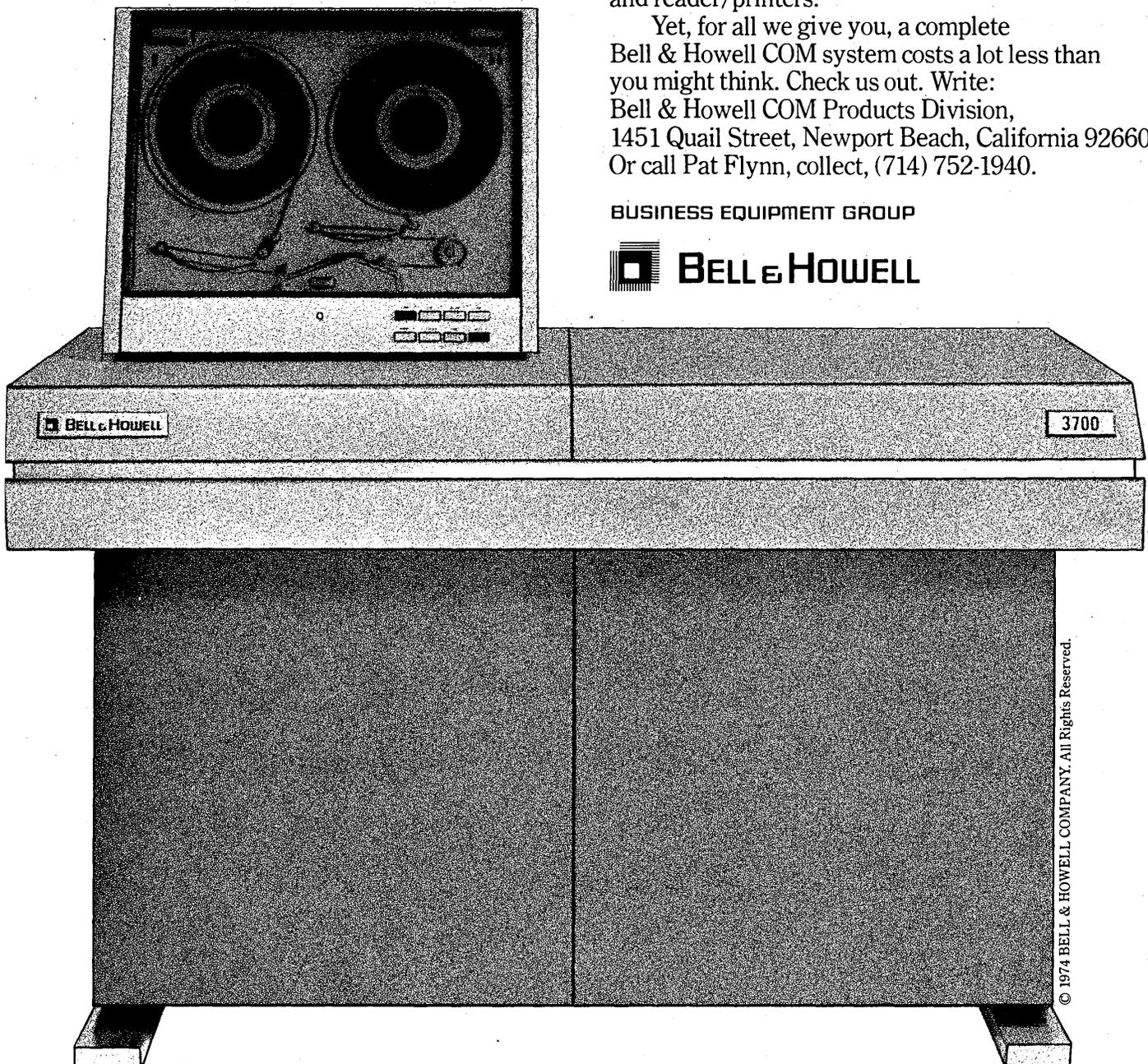
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news in perspective

time that a signal spends in moving from one part of the machine to another.

The propagation time on conductors, whether strip lines on printed circuit boards or along twisted pairs of lines, is half or two-thirds the speed of light. On a pc board, a signal moves about six inches in a nanosecond, about nine inches along a twisted pair of lines. "Those times are very significant because the properties and times through the computing elements in the printed circuits are of the order of 800 picoseconds. By the time you put a few of them together, you end up spending about half the time communicating over conductors and the other half in the elements."

Bipolar memory

The Cray computer has a clock period of 12.5 nanoseconds and its 50 nanosecond memory is constructed of bipolar 1024-bit chips. Up to one million 64-bit words are arranged in 16 banks with a bank cycle time of four clock periods. The 500,000 word machine being demonstrated in Chippewa has a \$5.5 million price tag. A 250,000 word machine would cost \$4.5 million. The memory size can be increased to one million 64-bit words without changing either the number of modules or the size of the mainframe.

The company will provide an operating system and a FORTRAN compiler.

With early users, there would be a joint development of more sophisticated software. When interviewed in early June, Cray had not yet received an order for the Cray-I but was confident that it would be installed somewhere next Jan. 1. Persons close to the company in Minneapolis were betting that would be the Lawrence Radiation Laboratory in Livermore, Calif., where the first serial numbers of most of CDC's large machines have been installed. Some 20 prospects have visited the Chippewa laboratory to inspect the Cray-I and the company hopes it will sell at least 50 during the next five years.

Software

It's Round Two for Software Patents

The Supreme Court has agreed to take a second crack at examining the issue of software patentability.

It has agreed to review the case of software specialist Thomas R. Johnston whose automatic financial record keeping system was deemed patentable by the U.S. Court of Customs and Patents Appeals, (March, p. 18). Hearings are expected to start this fall.

In its first grappling with the issue, late in 1972, the high court ruled that an algorithm for converting BCD to binary developed by Bell Labs engineers

Gary Benson and Arthur Tabbot was not patentable on grounds it was basically an idea.

As with the Johnston case, Benson and Tabbot's claim for a patent had been upheld by the Court of Customs and Appeals. In both cases, initial applications for patents were denied by the Patent Office.

But there are differences between the cases, the biggest being the distinction between software that is a mathematical algorithm (Benson and Tabbot's) and software that is a machine process (Johnston's).

In handing down the 1972 decision, Justice William O. Douglas left the door wide open for future software patent applicants. "It is said that the decision (in the Benson/Tabbot case) precludes a patent for any program servicing a computer. We do not so hold," he stated.

Douglas said in 1972 that Supreme Court precedents require a patentable process to be "either tied to a particular machine or apparatus" or to be based on an operation which changes "articles or materials to a 'different state or thing.'"

"New machine"

The Court of Customs and Patents Appeals has taken the position that when an application program is combined with a general purpose computer, the computer becomes a special purpose computer and a "new machine." It decided Johnston's system fit this description. If the high court agrees on this point Johnston could fare better than Benson and Tabbot.

(Continued from page 72)

Cray the President . . .

build a big computer."

When he began building the 1604, CDC was faced with serious cash shortages. As Cray tells it, "I went down to one of the old electronic distributor places in Minneapolis and bought some parts and started building the computer. I bought the cheapest thing you could get. The 1604 was kind of built out of semiconductor dropouts." But the result was the first solid state computer to hit the market (in January 1960) and it shot CDC's sales volume up to the \$25 million level.

Time to move

It was shortly afterward that Cray began to register signs of uneasiness with what he now calls "the large corporate structure problems" and announced to chairman William Norris, "I think I'm going to move to Wisconsin and start a little company of my own."

"In just a matter of a few weeks," he says, Norris had convinced Cray to stay within the company and CDC moved its 6600 development program to Chippewa Falls. Two factors influenced Cray's move: paperwork and war. "I wanted to back off from the big company that I helped create," Cray said. "The cleanest way to get out of that was not just to refuse to go to meetings, but to do something more dramatic like to pack up my bags. There was another factor, too, that caused me to do this. It was 1962 and the time of the Cuban missile crisis. I wanted to get out of the Big City because I thought I might get my head blown off there, and I might possibly live here (in Chippewa Falls)."

Life in the country seems to have been good for the tanned and youthful looking inventor. At the Chippewa plant Cray's dress is informal, but modish and well-tailored. At his appearance at Stanford, he sported a bright blue-and-white sport coat. "He's the best dressed

man in the company," says marketing vice president George Hansen.

During the development of the Cray-1, Cray's daily routine was to come to the plant around 11:30 in the morning, lunch with his associates, hold engineering conferences and leave at 4 p.m.—then to return after dinner and work in solitude late into the night. "That has changed, now that we are telling the world of the Cray-1," says an associate. "But we expect that once the machine is on its way, he'll be returning to the old routine, thinking about the Cray-2."

Cray says computer technology is to the point where people are beginning to consider three-dimensional simulations of physical events. To do that properly, however, would require a factor of 10 or 100 increase in computing power. That still leaves him room for new challenges. Cray says he could see himself in four or five years taking steps to produce another machine that's four to five times faster than his Cray-1. *

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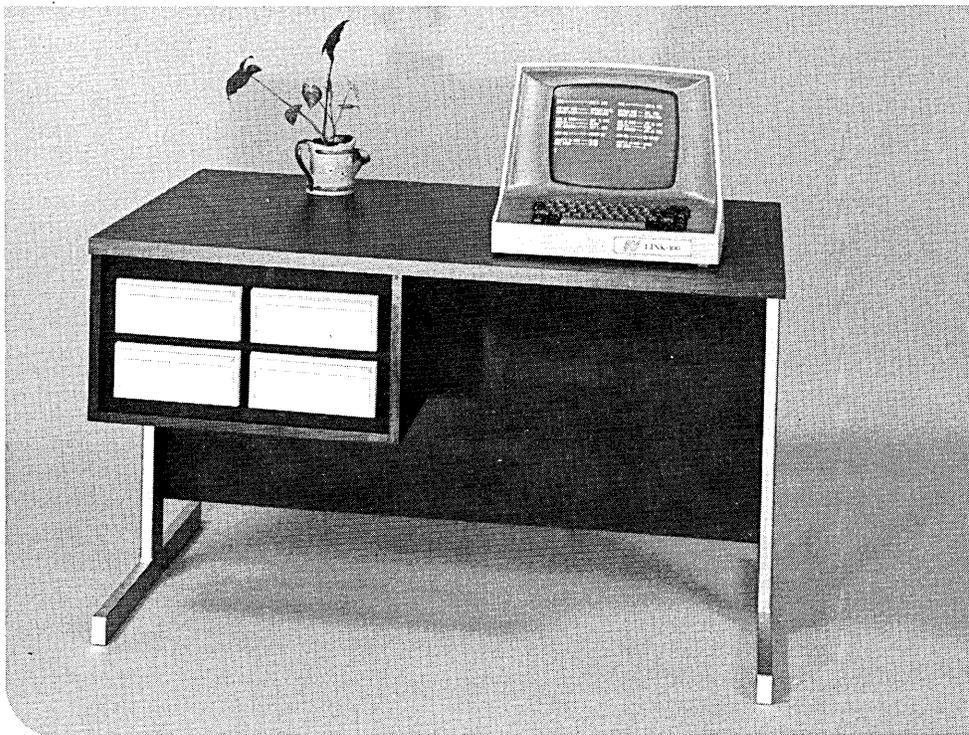
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news in perspective

In asking the Supreme Court to review the Johnston case, the solicitor general, representing the Patent Office, took an opposite stand. He claimed the Johnston system is neither apparatus nor machine, but an idea which is not patentable.

In agreement with the solicitor general is the Computer & Business Equipment Manufacturers Assn. (CBEMA) which was permitted to file a friend of the court statement in opposition to the patent. In it, CBEMA said the outcome of the case will "inevitably affect the future growth and development of the data processing industry in the U.S. and will have a corresponding or greater impact on the vast segments of our society which use and receive the benefits of technological advances in the industry."

The solicitor general used similar language. In a brief requesting the Supreme Court review, he claimed that the decision of the Court of Customs and Patents Appeals would "because of its immediate impact on computer programming . . . have a serious adverse effect on the computer industry and thus on the economy at large." The brief also said the lower court's decision's implications could have a serious adverse effect on competition in the use of business and other ideas.

An improvement only

The solicitor general contends in his

brief that Johnston's "idea" of having banks provide an additional bookkeeping service by programming their computers to sort check and deposit data in accordance to a category code was "in any event no more than an obvious improvement over prior art."

Using Johnston's system, a bank can use its own digital computers to provide regular detailed accounting information to customers on items such as rent, fuel, debit, and credit dividends. Machine readable records of each bank transaction are generated directly on the check or deposit ticket incorporating the customer's account number, amount and type of transaction. A set of code characters that identify the bookkeeping classification of each transaction, called "category numbers" are entered by the customer on each check or deposit slip as it is prepared. When the deposit is made or the check clears in the customer's bank, the machine-readable transaction records (the category numbers entered by the customer) are read by a document reader device and stored in a transaction file. In addition to that file, a master recordkeeping file stores all records required for each customer in accordance with his own chart of accounts. That chart is designed as he has specified and constructed to operate with the control system in processing transactions. The control system directs the generation of output reports.

revenues from leased equipment this year. To illustrate just how big that is, it can be noted that this figure is more than triple the entire annual revenues of the next largest computer firm (Univac).

"The leasing of IBM equipment over five years is almost pure profit," the report states. "The point is that any new product introductions which disturb the leasability of the more-than-five-year-old equipment will have a severe impact on the profitability of the leasing operation."

At 30% of list

IRD said that it believes IBM transfers its new equipment into its lease inventory at about 25 to 30% of the equipments' list selling price. Thus, if IBM transferred the equipment at the same rate or at a rate lower than full cost prices, then IRD's fictitious IBM Leasing Co. would be even more profitable. "Either way," the report states, "the company is using a considerable proportion of its resources to create future increased earning power."

Kenneth G. Bosomworth, IRD president, believes clearly that companies which lease most of their old equipment have a built-in interest in keeping their old equipment out on lease generating revenue. "Leasing, in a situation in which one company has effective market control, results in a climate that is not conducive to competition," says Bosomworth.

While Bosomworth didn't say so, there are those who believe that the delay of IBM's new system—the so-called FS (Future System)—had much to do with IBM keeping its older equipment out on lease. There is little competitive threat to IBM these days in op systems, the argument goes, so why should the firm introduce new equipment that would impact its existing lease base?

