DATAMATION®

75

March

THE COMPUTER INDUSTRY IN A DOWN ECONOMY

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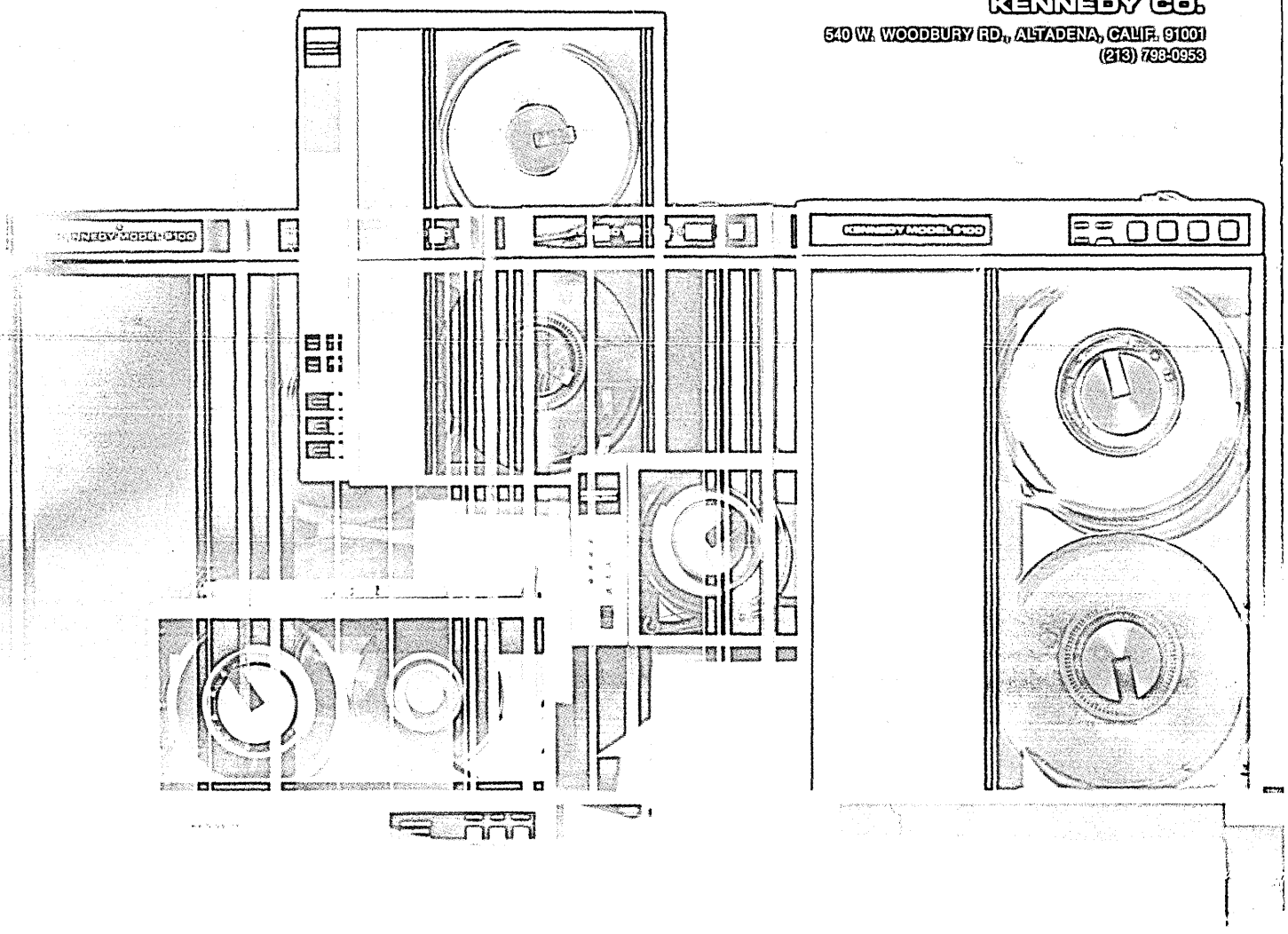
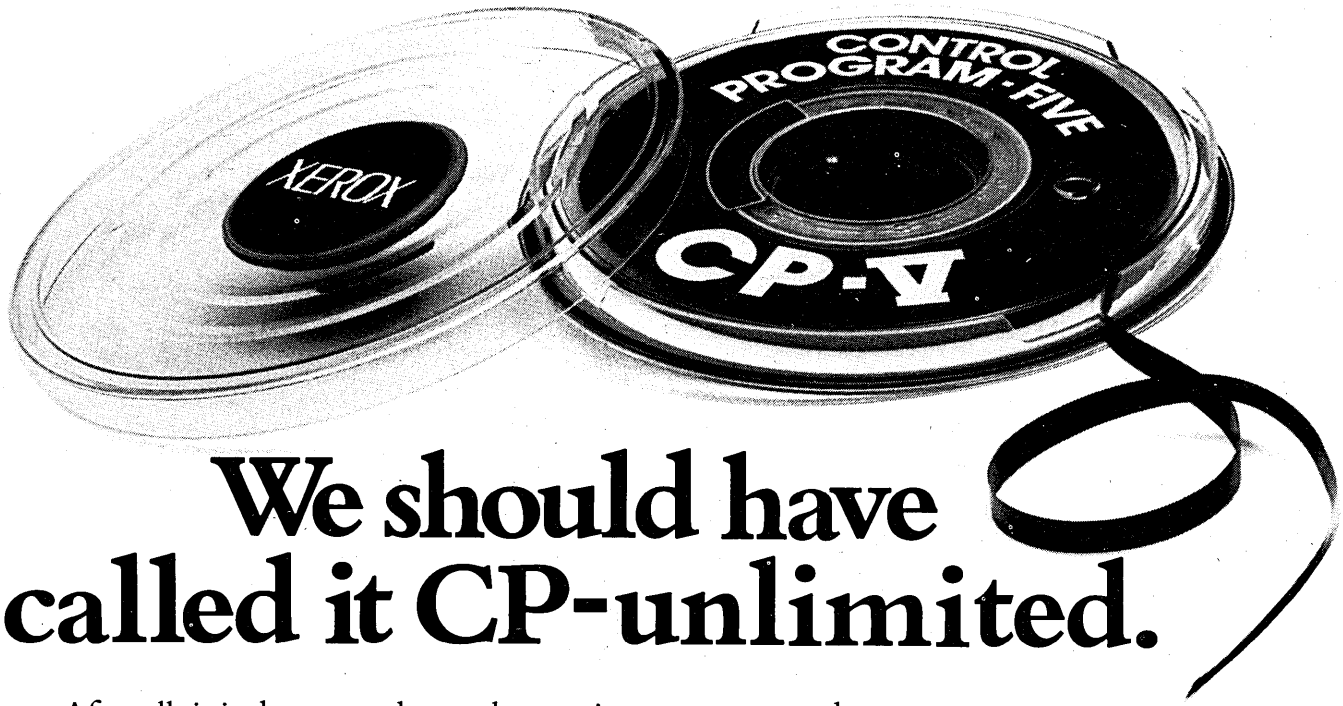


CIRCLE 1 ON READER CARD



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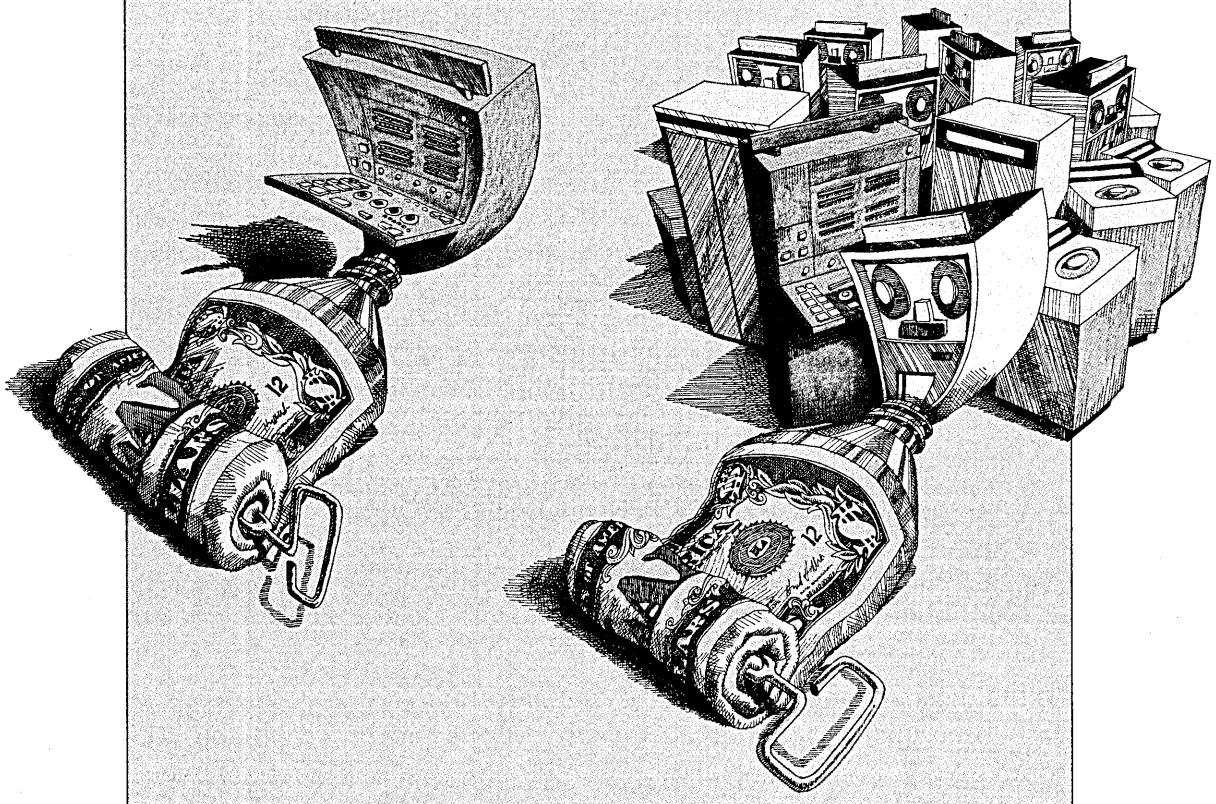

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VOLUME 21 NUMBER 3 | This issue 134,500 copies | MARCH 1975

FEATURES

NEWS IN PERSPECTIVE

DEPARTMENTS

ABOUT THE COVER
Given today's monetary woes, our theme dealing with dp and the economy is better served by subtle, somber shadings. The cool sensitivity needed for coping with today's environment is reflected in our design from "Scroll" by Los Angeles painter Jean Edelstein.

DATAMATION

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Circulation audited by Business Publications Audit BPA

Member ☆ABP American Business Press, Inc.

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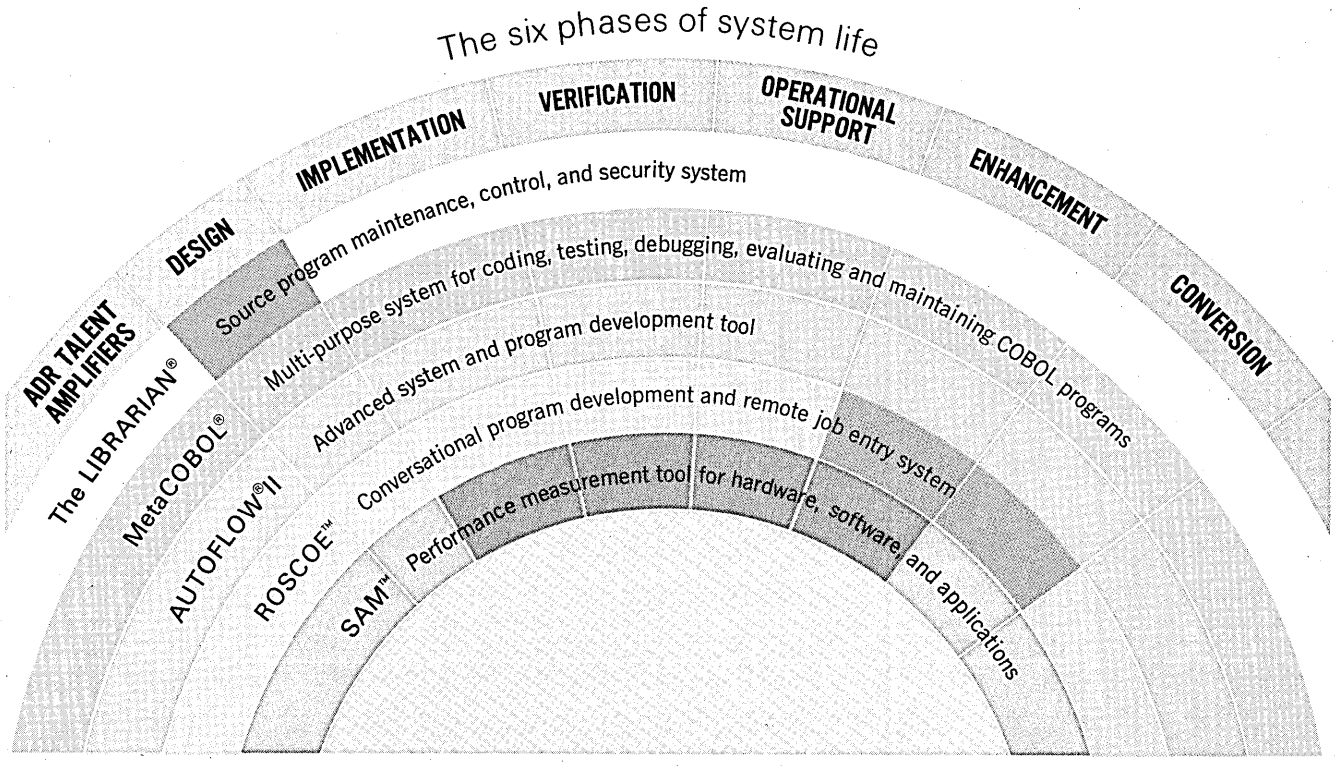
DATAMATION is published monthly on or about the first day of every month by Technical Publishing Company, 1301 South Grove Ave., Barrington, Illinois 60010; Arthur L. Rice, Jr., Chairman of the Board; James B. Tafel, President; Gardner F. Landon, Executive Vice President. Executive, Circulation and Advertising offices, 35 Mason Street, Greenwich, CT 06830, (203) 661-5400. Editorial offices, 1801 S. La Cienega Blvd., Los Angeles, CA 90035. Published at Chicago, Ill.

DATAMATION is circulated without charge by name and title to certain qualified individuals who are employed by companies involved with automatic information handling equipment. Available to others by subscription at the rate of $24; $40 Air Mail annually in the U.S. and Canada. Reduced rate for qualified students, $14. Foreign subscriptions are available for £16.80 or for the equivalent of $40 U.S. in most West European currencies. Sole agent for all subscriptions outside the U.S.A. and Canada is J. B. Tratsart, Ltd. 154 A Greenford Road, Harrow, Middlesex HA13QT, England. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulations paid at Columbus, OH and Form 3579 to be sent to Technical Publishing Company, P.O. Box 2000. Greenwich, CT 06830.

In a DP Operation

THE SUN NEVER SETS ON ADR SOFTWARE



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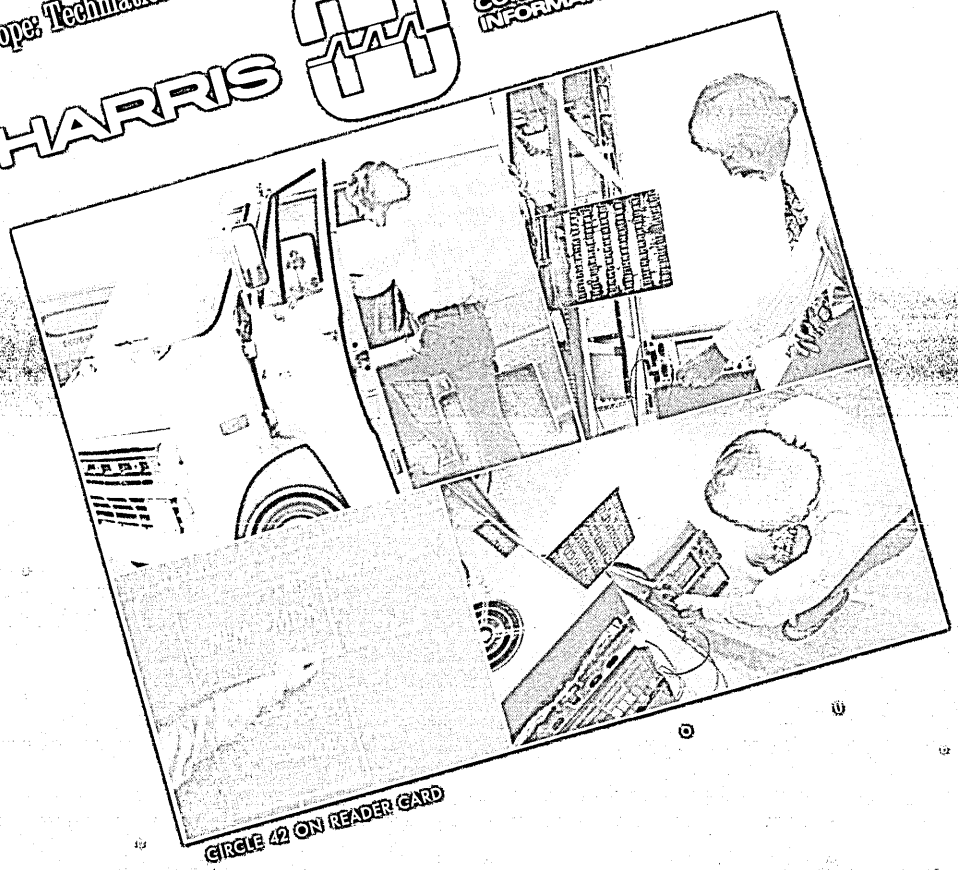

CIRCLE 42 ON READER CARD

letters

VS: Virtually Stipulated?

On November 22, 1974, I wrote to you to correct an error in your November issue (p. 11). You had stated ". . . when Control Data signed its antitrust settlement with IBM last year, IBM stipulated that CDC not be permitted to join the CIA." I said [January, p. 9], "that is absolutely not true. No such agreement was made or even considered." I reaffirm that statement.

I note that you printed a rebuttal quoting the affidavit of a person who was not a party to the settlement, a Mr. Miller. Mr. Miller in his affidavit reports his conversation with Control Data's outside counsel, Mr. Lareau, but even that recollection does not indicate that CDC is prevented from joining CIA by an agreement with IBM.

If you were interested in whether a simple point was right or wrong, you might have checked with the parties involved.

FRANK T. CARY
Chairman
IBM Corporation
Armonk, New York

. . . Your reply [to Mr. Cary's letter] was that IBM and CDC lawyers stipulated that "neither Control Data nor its attorneys would use other vehicles such as the Computer Industry Association . . . to pursue the substance of the Control Data complaint against IBM." Using an organization for a particular pursuit, and joining it, are quite distinct from one another. An apology and retraction would have been more in order.

T. F. MURPHY
Marketing Representative
IBM Corporation
New York, New York

. . . I suggest you reread your reply. There is a world of difference between "not being permitted to join the CIA" and "use . . . the Computer Industry Association . . . to pursue the substance of the Control Data complaint against IBM. . . ."

While your statement in no way contradicts or negates what Mr. Cary said, the first sentence insinuates that it does. Let's tell it like it is.

THEODORE J. STONE JR.
Senior Technical Analyst
GTE Data Services
Tampa, Florida

Perhaps Mr. Cary might find the quotation used in answering his letter "enlightening," but I certainly did not. The person quoted, Mr. Ralph E. Miller, is reporting what was told to him by another party, Richard Lareau, who was himself reporting only an interpretation of an agreement with yet another group of people.