The IRD report, which was prepared under the direction of Richard S. Carmichael, IRD executive vice president, notes that IBM has been able to control product residuals by introducing new products more or less when it wants to without much regard for the general happenings of the office equipment marketplace.

"The example of IBM is particularly interesting for two reasons," the report states. "First, the company is established in markets (office products and data processing) in which technology has moved relatively slowly over seventy of the past ninety years but very fast over the past twenty years. Thus, the challenge for IBM has been to retain market control and residual control in an increasingly difficult environment.

"Secondly, the company's size and growth rate, coupled with its startling profitability, serve as an interesting foil to others such as General Electric, RCA

Finance

Leasing: A Phenomenon That Drains the Balance Sheets of All But IBM

In the following multiple choice exercise for computer users, one answer is correct.

Computer users lease equipment because:

1. Almost everybody else does.
2. Their IBM (or other manufacturer) salesman tells them to.
3. They hope to save money.
4. They worry computer technology will change quickly, leaving them with antiquated equipment.
5. All of the above.

The correct answer is number 5 and while the exercise is presented here in a light vein, the whole issue of computer leasing, however, has been receiving new and serious attention in recent months for a variety of reasons. The prime reason is that the issue has been raised in the U.S. Justice Dept.'s antitrust case against IBM and, indeed, in the government's opening statement in the case, its attorneys hammered away at the industry's leasing environment, which

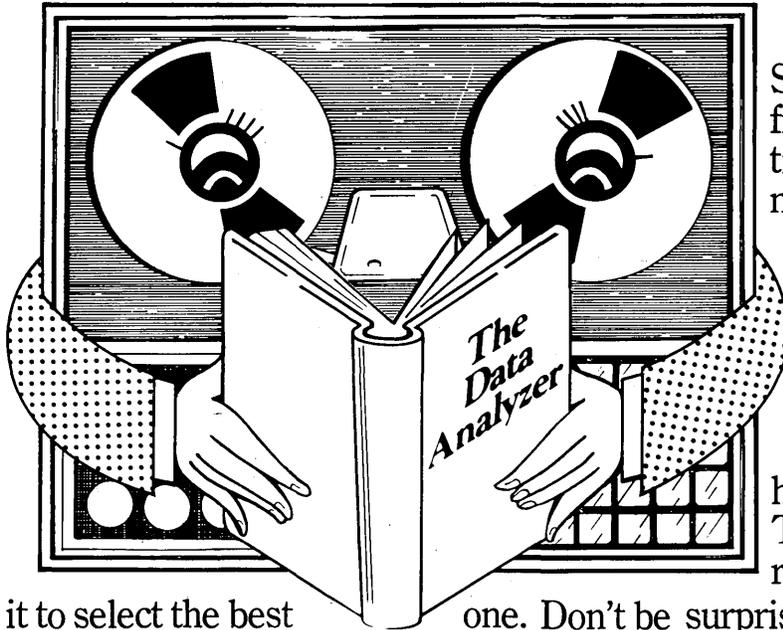
they maintain has helped IBM dominate the business. In addition, because of the current deep recession, computer users have been casting more scrutiny on the manner in which they finance their electronic data processing equipment.

It is a complicated subject. In many ways, it is the murkiest territory in the dark continent of computer procurement.

One consulting firm, International Resource Development (IRD) Inc. of New Canaan, Conn., has pulled together IBM stated accounts and other documents and from them has reconstructed a "fictitious IBM Leasing Company." In its exercise, IRD breaks the computer colossus into three segments—an IBM Leasing Co., an IBM Manufacturing and Sales Co., and an IBM Finance Co.

IRD assumes that if the IBM Leasing Co. acquired equipment from IBM at full cost prices, then the computer firm would be receiving about \$4.8 billion in

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or Singer, which have recognized the available opportunities but have not succeeded in grasping them."

IRD and Bosomworth raise the anti-trust questions that can be inherent in a market situation in which IBM, as the dominant manufacturer/lessor, maintains firm control. They make it clear, however, that they do not charge IBM with any illegality in its leasing practices. The IRD report notes: "It is by no means clear that mere exercise of market control in an ethical and competitive manner is illegal according to the way in which the antitrust laws are written, and the Justice Department has not found it easy to make a solid case against IBM."

Manage a weak market

In the government-IBM antitrust suit, the Justice Dept. discusses the idea that IBM assumes the risk of technological obsolescence of its equipment by leasing the equipment to users typically via the risk lease vehicle. Theoretically, the risk of technological obsolescence is avoided by the user because he is merely leasing the equipment. The user simply turns in his old equipment when the new equipment is announced and he does not have to worry about disposing of the old equipment. An advantage that accrues to IBM in this situation is that it is able to manage a weak computer market.

The Justice Dept., however, argues that there is no risk of technological obsolescence assumed on the part of IBM since the firm, in the words of one of its top executives, controls the "... timing of new technological insertion ..."

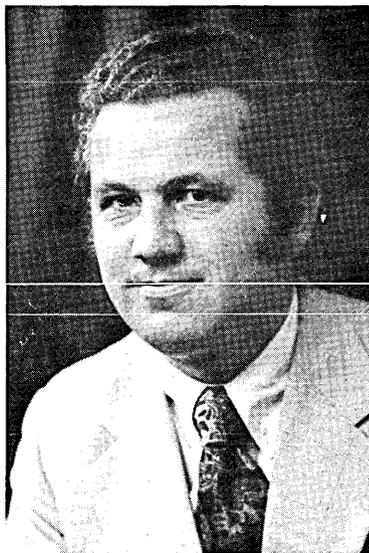
There is a vicious circle here. The government argues that IBM has traditionally had little pressure to introduce new equipment due to competitive factors because of the firm's hold over its leasing and software bundle.

For its part, IBM observes that the leasing environment has been declining in recent years. In the firm's pretrial brief on the government case, IBM states: "Short-term leases were of particular importance in persuading early customers in the 1950s and 1960s to try the edp solution . . . With the development of the industry, edp users have been willing to assume a greater proportion of risk, and as a result have acquired more and more edp equipment on longer-term leases or by purchase. For example, over 40% of IBM 370 series cpu's installed to date have been purchased . . ." (Neither IBM nor the Justice Dept. can comment on the subject directly to the press, because of a press gag order initiated by IBM that muzzles both parties from discussing issues

taken up in the government case.)

In its brief, IBM also notes that "most manufacturers" have demonstrated a willingness to lease computer equipment "as an alternative to purchase." In discussing "leasing as an alternative method of acquiring edp equipment," IBM said: "The customer's ability to return computer equipment on short notice has relieved the customer of much of the financial risk that the equipment (a) will not work, (b) will not save the customer any money even if it does work, and (c) will become technologically obsolete in a short period of time."

(The 1956 consent decree between the Justice Dept. and IBM required IBM to



KENNETH G. BOSOMWORTH
Formulas that built leasing companies won't work anymore

offer its products for sale for the first time.)

IRD's Bosomworth feels leasing equipment makes great sense for many computer users, although he feels, too, that it is to IBM's advantage to have users rent or lease equipment from the firm and that IBM has always encouraged this. "It suits the inherent business mode of most users to lease or rent," says Bosomworth. "Users want to know they can throw the equipment out in 30 or 90 days if they want to."

As another reason for leasing, Bosomworth cited changing business conditions—conditions that can dictate to a user the increase or decrease of his data processing capability. Leasing can often give users flexibility in changing and mixing their dp equipment without heavy financial penalty. In addition, Bosomworth notes that many firms simply like the idea that they can lease the computing equipment and pay for it month by month and thus put their cap-

ital to work at once in more immediately productive areas in the firm.

The 155 and 165

There are also indications that the computer user can be frightened into leasing. Computer leasing is riskless. But computer *purchasing* is fraught with danger—danger that the computer manufacturer may obsolete his equipment overnight.

An interesting example here is the case of IBM's introduction of its 370 family. When the new family—the 370/155 and 165—was announced in June of 1970, many users, thinking the new family of computers would be offered by IBM for many years, like the firm's previous computer families, rushed to purchase the new machines. But the users were generally stunned when they learned that IBM planned to obsolete the 155 and 165 just two years later with the 158 and 168.

The message, which was a tough one for many users who had purchased 155s or 165s, was loud and clear: If you want protection from product obsolescence, lease; don't purchase.

Furthermore, purchasers of 155s and 165s were upset further when they learned of testimony given by IBM's chairman Frank T. Cary, Jr., during the Telex-IBM trial to the effect that IBM knew it was going to obsolete the 155 at the time the 155 was announced and, indeed, the firm was hard at work on the replacement equipment. But, in accordance with the practice of IBM and most other computer manufacturers, users were not so informed when the 370 family was announced. Also, Cary testified that the 155 dynamic address translator (DAT box) which upgraded a 155 to a 158 with virtual storage cost just \$8,696 for IBM to produce while it sold for \$200,000 to users. Cary indicated there were additional costs charged against the DAT box, but is safe to say that its markup was enormous.

In any event, leasing and the firm's enormous rolling lease base that dates back to IBM tabulating days, has been the financial foundation that has helped IBM achieve and maintain its dominant position in the computer industry. Furthermore, IBM's accounting methods have been extremely conservative with one result being that the firm has a huge cash surplus. The firm, for instance, has liquid assets that are enough to cover its long-term debt several times over.

While other firms often capitalize costs over a period of years, IBM charges off virtually everything of significance as it goes along. As for its dp equipment, IBM generally depreciates this over three to five years while its competitors tend to depreciate their equipment over longer periods. The leasing companies—when they were a force to contend with in the marketplace in the late

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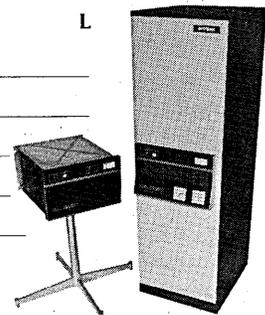
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SYSTEMS

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1960s—often depreciated their equipment over eight or ten years.

The result of all this is that many of IBM's competitors who employed liberal or even "creative" accounting practices, were and are in worse financial shape than they appear on their accounting statements while IBM is in better shape than it appears on its accounting statements.

"There are," says the IRD report, "some indications that IBM may be inherently very much more profitable even than it would appear from the earnings statements. It would seem that, over the past four years, IBM has been manufacturing an average of about \$10 billion worth of equipment per year (at full selling prices) which it has been slipping into inventory at its manufacturing cost (which, incidentally, is perfectly legal and conservative accounting practice). This makes present earnings look lower than they otherwise would be, but is reflected in higher earnings in future years, as the lease inventory continues to generate earnings."

The multiplier

Bosomworth makes an observation that others have made before him—by

lowering the lease-to-purchase multiplier on its equipment, IBM can make life difficult for the competition, specifically leasing companies. After IBM identified leasing companies as its chief competition, IBM lowered its lease-to-purchase multiplier in such a manner that it became unattractive for leasing firms to purchase equipment from IBM.

The leasing companies ran into other problems, not the least of which were the decisions of the Accounting Principles Board that required a general tightening up and elimination of abuses of accounting practices. Many of the older accounting practices tended to deceive stockholders in leasing companies to believe the leasing companies were performing better than they actually were.

The Accounting Principles Board was the predecessor of the current voice of the accounting profession, the Financial Accounting Standards Board. While the accounting profession boards operate independently of individual firms, they tend to reflect the philosophies and desires of the larger companies in the country, which means they are more likely to agree with IBM than leasing companies.

At any rate, computer leasing compa-

nies today possess the allure of buggy whip companies. "The formula that built the computer leasing companies won't work anymore," says Bosomworth simply. One of the problems from an accounting point is to set a precise depreciation schedule for computer equipment. "A 360 does not in fact live six years, four months and drop dead on October 14, 1975," says Bosomworth.

The depreciation schedule problem is virtually impossible to solve. Only IBM knows when it will choose to obsolete its equipment and IBM won't tell. IBM depreciates its equipment over three to five years, but the leasing firms stretch out the depreciation schedule. The accounting firms favor the shorter (and more conservative) depreciation schedules. But, in addition, the value of equipment itself can fluctuate, throwing another constantly moving target into the already complicated situation. (Computer broker Harry E. Goetzmann Jr. of Continental Information Systems, of Syracuse, says the value of 360/50s has risen 50% in recent months.)

Accounting problems

An example of just how intense the differences over depreciation schedules can become is illustrated by some of the accounting problems of the Reliance Group Inc., an insurance and leasing firm formerly known as Leasco Data Processing. The firm holds a huge portfolio of 360 equipment. The firm's outside accountants want Reliance to depreciate the equipment, but the company refuses to. At this writing, Reliance remains at loggerheads with its accountants and that is where the issue has been for several months.

While computer leasing firms initially tended to market 360 equipment on a non-payout basis, they are currently attempting to sell the old equipment or, when they can and particularly with 370 and newer equipment, they are emphasizing full payout leases. This means many of the leasing firms will likely have rough near-term profit statements, but their futures look brighter.

The peripherals firms were particularly hard hit by new accounting standards in the early 1970s when the Accounting Principles Board required the peripherals companies to account for their leased equipment in a new and conservative manner. Previously, the peripherals firms tended to record leases as outright sales (under the financing method of accounting) although the firms often received payment from the user of the equipment over an extended period. The Accounting Principles Board, however, began requiring the peripherals firms to record the lease income over the extended period as it came into the firm (on the operating method of accounting).

One result of all these accounting

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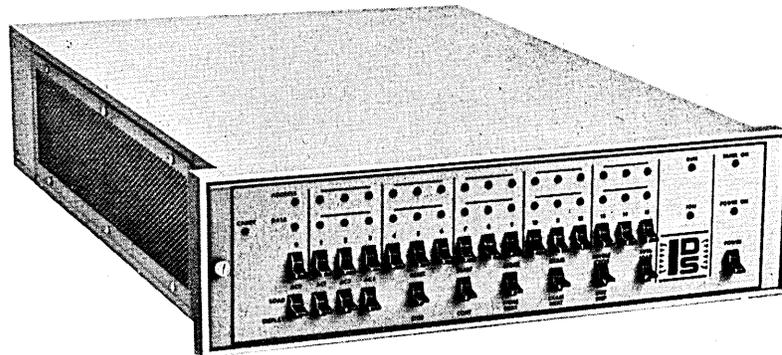
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changes was that when Wall Street and other stockholders looked at the new accounting statements of the peripherals firms, they were horrified. Overnight, most dp peripherals firms went from highly profitable companies to highly unprofitable companies. Consequently, the stocks of the firms plunged and, with that unkind cut, the peripherals firms were cut off from their financial life blood—they were unable to return to the Wall Street equity markets for capital to finance their new products and growth.

Memorex, once the mightiest peripherals company of all, had the most precipitous drop. When the accountants were through and the dust had settled, Memorex' stock had plunged from \$170 a share to \$2 and the firm owed the Bank of America \$130 million. In May of 1973, as the financial crunch tightened around Memorex, its president, Laurence L. Spitters complained that Wall Street had discouraged investors from supporting IBM's competitors. He said the investment community had "failed in its role" of helping firms like Memorex accumulate capital.

Leasing hasn't been much kinder to

the mainframe companies. Lease financing requirements played instrumental roles in the demise of two of the Seven Dwarfs—GE and RCA. Of the remaining five dwarfs, Control Data is increasingly leaving the mainframe business—with its heavy lease financing requirements—and entering the service business. Honeywell is currently being pressed by the lease financing demands of its new Series 60 line and the firm's computer operation is now marginally profitable. The mainframe operations of both Burroughs and NCR are profitable, but it took several years for NCR to get out of the red ink and with perhaps 3% of the dp mainframe business, NCR is not exactly an awesome factor in the business. As for Burroughs, the margins on its computer equipment are believed to be substantially lower than the margins on its accounting equipment.

Univac, too, is profitable, but that firm, like IBM, enjoyed a rolling lease base from its tabulating equipment and Univac picked up the RCA base at bargain basement prices—a move that helped Univac's profit picture considerably.

The question that must now be asked is this: Is it worth it for dp firms to struggle in the leasing environment? The firms in that environment must answer in the affirmative, because they have no choice, but there must be times—particularly when they draw up their accounting statements—when they wished there were no such thing as leasing or renting of computers. The problem, then, is what should be done, if anything, about leasing, which is good for some of the people all of the time and all of the people some of the time, and all of IBM all of the time.

—W.D.G.

Communications

IBM—New Emphasis On Communications?

When IBM formed a System Communications Division (SCD) in late May, Chairman Frank T. Cary said the move was made to "strengthen the company's focus on the growing importance of communications products and make us more responsive to customer needs."

What some of these needs will be over the next 10 years and some of the complications that will arise in filling them were predicted earlier the same month by Ed Sussenguth, IBM's director of communications systems architecture. "We expect about a 25% compound growth rate (in terminal installations)," said Sussenguth. "We are going to see a lot of contention or competition among the dp manufacturers, carriers, PTTs, (Post, Telephone & Telegraph) and specialized carriers." They will be "building terminals, multiplexors, concentrators, and the like, each one thinking that that is their rightful share of the business."

Rightful share

Some see IBM's formation of SCD as a step toward assuring that satellite communications becomes part of its rightful share of the business. The Federal Communications Commission has told IBM it could enter the satellite communications business if it satisfied a number of conditions, one of which was that it form a separate subsidiary for the domestic satellite business. Creation of SCD could be a first step.

The new division has responsibility for the design, development, and manufacture of computer-based communications system and terminals. Formerly, these chores were part of the System Development Division's charter. Bob O. Evans, former SDD president, was named head of SCD. SDD was abolished as a separate entity and its non-communications operations were divided among other divisions.

Sussenguth had some specific as well



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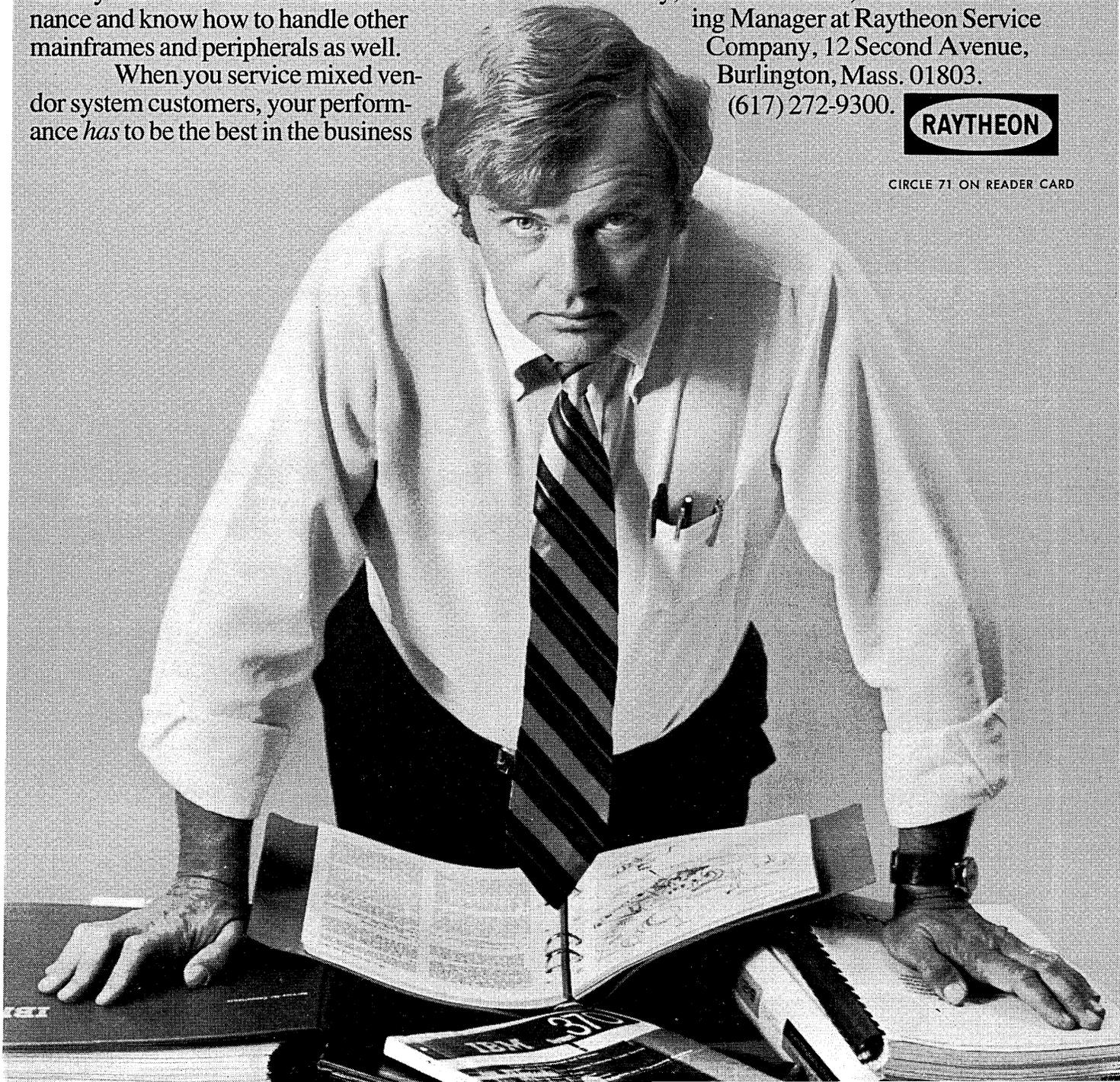
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as some general predictions for the next 10 years in teleprocessing which might indicate the directions the new SCD will be taking.

He predicted growing specialization in terminal applications and increased use of distributed processing. The most dramatic example of the latter trend, he said, will occur toward the end of the 10 year period, when business firms will be making widespread use of electronic mail and secretaries will be composing letters on computerized, crt equipped word processors.

In the '60s, the cost-effectiveness of on-line entry was demonstrated in the airline and banking industries, Sussenguth said. Now, basically the same thing is starting to happen in "supermarkets, insurance offices, and perhaps later on, as we get further into the decade, in the secretarial kind of system."

He pointed out that improvement in LSI technology underlies the growing specialization and sophistication of terminals. "Typically, today, you can get 1,000 to 2,000 circuits on a chip. Within the next five years, you will be able to have something like 5,000 circuits. . . . So the power of what (formerly required) a glass-enclosed room and a very special kind of (environment)

will now be sitting right at your fingertips."

Software is the major obstacle deterring these improvements, he contended. Specifically, there are "a large number of existing applications which have been designed around unique solutions, unique terminals, unique line controls, unique access methods, and unique applications." In the next decade, he added, manufacturers hope to integrate these individual systems into a common network that can reduce systems and communication costs.

A first step

The first step, Sussenguth suggested, is to try to separate the network management function "which is now very often intricately (intertwined with) the application program." IBM's recently-announced Systems Network Architecture (SNA) is one example of this effort.

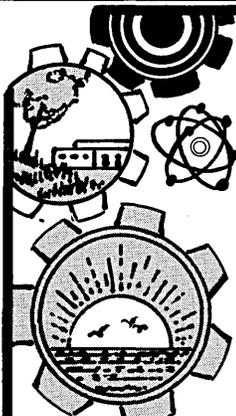
Another requirement is standardization of communication protocols, access methods, and application programs. "I think it will take a number of years," Sussenguth added, "but we will gradually see (such) a stabilization . . . so that we (will) really be able to mix and match different kinds of applications to different kinds of terminals

on these new kinds of communication facilities."

Sussenguth listed a number of systems requirements which, he said, are typical of today's airline and banking networks, and which will become common among supermarket, insurance, and other newly-emerging networks during the next 10 years.

First, there will be increasing emphasis on geographically-dispersed, multiple-application systems, with the "central site usually being on some kind of regional basis;" with program preparation, network control and system management only at these regional centers, and with no dp-trained personnel at the extremities of the network. These systems will have to be "intrinsically reliable" so that total failure, while not eliminated completely, has the same probability as total breakdown of the telephone network. "These kinds of teleprocessing systems would be essentially prohibitive four or five years ago (but are becoming) more and more possible as time goes on" because of improvements in the technology and economics of LSI.

At the remote site, total failures on the order of once a year, will be tolerable, provided the site can be brought back up within one to three hours, Sussenguth added. At the extremities of the system, "the fact that a given terminal is down is not nearly as critical, and the



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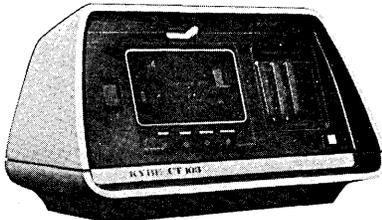
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repair time on that terminal is not critical either."

The typical system will require an average of about 5,000 terminals and will have to handle one interactive transaction/minute/terminal. Each transaction will consist of two to five messages—a total of 20 to 100 bytes in and 200 to 1,000 bytes out. Response time will be about a quarter of a second for a simple task, two to three seconds for a data base inquiry, and five to ten seconds for a query requiring file search and computing. The "average" peak load will have to be supported about two to three hours per day.

Data security and privacy, says Sus-senguth, "are real customer requirements and will probably be coming about in a number of countries because of legislation." Systems will have to keep independent applications separate from each other and also will have to do a better job of keeping track of messages than is the case today. "The ability to encrypt information as it goes over the networks will essentially be invocable on demand."

The system structure will have to be capable of being continuously modified to accommodate new applications, additional terminals, changing terminal types, expansion or contraction of the geographic area served, new tariff offerings, and new communication technologies.

Each remote terminal will have its own computer and will be driven by a small cluster controller which, typically, will handle 10 to 100 terminals. It too will contain a small cpu and, in general, will also have a data base stored in 10 to 500 megabytes of memory. This arrangement will allow the user "to limp along" if the central site or the communications links go down, and "if your controller goes down, you (will be able to) switch the terminals to another controller." Also, with more work done at or near the remote location, the central site will "become more and more batch like . . . allowing a better throughput."

—Phil Hirsch

Conferences

The Stuff of the Future

The future of computing is in good hands if the 17 students who participated in the 1975 National Computer Conference's High School Computer Science Fair are typical of the people who will become the computer professionals of the 1980s.

The fair was organized by George Vassilakis of the Univ. of Southern California and Charles Ray of California Inst. of Technology. Participating students ranged in age from 12 to 18. De-

spite a disappointingly small number of exhibits, the technical proficiency displayed drew critical praise from the many attending educators and computer professionals.

John Parsons, a senior at Hawthorne high school, Hawthorne, Calif., won the grand prize, a Hewlett-Packard calculator. His logical tic-tac-toe machine, fabricated from integrated circuits, also took first place in the design and construction of computers and components category.

Jack Kohn, a 16-year-old senior from Aragon high school in San Mateo,



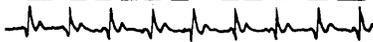
Calif., took first place in the systems programming category for a software project—"Cosmo/A Custom Operating System."

In the applications programming category, first place went to James Lux, 17-year-old senior from Mount Carmel high school in San Diego. His entry was titled, "Computer Optimization of a Solar Power Plant Design."

Steven Heller of Poughkeepsie, N. Y., traveled the farthest to get to the fair, earning his way across country by giving magic shows and doing balloon sculptures for children so he could exhibit his



John Parsons, grand prize winner at the 1975 National Computer Conference High School Computer Science Fair, shows off his award placard and the device that won it for him, a logical tic-tac-toe machine fabricated of integrated circuits. Magician Steve Heller, right, displays balloon sculpture. He sold them and did magic shows to finance trip to NCC.

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		(one SPC slot)	(one I/O slot)		
2116					11/10
		● SINGLE PC CARD			
		plugs into CPU or Extender			
	11/40	● TV REFRESH from 4K RAMS			BOS
		256 X 256 dot matrix			
		● COLOR/GREY SCALE			
		using multiple cards			
	2114	● DELIVERY FROM STOCK			11/15
		DEC: 4411 GVG — \$2750			
		HP: 4416 GVG — \$2500			
11/20		 intermedia systems			5662C
		20430 Town Center Lane, Cupertino, California 95014 (408) 996-0900			

*Reg. T.M. of Digital Equipment Corporation

news in perspective

"Computer Simulation of an Elementary Model of the Economy."

Other projects worthy of note included a basic compiler in PL/1 by John Dundas of San Marino high school, San Marino, Calif.; "Graphics/The Hidden Surface Problem" by Joel Parke of Mills high school, Burlingame, Calif.; a binary adder-subtractor by Martin Hamano of Mark Keppel high school, Monterey Park, Calif.; and two unnamed projects:

a display featuring computer assisted instruction and a construction project consisting of an attache case keyboard and calculator.

Most who inspected the exhibit judged it a success in that it afforded an opportunity for today's computer professionals to meet and encourage the youngsters who will be helping to expand the frontiers of computing in the near future.