I am enlightened only that DATAMATION doesn't recognize the difference between first- and third-hand accounts. I have no great love for IBM; on the other hand, if your answer to Frank Cary's letter represents general editorial policy, DATAMATION's credibility is also in serious jeopardy.

STEVEN WORONA
Technical Associate
Department of Computer Science
Cornell University
Ithaca, New York

Datamation's interpretation of the affidavit by Ralph E. Miller, a Justice Dept. economist, was that the understanding between IBM and CDC was in effect a stipulation that CDC not be permitted to join the Computer Industry Association (CIA). We come up with the same interpretation again when we reread Mr. Miller's affidavit. Others may come up with differing interpretations and we respect their right to draw their own conclusions from the record. It should also be noted that Mr. Miller's affidavit was filed in the IBM-Justice Dept. case, and IBM's attorneys in that case instigated a press gag order that forbids discussion with the press of any aspect of the case by either IBM or the Justice Dept. Thus, IBM's gag order prevented Datamation from obtaining complete clarification on the issue from either Mr. Miller or IBM.

Bugged down under

I found Ted Withington's article in the January issue (*"Beyond 1984: A Technology Forecast,"* p. 54) very interesting. The execution times associated with individual operations in computers are being measured in microseconds if not nanoseconds; but the execution times for fixing bugs will still be measured in gigaseconds! Surely by the time another decade has elapsed the purveyors of hardware and software will have devoted some portion of their resources and the new technology to the worthwhile objective of reducing the cycle time for bug fixing to, at most, a few hundred kiloseconds.

ROBERT M. GORDON
Director
Computing Services Centre
Victoria University of Wellington
Wellington, New Zealand

A plug for tradition

Your January "Look Ahead" column carried a lead item on the discounts offered by non-IBM peripheral sources. In it you list four companies whom you label as ". . . the traditional plug compatible manufacturers."

Memorex Corp. was not listed, apparently for failing to qualify as traditional, our compatibility dating back only to 1968. This oversight is, say, similar to compiling a list of leading computer industry publications and failing to include DATAMATION.

R. V. SPELLERI
Manager
Corporate Public Relations
Memorex Corporation
Santa Clara, California

We wouldn't want to be left out either.

Supporting a stand

Speaking as one member of the ACM Council, and as chairman of the ACM Committee on Computers and Public Policy, I would like to correct a misimpression that may have been conveyed by the December Look Ahead. It was stated there that the ACM Council resolution on universal identifiers took a "limited" stand, and that the resolution as passed was a "watered down" version of the one proposed by the committee.

Actually, the resolution as passed is stronger. The two are identical except for the last paragraph, which was amended to make it clear that the ACM Council is opposed to the use of *all* universal identifiers (in the absence of legislative safeguards against misuse), not just the Social Security number, and that what we seek is the passage of corrective legislation, on which the resolution as proposed said nothing.

Short of urging irresponsible radical action, I don't see how we could have done anything stronger than that, and I don't understand in what sense the stand is "limited." All this would be true even if it were not for the fact that in taking *any* such action, the ACM was breaking new ground for itself, since to my knowledge we have never before taken a stand on any public policy issue.

DANIEL D. MCCRACKEN
Ossining, New York

Registering complaints

Mr. Lias' December article ("On-line vs. Batch Costs," p. 69) comparing batch versus on-line data entry costs for a college admissions system has, in my opinion, an error density that boggles the mind. I reread it several times, with increasing puzzlement.

Back up a disc file onto punched cards? Code a good on-line program in five hours? Verify at the punch point? A million dollar processor?

We all love tubes, of course! But

letters

they are not cost-effective devices for data entry near a computer site because they are more expensive than off-line devices, and because they absorb data much more slowly. The virtue of instantaneous verification is significant in a cost analysis only if either the data is critical (a patient's temperature, for instance), or one heckuva lot of errors are being made.

The batch system described is not the most efficient one for this application. The tube cost estimate assumes that the other two-thirds of the hardware day is fully utilized. The one tube mentioned would be swamped for days after fall registration. . . . the list of deliberately ignored drawbacks to the on-line position is nearly endless.

BEN SHELTON
Assistant Director of Computer Services
Associated Colleges of Central Kansas
McPherson, Kansas

The author replies: 029 Keypunch Machines purchase for $3,550. One terminal, two 202 Data Sets and the front end port together purchase for $3,300. Thus the tube is not more expensive.

The absorption of data by a terminal is slower, but is offset in the analysis by the increased human activities and operations attention which the merges incur.

Admissions officers from all parts of the United States have visited the college [Ocean County Community College] to assess the system. The software has been successfully installed at other sites. Visitors are welcome.

As is the case with most "on-line" data entry systems, Mr. Lias merely transferred the data entry task to the user group at an increased cost. Exactly what the cost is to the user is ignored, but more than likely it is several magnitudes greater than that of a batch system.

Another fallacy is the statement that the file is clean, up-to-date, and ready for reporting at all times, but I suppose like most "on-line" systems, Jeannie (the Genie) blinks her eyes and all 30,000 data items are instantaneously entered into the system through one terminal.

Mr. Lias, keep your head in the sand; your costs have just begun.

R. C. MAY
San Francisco, Calif.

The author replies: The cost to the user was not ignored, cost item #4 stating: "The clerk in the Admissions Office enters data for 1/3 day each day; the cost for this is $3,000 to $5,000 including rejected entries." With more than 2,000 such programs on the system covering 40 application areas, the costs, as stated, are well documented over a three year period.

Lacking a Genie, the registrar's clerk enters data each day from the mail registration. Those not registering by mail come to a gymnasium where eight terminals carry the process for two days. Drop-add is then performed on the single terminal in the Registrar's office.

I failed to cost the eight terminals for two days.

Anti-ad adversary

I suggest that you attempt to advise advertisers against submitting ads prejudicial to women. What sparked this letter was a particularly annoying ad for CalComp which implied that the female staff was likely to waste time at chitchat and coffee where a computer would not. Ads or articles that portray women as peripheral, unmotivated subordinates work to ensure that we continue to be considered this way, especially in nonmanagement or unskilled jobs.

While companies do hire a woman with a degree and five years technical

(Continued on page 146)

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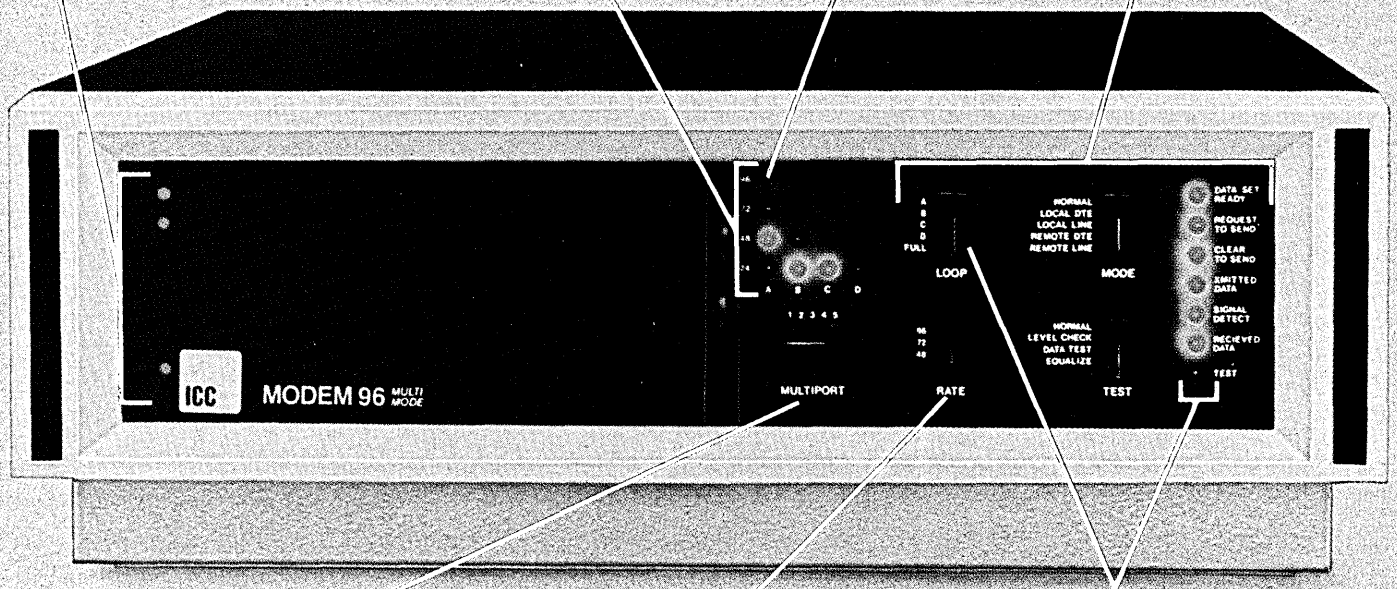

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THE STABILIZATION OF PERTEC

His election in April 1973 as president and chief executive officer of troubled Pertec Corp. was the fourth top executive job in three years for Ryal Poppa who refers to himself as a problem solver. Pertec's management problems are well behind them now, but the 41-year-old former IBM marketing man has no intention of moving on to other problems.

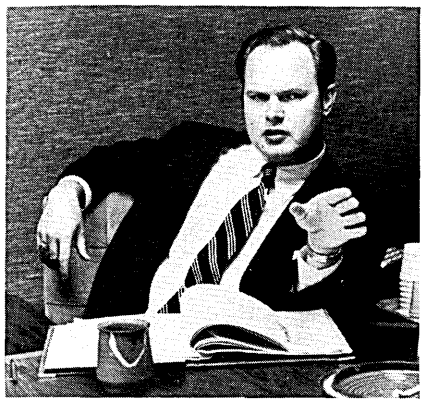
"I'm back in California. We like it here. And besides, I want to build Pertec into a $500 million company." He envisions it as a $100 million company in the next four to five years.

The El Segundo, Calif., peripherals manufacturer did $33 million in its fiscal year ended last June 30, and at its half-year point last December registered revenues of $21.5 million, well on the way to a $45 million year record. Although in recent years the company consistently had been profitable, its growth and product development had come in spurts. And in late '72, dissension among its management had led to the resignation of its founder Hal Kurth.

Poppa was brought in to "take inventory and to stabilize the company," as former director Frank A. Grizanti once put it. He moved decisively. Besides revamping the management organization and drawing up a detailed business plan, Poppa chopped off a line printer development program and sold the firm's computer output microfilm (COM) business to Bell & Howell, but forged on with a crt terminal and a key-to-disc system, even though software development costs for the latter had more than quadrupled over original estimates.

His presence at Pertec has drastically changed its traditional entrepreneurial leadership. "In a $45 million company, one guy can't be expected to have command of all the facts needed to make a decision," says Poppa whose management style, in contrast with Kurth's, has been likened by some associates to that of a controller. He expects his people to propose projects rather than the other way around. Poppa says the company encourages an entrepreneurial spirit but makes sure it's coordinated. "There are no more personal programs in the company."

Despite a varied business career, Poppa has never escaped the shadow of IBM where he was a member of the 100 Percent (of quota) Club. He was president of Greyhound Computer Corp. when Greyhound was preparing for its antitrust suit against IBM and, as president of Data Processing, Financial and General (now DPF), he settled



RYAL POPPA
"No more personal programs . . ."

that leasing company's suit against IBM out of court. Poppa, who left the vice presidency of Mohawk Data Sciences to join Pertec, still adheres to the conservative IBM dress code of thin neckties and buttoned-down white and blue shirts, although he's admitted to associates that he does "have some cool clothes at home."

While at Mohawk, he helped found the Computer Industry Association, and he thinks the Justice Dept.'s antitrust case against IBM will eventually be proven, "but it will not happen in the next year or two." Therefore, he told an interviewer last year, "I would prefer that IBM takes a statesmanlike view of the industry" on such issues as early announcement of interface specifications. "IBM's unwillingness to give up on some very minor points to assist the entire industry is the reason it is predatory today."

Poppa has been in the computer business 18 years, starting as a part-time computer room "card walloper" at Kaiser Steel in Fontana while studying for a bachelor of science degree in business administration at nearby Claremont Men's College. His long-range growth plan for Pertec is through new products, new markets and acquisitions. But the present product lines will contribute significantly, says Poppa, noting that although it disposed of its COM line, it still does the manufacturing for Bell & Howell. The COM production volume doubled this year. It has large orders from Singer for the crt product and from Univac for the key-to-disc system. And it continues to be the largest independent producer of tape drives for the minicomputer market. A noteworthy record for a man brought in two years ago to stabilize things.

A DEVOTION TO THE AMERICAN SYSTEM

Many presidents of small to medium sized corporations are frustrated by the present state of the economy. Dr. Ben Wang, president of Wangco, Inc., an $18 million/year, 650 employee, computer peripherals company, thinks they can help it. And he has so advised President Ford.

In a letter to the President written in January, Dr. Wang made a number of suggestions of ways to stimulate the economy, one of which was establishment of a council of presidents of small to medium sized corporations which could provide the government with practical, businesslike advice. "After all," says Dr. Wang, "a corporation is like a small nation. We are concerned with the welfare of our employees as the government is with the welfare of its citizens." In his letter he states: "The views of big business and labor are well known; less vocal perhaps are the leaders of small to

DR. BEN C. WANG
A letter to the President

medium corporations." Dr. Wang received an acknowledgement of his letter but not from the President. It came from Ronald Elliott, Director of Correspondence. No reference was made to specific suggestions.

Forty-seven-year-old Dr. Wang ended his letter to the President with an offer of "my wholehearted support and confidence." And he explained his devotion to the American system. "I am a naturalized citizen and have a deep reverence for this country and the American system. Both have given me much. As a youth, I came to this country with $100 in my pocket. I had the opportunity here to get an education through the doctoral level, achieve professional advancement through my association with a number of dynamic companies, and finally to realize the ultimate dream of starting my own company."

Dr. Wang started Wangco in May of 1969. An engineer by training and experience, he learned business by doing business. He was with Scientific Data Systems when he made the decision to start his own company. He was impressed by what Max Palevsky had done with SDS.

Minicomputers were just starting to take off. Dr. Wang's specialty was peripherals (he headed an advanced development group at Ampex which came out with the first direct-driven single capstan tape drive, now an industry standard). So Wangco (then called Wang Computer Products) was formed to make peripherals for minis, tape drives first and now tape drives and disc drives.

Dr. Wang doesn't do any engineering now. "Marketing's the big thing and interpreting customers' future needs for product planning." He's considering peripherals for microprocessors and is watching developments in that field closely. And the company, which traditionally has concentrated on the minicomputer market, in January signed its first major contract with a large mainframer, Sperry Univac, for $6 million worth of tape drives.

The energetic Dr. Wang says his goals for his company have altered over the past five years. "At first my goal was to build the best peripherals, the best gear, and a good reputation. Now my goal is to have the best managed company. You can have the best product in the world but if management falters . . ."

He sees as part of his job as company president, "establishing a good working relationship with every president of every company we are dealing with." He tries to do this even if the customer is in Bulgaria. "It takes a little longer but it can be done." Wangco has a $1.3 million contract for tape and disc drives with the Bulgarian State Commercial Enterprise (ISOTIMPEX).

Dr. Wang had something to say about sales to Eastern Bloc countries in his letter to Ford. "There is another way that we handicap ourselves, a problem of special concern to technology companies. I refer to the incredible red tape and somnolent slowness with which our Department of Commerce grants licenses for the sale of American products to the Eastern Bloc nations . . . Our overseas competitors do not labor under similar restrictions and may penetrate these desirable markets at the expense of American companies."

It's a far cry from a boyhood in Shanghai under Japanese occupation, and from weaving bamboo curtains and working as a bus boy in San Francisco's Chinatown to get through college to giving advice to presidents and being a company president.

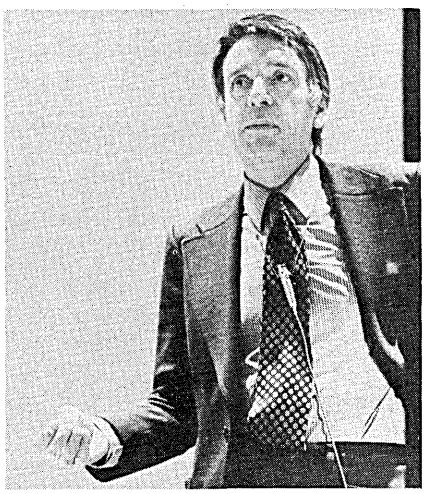
Dr. Wang had the drive and talent to make it. He received bachelor's and master's degrees from the Univ. of California at Berkeley and his Ph.d. from the Illinois Institute of Technology. After ITT, he worked four years for IBM which he left to join Ampex.

JOB: SECURITY

Most people in the computer industry know the difference between 'privacy' and 'security' these days, even if politicians and journalists outside the industry sometimes mix them up. Like centralization and decentralization, it has been said that you can only combine them sensibly when you've managed to separate them first.

Thus it may be a mark of maturity in the computer business that Britain's "Mr. Privacy" is now becoming "Mr. Security." Joe Kenny, long known for his activities in computer privacy issues for the British Computer Society, has shifted from general management and computer consulting to a security-oriented service, with the opening of his company in London called Dataguard Ltd.

"I started working on the BCS privacy committee about five years ago," says Kenny. "From that it's a natural step to begin asking how you can have a right to privacy without the means to keep information secure. Gradually I began to realize that this particular link between the two deserved more attention than it was getting in Europe. In the U.S. there are firms like Arthur D. Little and Stanford Research Institute gathering information; there's some work in physical security and some in auditing, though very little hard-core technical work seemed under way.



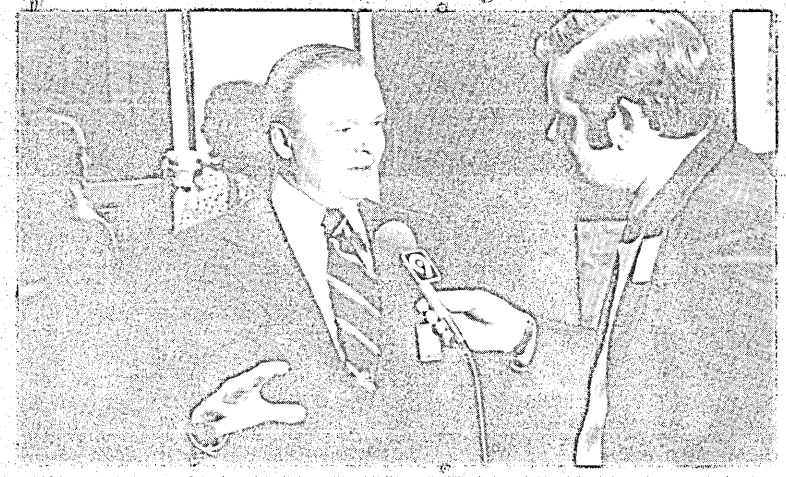
JOE KENNY
Mr. Privacy becomes Mr. Security

Kenny's company will concentrate on the entire spectrum of activities related to security: operating systems, programs, languages, I/O, data base storage, communications, physical security—"and above all personnel," which is where the British Computer Society's code of good practice fits in. He also plans to bridge the Atlantic Ocean. "I couldn't find any organization in Europe doing the total thing. Various software houses were doing bits and pieces, but nobody was doing the full spectrum of security and privacy of computing systems, including legal as well as physical as well as technical security, certifying systems, even doing intruder studies. To be worth anything inside Europe, you have to work in four or five languages: English, French, German, and some Italian or Dutch. I couldn't do it alone, and I'm not the tycoon type." He wanted to pull different people in for different aspects.

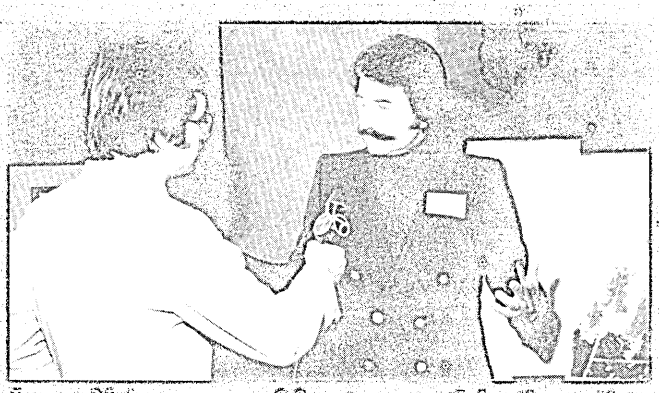
Kenny found his partner in Marcol, a software company in London headed by an expatriate American named Martin Brody, just running up to £1 million turnover, with offices in Germany and Scandinavia. This gave him not only financial backing (Marcol took shares in Kenny's company rather than annexing him), but also language and technical resources for Dataguard, which started in London at the end of 1974. □

At Lincoln Center, Talcott tells the press about the newest look in computer leasing in over a decade.

J.C. Slaughter, Chairman and H.L.M. Kelsey, Jr., President of James Talcott explain it to ABC Television.

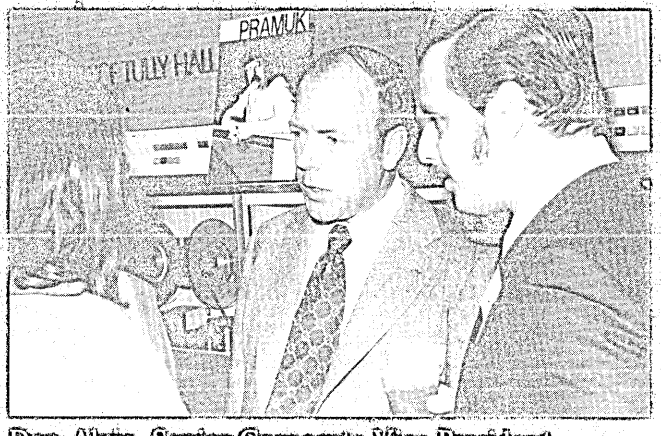


Truman Rice, President of Talcott Computer Leasing informs WOR.

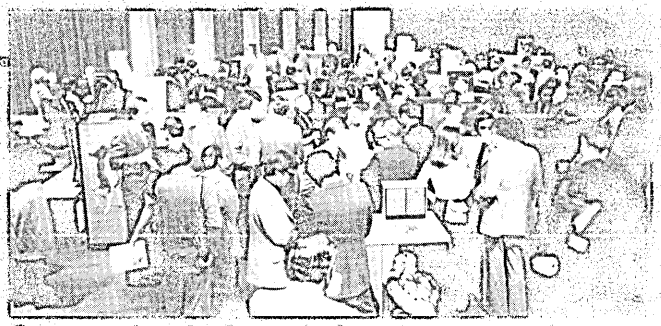


Leroy Neiman, one of fourteen participating artists from across the country expresses his views.

Neil Glaubman, Senior Vice President, Talcott Computer Leasing tells how it works.

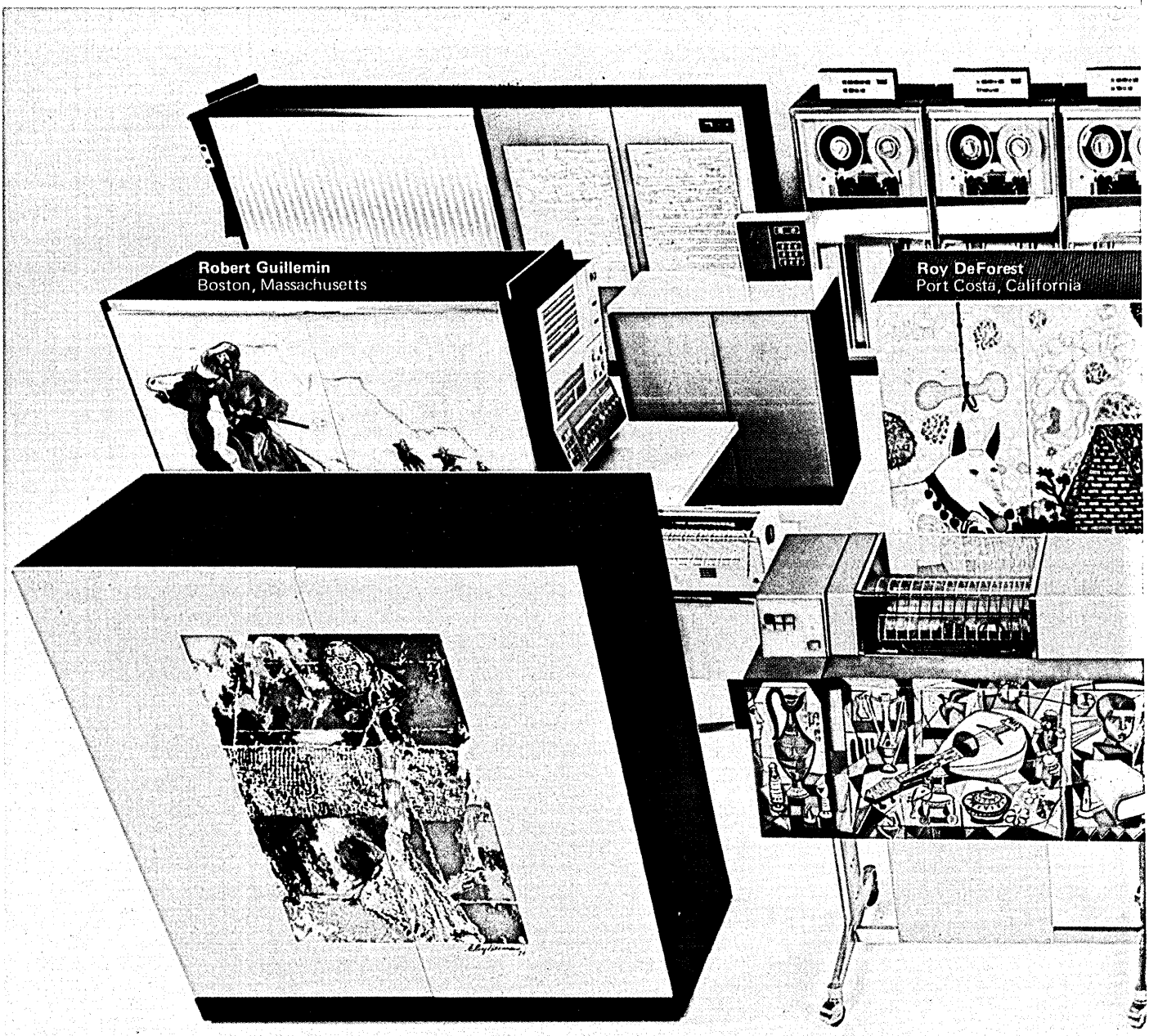


Don Alvin, Senior Corporate Vice President — Marketing, James Talcott explains why it will work.



Over two hundred people from business and the media listen.

What we told them...



Announcing a program to encourage environmental art.

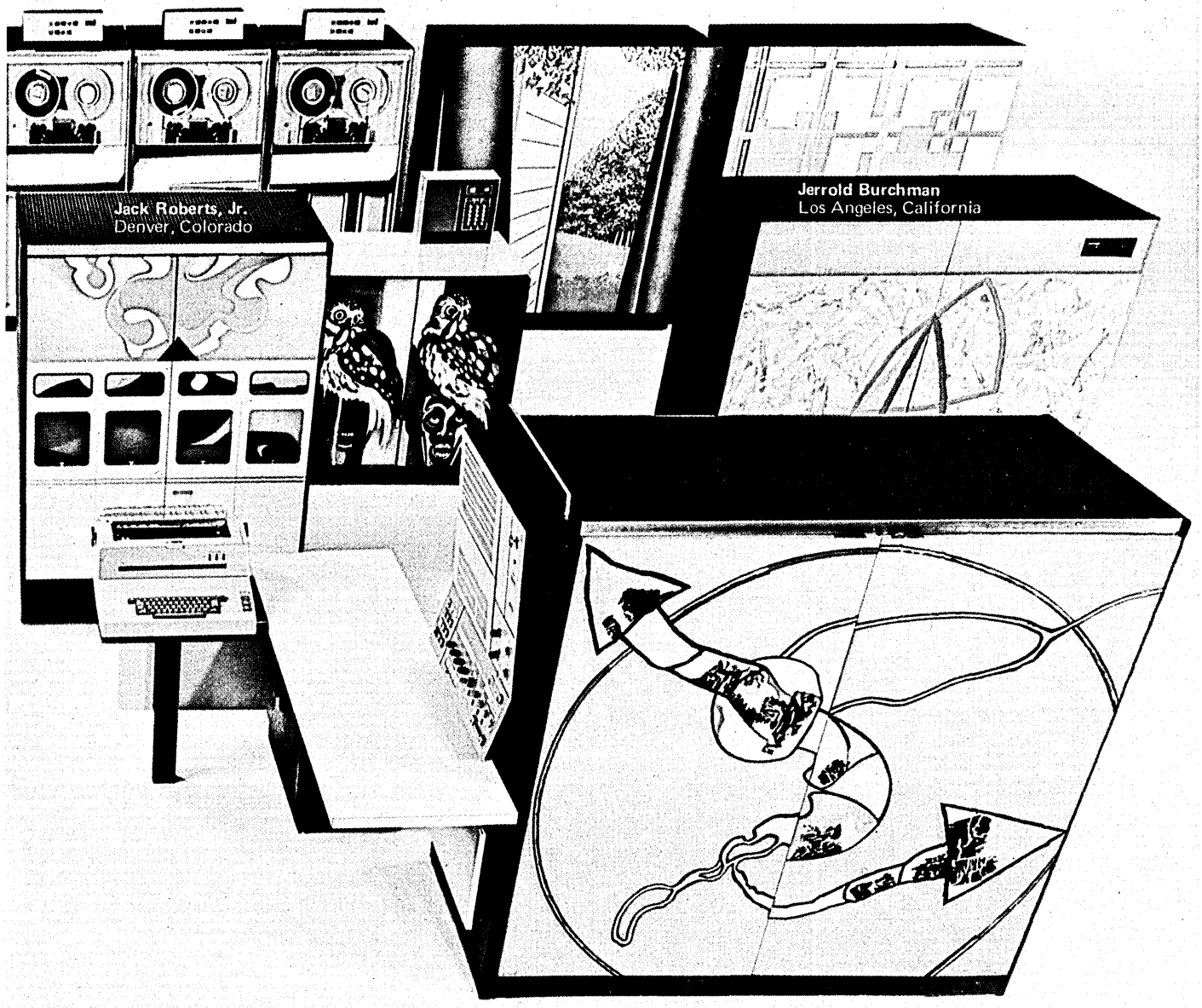
This computer equipment has been transformed into works of art by 14 American artists. James Talcott, Inc. commissioned these artists in an effort to help bring art through the doors of business and into the working environment.

While there has been great progress in bringing art to the people, Talcott believes there has been little or nothing done in a very vital area. The area where most of us spend most of our waking hours and nearly half our lives – the working environment.

Traveling to and from work we are literally bombarded by art. Building facades are ablaze with color. Lobbies are doing double-duty as galleries. But when most of us enter our offices, we are shut off.

Talcott sees no reason why art should stop at the door of business. What we do see is an opportunity to bring art to where most of the people are, most of the time. We believe it will make people happier. And it might even result in better work.

As a first step toward accomplishing this, Talcott has directed its efforts toward the computer technology environment. We feel it is one of the most challenging working environments to humanize. And one of the areas we



have been involved with for many years.

With the advice of major museums, Talcott identified 14 talented artists from across the country and commissioned them to create works for the computer environment. Pictured here are the results of their efforts.

You and your company can be a part of this picture.

Companies that lease, or renew leases, from Talcott for central processing systems will have the opportunity to select any of the program's participating artists (named in the photograph) to create signed original paintings on their equipment — at no charge. And companies who fulfill the terms of their leases become sole owners of the works of art.

Talcott hopes that the emergence of art into the computer environment will encourage you and other businessmen to take a look at their data processing operations. And then to take action in humanizing their businesses.

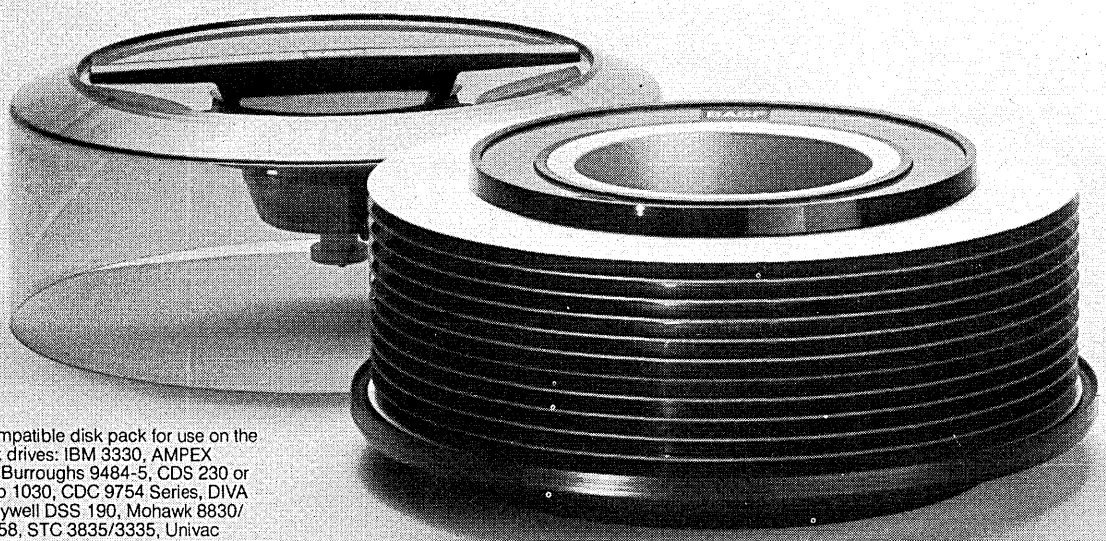
Hopefully our efforts will lead to wider — programs. Maybe even into designing entire working environments. Talcott is looking into these possibilities.

But for now, our initial program is a simple one. One we hope will interest you. Not for business' sake. Nor for art's sake. But for people's sake.

For information, contact Truman F. Rice, President, Computer Leasing Division,

James Talcott, Inc.
1290 Avenue of the Americas,
New York, N.Y. 10019 (212) 956-4123

If you think all disk packs are alike, take a closer look at the BASF 1236.



IBM 3336 compatible disk pack for use on the following disk drives: IBM 3330, AMPEX DM/DS-330, Burroughs 9484-5, CDS 230 or 231, Calcomp 1030, CDC 9754 Series, DIVA DD-40, Honeywell DSS 190, Mohawk 8830/8330, NCR 658, STC 3835/3335, Univac 8430, Telex 6330, Xerox 7275.

Because all 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. It's a matter of making a disk pack better than you really need, because there could be times when you need it. Let's look at a few superior points of the BASF 1236 disk 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

As the trend toward higher packing densities continues, it becomes increasingly 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 decreases. For those 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. We've been able to achieve a surface 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 of shifting inherent in a conventional adhesive weighting system.

And to make sure...

We test our 1236 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 1236 disk packs are error free.

Finally

Our 1236 costs no more than other twelve-high disk packs. You're already paying for BASF quality... you might as well have it. For more information on the 1236 or other BASF disk packs or cartridges, write to BASF Systems, Crosby Drive, Bedford, Massachusetts 01730.

BASF

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

CIRCLE 12 ON READER CARD

LOOK AHEAD

MASS STORAGE: WITH IBM IN, BUYERS ARE SERIOUS

IBM's introduction last fall of its 3850 mass tape storage system predictably has heightened interest in the concept. "Suddenly the problem of educating prospective users has passed," says Erik Salbu, manager of mass storage systems at Ampex Corp. which introduced its Terabit Memory System (TBM) more than three years before IBM. "Now all you have to do is compare yours with IBM's. Those who evaluated systems out of fun curiosity are now serious."

IBM and such other suppliers as Ampex, CalComp, Grumman Data Systems and Precision Instrument Corp. are estimated by industry sources to be sharing orders for 1,000 units, of which some 750 are for the 3850. IBM doesn't comment on that figure but says it is "quite pleased" that "customer acceptance of the 3850 has been excellent." It is quoting 22 months delivery on the system which will store from 35 to 472 billion bytes on 50 megabyte tape cartridges for transfer to model 3330 disc drives in a process called staging (November '74, p. 118). Thanks to its introduction, what appeared to be a 1975 market of about $25 million for mass storage systems has increased by two or three orders of magnitude, according to some who watch that market.

Ampex, which uses videotape and staging, has installed two systems, but soon will announce summer deliveries of three 22 billion byte systems interfacing with IBM 370s, a DEC PDP-10 and a high-end Control Data system. It will be at least a year before TBM supports IBM virtual storage systems. But Salbu is forecasting a healthy market for TBM among large 360 and 370 users of OS/MVT systems which IBM doesn't support.

FUTURE SYSTEM: NOT BEFORE 1980?

Latest guess in the IBM Future System (FS) announcement date sweepstakes is 1978, not 1976 as previously guessed. The slip, according to some sources, is because users aren't progressing into 370 VS systems as quickly as IBM expected. Supposedly IBM wants a preordained number of "stable" users of virtual technology before it will announce the next family jump--as if stability had to bring on obsolescence. There are other sources who claim neither IBM nor the users will be ready for FS until after 1980.

NCR: NEW LINE BEFORE THE COMMON LINE

NCR confirms reports that it will introduce a new line--"interim machines"--before it and Control Data introduce what they have called a "common line." But the Dayton company says an announcement date has not been fixed, despite word that a series along the lines of the lower end of CDC's Cyber 170 products could be offered this year. Advanced versions of the CDC 170 and the forthcoming NCR line, however, will share the common operating system jointly under development in San Diego.

BIG 32-BIT BET

Systems Engineering Laboratories thought the computer industry at its home base in Ft. Lauderdale, Fla., was so inbred that it designed its new 32-bit, real-time computers in Southern California. The whole project remains clandestine, although two machines -- the SEL 32/50 and the SEL 32/55 -- have been announced. The company, though, is betting its future on the idea that its 32-bit machines will be more attractive to users than the popular 16-bit minicomputers. The company will be seeking orders in that tough oem mini market. There'll be more machines in the line later. Initial production run deliveries should begin this summer.

PRIVACY AND THE PRIVATE SECTOR

Private industry is marshalling its forces to fight for privacy legislation it can live with amid some confusion as to where to point the guns. While most concerned trade associations would like to concentrate on helping the privacy commission set up by the Privacy Act of 1974 (February, p. 71) in a two year study they hope would be completed before Congress enacts any legislation affecting the private sector, many are worried that the Goldwater-Koch

LOOK AHEAD

bill (see p. 112) seems to be proceeding through the House of Representatives as though the commission didn't exist.

Late last month letters from Representatives Goldwater and Koch were received by state governors, mayors of large cities, corporate executives of the Fortune 500 companies, banks, insurance companies, universities, trade associations and unions, seeking answers by March 15 to questions about the bill. Each letter was accompanied by a questionnaire. One critic of the questionnaire noted that the question of cost wasn't treated at all and that a broad question like "if the provisions of the Privacy Act of 1974 were to cover the private sector what would be the problems faced by your company" had only one-half inch of space for an answer.

The prestigious American Bankers' Assn. became the latest group to form a privacy committee. It named Robert Fabian, general counsel of Bank of America, as chairman. Other associations now taking an active interest are the Computers and Business Equipment Manufacturers (CBEMA), the American Medical Assn., the National Retail Merchants Assn. (NRMA), the National Chamber of Commerce, the National Manufacturers Assn., and WEMA.