EFTS

The Latest Network Is a \$35 Million Project

New electronic funds transfer systems (EFTS) are popping up all over.

In St. Louis, Financial Communication Services Corp. has announced that specifications for a system encompassing more than 6,000 EFTS and point-of-sale (POS) terminals, plus a "very sophisticated" communications network costing about \$35 million, probably will be released late this summer.

Financial Communication is a joint venture recently formed by 10 midwestern banks belonging to the Interbank

(Master Charge) Card Assn. The company evolved from a study done by Credit Systems, Inc., which operates the Master Charge processing center in St. Louis, and which designed the present nationwide Master Charge credit authorization network. CSI may help evaluate the bids that Financial Communication receives from vendors. It also may help manage the project as it moves forward.

The proposed network is planned to be operational next year. It will cover Missouri, Kansas, Iowa, Illinois and western Kentucky. Some 6,000 terminals are to be installed in retail outlets. Another 130 "financial convenience

centers" will be put in shopping malls, industrial plants, airport terminals and other heavy traffic locations.

The owners and proprietors of all these properties will "acquire" the terminals—presumably buying or leasing them—from the individual banks belonging to Financial Communication Services. These banks will obtain the equipment from the joint venture organization, which plans to purchase it from the original manufacturers in quantity at oem prices.

Supermarket installation

The Bank of America installed NCR Model 770 automatic teller stations last month in five Los Angeles-area branches of Ralphs supermarkets. Besides providing B/A customers with remote access to all the standard banking services, the automatic tellers cash checks, which should improve service at the checkout registers and may reduce Ralphs' losses from bad checks.

Quicker payment

On the East Coast, NCR is designing an interface that will enable its model 280 electronic cash register to access First National City Bank's demand deposit accounting system on-line. The interface is being developed for J. C. Penney and should be completed "in four or five months," says NCR vp William Walsh. Penney's will then be able to

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CIRCLE 105 ON READER CARD

verify that a customer who wants to pay for a purchase with a Citibank credit card can legitimately do so. Also, the store will get paid quicker.

Walsh said a similar interface is being developed between a Model 280 terminal at Fortunoff's, a Long Island housewares and home furnishings store, and Chase Manhattan's BankAmericard processing center. Later, the interface will be modified to allow on-line authorization of purchases covered by Master Charge cards. Chase Manhattan's BankAmericard processing center, at Lake Success on Long Island is already connected to the Master Charge center in downtown Manhattan by a tie line. Ultimately, Fortunoff's in-house credit card data base, plus others, operating only within the New York City metropolitan area, may be made on-line accessible through the 280, said Walsh. The store hopefully will then be able to get rid of the other four credit authorization terminals it's now using.

A net for S&Ls

The Federal Home Loan Bank Board (FHLBB) has requested proposals on a switched data communications network ultimately capable of supporting electronic funds transfer services throughout much of the U.S.

District federal home loan banks would contract for the network, with the board's approval, and their customers

would be the individual savings and loan associations in the district supervised by each bank. There are 120 federal home loan bank districts altogether.

The S&Ls would use the network to link their headquarters with electronic cash registers, credit transaction terminals, and unattended teller stations in stores and other remote locations. The system also would be capable of interconnecting with commercial banks and other financial institutions, said Marvin Sendrow, an FHLBB contract administrator.

Proposals originally were due June 18, but because of vendor interest, a new deadline is under consideration, Sendrow said. Probably, it will be the 25th of this month. He reported that more than 100 firms have expressed interest in bidding.

Five of the 12 district federal home loan banks have large on-line systems, and "we expect at least one of them, possibly two, to contract for switched EFTS networks this year," Sendrow added. He declined to identify which ones. The five banks which now have large on-line systems are in New York City, Chicago, Cincinnati, Pittsburgh and Des Moines.

The board's 167-page request for proposals basically asks for two network designs—one to support a metropolitan area with a population of 2 million, the other to support a city/suburban com-

plex having 5 million residents. The former system would include close to 1,600 remote terminals, mostly electronic cash registers and credit card devices (e.g. Addressograph-Multigraph's Amcat or IBM's 2730), while the latter would have about 2,600 of those devices.

IBM scales down

IBM introduced an "entry level" POS system in late spring for the supermarket that can't justify either a central computer or automatic data input through an ocr wand or slot scanner. Both features can be added later, however. The new system consists essentially of IBM's standard 3663 terminals connected to a new in-store controller, the 3661. A typical six-terminal configuration sells for \$40,388, including \$12,620 for the controller. The terminals are purchase-only equipment; the controller can be rented for \$467/month. First shipments are scheduled for the second quarter of 1976.

A similar system for retail stores may be on the way. IBM reportedly is testing a controller-run version of its 3650 POS system at a J. C. Penney store in North Carolina.

Files for the new supermarket system must be created on a 370, but an IBM spokesman said that a small chain could have this work done at a service bureau.

—P.H.

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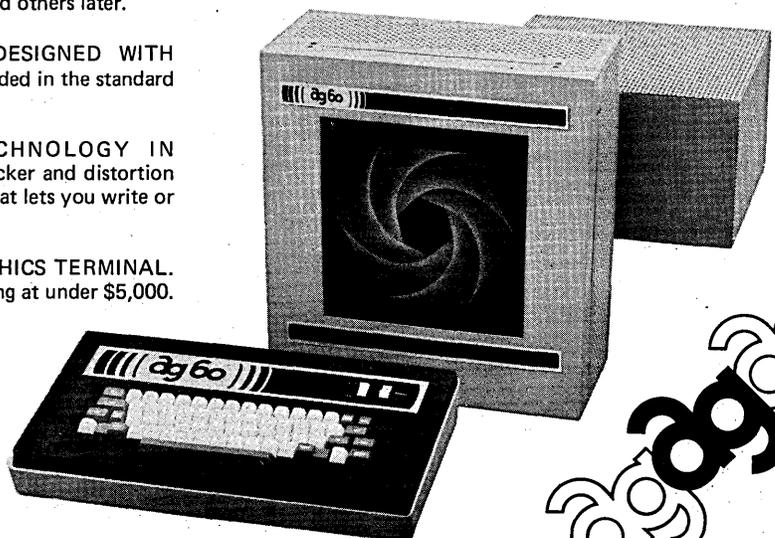
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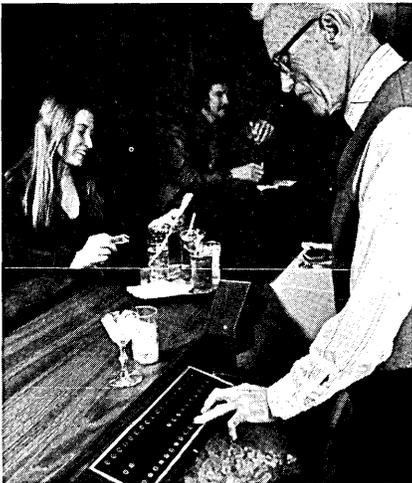
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News in Perspective **BENCHMARKS . . .**

Against Licensing: Government licensing of computer professionals "all too frequently results in increased price to the public without comparable improved product and performance," says the Association of Data Processing Service Organizations (ADAPSO). The organization issued a position paper, spurred by controversial model legislation submitted to state legislatures by the Society of Certified Data Processors (SCDP) as a guide for state dp licensing laws (January, p. 118). It says it opposed licensing at federal, state or local levels. It instead called on the computer services industry to "develop and publicize even higher voluntary standards of performance and product, and permit the free marketplace to be the determinative factor."



MICROPROCESSOR-BASED cocktail dispensing and inventory/cost control system has been introduced by Electro Units Corp., San Jose, Calif. It uses the 16-bit Pace microprocessor from National Semiconductor, can be preprogrammed for lower per-unit prices during Happy Hours (relying on its real-time clock) and to pour (bartender-selected) light, normal or heavy dosages. Keeping a strict count of liquor dispensed and amount remaining in inventory, it's reported to make practical absentee ownership of bars.

The Weak to be Weeded? Some of the weaker independent suppliers of terminals "are headed for trouble," despite a doubling in the shipments of computer terminals in the next five years, says a report of a study by Arthur D. Little, Inc. The reason is a shift in emphasis from hardware to software for solutions to communication system problems. The need to have the software used by terminals compatible with the rest of the system makes it more likely that companies supplying a full product line will capture an increasing share of market, the report says. "Independent producers will have to assess their alternatives and develop specific

market strategies to survive the seventies," the Little study observes. It predicts that by 1981, 3,000,000 terminals will be in place—three times as many as today and they'll account for 25% of total computer system value compared to 10% at the end of last year.

Wanted: \$10 Million: A spokesman for Wyly Corp. said last month he didn't know where the company planned to get \$10 million it needs to keep its Data Transmission (Datran) subsidiary operating until the end of this year. Earlier, Walter Haefner, a Swiss investor who has loaned Datran several million dollars, agreed to wait until Sept. 30 to collect. The original agreement required payment on demand any time after June 13. Haefner is "the most viable source" of the additional \$10 million, said the spokesman, but he declined to speculate on when, or whether, an agreement would be reached. Late this spring, Wyly Corp. president Sam Wyly announced that an offer to purchase Datran had been turned down. The prospective buyer wasn't publicly announced, but a reliable outside source says it was Southern Pacific Communications Co.

Answer to DDS: Western Union plans to announce a new digital, circuit-switched network by the end of the year and have it in service by mid-'76. "It will be Western Union's answer to (AT&T's) DDS," says one observer. With rates slightly lower than the telephone company's, the new WU offering, presently called Synchronous Digital Transmission Network (SDN), will connect New York, Washington, Atlanta, Dallas, Los Angeles and San Francisco. Soon after startup, a total of 24 cities will be accessible. It will link these cities by satellite as well as land, attracting the user who wants the higher efficiency of

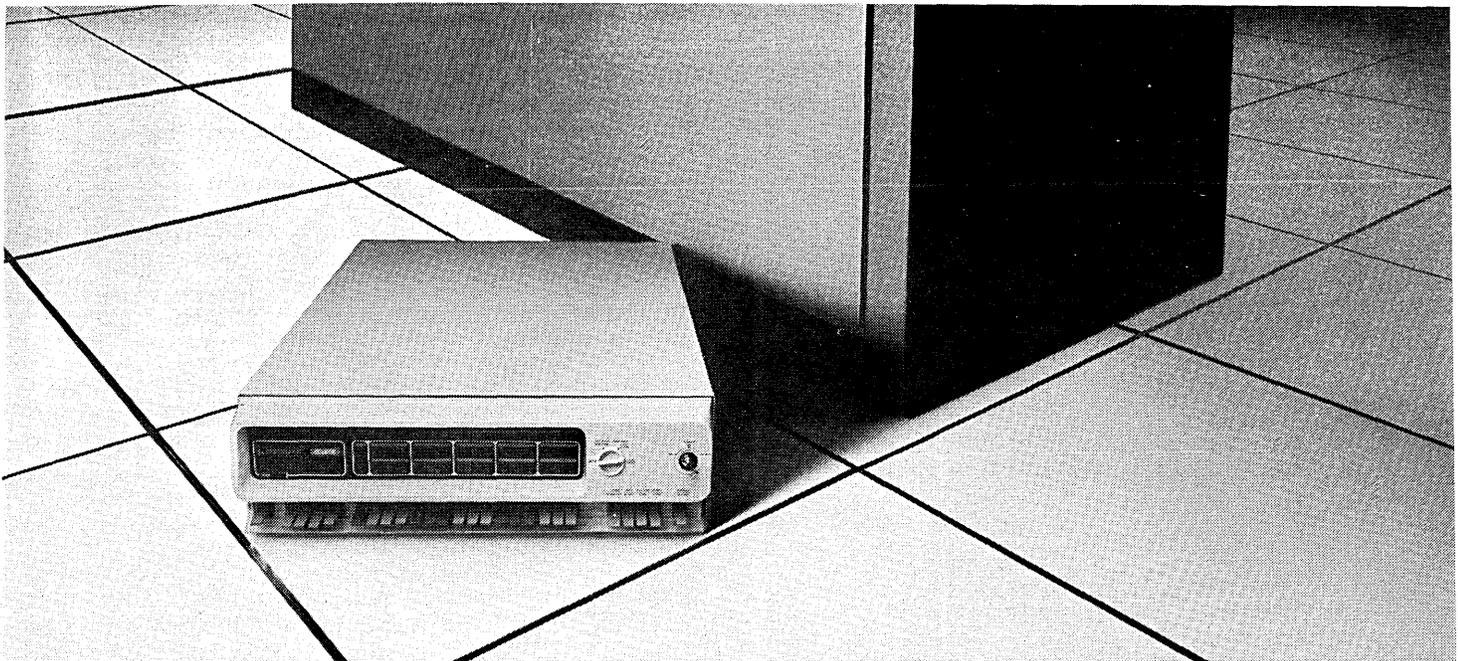
satellite transmission and is willing to modify his present system to get it. It also would attract the user who operates on bi-synchronous or some other "stop-and-wait" protocol affected adversely by satellite transmission path delay, but doesn't want to change.

Brule Nominated: Jean Pierre Brule, the driving force behind the proposed merger of France's Compagnie Internationale pour l'Informatique (CII) and Honeywell Bull, will head the merged operations when the new company comes into existence. Brule, who has been president of Honeywell Bull since 1972, was nominated to the post by the French government and Honeywell, Inc. shortly after the resignation of Michel Barre who heads CII. Robert Gest, who succeeded Barre, was nominated as general manager of the proposed new company, CII/Honeywell Bull. Barre resigned to protest the planned merger (June, p. 117).

Body Blow from GAO: The Agriculture Dept.'s much-bedeveloped plan for a nationwide data communications network—four processing centers and up to 5,000 terminals costing \$106 million to acquire and \$398 million to operate over eight years—has received another body blow. The General Accounting Office last month recommended cancelling the procurement. Basically, the GAO said Agriculture had not defined its users' requirements adequately, nor properly evaluated alternative designs. The department had been planning to award a contract in June. Bids had been received from Univac, Burroughs and Honeywell. The government's purchasing agency, the General Services Administration, has suggested delaying rather than cancelling the award, pending completion of an analysis recommended by GAO. *



COMPUTER PIONEER and U.S. Navy Captain Grace Murray Hopper, who developed the forerunner of today's COBOL, discussed the widening use of the language with Jon S. Gould, center, vice president of systems and software development with Interdata, Inc. and Donald W. Wyatt, president of Diversified Data Systems, Inc. Wyatt developed a COBOL compiler for Interdata minicomputers, part of a trend Capt. Hopper says demonstrates the increasing capabilities of minis.