Meanwhile, one provision of the '74 act that could be transferred to the private sector, is being ignored in some quarters. The United Federation of Teachers, big champions of civil rights, still wants social security numbers and new subscribers to Pacific Telephone service are asked for theirs.

IBM DOCUMENT SNAFU: SMOKE SCREEN OR LACK OF RESOURCES?

As long ago as 1972, the Justice Dept. said that only IBM and Control Data were capable of handling the enormous documentation of an IBM antitrust case. That observation would appear to be apt still, as the Justice Dept.'s antitrust case against IBM continues to sag under the weight of an enormous documentation snafu that has delayed the start of the trial indefinitely. A Xerox Corp. foulup in copying 60,000 pages of documents to be used in the trial is attributed to the Justice Dept.'s foulup in indexing the documents. Some observers see it as just another illustration that Justice doesn't have the resources to combat the IBM blizzard of papers and documents. Moreover, it could get worse. (IBM once pointed out to the government that it had nearly 5 billion documents in its files. Thus far, maybe 20 million IBM documents have been processed.) Furthermore, much help can't be expected from the White House as President Ford, once an outspoken advocate of beefing up governmental antitrust activities, is not seeking much enlargement in the Justice Dept.'s meager antitrust unit. There won't be any help from Attorney General Edward H. Levi either, who has disqualified himself from participation in the case because of IBM stockholding by his family.

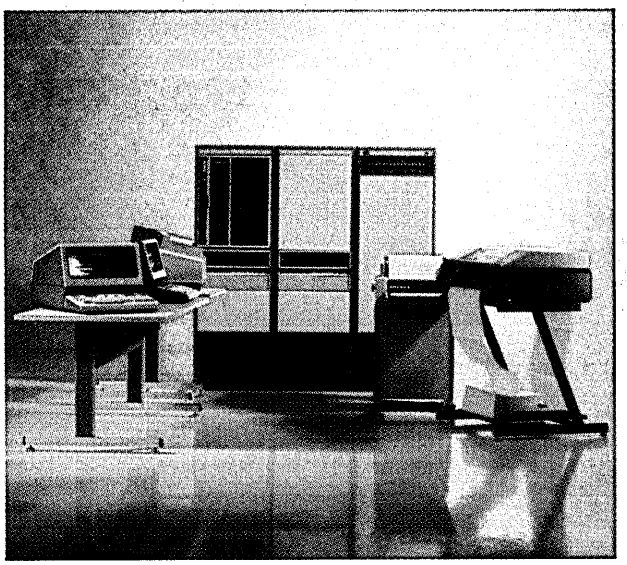
HIGH LEVEL LANGUAGES FOR RETAILERS?

While the big competitive thrust among point-of-sale equipment manufacturers currently seems to be software ("the equipment has been identified and everybody knows where to get it," said one) this could shift to training as customers take over their own programming. Now Gary Liebl of MSI Data Corp., whose Astros pos system is installed in 11 supermarkets, sees this happening and foresees that MSI would provide a high level compiler along with the training. Litton/Sweda is getting ready for the trend with developments of a high level language it calls POS/L.

ISSUE OF SOFTWARE PATENTS BEFORE SUPREME COURT AGAIN

Some software may be patentable after all. The Supreme Court, which has issued one ruling against software patentability in the Benson/Tabbot case, has another chance to examine the issue. The U.S. Court of Customs and Appeals has approved the patentability of an automatic financial record keeping system held by a software specialist, Thomas R. Johnson. The U.S. Patent Office has appealed the decision of the lower court to the Supreme Court. The chief issue is the importance of the distinction between software

(Continued on page 128)



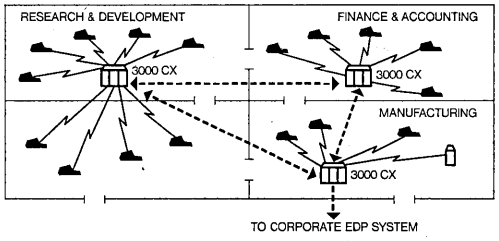
HP 3000CX Mini DataCenters

Think of them as branch offices. Computers for the many data handling "customers" within a company. The 3000CX is a series of small, terminal-oriented systems that work as an adjunct to the corporate EDP center.

Not just minicomputers. Mini DataCenters. They're the only minis with a single, fully multiprogrammed, multiuse, operating system. You get spooling, virtual memory, and a communications subsystem to link Mini DataCenters to each other. And to the big number crunchers as well.

You can run programs in five languages (any combination), in all three modes — time-share, real-time, and batch.

Full service "branches." A Mini DataCenter will support an entire department or division with interactive terminals and options to handle tasks in business, science, and industry.



So, while the folks in R&D are using a Mini DataCenter for real-time data acquisition, shipping is using it to call up orders, and marketing is generating a quarterly sales report. As the volume increases, add another 3000CX (or two).

More for your money. Call HP and see one in action. Then you decide. Four 3000CX models cost from $99,500 to $203,500 in the USA. Low enough to let you branch out now.

HP Mini DataCenters. They work for a living.

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What's the secret? None, really. Just a synergistic combination of hardware, software, and firmware enhancements. Like 64K bytes of 330-nanosecond semiconductor memory. Varian's async memory bus allows you to intermix core and semiconductor at full speed in any ratio.

Then there's the new Varian VORTEX II operating system, with the fastest, most sophisticated FORTRAN IV compiler in existence. Memory can be expanded to 256K, with full hardware memory protection, optimum allocation, and dynamic relocation of multiple tasks.

But for real speed, you can go into overdrive with Varian's new firmware, specially constructed to accelerate FORTRAN-compiled tasks. And if you're in a real hurry, take advantage of the new Floating Point Processor that performs all floating point calculations in integrated hardware.

Sound good? Here's the best news of all. You can get the V-74½, with all this speed and power, at a price of less than $50,000. Write today for our "Fast FORTRAN And Floating Point" brochure.

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The mini killers
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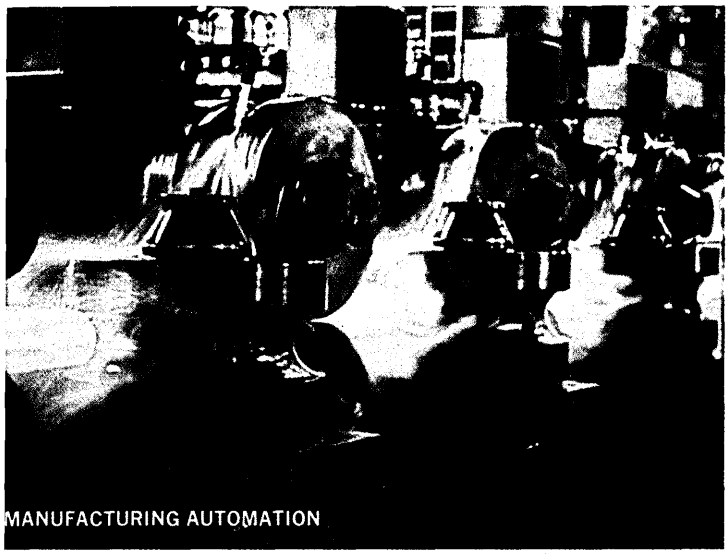
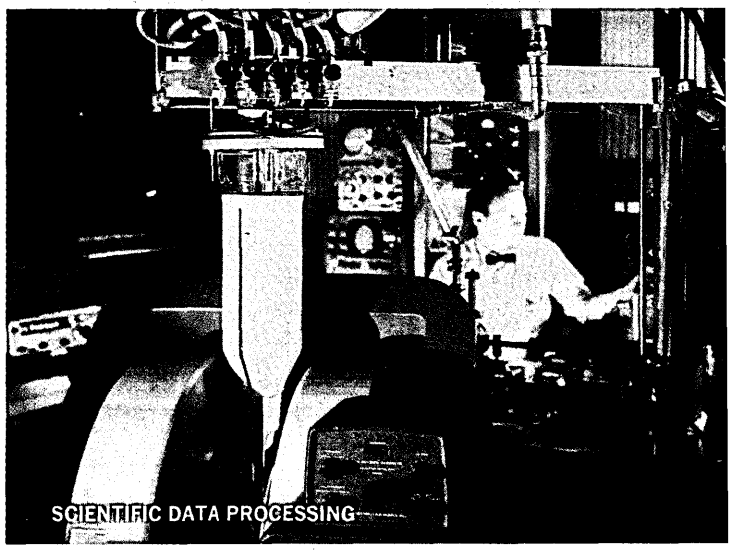

MANUFACTURING AUTOMATION


PROCESS CONTROL


DATA COMMUNICATIONS

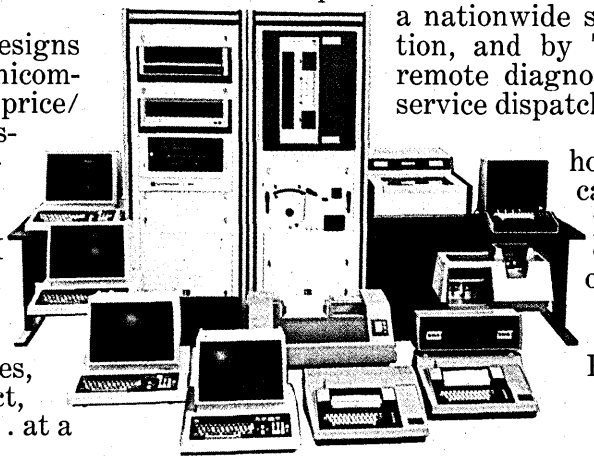

SCIENTIFIC DATA PROCESSING

TI computer products... helping to improve productivity

Productivity, and ways to improve it . . . a big challenge facing business and industry today.

Texas Instruments has designs on productivity . . . with minicomputers and systems that are price/performance leaders in industrial automation, data communications and scientific data processing.

Computer products from TI are helping large and small companies to automate manufacturing and testing operations, to control processes, and to more effectively collect, handle and distribute data . . . at a site or throughout a network. All TI computer products are backed by applications assistance, a nationwide sales and service organization, and by TI-CARE*, an automated remote diagnostics center and customer service dispatching system.



For more information on how TI computer products can help you improve your productivity, call the nearest sales office listed below, or write Texas Instruments Incorporated, Digital Systems Division, P.O. Box 1444, M/S 784, Houston, Texas 77001.

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CIRCLE 39 ON READER CARD

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The best solutions for leaders in medicine, research, business, math, science and energy-related fields. The best for taking the most data and making it the most workable information. Instantly. Profitably.

In seconds, our 4014 flashes your data on the screen. In the form of high resolution graphs, plots, maps, models, line drawings. Whatever you can visualize being visualized. Whatever you need to work with.

And since cost efficiency is also part of your job, our Graphic Terminals, although the best in the computer products industry, are also the best priced. Terminals from $4195 to $10,395.

Our CRT direct view storage screen displays clear graphics and alphanumerics in standard ASCII or APL. With 19″ of picture. And the terminal plugs right into most computers and minis. With software support you just can't get elsewhere. Our Graphic Tablets from $2995 give you fast, freehand digitizing. Flexible Disc Memory from $3695 cuts mainframe and CPU time. And our 4631 Hard Copy Unit at $3895 provides a high resolution dry copy. So you get the picture both ways.

But there's still more to Fast Graphics than meets the eye. And since our Tektronix network is both local and worldwide, your area Applications Engineer is as fast as a phone call away. Or, write us for some fast information on the efficiency of Graphics in your area.

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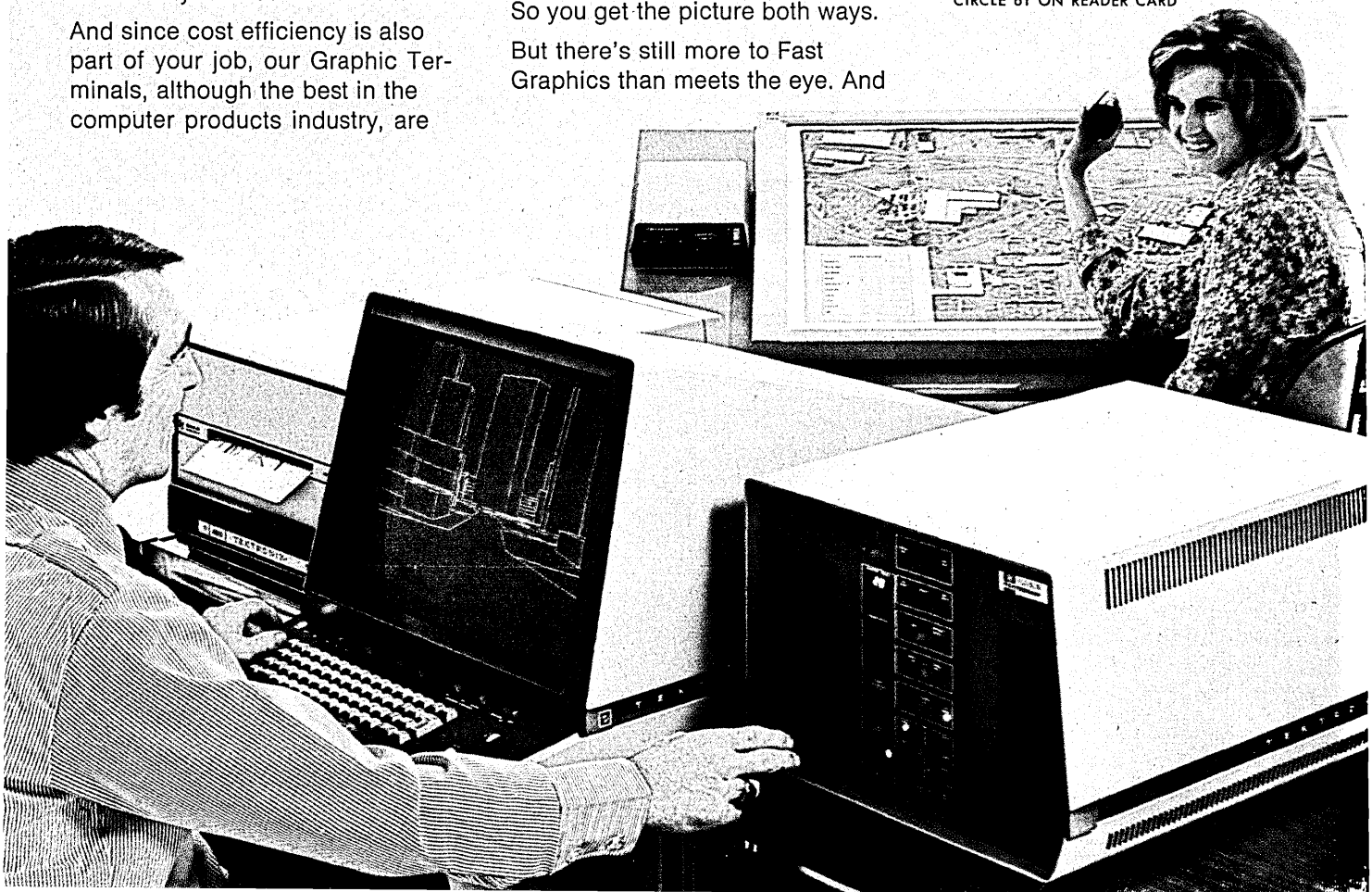
CIRCLE 61 ON READER CARD



calendar

APRIL

42nd Management Conference, Assn. of Data Processing Service Organizations, April 16-18, Mexico City. ADAPSO illustrates the theme "The Computer Services Industry Prepares for the 21st Century" with sessions on government regulation, industry standards, taxation, unfair competition, time-sharing and software. Fees: $125, member, $85 each additional person from same company; $190, nonmember, $125 each additional person. Charter flights are available from both Coasts. Contact: ADAPSO, 210 Summit Ave., Montvale, N.J. 07645, (201) 391-0870.

3rd International Optical Computing Symposium, April 23-25, Washington, D.C. Papers will cover "the role and use of digital processing in optical computers and the role of optical processing techniques and systems in digital computer processes," at this meeting sponsored by the IEEE Computer Society and the Society for Optical Instrumentation. Fees: $50, members; $65, nonmembers; add $10 after April 11. Contact: Harry Hayman, P.O. Box 639, Silver Spring, Md. 20901, (301) 439-7007.

13th Annual Convention, Assn. for Educational Data Systems, April 29-May 2, Virginia Beach, Va. Vendor exhibits, workshop sessions and special presentations are geared to the topic "Discovery: New Worlds of Educational Data Systems." Fees: $55, members; $65, nonmembers. Contact: Shirley Easterwood, AEDS, 1201 16th St., Washington, D.C. 20036, (202) 833-4100.

20th Annual College and University Machine Records Conference, April 30-May 3, Atlanta. Representatives from 300 educational institutions in the U.S. and Canada will discuss data base management, on-line systems, implementation techniques, and computer system applications. Fee: $80. Contact: Harry C. Grothjahn, CUMREC-75, P.O. Box 8105, Athens, Ga. 30601.

MAY

7th Annual ACM Symposium on Theory of Computing, May 5-7, Albuquerque. More than 30 papers will be presented at the symposium sponsored by the ACM Special Interest Group on Automata and Computability Theory, in cooperation with the IEEE and the Univ. of New Mexico. Fees: $34.50, member ACM and SIGACT; $37.50, member ACM *or* SIGACT; $42.50, nonmembers; (all $5 additional after April 18) $7.50, students. Contact: J. W. Carlyle, Dept. of System Science, UCLA, Los Angeles, Calif. 90024, (213) 825-2240.

ABA National Operations & Automation Conference, May 11-14, Bal Harbour, Fla. More than 40 workshops will discuss "Productivity for Progress" for members of the American Bankers Assn. Fees: $150, bankers; $180, nonbankers; badge and preregistration until April 21. For advance program and information, contact: Arnold Kaplan, ABA, 1120 Connecticut Ave., N.W., Washington, D.C. 20036, (202) 467-4038.

Computer Graphics Conference, May 14-16, Beverly Hills. UCLA Extension combines with the IEEE Computer Society and the Assn. for Computing Machinery (ACM) to present this forum on "Computer Graphics, Pattern Recognition, and Data Structure." The meeting aims to "promote the exchange of information on human interaction with patterned data to achieve flexible and intelligent computer processing." Fees: $60, members; $75, nonmembers; (add $10 at the door); $35, students. Contact: UCLA Extension, P.O. Box 24902, Los Angeles, Calif. 90024, (213) 825-1295.

1975 National Computer Conference, May 19-22, Anaheim. An audience of 30,000 dp users, industry executives, government officials, educators, computer specialists and overseas visitors will view a multitude of exhibits and attend the varied programs. The giant conference is sponsored by the American Federation of Information Processing Societies, Inc. (AFIPS). Fees: $60, advance, $75, at conference including Proceedings; students, $25; special fees for one-day and exhibits only. Contact: AFIPS, 210 Summit Ave., Montvale, N.J. 07645, (800) 631-7070.

JUNE

ACM, IEEE and Euromicro Conferences, France. Meetings planned for June include: **ICS 75, International Computing Symposium, June 2-5,** cosponsored by European ACM chapters, Antibes; contact AFCET, CUD, avenue de Pologne, 75775 Paris, Cedex 16, France; **IEEE International Symposium, Fault Tolerant Computing, June 18-20,** Paris; contact International Conference, Secretariat, 16, Rue De Presles, 75740 Paris, Cedex 15, France; **Workshop on the Microarchitecture of Computer Systems, June 23-25,** sponsored by the European Assn. for Microprocessing, Nice; contact Dr. Rodney Zaks, Université de Compiègne, B.P. 233, 60206 Compiègne, France.

APL 75, June 11-13, Pisa, Italy. This international conference for those involved in development, implementation and application of A Programming Language is sponsored by CNUCE (Institute of National Research Council, CNR) and a variety of national organizations. English is the official language of the forum; there are special round trip airfares for participants. Registration deadline is April 15. Fees: $95-110, approx. Contact: Philip S. Abrams, North American coordinator, 7316 Wisconsin Ave., Bethesda, Md. 20014, or Stefano Trumpy, Via S. Maria 36, 56100 Pisa, Italy.