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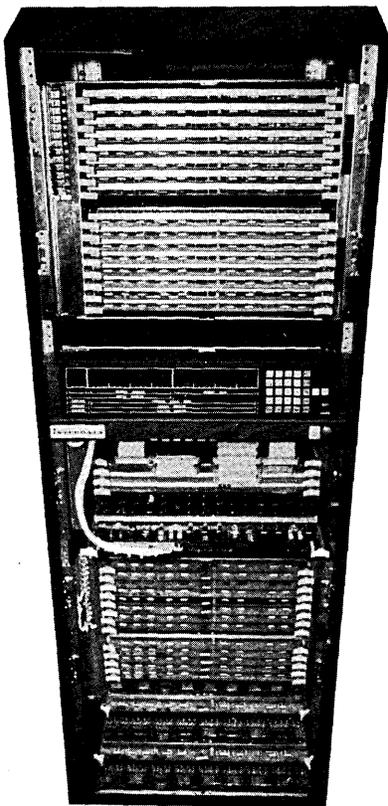
look-ahead stacks, multiple register sets, interleaved 32-bit memory, and fast floating-point hardware. What our 8/32 Megamini means to you is an unequalled combination of power, flexibility, and reliability in a compact package. All at a price that's fully competitive.

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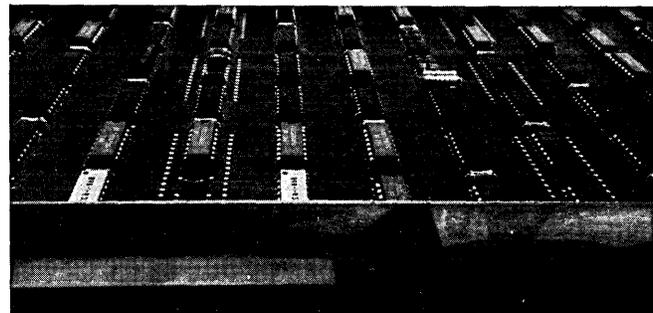
Today's hardware must be designed to ease your software effort. You shouldn't have to spend a lot of expensive programming time trying to figure out how to get around minicomputer hardware limitations. With the 8/32 Megamini you don't — because there are none.

For example. The direct addressing capability of the 8/32 Megamini allows you to build programs and data arrays in any size up to the amount of memory you have — no more 64K limits.

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WORD LENGTH	32 bits	32 bits	32 bits	16 bits	16 bits
INSTRUCTION TIMES (Register to Memory)					
Integer Add	1.25	1.8	.9	1.8	2.5
Multiply	3.54	6.2	2.0	3.9	8.8
Divide	5.8	14.4	9.9	8.3	11.2
Floating Point Add	2.3	6.1	2.4	8.25	5.5
Multiply	3.0	9.1	2.3	11.25	7.2
Divide	5.35	23.3	8.9	12.25	7.9
HARDWARE I/O	Yes	Yes	Yes	No	No
MAX. DMA RATE/SECOND	6MB	4MB	6.7MB	4MB	2MB
DIRECT ADDRESSING RANGE	1MB	1MB	16MB	64KB	64KB
GENERAL PURPOSE REGISTERS	2 stacks 16 each*	4 stacks 16 each	1 stack 16 each	2 stacks 8 each	1 stack 4 each
PRICING (Basic Configuration)					
CPU + 128KB Memory	\$51,900	\$128,700	N/A	\$54,600	\$32,500
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program development capabilities. Software that has an optimizing macro assembler, MACRO CAL. And software with a sophisticated telecommunications access package, ITAM, that allows you to treat remote communications terminals and computers as if they were simply local devices.

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DATA/75

LOOK AHEAD

(Continued from page 18)

IBM BUFFS

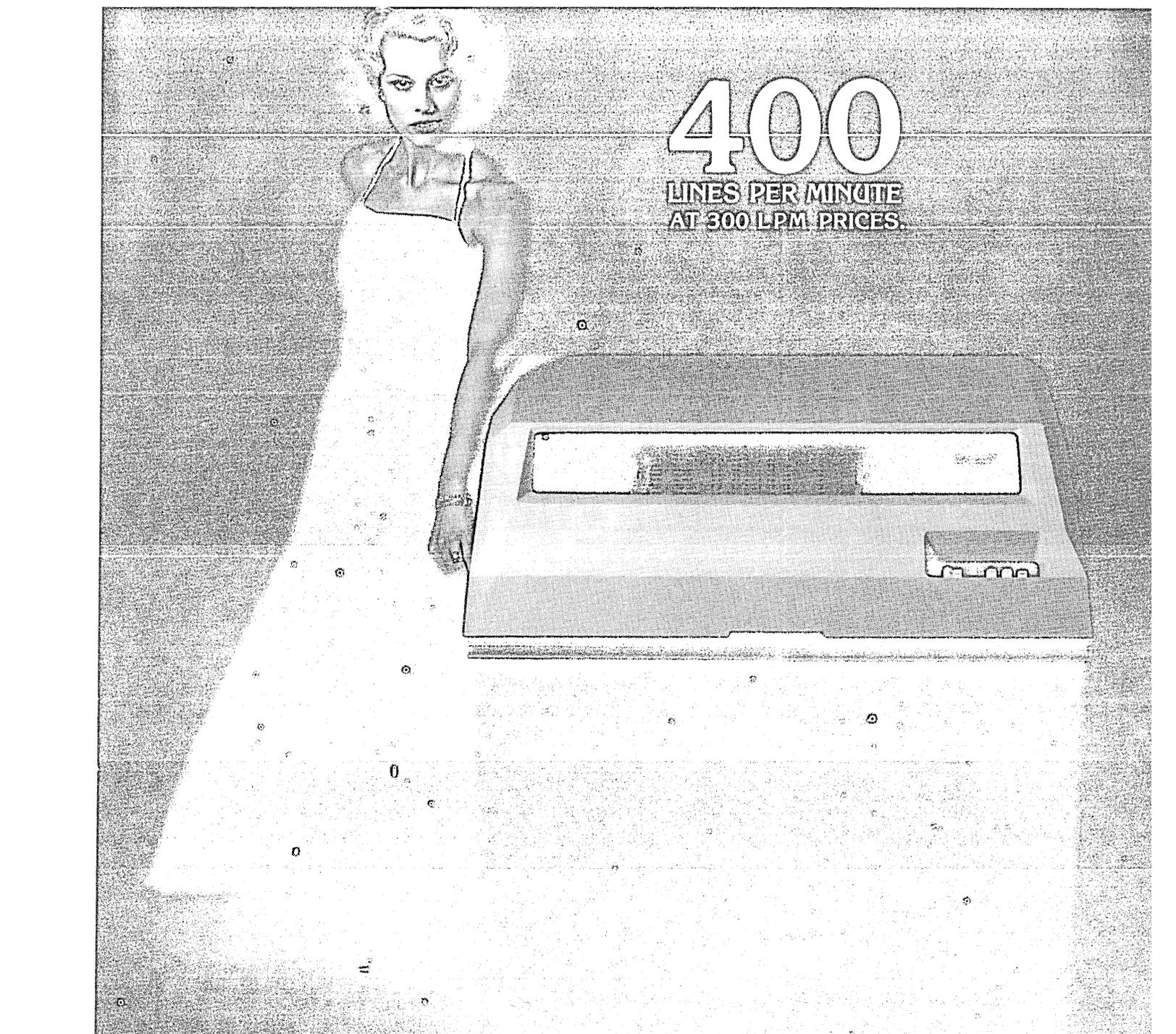
To the Civil War buffs, baseball buffs and Laurel & Hardy buffs, add the IBM buff. The Computer Industry Assn. which sells transcripts and other reports of the IBM-Justice Dept. trial (page 70), has found that some who buy the service are chiefly interested in the history of the computer Goliath and how it works. Though most buy it for business reasons, the CIA's Jack Biddle says there is a pass-along readership among people who simply are "IBM fans." A daily executive summary of the trial, prepared by J. Thomas Franklin, computer law specialist, is the most popular CIA offering, but the CIA, at 1911 N. Ft. Meyer Dr., Rosslyn, Va., also offers transcripts of the trial.

CHECKOUT AT HALF PAST FOUR

Much note has been made of consumer objections to lack of item price marking in supermarkets testing scanning checkout systems. A reporter for the Dallas Morning News, interviewing customers at a Piggly Wiggly market in Ft. Worth, which is testing an IBM system, uncovered a new objection. A woman customer didn't like the fact that the time she was in the store was printed on her tape receipt because, "My husband can check up on me."

RUMORS AND RAW RANDOM DATA

IBM's minicomputer program in Atlanta, called Project Peachtree, is alive and well. One idea being studied: the possibility of introducing an inexpensive mini aimed at the oem market...Plagued by pesky rumors that its level 64 systems do not have a native mode operating system, Honeywell answers that the prototype is now in test at its Billerica, Mass., facility and is still scheduled for delivery around year end...Another twist on the "back-to-third-generation" theme: DPF has just done two conversions of System/3 sites to 360/30s. It also claims to have replaced five 135s and 145s with enhanced 360s...Some pricing notes: Latest price for a 370/155 is 60% of the original price. The Army's request for bid on 22 IBM 360/50 cpu's has driven up the price on that system by about \$40,000...If stockholders of both companies go along with the directors, Data 100 Corp. of Minneapolis will double its oem sales volume to \$30 million in acquiring Iomec, Inc., Santa Clara disc drive supplier, for about \$1 million in stock. Iomec also makes tape drives, printers and other peripherals, but Data 100 had its eye on the company's disc drive business to round out its oem sales activity started last December...IBM may switch tables on Amdahl: The computer colossus is still working on a big machine--possibly to be called the 370/178--and the machine is said to incorporate some of the concepts Amdahl uses in its 470 virtual memory machine. The Amdahl machine, the first of which has been installed at NASA's Institute for Space Studies at Columbia Univ., runs IBM's operating system... Jonathan Swift's Gulliver made it and maybe this one will too. It's Gulliver Technology Corp., formed this summer in Los Angeles to make a 6250 bpi tape system, challenging IBM and Storage Technology. The company, which will sell to both oem's and end users, currently is seeking financing...Control Data soon will announce semiconductor memory products for the oem market, the first being a 32K module using 4K chips. The company's memory development division, formed a year ago in St. Louis Park, Minn., is headed by former IBMer Fred A. Ordemann who left Advanced Memory Systems last September for Minnesota...We hear that the Navy is due out soon with another strong stand behind Codasyl's data management work.

A black and white photograph of a woman in a long, white, sleeveless dress standing next to a large, light-colored printer. She is looking towards the camera with a serious expression. The printer is a Tally Model 4400, featuring a large paper tray on top and a control panel on the right side. The background is a plain, light-colored wall.

400

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The Model 4400 has all the data processing functions your user needs for efficient print runs. 132 columns. Handles 6 part forms up to 19 inches wide. A choice of a 2, 8 or 12 channel VFI. 20 inches per second slew. 6 or 8 lines per inch, switch selectable. Low acoustic noise level. And it has Tally's new innovative single reel snap-in ribbon cartridge.

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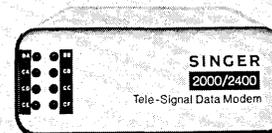
THEIR MODEMS	BPS	OUR MODEM	BPS
Model 201A.....	2000	Model 883P	2400
Model 201B.....	2400		2000
Model 201C.....	2400		1200
			1000

THEIR MODEMS	BPS	OUR MODEM	BPS
Model 202C.....	1200	Model 898D	1800
Model 202D.....	1800		1200
Model 202S.....	1200		
Model 202T.....	1800		

Our modems offer some solid extra benefits. For example, SINGER/Tele-Signal Model 883P combines all the features of the Bell 201 modem series in one compact unit. And, SINGER/Tele-Signal modems are smaller (*our* model 883P is 1/5 the size of *their* 201A). They're available as stand-alone units, as well as optional card sets and rack-mounted multi-modem assemblies. All functions are either strap or switch selectable, and the packaging is uniform. The Model 883P and Model 898D are the same size and the PC cards are interchangeable.

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hardware

Off-line

Is Data General destined to go through life always being "number two?" Maybe not—they almost won at Indianapolis this year. Johnny Rutherford's car, the Gatorade McLaren Special (Number 2 in the race, of course), was outfitted with a fancy telemetry system that allowed them to measure such critical data as temperatures, RPM, pressures, and fuel flow both in preparing the car for the race and during the race itself. Data General supplied the Nova mini and software, while EMR Schlumberger, with 20 years of experience in aerospace telemetry handled that portion of the project.

The popular Termiflex handheld interactive terminal that was such a hit at last year's NCC (see June '74, p. 136) has had its price reduced from \$1,570 to \$995 in quantities of 100 or more. The company (Termiflex Corp., Nashua, N.H.) insists it's not a simple price cut to get it to sell better, rather because it's been selling so well.

IBM continues to dazzle with technological research announcements. This time it's a ten-fold increase in the packing density of large-scale semiconductor memory chips by using electron-beam lithography and ion implantation. An experimental 8 kilobit field-effect transistor (FET) memory was recently described at a Symposium on Electronic, Ion and Photo Beam Technology in Colorado Springs with a density of 5 million bpi². Memory access time on fully decoded chips was measured at 90 nsec.

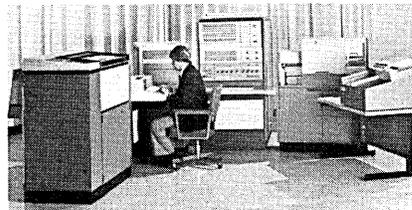
On the subject of semiconductors, Dataquest, Palo Alto, Calif., says that the industry will show a slight increase in the last quarter of 1975 and grow 16% next year, from \$3.9 billion to \$4.5 billion.

Did you know that United Airlines was in the printed circuit board testing business? They are—more or less—because the firm has recently installed a Honeywell circuit board tester to check more than 500 types of electronic pc boards incorporated in navigation and flight control equipment. United claims to be the first airline to run its DC-10 avionics gear through automatic testing equipment and has been sharing its know-how with other airlines.