Computer Networks Symposium, June 18, Gaithersburg, Md. Managers, engineers, and users of computer networks will share practical experience and new research on "Computer Networks: Trends and Applications." The IEEE Computer Society and the National Bureau of Standards are cosponsors. Fees: $10, members; $13, nonmembers. Contact: Computer Networks, P.O. Box 639D, Silver Spring, Md., 20901.

AUGUST

2nd USA-Japan Computer Conference, August 26-28, Tokyo. Special travel packages are being offered to attendees of this conference, sponsored by the American Federation of Information Processing Societies (AFIPS) and the Information Processing Society of Japan (IPSJ). Designed for computer hardware and software professionals in the academic and commercial fields, the formal program will be augmented by exhibits, tours of Japanese computing activities, preconference symposia, and a "people-to-people" program. Fees: $83, members, advance; $100, nonmembers; $17, students; $35, social registration. Contact: AFIPS, 210 Summit Ave., Montvale, N.J., (800) 631-7070 (toll-free).

Conferences are generally listed only once. Please check recent issues of DATAMATION for additional meetings scheduled during these months.

Honeywell Announces: A New Series 60 Computer

Model 66/10 GCOS

Now The Honeywell Information System brings you the multidimensional benefits of our large-scale (Level 66) GCOS environment at a lower price than ever before.

If you do a lot of different kinds of computing (batch, remote batch, online processing, time sharing), you will probably find that one versatile computer is more efficient than using several different computers. Model 66/10 gives you this capability.

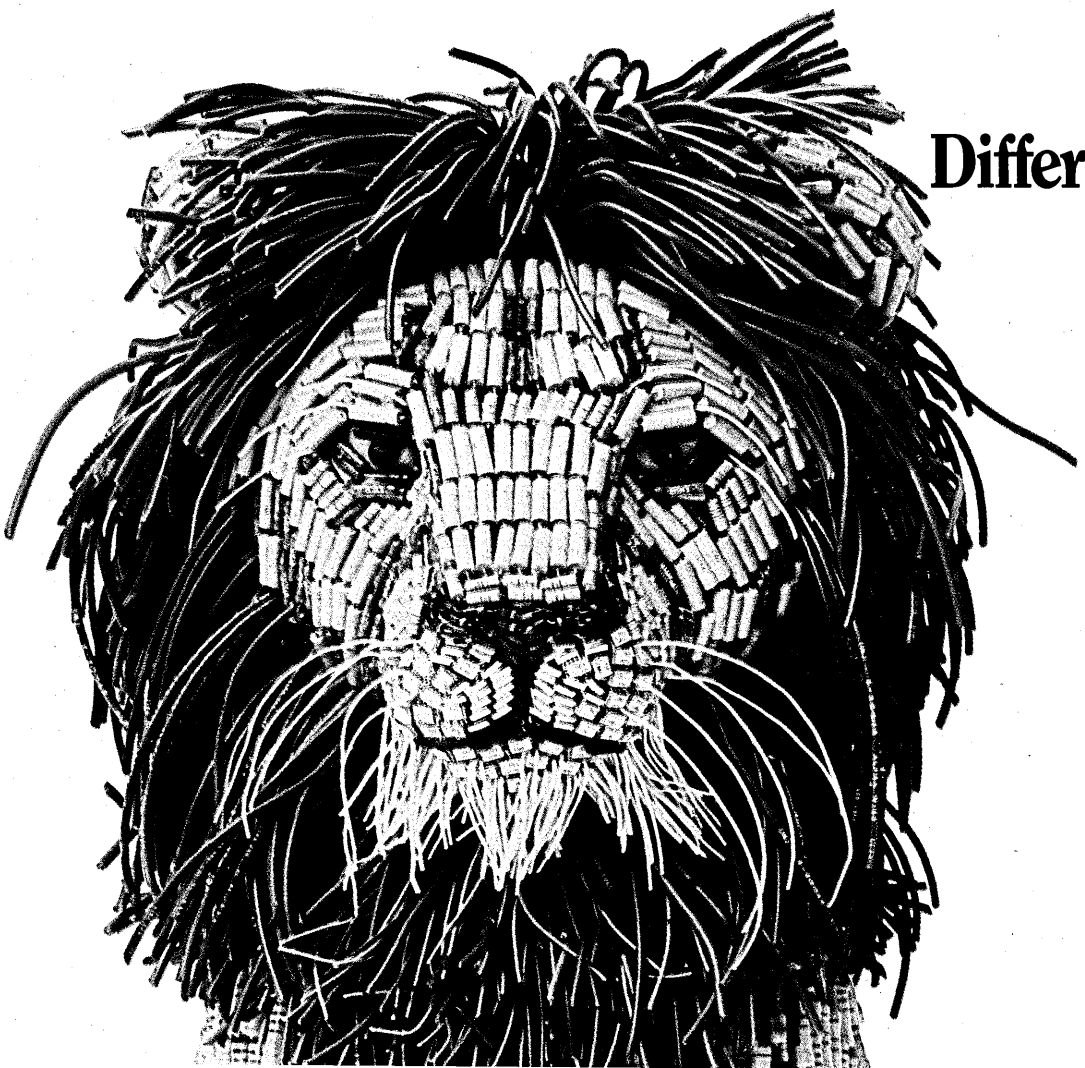
If you want continuously up dated files — an information system that accepts and processes transactions as they occur — you need Honeywell Transaction Processing. Model 66/10 gives you this capability.

If you want to consolidate several different data files while offering immediate, controlled access, you'll want Honeywell's Data Base Management. Model 66/10 gives you this capability.

If you want the efficiency of a computer-controlled data communications network, you'll appreciate Honeywell's Network Processing System. Model 66/10 gives you this capability.

If you want upward compatibility that will let you move to a more powerful computer system without reprogramming, Series 60 and GCOS anticipate your needs. Model 66/10 puts you in the GCOS environment.

If your business needs all of this, in a system that is easy to program, easy to schedule, easy to control, and easy to maintain — you need the Honeywell Model 66/10.



Different breeds

Honeywell Announces: A New Series 60 Computer

Model 68/60 Multics

Now The Honeywell Information System brings you the benefits of the unique, interactive, utility-like processing capabilities of Multics in two models — our new lower priced Model 68/60, as well as our previously announced Model 68/80.

If you need a high level of security to control confidential computer files or programs and to limit access on an individual, authorized basis, Multics is the acknowledged leader. Model 68/60 puts you in the Multics environment.

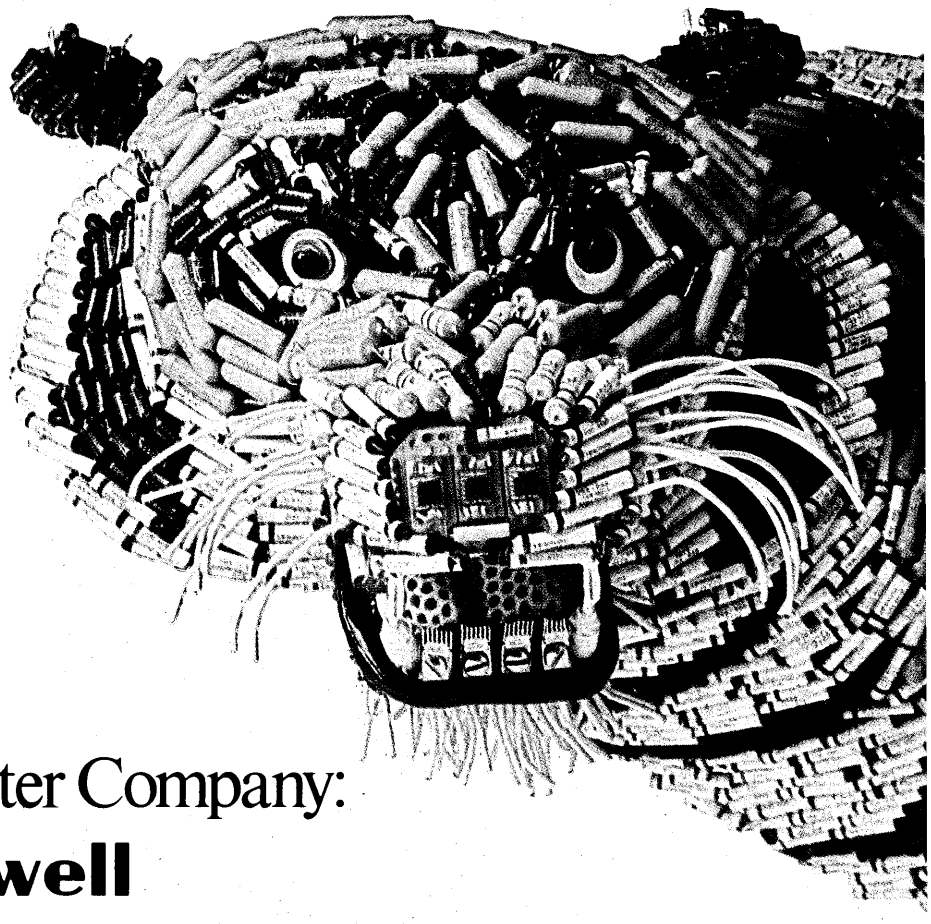
If your scientists, engineers, programmers need a lot of interactive computing power, sufficient to justify a large dedicated system, they can do much more with Multics. Model 68/60 puts you in the Multics environment.

If you need increased productivity, through increased accessibility and ease of use, Multics is your answer. Model 68/60 puts you in the Multics environment.

If you want the capabilities of advanced virtual memory for handling large files and programs, Multics provides one of the best techniques yet devised. Model 68/60 puts you in the Multics environment.

If you want to be at the forefront of computer technology with one of the most sophisticated systems available, you'll find Multics particularly appealing. Model 68/60 puts you in the Multics environment.

..for different needs.



The Other Computer Company:

Honeywell

Honeywell Information Systems, 200 Smith Street (MS 061), Waltham, Massachusetts 02154.

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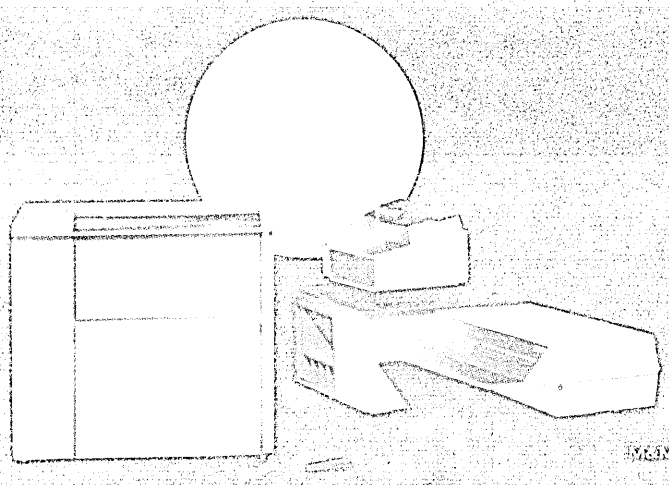
A World of Difference



SINGER

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(714) 998-1551 Telex 655-462

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source data

SOURCE DATA provides information on books, courses, references, reports, periodicals, and vendor publications.

books

KEYSTONE

by Paul F. Schmidt et al.
Precision Publications Inc., 1974
9841 Airport Blvd., Los Angeles, Calif.
Five vols., $9,800

KEYSTONE is the trade name for a five volume set which details how to do computer documentation. Some years ago the staff of Precision Publications Inc. contacted 15 large companies to see how they did computer documentation. This set (over 400 pages) is the distilled results of those contacts plus the accumulated knowledge and experience of Schmidt and others of the PPI staff.

Despite the claims made in the introductory material, the documentation scheme described looks like one appropriate for large projects or a medium to large software house. The scheme is built around a product development cycle which stems from a seemingly unending stream of objectives, specifications, approvals, etc. Most computer programs today are informally documented (unfortunately), but to move from such an informal state into this highly regimented, almost autocratic mode would be a shock few existing organizations could stand.

After about a 50 page introduction to the set, the reader is left with four large volumes, containing about 100 pages each, which cover the documents related to computer program design, system support, operations, and user support. In each volume, specifications are given complete with examples and descriptive text. The tone and volume and rate of delivery are reminiscent of an army field manual telling how to wash your face.

Some of the checklists are good and the development process that produces all this documentation brings to mind some pioneering work SDC did many years ago in producing documentation for the SAGE system. I was disappointed to see that the documentation is produced, edited, and maintained manually, computer text editing programs and word processing systems being nowhere in evidence.

In summary, this massive compendium is mostly form with a prosaic content. If you had a big job to do with several hundred technical writers to school, the system would probably be worthwhile. For those of us dealing with medium to small endeavors, the system at first reading looks overwhelming.

—Robert L. Patrick

Mr. Patrick is a multitalented dp consultant, and one of DATAMATION's contributing editors.

Data Processing Contracts and the Law

by Richard L. Bernacchi and Gerald H. Larsen
Little, Brown & Co., Boston, 1974
715 pp. $25

Many articles have been written about the legal aspects of data processing contracts. Any businessman or lawyer who has the fortitude and patience to track them down, can pick up the fine points. But it is no longer necessary! *Data Processing Contracts and the Law,* surveys the field very well.

This book will serve as a handy reference guide for those who have occasion to draft, analyze, or negotiate dp contracts. For the novice, it is a must. And for the experts, I recommend it highly.

It's a judicious blend of technical and legal expertise, with Larsen providing the technical, Bernacchi the legal. Whether you're concerned about commercial or government contracts, hardware, software, maintenance, patents, trade secrets, unfair competition, etc. there's something in it for you. Of particular interest are the comparative contract clauses.

About this time the reviewer is supposed to impress you with his knowledge and throw in a few barbs aimed at the jugular. So here goes:

1) It's heavy (715 pages).
2) I personally dislike Bernacchi and Larsen because they thought of the book before I did.
3) Those who need it most, the "contractual illiterati," will probably not read it, while those who need it least will.
4) If there are many more books like this, it will drive people like me out of business because there will be nothing left to say.

To sum up, if DATAMATION hadn't given me a complimentary copy to review, I would have sprung for the coins myself.

—Robert A. Bucci

Mr. Bucci has written articles on dp contracts for DATAMATION, and has worked on the legal staffs of two computer vendors.

Networks for Research and Education

M. Greenberger et al., eds.
MIT Press, Cambridge, Mass., 1974
618 pp. $12.50

Functional Analysis of Information Networks

by Hal B. Becker
Wiley & Sons, N.Y., 1973
281 pp. $16.50

Communication Networks for Computers

by D. W. Davies and D. L. A. Barber
Wiley & Sons, N.Y., 1974
575 pp. $38

A naive observer might look at the thousands of computers scattered all over the U.S. and wonder why they are not more concentrated to take advantage of scarce operating talent and economies of scale. Part of the answer, no doubt, concerns questions of status and prestige, noted often by many writers. However, more instructive insight is available by comparing the relationship between computer and user to that between factories and consumers during the industrial revolution.

Until recently the state of the computer industry was almost exactly comparable to the cottage industry stage of the industrial revolution. Then, lack of transportation and distribution networks forced industrial production to take place in close proximity to its consumer-user. The dramatic and extensive proliferation of railroads, highways, and motor vehicles during the nineteenth and early twentieth century allowed for consolidation of industrial manufacturing resulting in economies of scale which in turn made possible the dramatic reduction in costs of all types of products. The economic law of elasticity-of-demand at the time ensured a flow of goods and a standard of living hitherto unmatched.

An analogous process is observable in the computing business today. Data processing "factories" are, for the most part, organized in a widely scattered "cottage industry" with relatively tight coupling to their consumer-users. Since the situation is one of a local computer service monopoly, the computer/user relationship has been dominated by the benevolent rule of the computer technocrat. The peasant-user has had no choice but to adapt to the computer, paying homage to technical gurus. The fact that users have been willing to surmount the adaptation barrier is powerful testimony to the usefulness and desirability of the fac-

source data

tories' product.

In the computer industry we are now witnessing the early development of the transportation and distribution networks which will have similar dramatic effects on the relationships between computing factories and consumer-users, and the revolution is accelerating with astonishing speed.

However, the development of transportation and distribution networks for computing services is still in its infancy. The real explosion of computer-based services still awaits general availability of nationwide common carrier data communications networks designed specifically to meet requirements of the computer user environment.

An interesting thing happens when users have to interface with their computer via a telecommunications link rather than over-the-counter with a human interpreter. The providers of the service find that they have to make the computer easier to use. Again the time-sharing industry was the early pathbreaker in this regard, but the real action is in the heterogeneous computer networking environment such as ARPANET. Heterogeneity will certainly characterize any large scale future market place.

The increased attention to computer networking has been shown by an accelerated pace of conferences and seminars on the subject. The appearance of a number of books on networking in the last year or so further emphasizes the perceived importance of networks to future computer systems. The three books selected for review here address computer networking from three very different viewpoints.

Networks for Research and Education examines networking from a political, economic, and management viewpoint; it grew out of the papers, discussions, and analysis in three seminars on computer networking conducted by EDUCOM and supported by the National Science Foundation. These seminars, held in late 1972 and early 1973, were designed to help identify the central issues in building operating networks on a national basis. Although the participants were predominantly from an educational environment, the issues addressed are really institution independent.

The book contains edited versions of the 25 prepared papers and 12 workshop reports, plus an introductory highlight, conclusions, and recommendations. Collectively, they are a fascinating examination of a broad spectrum of issues that arise in computer networking. The papers are organized into: "User Characteristics and Needs," discussing the ways in which computing information is used; "Organizational Matters," covering the topics of network management, user organizations, institutional relations, and regional computing systems; "Operations and Funding," covering computers and communications, software systems and operating procedures, applications development and user services, and network economics and funding.

The most interesting chapters are on organizational matters, which will be the most difficult barrier to obtaining the benefits of sharing in computer networks. Although a few of the papers delve into some detailed technology issues, by and large the subject matter is management oriented and should appeal to those with the broadest interests in organizing and sharing computer resources.

Functional Analysis of Information Networks is what I would describe as a technical taxonomy of networking. What the author has done is to take the entire environment of physical hardware and logical software of teleprocessing networks and organize them into a hierarchical tree structure that clearly shows their relationships to one another. For example, the logical control functions are organized into Information Routing, Network Integrity, Journalizing, Statistical Recording, Utility, and Supervisory Control. A further breakdown of each function is then made, e.g., Information Routing is discussed in terms of Addressing, Trunk Routing, Load Leveling, Priority, Reroute/Intercept, and Processor Interface.

From organization comes insight. This book is particularly well suited for a systems analyst or programmer who needs a rapid introduction to the world of networking. The text is written in an intermediate technical narrative (with no mathematics). Anyone interested in actual systems design will have to pursue each of the many functional areas described in much more detail than will be possible with the material here.

Communications Networks for Computers is a work of major importance to technologists in this field. Some of the earliest work in packet switch networks which are now the leading edge in computer communications technology, was done at the National Physical Laboratory in Teddington, England. Both authors have been

(Continued on page 144)

reports & references

Micro Survey

Microprocessors and microcomputers are changing the way we process data by making low cost intelligence available for terminals, peripherals, and specialized processors. All known models of each were presented in detail in DATAMATION's December issue, along with text describing their architectures and applications. A total of 42 products from 32 vendors was covered. A limited number of reprints are available free of charge. DATAMATION, Los Angeles, Calif.

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Data Communications

A 160-page guide to data communications planning, buying, implementation, and applications, is aimed both at the novice and the established user of data communications. Described as a combined tutorial handbook, applications casebook, and industry directory, the guide treats data communications use in manufacturing, process control, petroleum/pipeline, banking, securities, insurance, retailing, wholesaling, transportation, government, computer services, service industries, education, health care, law enforcement, and utilities. KEN PULEO ADVERTISING, Londonderry, N.H.

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NMA Buyer's Guide

The 1975 edition of the NMA *Buyer's Guide*, providing a ready reference to equipment, software, and services offered by more than 250 NMA Sustaining Members, is available. Companies are categorized by product or service offered, both alphabetically and geographically.

Also available is the *Micrographics Index*, a comprehensive reference source to articles, books, and pamphlets on specific areas of micrographics (for $3.50 to NMA members; $4.50, nonmembers).

The *Guide* is free. NATIONAL MICROFILM ASSN., 8728 Colesville Rd., Silver Spring, Md 20910.

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Product Surveys

Datapro produces hundreds of reports

4000 deliveries later, Nashua's ready to call its Mod/11 disc pack an instant success.

At last there's a dependable, trouble-free disc pack for your 3330 Mod/11 drive. It's called our Model 4436DD (for Double Density). And it's available today from Nashua.

As the leading independent disc pack manufacturer, Nashua was the logical company to come up with a reliable Mod/11 pack. But if you know us at all, you know that we wouldn't want to talk about it until we were really ready.

Well, now we are. With over 4000 Nashua packs spinning on Mod/11 drives worldwide, we've geared up our manufacturing effort to be able to provide volume shipments of the 4436DD to meet your delivery needs.

If you're a Mod/11 disc user, you can appreciate the advantages of having a reliable, technologically topnotch alternative to IBM's own disc packs. And if you've already been looking for a supplier, you can stop now.

The 4436DD is the latest brainchild of Nashua's 125-year history of leadership in particle technology, joining a growing line of disc packs, cartridges and tapes that combine competitive pricing with an unmatched 3-year parts and labor warranty.

With factory formatting to insure absolute system compatibility, and Nashua's unique weighting system to maintain perfect balance in the drive, the 4436DD has already received wide user acceptance as the best long-term answer to everybody's Mod/11 needs.

Nashua offers a whole line of disc packs, cartridges and diskettes, with a major Winchester announcement coming up soon. But if all you care about is Mod/11, why wait? Get the good news today from your Nashua representative. OEM and system house special discounts are available. Call us collect at (603) 880-2885.

Nashua Corporation, Nashua, New Hampshire 03060.

David Wright, Marketing Manager
Computer Products Division
Nashua Corporation, Nashua, NH 03060

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source data

on data processing products, services, and users. These reports become part of a large reference service the firm sells, but are also offered separately at very reasonable tariffs. Recent publications include *All About Modems,* a 42-page report detailing the characteristics of 280 models from 50 manufacturers and relating customer satisfaction with Bell and independents (the average independent supplied modem is liked about as well as the average Bell product, but there are wide variations).

A Buyer's Guide to Data Communications Monitors compares six monitors—IBM's CICS, Environ/1, Intercomm, Minicomm, Swift, and Task/Master—and finds IBM's is considered the least satisfactory by users polled. Charts compare these and other monitors feature by feature.

All About Graphic Display Devices, an 18-page report, is mostly composed of charts detailing the specifications of 44 devices from 20 vendors. Limited user experience with some of them is also shared.

The reports are only $10 each from DATAPRO, 1805 Underwood Blvd., Delran, N.J. 08075.

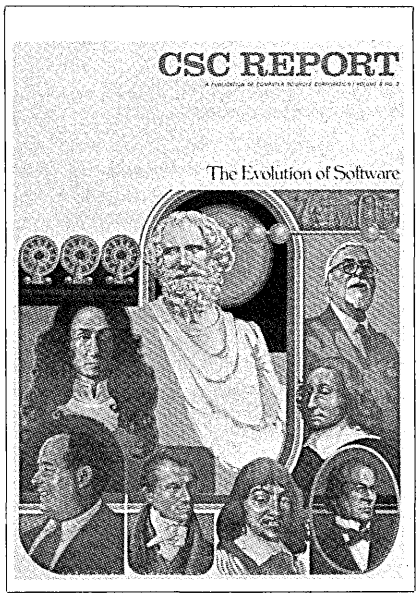
ANSI COBOL Standard

A new edition of *American National Standard Programming Language COBOL* is available. The revision, approved by ANSI's Board of Standards Review, is already in use in federal government dp applications, and is compatible with the international standards for COBOL, adopted as recommended in 1970 by the International Organization for Standardization (ISO). This 535-page paperback spells out vocabulary, specifications, and rules for usage of COBOL. Both the form and interpretation of COBOL programs are specified.

Major changes include replacing the Random Access module, adding a new Inter-Program Communication module to provide for communicating with one or more other programs, and a new communication module to provide the ability to access, process, and create messages and to communicate with local and remote communication devices. Price: $12. AMERICAN NATIONAL STANDARDS INSTITUTE, 1430 Broadway, New York, N.Y. 10018.

History of Software

The 15th anniversary issue of *CSC REPORT,* entitled *The Evolution of Software,* traces the history of software from its beginnings to current OS structures. This interesting, 16-page multicolored brochure goes into a relatively



detailed chronology of software development, and gives credit where due. COMPUTER SCIENCES CORP., Los Angeles, Calif.

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vendor literature

Display Booklet

Oem buyers of crt monitors are given a little help in understanding the differences between them in this 20-page booklet. Various types of displays (random scan, vector scan, etc.) are illustrated and their terminology defined. More than half the pages are devoted to a non-salesy tutorial, making it a worthwhile reference. TEKTRONIX, INC., Beaverton, Ore.

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Remote Batch Plus

This remote processor has up to 64K of memory and its own operating system. It can process concurrent job streams, operate multiple peripherals, and emulate the IBM 2780/3780, Univac 1004, and CDC User Terminal 200. It interfaces to synchronous or asynch lines at speeds from 75bps to 9600bps, and can act as a standalone for source data entry, data base inquiry, and media conversion. A glossy six-page brochure covers all its functions and even suggests further enhancements. HARRIS CORP., Dallas Texas.

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Videocomputers

There may be a better name for a crt "terminal" with a built-in minicomputer, but for now this trade name will have to do for this vendor's products. The technology, applications, and peripherals are described in two flyers and a third covers a registration and inquiry badge system based on the equipment. JACQUARD SYSTEMS, Santa Monica, Calif.

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Tape Transport

The claim for this vacuum column mag tape drive is that it is the quietest one available. It comes in 7- and 9-track versions, running at tape speeds of 25-75ips. Read/write and read-after-write units are offered which record at the stock densities of 200bpi to 1600bpi. This six-pager tells the story for the Model T9000. PERTEC CORP., Chatsworth, Calif.

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Communications Gear

Most of the equipment listed in this small fold-out catalog looks super technical, ranging from modem test sets to error correctors and various line interface adaptors. It should be of most interest to communications maintenance personnel. INTERNATIONAL DATA SCIENCES, INC., Providence, R.I.

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Ribbon Re-inking

According to this vendor, the average line printer ribbon can be re-inked four times, and re-inked ribbons may actually produce better images than brand new ones, due to their ability to hold more fluid. The equipment to do the job is described in this two-page bulletin. COMPUTER-LINK CORP., Burlington, Mass.

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Supplies & Accessories

This catalog lists 64 pages worth of warehoused dp items, from sorting needles to plugboard wires, to rotary files, safes, furniture, and media. It seems to cover every conceivable type of accessory, including many which must be difficult to get due to their age. Some products listed are new, others used. Prices are quoted on everything. EDWARD OCHMAN SYSTEMS, Fairfield, Conn.

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(Continued on page 143)

"Your debut has been a sensation. To what do you attribute your success?"

Hazeltine 1200:
"Good Breeding. I'm the latest in a long line of outstanding performers."

"But there are others who claim to be as good as you are. Could you be more specific?"

Hazeltine 1200:
"Take character for example. I have 1920 of them. 80 across and 24 down. Not only that, I'm available with switch-selectable baud rates in any combination of two standard rates all the way up to 9600.
"My options—such as upper and lower case, current loop and others—make me adaptable so that I can play to several different audiences."

"But Great Performers like you usually demand a high price. What do you have to say about that?"

Hazeltine 1200:
"Well! That's one of the other reasons for my success. I give people the features they want and need, at a price they can afford—only $65 a month, 12-month rental, maintenance included."

"How do you fit in with the other members of your family—the Hazeltine 1000, the Hazeltine 2000 and the Hazeltine 3000? How does your success affect them?"

Hazeltine 1200:
"Each of us is talented in different ways. But of course we all share the advantage of a worldwide sales and service network backed by more than a half-century of leadership in electronics and displays."

"I know that you're in great demand. Where will you be appearing next?"

Hazeltine 1200:
"That's up to my agents in Hazeltine sales offices throughout the world. A phone call at any time is all that's required to arrange for a personal appearance."

Hazeltine Corporation

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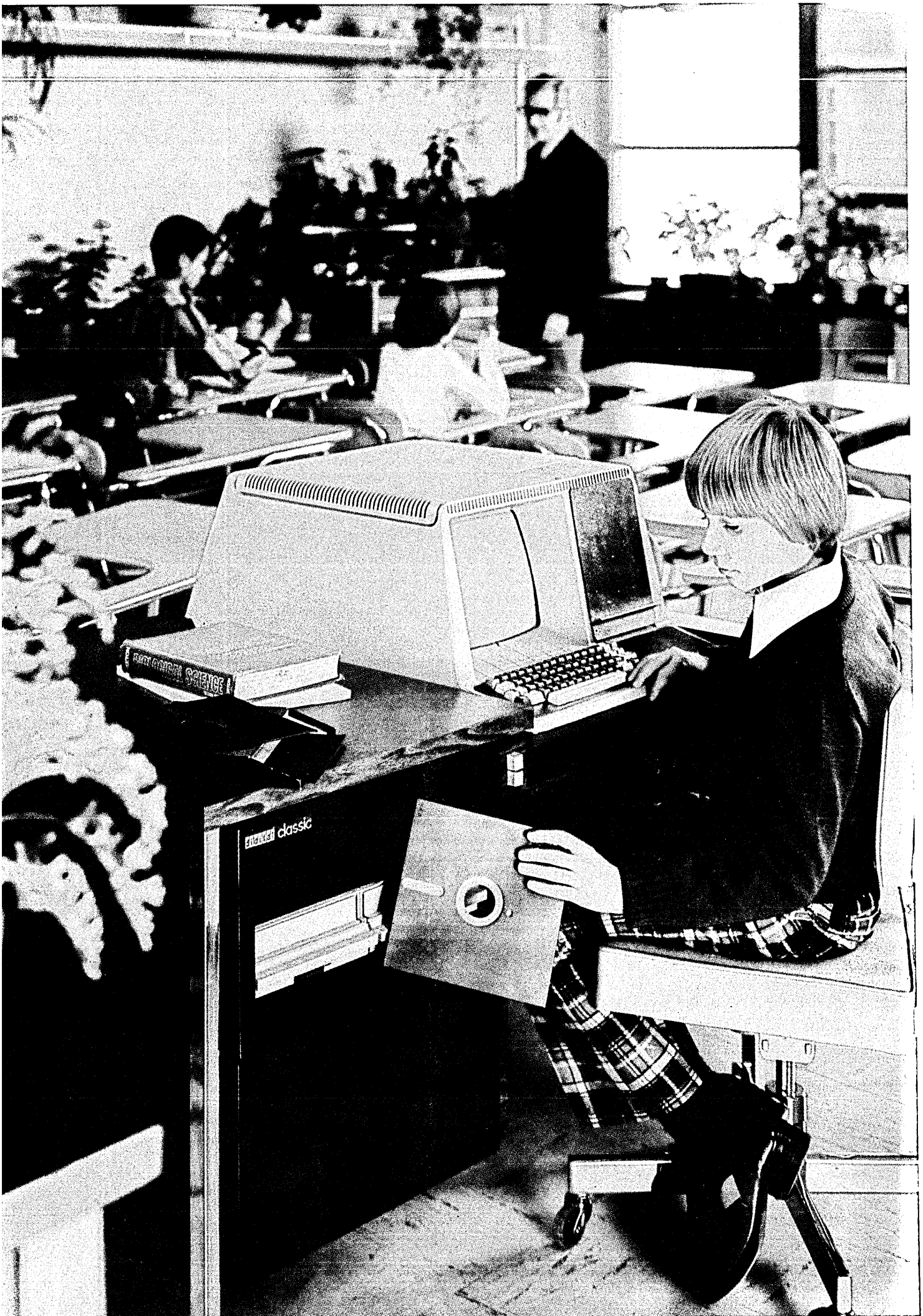
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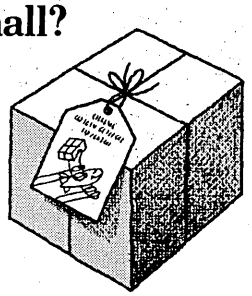

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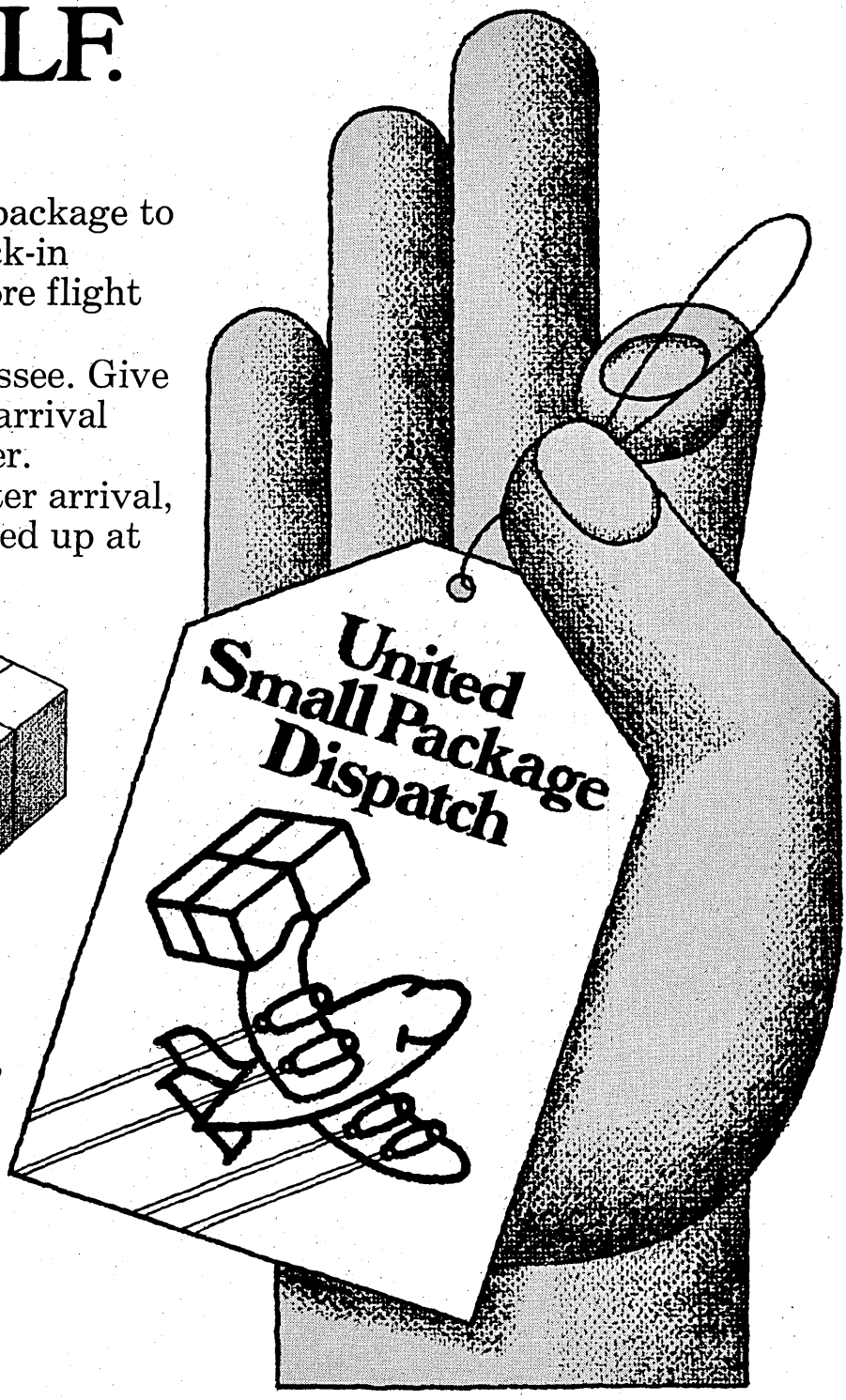

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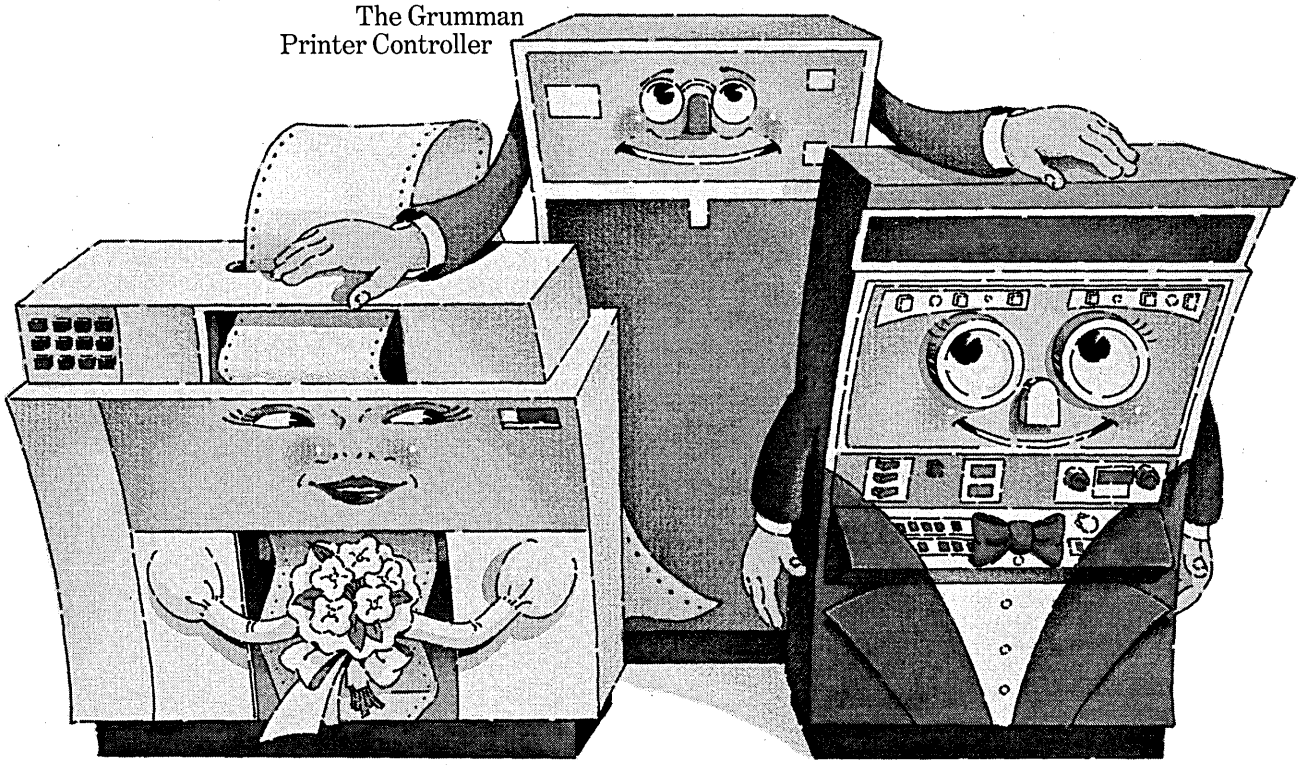

For years people have been trying to imitate the IBM 1403. Unsuccessfully. Now, with the Grumman Printer Controller you can connect your present computer to an IBM 1403 and give yourself the best printing in the business.