IBM-compatible Peripherals

Though the market for IBM 360 hardware has recently seen an upsurge, the prices of used last-generation mainframes are still only a fraction of the original book prices. Not so with peripherals and peripheral controllers, most models of which IBM still markets for use with 370s. Third-party leasing firms have not been able to offer much of a discount on that equipment, so this leasing firm has decided to offer new peripherals for 360s and 370s at reduced rates instead.

The products are the Phoenix I/O Subsystems; they include various mixes of line printers, card equipment, and controllers. A high-speed mix might include the controller, an 1800 lpm printer, 1000 cpm card reader and 100 cpm punch, all for \$2,600/month on a one-year lease basis (or \$2,300/month on a three-year basis). A slower ver-



sion, with 600 lpm printer and 600 cpm reader plus punch, goes for \$2,000/month and \$1,700/month on the same length leases.

Pricing is made more attractive by including maintenance and *personal property tax*, and by the fact that the printers don't require the \$100/month print cartridge.

Unlike the IBM offerings, the same controller can handle up to eight peripherals, and it is not necessary to upgrade from one model of the controller to another when adding more gear. Also, the systems will operate up to 2,500 feet from the mainframe they serve, making them look like remote batch stations in many cases. Real remote batch and interactive operation options will be added later. GREYHOUND COMPUTER CORP., Phoenix, Ariz.

FOR DATA CIRCLE 222 ON READER CARD

Intelligent Displays

The spate of new products flowing out of Xerox' development labs continues with a programmable interactive display system capable of supporting up to 12 intelligent display terminals. The Intelligent Display System (IDS) comprises a microprocessor and one or more display terminals to provide in-

quiry/response and data entry/retrieval capabilities for all Xerox computer systems. IDS receives and formats messages from the host computer, automatically performs the necessary control interactions, and checks the validity of received information.

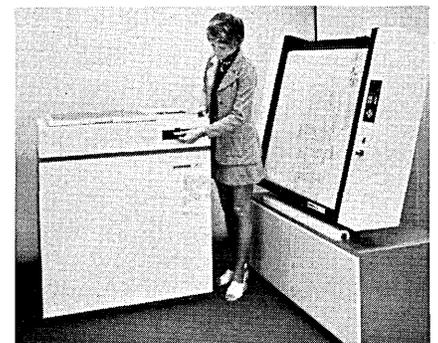
Editing capabilities include roll-over when inserted or deleted characters exceed one line, six function keys, cursor control, and text justification. Additional features include 7x9 dot matrix characters, protected fields displayed in reverse video, 96 character font that includes upper/lower case, a solid rectangle for histograms, and a 10-key numeric keyboard for accounting applications. A typical IDS including the microprocessor and eight display terminals sells for \$35,100, or \$1,060/month on a one-year lease that includes maintenance. Deliveries have already begun. XEROX CORP., El Segundo, Calif.

FOR DATA CIRCLE 224 ON READER CARD

Intelligent Plotter

CalComp first became known for plotters, specifically for the small Model 560 drum plotter. That was about 10 years ago. In the intervening years the firm has branched out in many lines, including discs, microfiche systems, and flat-bed plotters. Its latest product, the 960 plotter, is a return to its old success—sort of—but on a vastly different scale.

The 960 is like a drum plotter the



size of a flat-bed plotter. Like small drum plotters it moves the paper under the pen as well as the pen over the paper. Unlike small drum systems, however, it operates on paper up to 34½ inches wide, either in continuous rolls or in sheets (individual sheets get taped to a mylar sheet running between the two paper rollers).

The plotter has two pens, operates at up to 30 ips with the ballpoint, and has a drawing resolution of 0.00049 inch. Its intelligence is used for buffering,

hardware

some formatting, deciphering commands, and standalone diagnostics. The system operates on-line to a Nova 1200, HP 2100, or PDP-11, or through an RS232 interface at speeds to 9600 baud. Priced at \$30,000 including the first-year's maintenance, the system can also be run with CalComp's 925 controller (an additional \$26,400). Deliveries are scheduled to begin in December. CALCOMP, Anaheim, Calif. FOR DATA CIRCLE 225 ON READER CARD

Word Processing System

The recipe for the hardware for a shared-processor word processing system is straightforward: 'take one key-to-disc system and add a printer.' The result is, at least in the case of the DataText, a multiple-crt text processing system which has a disc for staging files, a mag tape for storing permanent text, and a printer for output.

The software part of the recipe is not quite as simple. For one thing, the mag tape becomes an input device as well as an output collector, and the terminals have to support specialized text functions for editing, inserting lines and paragraphs, complicated tabulating and alignment, page numbering, etc. In fact, DataText provides more, including automatic page positioning for output and even automatic envelope generation (since the system is expected to be most often used in correspondence generation).

As is now common, models are differentiated primarily by disc size. The smallest model includes a 2.2MB disc, 45cps printer, the processor, mag tape and 4 crt's; it runs \$1,894/month with maintenance or \$72,450 on purchase (plus \$319/month for maintenance). Additional terminals run \$136/month or \$5,750. GENERAL COMPUTER SYSTEMS, Addison, Texas.

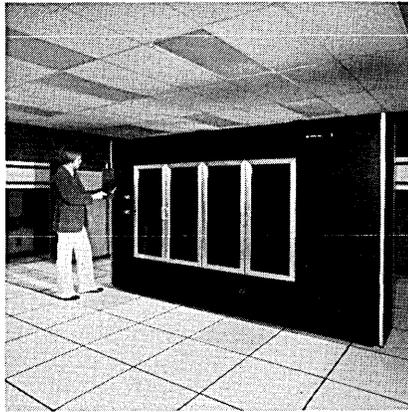
FOR DATA CIRCLE 223 ON READER CARD

Talking Computer

MAVIS has a triply-split personality. It is either a crt-based data entry system, an audio-response inquiry system, or a batch processing system. Its schizophrenia is sufficiently complete that MAVIS can do all three concurrently, though sufficiently compartmentalized to prevent it from talking to the data entry operators.

Referred to as a data exchange system, MAVIS' acronym actually stands for McDonnell Douglas Automated Voice Information System, and the system is the first computer product from McDonnell. It comes from McDonnell's electronics division too, not the computer services operation

product spotlight



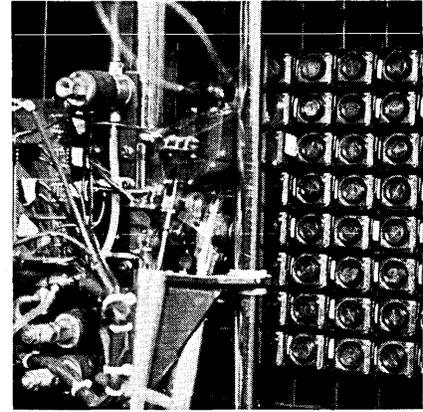
Mass Memory

In introducing the Model 38500 Mass Storage System, CDC referred to it as "the most important computer peripheral system ever introduced by Control Data." Whatever its importance to its manufacturer, the product is an impressive system, destined to be a good competitor for IBM's 3850 mass memory and Ampex's TBM.

Like the IBM and Ampex products, the 38500 is based on magnetic tape technology. It is most closely related to IBM's product, however, since the tape is packaged in small addressable cartridges rather than on large reels like Ampex's. In fact, there are 2,000 cartridges in the 38500, each holding a strip of tape which is 2¾ x 150" and each capable of storing eight million bytes. The entire system provides 16 billion bytes of on-line storage, about the same as 6,400 mag tapes or 200 big disc packs.

The cartridges are accessed by a selector which operates like the pen-carrying mechanism on an x-y plotter. The access mechanism seeks out a cartridge in a couple of seconds and delivers it to a wait station. There is nothing really innovative in the access system, nor in the read/write station either. The read/write station is nothing more than a vacuum column tape drive for superwide tape. Even the recording density, 6250 bpi, is nothing special. But it works. The total process of finding and loading a tape takes about five seconds, and data transfers can be accomplished at 806KB (IBM 3330 disc rates).

The system operates under its own access method, named VDAM, under OS or VS operating systems (but not



DOS/VS). It can be connected to up to four IBM 370 mainframes either with 3330 discs for staging data or through direct CPU connection.

VDAM controls the storage of data on cartridges, remembering the location of data sets and otherwise acting transparently. VDAM also handles the staging of data on disc and the queuing of accesses. Alternately, VDAM will support user sequential access (where the user knows the location of the data sets) and user direct access (where the user calls for a block within a known data set but doesn't necessarily know the location of the set). To the user, and to the 370, the facility looks like a 3330 disc. User jobs and JCL reportedly need no changes.

Presently offered for attachment to IBM systems of 370/145 size and larger, the 38500 will later be made in models for Cyber 170 mainframes and other large-scale computers. Since the minimum data set size is one million bytes, the device cannot be expected to efficiently replace tape libraries or all the discs in an installation, but it can take care of a great deal of an installation's storage requirements, cut operator handling of data files, and streamline operations considerably.

Priced at \$326,335 plus \$987/month for maintenance, the basic system has all the 16 billion bytes of storage and two tape read/write stations (which connect to the back of the unit). Two additional drives can be added at \$52,000 each. Three-year lease terms bring the basic unit in at \$9,340/month plus maintenance, and cartridges are available for \$120 for eight. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 221 ON READER CARD

known as McAuto.

The company started working in voice response systems for use in cockpits, telling pilots what was going wrong. Apparently the technology, involving high levels of data compression, lent itself to a commercial application.

MAVIS actually includes several new products, all designed and built by McD: the audio response unit, the crt terminals, and the 16-bit processor.

The audio response unit can be programmed with almost any size vocabulary. The processor can support up to 256 phones and a comparably large number of peripherals or terminals; it has a 184-instruction repertoire and supports background batch processing, as mentioned, in COBOL. It can also operate its terminals in 3270 simulation mode.

Another surprising feature of MAVIS

is its price. For \$130K the user receives the processor and audio response unit, a 9-track tape, a 2314-like disc, four crt's, eight phone lines, 256K of core, a dual-cassette console, plus the COBOL, key-to-disc, and simulation software. Looks like the firm means to be a serious contender in the dp business. MCDONNELL DOUGLAS CORP., St. Charles, Mo.

FOR DATA CIRCLE 226 ON READER CARD

370/158 Memory

Up to three megabytes of MOS main memory can be added to 370/158 models in 512K and 1 megabyte chunks using this manufacturer's 370/STOR 158-3 product. Such a system might offer an attractive alternative to a dual-cpu system for extra reliability, as the reconfiguration panel on the memory lets users duplex main storage on a single 158 processor under

operator control. While it doesn't represent a back-up cpu for increased power, the memory does assure the availability of two separate memory systems for critical on-line applications. The fully compatible memory uses "N" channel MOS chips which retain information in a stable state without the need for being "recharged" electrically at frequent intervals. A megabyte added to a resident 1024K machine costs \$155K, or \$4K/month on a five-year lease, with maintenance separately priced. Full production shipments commence in August. CAMBRIDGE MEMORIES, INC., Bedford, Mass.

FOR DATA CIRCLE 228 ON READER CARD

System/3 Memory

This may possibly be the only add-on memory company around willing to sell only 4K increments for the System/3—which might just be enough to

Multiple-terminal Systems

Minicomputer manufacturers looking at end user markets are more and more frequently configuring multi-terminal systems for time-sharing, transaction processing, order entry, etc. Here are three that were introduced within 30 days of each other.

General Automation's multiple terminal system, designated the DM 250, adds time-sharing to the firm's older 200 series batch systems, making them capable of running t-s, batch, and real-time concurrently. The DM 250 supports up to 16 crt terminals, offering each the facilities of the entire system, referred to as a "virtual computer." One of the system's biggest advantages is its IBM 1130 and 1800 heritage; it can run programs designed for either of those systems or for later GA systems since it includes a GA 18/30 processor.

Languages handled include FORTRAN, RPG II, COBOL, a minor implementation of BASIC, assembler, APL, and CYTOS, a conversational file management and text editing system.

Prices begin at \$74,200 (for a 16K mini, 10 million word disc, 300 lpm printer, 400 cpm card reader, teletypewriter console and basic software) plus \$4K each for the crt's. GENERAL AUTOMATION, Anaheim, Calif.

FOR DATA CIRCLE 229 ON READER CARD

Texas Instruments' offering is a dual processor configuration using 960B minis and a new 914A crt terminal. As it's TI's policy to run products in-house for some time before announcement, the system being

offered for the first time is actually nearly two years old. That shows some kind of restraint.

Called DXS (for Data Exchange System), the product is offered in two versions, either of which operate as a standalone or attaches to IBM 360/370s. Designed primarily for transaction processing, DXS incorporates an indexed access method for disc file management and a high level transaction programming language similar to COBOL.

Much of the intelligence of the system resides in the crt's, which have built-in micros and can do data formatting, editing, field protection, etc. on their 1920-character screens. They can also emulate IBM 2260s and 3270s through the DXS controllers.

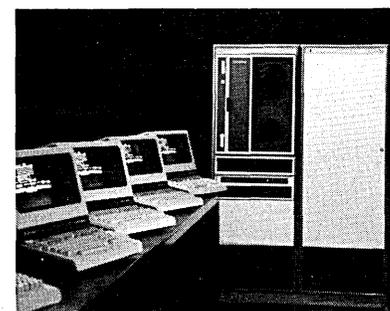
Two models are available, each of which can have up to 64 terminals



and 11 communication lines in their basic form and are expandable way beyond that. DXS-20 uses up to four 2.2MB disc cartridges; DXS-40 uses up to four 100MB packs. Prices start at \$66,000 including a 9-track tape, 300 cpm reader, console, 64KB of memory, one channel, and the second processor for multiplexing. Terminals are \$3,200 each. Maintenance runs roughly 1% of the total per month. TEXAS INSTRUMENTS INC., Houston, Texas.

FOR DATA CIRCLE 230 ON READER CARD

The HP 2000 Access Systems handle BASIC time-sharing, source data entry, and remote job entry concurrently, but the RJE is intended for flushing jobs to a larger IBM or Control Data cpu rather than for handling by the 2000 itself. One of the beauties of the system is that it allows RJE jobs to be initiated by any of the up to 32 terminals, and al-



lows any terminal to access any of its peripherals. Another advantage is the expansion of BASIC to handle multiple files and string manipulation.