The IBM 1403 has built an extraordinary record. Highly reliable, high speed operation. Unusually consistent, clearly readable printouts. (No wavy lines so typical of drum printers.) Type fonts your operator can readily interchange. And, of course, it handles form changes easily.

With the Grumman Printer Controller you can improve your printing quality, speed, and reliability. All at an attractive, and perhaps, money-saving price. Speaking of price, you can buy our controller or rent it. We provide maintenance, of course.

With our printer controller you can connect the IBM 1403 to your present DEC, Xerox, GA, or CDC computer. We'd like to hear from Burroughs, Univac and the other computer users, too. For complete information please write or call Jon Ayers, Grumman Data Systems, Computer Products Division, 45 Crossways Park Drive, Woodbury, New York 11797. (516) 575-3034.

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Products and services that lower the cost of computing.

Envoy.

The Paperless Portable vs. Portable Paper.

The Paperless Portable is a sleek 26 pound CRT terminal. It looks and acts like an engineer's fondest daydream, but it's as real as the tip of your nose.

Until now, man has been content with 'portable paper.' He put a noisy 100 pound teleprinter on wheels and carried a box of paper around and called it portable.

Or he used a portable thermal printer. It too demanded reams of paper, and it still weighed almost 40 pounds. At the end of your arm, portable was a euphemism for heavy.

The Paperless Portable is Envoy. If you're familiar with ADDS' larger desktop CRTs, you recognize a few of the features we gave the Envoy. Formatting, graphics, an edit submode for programmers, even video output display capability for presentations.

Unlike the two mechanical contraptions described above, Envoy is reliable. Its solid state electronics can't get out of alignment. And the only noise you'll hear is the faint hum of progress.

Now, as the name implies, the Envoy is paperless. If paper is essential to your operation, you'll have to make do with teleprinters.

But if you're using paper just because you're used to it; or because you like the 'security' of paper, you owe it to yourself to consider Envoy.

The Paperless Portable.

It's better than heavy.

And at $99 a month, it's better than paper.*

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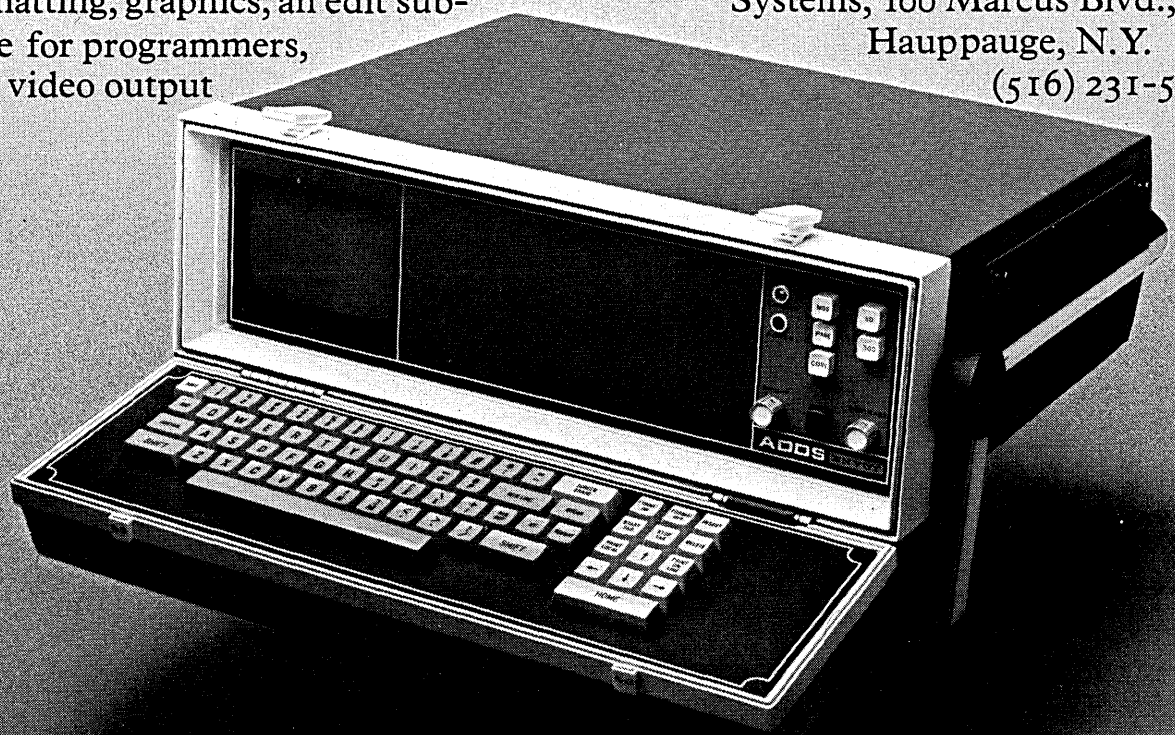

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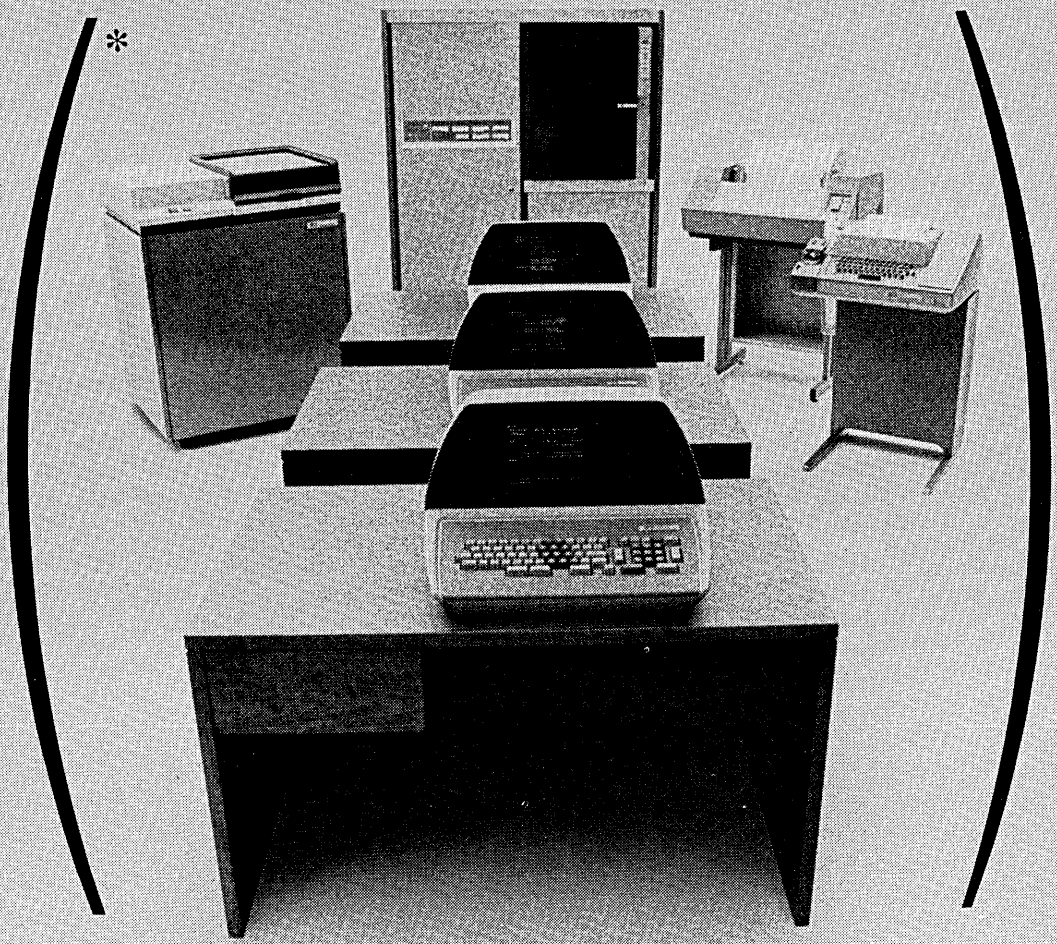


General Computer Systems, Inc.
GCS 2100 multifunction, multimedia data entry system.
Which we've never advertised.

For the past four years we've been developing our powerful GCS 2100 system and building its software support and service program. And we've never taken the time to tell enough people what a great system it is.

How efficient it is (average of 80% reduction in errors—35% to 85% faster document handling).

How reliable it is (less than 1% downtime).

How simple it is (operator training time less than 8 hours).

Or how economical it is (10%—40% savings in data preparation costs).

And our competitors have loved us for keeping it such a secret!

The GCS 2100 is a complete data entry system: it lets you collect and edit data at the source (data is actually edited while it is being keyed).

Store the data on disc. Then transfer the clean data to an output media like magnetic tape.

(Conversely, data already on tape or cards can be re-submitted to the GCS 2100 for editing, reformatting, etc.)

By editing input data before it goes to disc storage, the GCS 2100 lets you quickly spot errors that could have become costly.

The GCS 2100 can interface up to thirty-two Touch-Tone® telephones. Card readers. Medium and high speed line printers. Four-tape drives. Four fixed or moving head discs.

All on a single system.

The GCS 2100 provides extensive I/O functions that allow you to transfer data to and from disc storage and other I/O devices, and provides an audit trail (comprehensive statistical reports aid in monitoring the system and the operator's performance), all with minimum impact on a supervisor's time.

The GCS 2100 can accommodate up to 64 local or remote terminals: local terminals can be located up to 2500 ft. from the system's CPU. You get faster, more accurate data entry for functions like payroll, shipping, receiving and manufacturing, because the person most familiar with the data does the keying. (Note: we can supply a typewriter keyboard and a special CRT format so this person doesn't have to be a keypunch operator.)

In addition to data entry from local terminals, the GCS 2100 offers data entry from remote terminals (it can handle up to five remote terminals over one dedicated telephone line); Touch-Tone® data entry; remote batch communications; and word processing.

A Programmable Extension Package (PEP) extends the power and the flexibility of the 2100 system: up to 255 PEP tables provide capabilities like automatic data insertions; range and value checks; table look-ups; logical tests; character expansion (the operator keys S.D., South Dakota is generated on output); and automatic format switching.

And because these tables are not job assigned, they can be used on several different jobs. (Note: no programming experience is needed to work with PEP.)

A library of over 100 special edits is also available. It handles things like field relocation; special balancing routines; manipulation of constants; and output editing requirements. (If there isn't an edit for your needs, we can design one.)

The GCS 2100 also provides up to 99 format levels per job; up to 255 balance accumulators; variable length record and blocking factors; and up to 255 jobs stored in the system.

GCS DataTel: provides remote batch communications capabilities between the GCS 2100 systems and other 2780-compatible terminals and mainframes. And since the batch transmission of data is directly from disc to another mainframe, the usual step of transferring data to tape can be eliminated.

GCS DataTone: is a low-cost, efficient and convenient method for collecting numeric data from remote sites. It is designed for updating inventory, shipping documents, orders, etc.

DataTone answers automatically and handles up to thirty-two incoming lines at once.

With DataTone, the GCS 2100 system can accept incoming telephone data without interrupting data entry from the terminals.

GCS DataText: is a multi-purpose shared-processor approach to word processing. Designed for high-volume typing requirements, it is a fast, efficient, low-cost method for producing customized letters, envelopes, forms, labels and reports.

And since DataText uses a disc library, manual handling of storage media like cards, cartridges, etc. is eliminated.

If you'd like to get in on more Great Computer Secrets, contact Agent 2100 at General Computer Systems, Inc., 16600 Dooley Road, Addison, Texas 75001. (800) 527-2568 toll free. In Texas (214) 233-5800.

GCS 2100

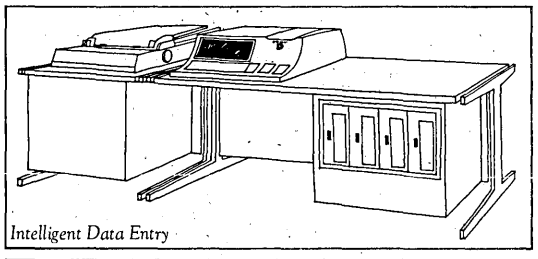
general computer/systems inc.

Dispersed Data Processing: An Idea Whose Time Has Come– Just in Time.

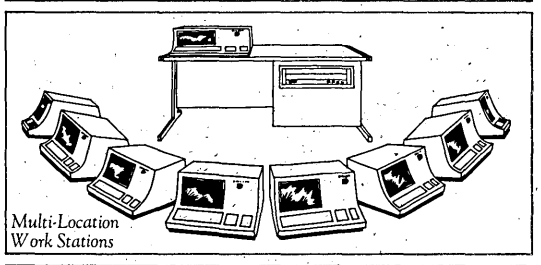
Dispersed data processing the Datapoint way offers a practical, convenient, economic way to get computing power out where the action in a business really is, out in field facilities where sales, purchasing, manufacturing, inventory and other important source documents are first generated.

Many organizations today have costly central computers but find it difficult to make their power available to remote locations where it can be used most profitably. These central computers often operate only at a fraction of their potential. To solve this problem, Datapoint Corporation has pioneered and implemented the concept of dispersed data processing, an idea whose time has come, just in time, for maximum economy and efficiency at many businesses.

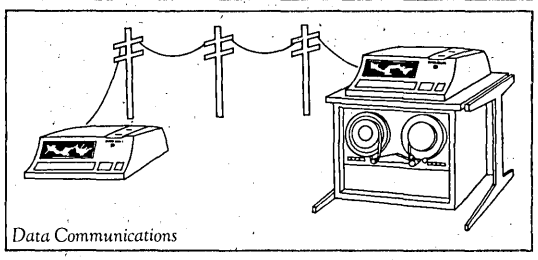
Datapoint dispersed processing equipment integrates a data conversion/entry, data processing and data communications capability. It makes it possible for personnel in a company's field offices to capture, "package", and move data efficiently to a central computer, and/or maintain local data files and perform processing tasks without having to go to a central computer at all. With three fully programmable dispersed processors, the Datapoints 1100, 2200 and 5500, associated peripherals and complete operating software, system configurations can be easily tailored to the work load of each field office, subsequently adjusted and expanded as that work load changes. Further, Datapoint equipment interfaces readily with all standard central computers and line disciplines through proven emulation routines.



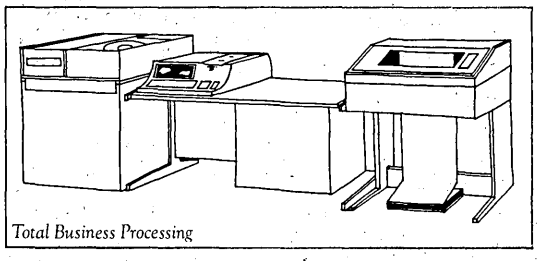
Intelligent Data Entry



Multi-Location Work Stations



Data Communications



Total Business Processing

Typical application configurations include:

- Intelligent Data Entry–for field offices and other departments handling a heavy volume of data conversion and entry work, the new Diskette/1100.
- Datashare–for multi-location, multi-application situations with a single Datapoint 2200 or 5500 processor serving as the source of compute power for from eight to sixteen low cost satellite terminals.
- Data Communications–for applications which require speedy transfer of large volumes of data between facilities.
- Total Business Processing–based on a powerful Datapoint 5500 processor and associated peripherals, providing a stand alone processing capability to field offices.

Datapoint dispersed processing systems are now at work in hundreds of organizations around the world. (Our total installations exceed 10,000 and purchase value of equipment shipped for sale or lease was over $66 million in fiscal 1974.) Could be dispersed data processing is an idea whose time is coming at your company. For more information contact the sales office nearest you or Datapoint Corporation, San Antonio, Texas 78284 (512) 690-7173.

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The leader in dispersed data processing

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Editor's Readout

John L. Kirkley, Editor

What Goes Around Comes Around

Frank T. Cary, IBM chairman of the board, said he was "very pleased."

Others reacted to the reversal of the IBM-Telex case with less aplomb. "This has ominous implications" said one computer industry prognosticator; he warned that IBM could bring the full weight of its competitive strength against any segment of the industry without fearing antitrust constraints. Still others argued that IBM's brilliant management, innovation and boldness, and its role as a major contributor to this country's progress had been vindicated.

The appellate court's findings that Judge A. Sherman Christensen's 1973 decision was in "plain error" is also being hotly debated. There is no question that Judge Christensen worked long and hard to understand our complex and pervasive industry; he carefully traced the history and described the evolution of a marketplace in which IBM was clearly dominant. But the 10th Circuit Court took a different view of the pcm market, identifying a sprawling arena where over 250 firms offer easily interchangeable peripheral devices.

And, even more importantly, the court decided that IBM does not have monopoly status *in the entire industry:*

"Inasmuch as IBM's share of the data processing industry as a whole is insufficient to justify any inference or conclusion of market power in IBM, the exclusion from the defined market of those products which are not plug compatible with IBM central processing units has a significant impact on the court's decision that IBM possessed monopoly power."

This finding is based on 1971 Bureau of the Census figures, a sweeping potpourri which estimates IBM's market share at only 36.7%—a market much broader than the one most of us instinctively feel comfortable with. This huge relevant market definition is also a cornerstone of IBM's pretrial brief in the federal antitrust case. (Of course, IBM's own internal documents, unearthed during the course of this case, contradict its own brief. In 1969, Thomas J. Watson, Jr., then chairman of IBM, in a letter to Ramsey Clark, attorney general in the waning days of the Johnson administration, estimated that IBM's "present share of the business is somewhere between 55% and 70% depending upon the criteria used . . . ".)

The lead story in this issue's News in Perspective explores reactions to the Circuit Court decision, the impact it may have on other litigation, and quotes industry soothsayers.

There's confusion. And concern. Against a background of mergers, layoffs, chapter XIs, and elusive capital, the non-IBM segment of the computer industry is asking itself where does it go from here.

Back in March 1969, a DATAMATION story on the newly announced Justice Department suit commented that the industry "may now be putting on its first pair of long pants." It cited the industry's first hard, introspective questioning to find out why IBM was such a success and how the antitrust action might change the structure of the computer industry, the nature of the competition, the lives of the data processing end user, and the course of the country itself.

Well, it's been a long adolescence. As this issue's story so vividly illustrates, the debate still continues. And despite the positive assertions of many partisan voices, the future is still murky.

It is clear though that computers and information processing are playing an increasingly critical role in the cultural evolution of this nation, and, for that matter, the nations of the world. And there is also little doubt, no matter what percentage of market share is claimed, that IBM has a center stage role in this unfolding drama. Decisions about restructuring IBM are decisions about restructuring our industry with all that that implies.

We think it's time for some long, hard, *informed* thinking on the part of the government about where the computer industry is going. And we also think a consent decree with IBM should be a by-product of that thinking.

We caution against haste: a quick settlement now, based on short-term economic considerations and the fact that IBM is in the catbird seat after the appellate decision, could be disastrous. On the other hand, going all the way with the trial and the subsequent appeals—perhaps five years or more—would also be a disaster. Judge Edelstein, ready to pronounce sentence, might look up to address IBM's waiting competitors and find his audience gone.

Arriving at an informed, thoughtful opinion about restructuring our industry is a tough job for a judge, a government, a federal agency or for any of those involved—and we all are. And that's why we want to repeat an offer made in the Editor's Readout column of this magazine in that same March 1969 issue.

We're urging all of you who have information and ideas about this vital topic to submit short, coherent statements to DATAMATION. By providing this kind of nonpartisan format, we hope to circulate these ideas throughout our industry and to those key individuals whose decisions impact our future.