Based on dual 21 MX processors—one for application processing and one for communications and peripheral control—the configurations can include up to seven line printers, up to seven card readers, mag tape and disc. Two versions are available, each of which comes with a console, 800 bpi tape drive, and paper tape reader. The Model 30 includes 96KB of 650-nsec semiconductor memory, a 5MB disc, and a 16-port multiplexor, for \$59,900. Model 40 has 128KB, a 15MB disc, and 32 ports, for \$67,600. Terminals are priced separately. Deliveries begin in September. HEWLETT-PACKARD, Palo Alto, Calif.

FOR DATA CIRCLE 231 ON READER CARD

hardware

tide many users over. And the rental is only \$85/month including maintenance. Users also get a software package and supporting documentation said to permit faster system generations. CFI MEMORIES, INC., Anaheim, Calif.

FOR DATA CIRCLE 232 ON READER CARD

Oem Peripherals

Control Data must have found economies in batch processing new product announcements, for as well as the new

mass memory system the firm has simultaneously introduced a half-dozen other oem products. One of them is an extremely low-priced *page reader* which is capable of reading upper case OCR A or OCR B at a rate of 683 cps from 8½ x 11 or half-size pages. Numbered the 92650, the device is intended to be used as a terminal or a peripheral; it has no data collection medium. Full-size pages can be read in 12 seconds, however, a quite reasonable rate for a peripheral selling for \$10,000 (in huge oem quantities).

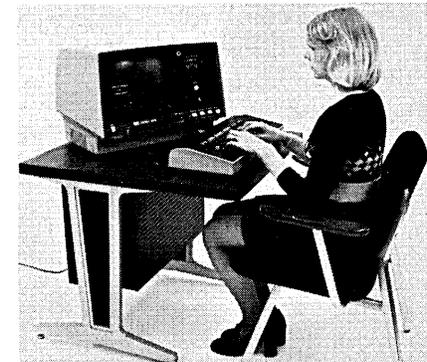
Included in the batch announcements is a Model 92451 *crt display terminal* with detached keyboard. Built around an Intel 8080 microprocessor,

the unit can display up to 12 lines of 80 characters (expandable to twice that much optionally), can be programmed to perform edit functions and respond to a number of function keys, can be used on multi-drop lines, and can be supplied with printer and cassette interfaces. Oem prices start at \$2,450 in a bare-bones form, with discounts for quantities.

Winchester-like discs and the disc packs for them appeared too, along with a triple-headed pack module ca-



pable of accessing a half-million bytes at a time. In these kinds of disc systems, the drive stays the same while the packs change, so only a single drive is offered, the 9770-B2 at about \$13,000 in big quantity buys. The 35MB pack (including heads and access arms) goes for about \$1,300; the 70MB module for about \$1,750, and the module with three read/write elements per head for \$3,500, roughly. (The mind-boggling prices on "packs" of the Winchester variety will surely change our old habit of referring to packs as "ex-



pendables.")

Bigger *drives conventional* are part of the package too. One is the 9764 40MB drive (using a 12-high disc pack) and another is the double-density equivalent, the 9766. Priced at "under \$10,000 and under \$12,000, respectively," the drives are expected to be used with minicomputer systems and small cpu's; their transfer rates are 1.2MB. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 227 ON READER CARD



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Updates

IBM's Scientific Subroutine Package, a collection of over 250 routines, is not getting high marks at Stanford Univ., and will be expelled before the end of the summer. Though the package was free (or more likely because of it), vendor support for the package was "never particularly outstanding (and) is now nonexistent." But the real reason SSP is being bounced, says the school, is that many of its routines are inaccurate, obsolete and downright dangerous to use." For example, in RANDU, a uniform random number generator, consecutive triples of numbers are completely correlated. MFCR and DMFCR "purport" to calculate the rank of a matrix. "Because of round-off errors, this function cannot be done by this method, and the documentation even admits this," says the Academic Computing Services Bulletin. Numerous other routines were also indicted.

An SOS (Save Our System) has been received from Brazil. An IBM 1130 user down there has just installed four 2415-IV tape drives and would like to hear from vendors and universities that offer software support (including sort routines) for the tape system. Contact Mr. Jean-Jacques Reuter at ENGEPEL, Rua Rio Grande do Norte, 1164 30.000 - Belo Horizonte - MG Brazil.

ITT has awarded Applications Software, Inc., (Torrance, Calif.) what may be one of the largest packaged software contracts ever. The ASI-ST data management and reporting system can be acquired by ITT unit companies and subsidiaries at discounts from list prices by simply referencing the master agreement. Potentially, this arrangement could mean as much as \$1 million to ASI.

With IBM's recent pullback of support for the FASTER Program Products, users should know that Software Module Marketing Inc., Sacramento, Calif., offers a FASTER to CICS Translation Service (FLTS). FASTER source statements are converted directly into CICS macros and assembly language source statements so that users don't have to run an inefficient simulation or emulation environment. The company is located at 1007 7th St., 95814, and can also be contacted by phone at (916) 441-7234.

"Easy" Array and Signal Processing

Complex mathematical operations, such as accurate array and signal processing, might become relatively easy to do using this manufacturer's SNAP II, a FORTRAN compatible language. The language is used to control a line of high-speed, floating-point peripherals. The speed of these peripherals makes it possible for relatively slow speed computers to do such complex computation, performing 32-bit floating point multiply/add in 415 nsec, or a 1024 complex Fast Fourier Transform in 4.5 msec. SNAP II is used to call for any of 39 basic operations in the MAP peripherals, such as matrix and polynomial evaluations, as well as call for a sequence of previously programmed operations. Programmers can add specific commands or update programs without getting involved in microprogramming. An important feature is that many sequences of basic mathematical operations can be programmed, stored, and later executed by a single call. SNAP II is available as a bundled option with the firm's processors, which start at about \$5K. CSP INC., Burlington, Mass.

FOR DATA CIRCLE 212 ON READER CARD

Fortran Maintenance

This FORTRAN analyzer program comes from Hitachi, Ltd., where it was used to aid in the revision, machine conversion and documentation of existing FORTRAN programs. Source languages allowed as input for analysis are IBM FORTRAN G and H, CDC FORTRAN 66

and 63, GE 600 Series FORTRAN IV, and even IBM 7090 (and we could assume 7094) and HITAC 5020 HARP FORTRAN as run on Hitachi equipment. For use in machine conversion, the user can specify as an object set of FORTRAN any one of the source FORTRAN languages, and any statements in the input that do not have equivalents in the target are flagged. Processing time is approximately one minute per 1,000 source statements, and unless output is omitted, lines equivalent to four times the number of input cards are printed out.

Printed output is controlled by the user and includes a program listing with flags showing the results of the analysis, a symbol table giving symbol attributes, symbol cross reference table, statement number cross reference table, a storage map showing the locations of symbols within COMMON areas, subprogram definition and cross reference tables containing subprogram names, argument forms, reference locations, undefined subprogram names, etc. Additional user control options include output page titles, internal table size specification, input source Hollerith code control (BCD, EBCDIC or HITACHI), standard input and output logical unit number control, and printer page size control. In all, for a price of \$970, the IBM 370 program (93% FORTRAN and 7% assembler) might be a real boon to migrating FORTRAN users. COSMIC, Univ. of Georgia, Athens, Ga.

FOR DATA CIRCLE 213 ON READER CARD

software spotlight

University DBMS

A Data Base Management System called OASIS, originally developed at Stanford Univ. for small IBM 360 configurations, has been modified for larger 360 and 370 systems and is now being offered by this Canadian university. Equipment requirements include a 360 or 370 running either OS/MVT or OS/MFT, 2314, 3330, or 3330-11 disc drives, and one or more 9-track magnetic tape units. At present, the DBMS operates in batch mode, but an on-line system for support of 3277-type intelligent terminals goes into full test in September.

OASIS is designed to integrate all computerized administrative systems, allowing administrators to query files such as finance, personal records,

course assigned, faculty and administration, library, bookstore, etc. Replies on the crt would show outstanding accounts at these facilities. Confidentiality is preserved by permitting access only to authorized persons for data reserved for them down to the data element level. The Univ. of North Dakota is the first U.S. customer, planning to use OASIS for student records, though the system has been used in Canada to reference course inventory, financing formula data base, subsidized research data base, teacher salary analysis, and audio/visual material inventory. The complete system, which has had several man years of modification time put in on it, is available to other academic institutions for \$4K plus a mandatory year of maintenance at an additional \$3K. UNIV. OF WINDSOR COMPUTER CENTRE, Windsor, Ontario, Canada.

FOR DATA CIRCLE 211 ON READER CARD

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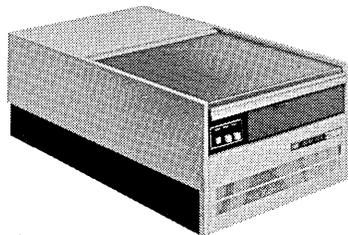


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Production/Inventory

UNIS/90 is a new, modular, data base-oriented software product Univac has developed for its Series 90 and 9000 base (nee RCA). The initial key modules are the Data Management System and the Master-Data Processor for bill of materials processing and engineering data control. The Master-Data Processor enables a company to have an engineering data control and bill of materials processing system with a full complement of "explosion" and implosion reporting and all necessary capabilities required for engineering change control. The production planning and scheduling module allows several bases for capacity requirements planning, infinite and finite. Detailed machine loading is also provided under the finite method. Backward and/or forward scheduling methods are allowed during scheduling. Other modules nearing completion for introduction this fall include the work order management module, and inventory management. A minimum configuration of 90/30, 90/60, 90/70, or 9000 series machine would have at least 64K bytes of memory on it. The Master-Data Processor rents for \$75/month; Inventory Management for \$75; Production Planning and Scheduling is \$175/month, and Work Order Management is \$25/month. SPERRY UNIVAC, Blue Bell, Pa.

FOR DATA CIRCLE 214 ON READER CARD

Data Entry

Eve (Express Validation and Entry system) is basically a form generator based on this vendor's IBM 370 and CDC 3300 data validation product called Data Check Express. This one is set up for the Wang 2200 and wcs minicomputer series. Form descriptions, entry fields, and validation rules are interactively described via a form generation program. A program tape can be generated for remote cpu use. Data tapes are generated at remote entry stations for later updating to master files, with no programming involved. Descriptions are stored as an EFM database and are said to be easily modified and maintained. The "introductory" price of \$2,500 sounds like it could go up if you don't move fast. EXPRESS SOFTWARE SYSTEMS, INC., New York, N.Y.

FOR DATA CIRCLE 216 ON READER CARD

Interdata Software

This six year old systems and software house has developed a business ori-

ented set of software for Interdata's 16- and 32-bit machines. IBOLS-32 (Integrated Business-Oriented Language Support) operates on either the 7/32 or 8/32 and runs under os32/MT. Included is an ANSI Level 1+ COBOL compiler, and indexed sequential access method, and a sort/merge. The license fee for the entire package is \$12,500, with component licensing available.

For 16-bit fans, IBOLS-16 consists of the ANSI COBOL compiler, ISAM, sort/merge, library directory system, "IBM-type" aids and various support subroutines. A new multiprogramming operating system accommodating up to 16 partitions is now available as is a

source library manager. DIVERSIFIED DATA SYSTEMS, INC., Tucson, Ariz.
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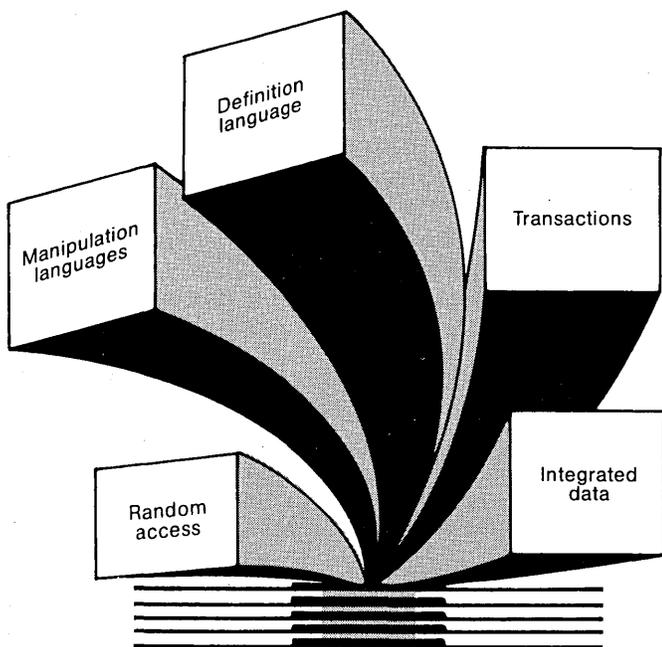
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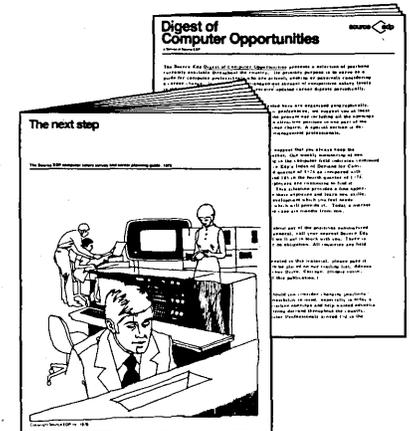
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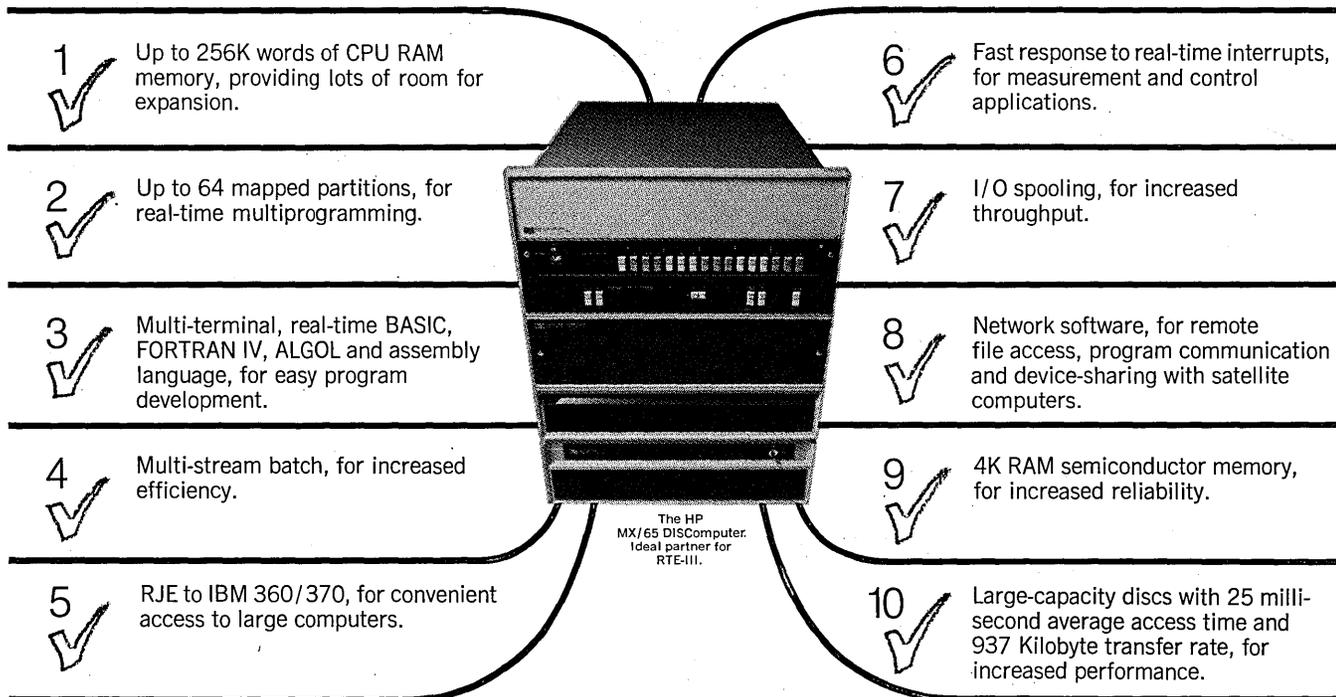
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DP AND THE DEVIL'S ADVOCATE

Data processing and data processing centers have been particularly vulnerable to boondoggles and mismanagement of assorted aspects—grandiose schemes and projects without basis in reality, empire building, one-thousand-page quintuple-copy reports destined for executive circular files, 15-level torque-amplified-chrome-plated priority schemes, overselling, and undermanaging. Data processing is obviously an activity which can benefit from a strong, clear, iconoclastic voice from the wilderness of Hollerith cards and glittering equipment hollering, “Hold on, let’s examine this for a moment.” There is a need for the person who can safely tell the director of data processing that his latest personnel policy brainstorm should die aborning.

One answer to this need is the formal designation of an individual as Data Processing Department Devil’s Advocate. The Devil’s Advocate in the Roman Catholic Church is an official appointed to present arguments against a proposed canonization or beatification. In secular usage, he is a person who opposes an argument with which he does not necessarily disagree, as to determine its validity. The department Devil’s Advocate would shoot down the director’s wilder inspirations, search for useless reports, collect customer complaints and suggestions, and cause good ideas and projects to pass a test of fire.

Robert Townsend in *Up the Organization* has described two organizational officers who combine to play the role of Devil’s Advocate at a corporate level. He suggests that organizations need a vice president in charge of Antibureaucratization whose duty it is to “kill a lot of bad ideas early” and generally be Devil’s Advocate to the chief executive’s ideas. This person “must have a loud voice, no fear, and a passionate hatred for institutions and their practices. In addition to his regular duties, it’s his job to wander around the company looking for new forms, new staff departments, and new reports. Whenever he finds one that smells like institutionalization, he screams ‘Horseshit!’ at the top of his lungs, and keeps shouting until the new whatever-it-is is killed. . . . Every chief executive should find someone to perform this function and then make sure he can be fired only for being too polite, (pp. 67-68).”

Townsend also describes the need for a vice president in

charge of Killing Things, whose job it is to retire ideas, products, services, and activities past their prime. Although most data processing departments cannot afford two full-time individuals of such a persuasion, they can formally describe a position with a part-time function of Department Devil’s Advocate.

Most successful dp departments have someone, or someone, who *sometimes* acts in the capacity of Devil’s Advocate. We have met the programmer who recognizes his current project as an exercise in futility, the operator who wonders at the boxes of continuous forms going to waste, the systems programmer maintaining unused systems, and the middle level manager who has the audacity to question official (as formulated by the Chief) policies or procedures.

Several problems exist with scattered and informal assumption of the Devil’s Advocate role:

- 1) that employee, especially at the lower level, becomes particularly susceptible to management’s reaction to criticism (one could get fired);
- 2) those who have the moxie to point at imbecility may not have the ear of the head man;
- 3) the opinion of a \$250 a week programmer, no matter how worthy, will not carry the weight of the opinion of a \$1,000 a week consultant (advice, whatever its intrinsic value, is heeded in direct proportion to its cost);
- 4) the person who questions causes may be considered an obstructionist;
- 5) that individual acting in an unofficial capacity may earn some hostility from other employees.

Most of the above problems can be alleviated by the formal recognition of an individual as Data Processing Department Devil’s Advocate. Where should he be placed in that organization? Townsend correctly places his vice presidents one level from the top. The same reasoning should apply to the Department Devil’s Advocate. He should not be the head manager, since some of the most killable ideas come (without check) from the top, but he cannot be more than one level removed or his cry of “hogwash” will go unheeded.

The Advocate should not be an “assistant to” or between the director and second-level manager since, as Townsend suggests, each level of management lowers communication effectiveness within the organization by about 25%. He should not be a decision-making executive (in a line activity sense) in his own sphere of non-advocate duties.

Thomas R. Gildersleeve in “Organizing the Data Processing Function” (November 1974, p. 46) suggests that data processing departments be organized with a Systems and Programming Manager, responsible for development and maintenance of data processing systems, the Computer Center Manager, responsible for day-to-day operation of the Center, and the Staff Manager all at the same level and reporting directly to the Director. The Staff Manager who is responsible for personnel development, development and enforcement of standards, and research into new equipment and techniques, should also be designated as Devil’s Advocate.

This manager will recognize most rapidly the potential effect of new policies and procedures on personnel, or on the department as a whole. Because of his concern for development and enforcement of standards he will be familiar with department systems (production and planned) and without backs to scratch or an ax to grind in this area. Since his is a staff function he is less likely to be an empire builder, but could still recognize the trait in others. Further, he should have fewer day-to-day managerial responsibilities and thus more time to act as Advocate. Since his staff recommends software or hardware addition and change, he is in the perfect position to let rationality reign in making these recommendations to the director. Although the formal organization of a department may vary from the preceding model, the formal duties of Devil’s Advocate should rest with the Staff Manag-

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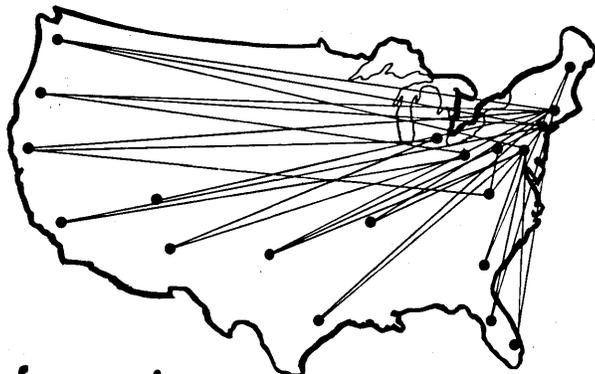
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er, or a manager in a similar position in the department.

The person who fills the Devil's Advocate position must, obviously, be a virtual paragon. While having a natural tendency and ability to sympathize with users, he must recognize when a useless system or report is requested. He must be willing to cry "hogwash" even though it is the director who has proposed an idea which won't wash. Fortunately, he need not be as technically oriented as the Systems and Programming Manager, as his concern is more with end products.

Nevertheless, he must be able to evaluate new systems and software when the need arises, as part of his managerial responsibilities. Part of the battle is won at the very outset when a director recognizes the need for defining a Devil's Advocate and, further, realizes that individual's cry of "hogwash" may be valid in many instances.

An individual willing to act as Devil's Advocate should be a valuable addition, or fixture, in a data processing department, and his value should be formally admitted in an organization chart. So, before beginning that new 50,000-statement system, converting to hardware with 16-times your present capacity, acquiring that nifty new stat package, requiring all programmers to take semiannual psychological profiles, glorifying that 1,000-page bimonthly report to the bottle-washing department, exalting your hermit systems programmer with a salary like no others, listen, listen for a lonely voice crying "hogwash" and hope you hear it.

— Trevor J. Swanson

An assistant professor of computer science at the State Univ. of New York at Potsdam, Mr. Swanson was previously the manager of information services at the Kansas State Univ. computing center.

Even Webster's Knows About QUEST

QUEST (kwest). v. 1. To make a search; to go on a quest.

QUEST SYSTEMS, INC. n. 1. A corporation founded in 1968. 2. The largest professional recruitment firm in the U.S. functioning solely in the computer sciences; its client companies pay all employment fees, interviewing and relocation expenses. Quest is known for its deep personal commitment to relate to each candidate as an individual with individual goals. 3. Its professional staff averages over 6 years of experience in EDP recruiting (additionally, staff members have direct hands-on experience in programming, systems, hardware sales, etc.) 4. Quest is presently searching for programmers and analysts (commercial, scientific, systems software) for over 3,500 client companies in the U.S. Quest has openings in over 700 U.S. towns and cities. 5. Methodology — see Questsystem.

QUESTSYSTEM (kwest sis'tem). n. 1. Discussing with an individual what he would like to be doing in light of what he has been doing. 2. Analyzing the realities of his objectives as they relate to the current job marketplace. 3. Contacting client companies and other Quest staff personnel to identify positions of possible interest. 4. Introducing the job candidate to his prospective employers by providing complete details to each about the other, ensuring the efficacious use of everyone's time. 5. Arranging interviews. 6. If employment offers are extended, Quest assists in evaluating the responsibilities, compensation and opportunities (and relates those to the initially stated objectives). The Questsystem has been working for thousands of professionals at no expense, whatsoever. Ask your friends of their past dealings with Quest. Then, put the Questsystem to work for you. For additional information on this subject, please inquire directly to Quest Systems, Inc. (All inquiries/resumes received will be responded to immediately and in confidence.)

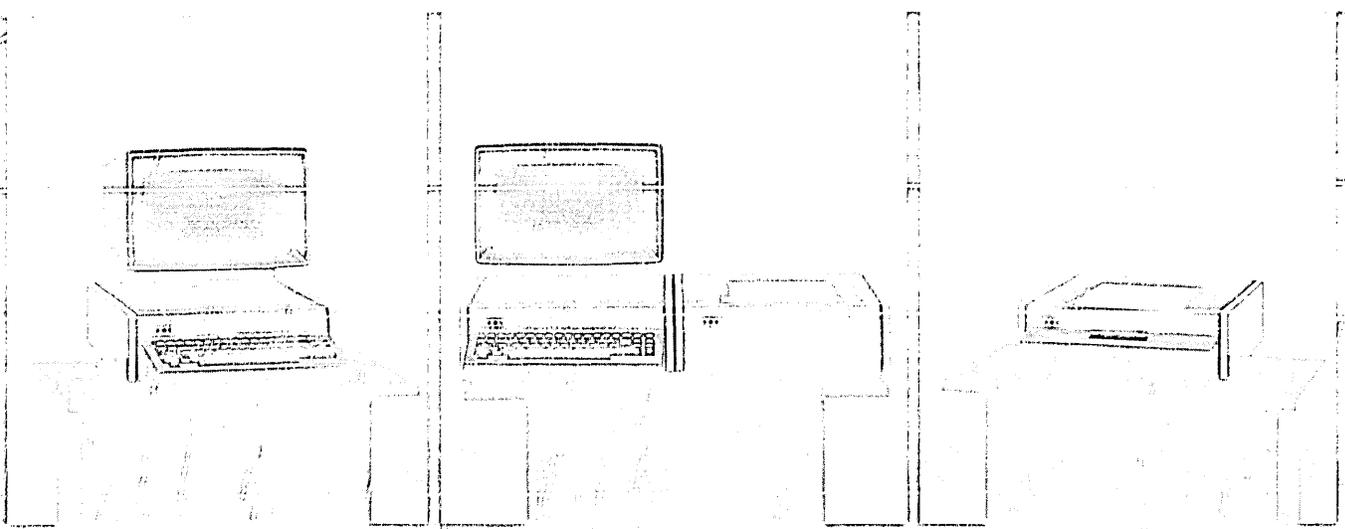


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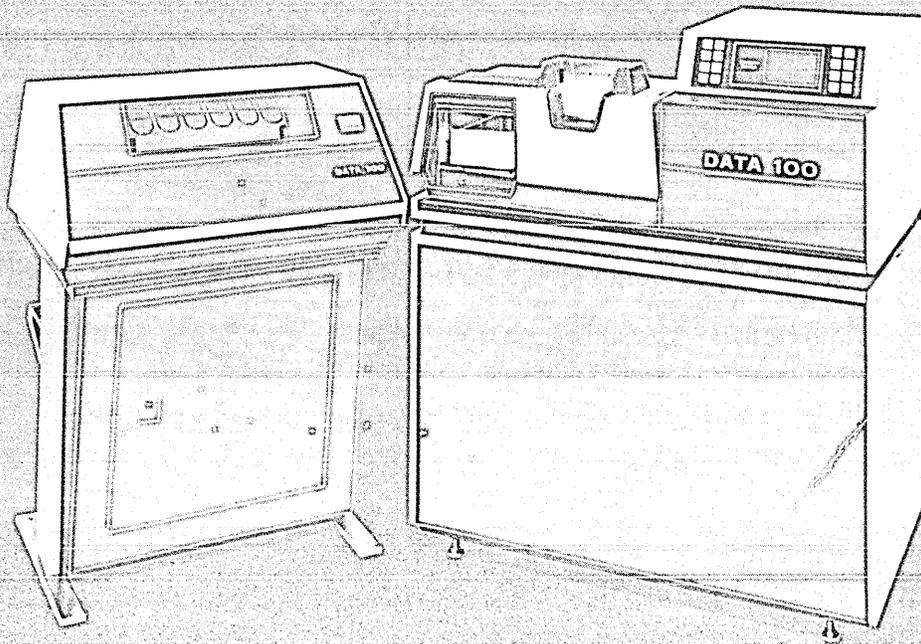
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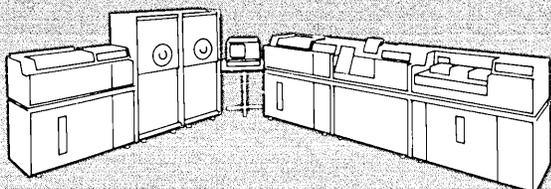
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