The guidelines for submitting your views are the same as they were six years ago:

" 'Think.' Then write." □

COMPETING

minicomputer makers will probably get the money they need to grow. but some large systems manufacturers will be hard pressed to show much return on investment

"CAPITAL" IS A LOADED WORD. It is a portmanteau that carries nearly as many meanings as "drag" or "like." Its preferred meaning is "a stock of accumulated goods, especially at a point in time." Capital obviously exists in all societies but not everywhere is it permitted to be individually owned or, on its own part, to generate an income. In most of the Western World capital is "saved" or collected, and, either hoarded, or "invested" in ventures with the expectation that it will expand its bulk to the delight of its owners.

Frequently, however, investments do not fulfill their promise and capital is disseminated with not only no income but also no return of principal. The chance of this happening is called risk. In a perfect society risk would be calibrated and ventures with higher probabilities of collapsing into insolvency would require equivalently larger offsetting income returns in order to attract capital. However the measurement of risk is an extremely inexact science and capital flows are often also determined by emotion, habit, hysteria, vogue, chicanery, promotion, ignorance, malfeasance, or national interest. In fact a continued access to required capital in itself can frequently carry tremendous weight in calculating the probability of success of entrepreneurial efforts—that is, in-

FOR CAPITAL

by george w potts

vestments can be self justifying. Also, the relationship between risk and return is multidimensional and frequently nontransitive.

To be more dogmatic, capital, however obtained, is an absolutely necessary ingredient in any attempted business. It must be present in sufficient force at the nascence and through the pubescence of all ventures. Some need tremendous quantities of financing, some very modest amounts, but all demands are nonzero. Mature companies usually stop requiring capital and start creating it—with abandon. These firms have been labeled "cash cows" by one waggish investor. These are the large dividend payers, the ones whose slowing growth can be funded internally with sufficient margin for a handsome return to be paid to their stockholders (realizing of course that "handsome" is a relative term depending upon the times). They may retain this blissful state for many decades, or like their bovine metaphorites, can require periodic capital insemination for continued production. Eventually senility overtakes them. They lose all elasticity and are finally turned into glue and hamburger. by an unforgiving stock market.

Computer companies have led a manic-depressive existence in capital markets over the last decade. No companies have been as high as they, and few companies have been so brutalized by a disillusioned public. The future of this tenuous relationship is the predictive purpose of this article—however only insofar as the two major segments of the computer mega-industry are concerned—the minicomputers and the general purpose computers (or, for contrast, "large" systems). Other segments are forsaken due to the paucity of our current research, or left for other articles in this issue.

We have two questions to answer: What are the capital requirements in the minicomputer and general purpose systems industries? And, are these requirements likely to be met?

When banks, investment banking companies, or other concerns are approached to provide capital, directly or through a public offering, to a corporation, a long series of investigations and analyses normally takes place. The investing public, taken as a whole, seems to have more simplistic investment criteria. There have been major vogues in analytic tools over the last few decades; first dividend yield was critical, then it was earnings-per-share growth, and now it appears return on investment is becoming most popular. Not wanting to neglect the fashion, the following analysis of the minicomputer and large scale systems industries uses this return as a cutting edge.

How much capital will be required?

These two industries are intriguing in that, to many they seem so similar when they are quite opposite. Two major differences are: (1) Minicomputers are sold; larger systems are most often leased. (2) Minicomputer prices have been steadily declining; large system prices have been advancing, much less than performance has increased, but nonetheless advancing.

There are, of course, many other blatant differences whose mention here would not serve the objectives of this article.

The "large computer" industry

The membership of this industry is commonly accepted as IBM, Sperry Rand, Honeywell, NCR, Control Data, Burroughs and, to a lesser extent, Singer and Xerox. Obviously general purpose computer systems are not the only product these companies offer but they are very important elements in each of the first six firms' product lines. We will concentrate our analysis on these half dozen corporations.

The overriding capital requirement of this industry by far is the funding of the computers that these companies have out of rental. Capital expenditures by this group in 1973 totaled

$3.196 billion of which 82% was used as additions, at cost, to the rental equipment account. Table 1 provides a breakout over the last four years of additions made to this balance sheet account by these companies. Although there are some inventories buried in these figures, they mostly represent computers that have been installed at user sites and are collecting rent. These additions are investments in the future, made by these companies (and in turn by their stockholders) with the expectation that rental and depreciation (cash) returns will be rewarding. The rental base character of the large systems market has historically been a major positive factor to security analysts. It has been said to provide:

- a stabilizing factor that keeps revenues and profits from fluctuating with the economic and product cycles.
- a method of generating a greater total return than could be achieved from an outright sale. Often computers are kept on rental long beyond the point when the sum of the rental increments surpasses the equivalent purchase price.
- a method of account control. If users rent computers they are more susceptible to add-ons or product upgrades.
- a relatively quick source of revenue. Heavy short-term capital needs can usually be met by modest shifts in the sales/rental ratios. Certain customer categories can be enticed, through pricing shifts and sales promotions, to purchase computers that were on rental.

However what few analysts have concentrated on is that the rental income and cash flow returns, in fact, have been extremely modest for most companies in this industry. (The major exception, of course, is IBM.) That is, for a given dollar invested in computers on rental, none of these companies except IBM has been able to generate sufficient income or cash (income, plus depreciation and net retirements, less additions) to make continued investment of capital in a like manner easily justified. If these capital budgeting decisions are tenuous internally, then the same kind of hesitation may eventually be reflected in capital markets.

If in fact return on investment is becoming more important as an analytic tool, then Tables 2, 3 and 4

Capital is provided to corporations from both internal and external sources. The major internal sources of capital are:

retained earnings. This is profit after all operating expenses, interest, taxes and dividends have been paid.

depreciation. More a bookkeeping entry than a real thing, depreciation nonetheless is a pretax expense permitted by the government. It does not in fact increase capital absolutely but reduces the amount of taxable income and thus the tax paid. As a result more cash is available to replenish capital items (machines, factories, etc.) which have deteriorated with age.

dividends. Dividends from other firms which are partially or wholly owned by the parent company.

money received from the internal sale of stock. Money from officers or employees of the corporation who buy through stock options, stock purchase plans, etc.

External sources include:

public or private sale of common stock. This is a normal ingredient in the capital structure of all businesses. Dividends paid to the holders of common stock are at the discretion of the board of directors but can (and usually do) grow with the expansion of retained earnings.

sale of preferred stock. Holders of preferred stock and common stock are the "owners" of the corporation and vote in the board of directors. These two classes of stock (along with accumulated retained earnings) are called the "equity" of a corporation.

long-term debt. Debentures (a statement of indebtedness) can be sold, either secured or nonsecured by property, usually with a fixed

ADDITIONS TO RENTAL EQUIPMENT ACCOUNT AT COST
($ Millions)

	1970	1971	1972	1973
IBM	$1,518	$1,372	$1,453	$1,749
Sperry Rand	142	115	221	121
Honeywell	282	244	270	374
Burroughs	195	107	115	146
Control Data	85	91	108	123
NCR	140	98	93	113
Total:	$2,362	$2,027	$2,260	$2,626

Table 1.

ESTIMATED RENTAL & SERVICE NET INCOME (AFTER TAX)
($ Millions)

	1970	1971	1972	1973
IBM	$719	$813	$862	$874
Sperry Rand*	7	12	14	20
Honeywell	20	26	28	35
Burroughs	7	7	5	7
Control Data	(23)	0	5	17
NCR	9	(5)	(46)	24

*Fiscal year ends March 31 of following year
Table 2.

AVERAGE GROSS RENTAL EQUIPMENT ACCOUNT DURING YEAR
($ Millions)

	1970	1971	1972	1973
IBM	$6,195	$6,931	$7,431	$8,090
Sperry Rand*	470	545	603	625
Honeywell	1,061	1,212	1,321	1,420
Burroughs	468	597	673	750
Control Data	230	282	339	404
NCR	461	529	570	590

*Fiscal year ends March 31 of following year
Table 3.

interest rate and payback schedule. There are sometimes debentures (or preferred stock) which can be converted into common stock according to specified terms and stipulations. These two major sources of investment (equity and long term debt) are called the "total capital" of a corporation.

bank debt. This is often referred to as "short term debt." Normally it is borrowed from banks, but insurance companies or other, less likely sources are sometimes used.

There are other sources and uses of capital that are a little more subtle in their descriptions:

mergers and acquisitions. These can be both sources and uses of capital. Capital, usually common stock or cash, is expended by the surviving company and in return the capital assets and debts of the absorbed company are assumed. Any difference between the fair market value of the assets acquired and price paid for same (including transferred liabilities) normally becomes the ephemeral asset "good will." One wonders why it wasn't labeled "friendship" or "grace."

trade credit. Many companies use this as a primary source of immediate funds. Essentially this involves collecting money-owed faster than money-due is paid to tradespeople . . . a dangerous but frequently used gimmick.

rentals and leases. These and other similar "off balance sheet transactions" permit the use of borrowed capital in the production of income by the payment of a use-fee to the assets owner. This fee is an expense of doing business but the capital asset (and liability) never appears on the user's balance sheet. Of course it does appear on the balance sheet of the provider and so represents a disproportionately large capital exposure to the leasor. This greater risk should be offset with a higher and more stable return, but, as we see, this is not always the case.

everything else. certificates of deposit, investment tax credits, equipment retirements, depletion allowances, tax loss carryforwards, etc. create capital. And prepaid expenses, deposits, pension funds, stock buy-backs, short-term investments, etc. use capital funds. □

NET INCOME RETURN ON AVERAGE GROSS RENTAL EQUIPMENT ACCOUNT

	1970	1971	1972	1973
IBM	11.6%	11.7%	11.6%	10.8%
Sperry Rand*	1.5	2.2	2.3	3.2
Honeywell	1.9	2.1	2.1	2.4
Burroughs	1.5	1.2	0.7	0.9
Control Data	—	0.0	1.5	4.2
NCR	1.9	—	—	4.1

*Fiscal year ends March 31 of following year

Table 4.

RENTAL AND SERVICE REVENUES AS A PERCENT OF TOTAL REVENUES

	1970	1971	1972	1973
IBM	73.0%	73.6%	69.8%	69.3%
Sperry Rand	20.1	23.1	25.9	27.5
Honeywell	27.0	29.2	28.3	27.7
Burroughs	31.9	36.1	37.8	36.7
Control Data	34.8	39.5	42.5	47.2
NCR	32.1	35.0	36.8	35.7

Table 5.

ESTIMATED CASH FLOW FROM RENTAL EQUIPMENT
($ Millions)

	1970	1971	1972	1973
IBM	$216	$590	$694	$535
Sperry Rand	(26)	8	(59)	75
Honeywell	(60)	9	38	(20)
Burroughs	(135)	(25)	(21)	(20)
Control Data	(54)	(38)	(32)	(27)
NCR	(47)	(4)	(20)	19

Table 6.

should prove enlightening. Table 2 is an approximation of rental and service net income, derived from company reports. It involves the allocation of research, general, and administrative expenses to rental gross income on a percent of total revenue basis, and the application of the corporate tax rate to the result. It does not include deductions for interest expense nor, in IBM's case, large interest income. Since computers on rental are a primary reason for borrowing, and since the "service" portion of these figures has been totally credited to machines on rental, these figures are distorted to the benefit of the five dwarfs.

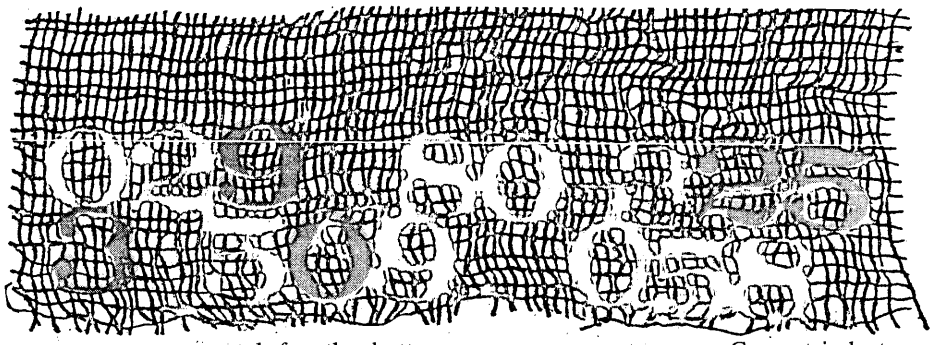
In our estimation 1973 is also biased upwards due to two major factors—inventory profits and benefit from foreign currency adjustments—and represents an atypical year. 1974 may include a residual of this same bias.

The average after tax return on equity investment for all U.S. industry is about 11%. A figure of 6-8% for after-tax return on total capital would classically have been used as an acceptable range for justifying new investment; however inflation has a way of also forcing up such standards. Nevertheless it is quite apparent that insofar as their rental systems return on investment is concerned, Sperry Rand, Honeywell, Burroughs, Control Data, and NCR are substandard. Fortunately for them this is not their only source of revenue nor the only investment criterion. Rental and service revenues are shown in Table 5 as a percent of total corporate revenues. As seen, the proportion of total revenue coming from this source is growing for all companies except IBM and possibly Honeywell. (Honeywell has expressed concern in 1974 that rentals were again growing faster than sales.)

The last marker to be passed on this tack involves the continued investment that has been and may be required to support the rental equipment accounts of these manufacturers. In order to approximate the new cash required to support this installed base, we have assembled the figures in Table 6. These are the cash flows from the rental equipment accounts.

The positives flows in these formulations are estimated rental and service net income (see Table 2), depreciation on the rental equipment account, and net retirements of older machines. The negative flow, of course, is the required additions of new computers (at cost). Again we have not included interest income (expense) in these calculations. The numbers in Table 1 show

that additions, at cost, to this account have not grown immensely over the last four years, either for most companies or for the industry as a whole. Yet cash flows are still tending negative in all cases but IBM. With a major new product cycle looming, it is easy to estimate capital requirements to fund



computers on rental for the bottom five companies of between $200 and 300 million per year, or well over $1 billion by 1980. Obviously some of this funding may come from outright sales of computers and the other lines of business that many of these companies are in. However if return on investment does not improve, the justification for such investment becomes difficult. If the industry is taken as a whole (including IBM), then there should be tremendous cash generation over this period. It is, however, the inequities of distribution that might cause major problems.

The minicomputer industry

The scenario for the minicomputer industry is much more straightforward. Minicomputers are not rented, they are mostly sold. Minicomputers do not require expensive plants or tooling to manufacture. It is a fast-paced technology industry with tremendous revenue growth over the last five years. It is in fact this high growth rate that causes the major capital needs of the industry. Over the past five years the minicomputer industry (including Digital Equipment, Data General, Computer Automation, Hewlett Packard, Interdata—now part of Perkin Elmer, Varian Data Machines, Modular Computer, Honeywell's minicomputer operation, Prime Computer, Microdata, and others) has, except in startup situations, been able to fund plant and equipment expenditures out of retained earnings. The major requirement for outside financing has been the necessity to expand working capital to support higher revenue levels. Normally this has meant that working capital has had to expand by approximately 15% of the change in revenues. In 1973 and 1974 this figure was considerably higher due to the high inventory positions most mini manufacturers took as a hedge against tight supplies coming out of the components companies. This 15% figure is likely to be more normal through 1980.

Many, including ourselves, are projecting revenue growth in the minicomputer industry at 20-25% for many years to come. Current industry revenues are guesstimated at over $1 billion. Growth of the above magnitude would expand industry revenue to $3-4 billion by 1980, or an increase of $2-3 billion. Working capital required to expand should be about 15% of this amount, or $300-450 million. We now believe that, increasingly over the years to come, the requirements for plant and equipment expenditures in this industry will diminish as a percent of retained earnings and that more internal funds will be made available for this other major need—working capital. Our single point, five year estimate for external capital needs for the minicomputer industry, assuming revenue growth of not more than 25%, is $300 million.

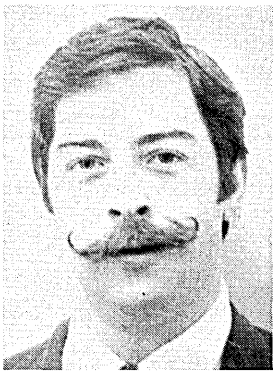
To justify this number another way, a good rule of thumb in the investment community is that a company (or industry) can fund growth internally roughly equivalent to its pretax margin. The minicomputer industry as a whole has maintained around a 16 or 17% pretax margin, which implies that they could support revenue growth of 16-17% without any external financing. Growth has been substantially above that recently—around 60% for the last two years—which has meant substantial external requirements. However a 20-25% growth rate, and a percentage point or two better pretax margins for this industry (which we feel is likely), would leave a margin shortfall of 5% or less. Five percent of the cumulative revenues between now and 1980 would be about $400-500 million, which is somewhat larger than the previous figure but close enough for a rule of thumb.

Will the capital be found?

Five-year capital requirements of $300 million or so for minicomputer companies and over $1 billion for large systems companies, not counting IBM, are not enormous. However they are also nontrivial. Capital is projected to be a very precious commodity over the near term. Tremendous amounts of capital have been flowing into Middle Eastern and other oil rich nations as a result of the tripling of oil prices in 1973 and 1974. Also these new imbalances are predicted to require huge investments in more efficient plant and new energy sources. Further, recent consumer legislation has caused and will cause large sums to be spent on antipollution equipment for heavy industry.

The net result is that the capital suppliers are taking more time to balance the alternative havens for their money. Return on investment is becoming a more critical parameter in this decision process.

It is our expectation that the funds required to finance the rental bases of general purpose computer systems companies will become more difficult to come by, but that the capital needs of the minicomputer industry, once it is evident to all that revenue growth will continue on a high plateau and margins may improve slightly, will be quite easy to obtain. □



Before joining Dean Witter & Co., Inc., as a senior investment analyst for the computer industry, Mr. Potts was president of Meta-Language Products, Inc., which developed the MUSE data base management system. Prior to that he was with White Weld, Inc., where he authored another language, First Financial Language (FFL), in a group that has since become Interactive Data Corp.

He was also assistant secretary in the investment research department at the Bank of New York, where he was engaged in computer applications for financial analysis. Active in many computer associations, Mr. Potts is currently a member of the End-User Facility Task Group of the Codasyl Systems Committee, where he is working on a user interface to Codasyl's DBMS.

Competition for customers will
lead to better services from common carriers,
but competition for tight money resources
may stall some specialized offerings.

FINDING CASH FOR COMMUNICATIONS

by Winston E. Himsworth

DATA COMMUNICATIONS, and in fact the entire communications field, is currently undergoing unprecedented growth and change. The changes will affect not only what services are to be offered, but who will provide them and at what price.

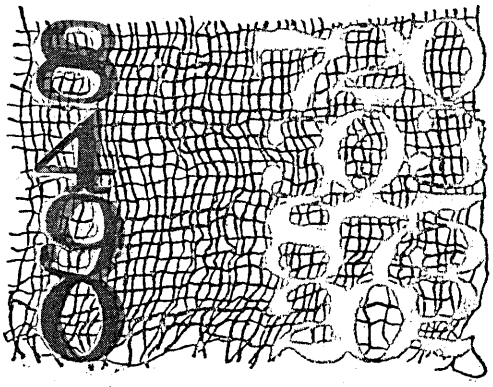
The data processing industry is already witnessing a number of significant changes in the interrelated fields of computers and communications such as the trend to distributed processing and the associated hardware introductions, and IBM's announcement of Systems Network Architecture and similar developments by other computer manufacturers. And, specifically, in data communications:

- DATRAN's offering of switched digital service (DATADIAL)
- the Bell System's introduction of Dataphone Digital Service (DDS)
- FCC approval of the value added carriers (Telenet and Packet Communications)
- a joint venture domestic satellite proposal by IBM and Comsat General.

Some of these forces which are shaping the communications industry, including trends in computer technology and the increasing demand and development of on-line applications, arise out of the data processing industry and are familiar to us. The impact of four other forces, however, may not be as obvious and requires further discussion. These forces are:

- the demand and availability of investment capital
- competitive inroads into communications
- trends in communication technology and usage
- legal and regulatory developments

As many companies found in 1974, business can be severely restricted by



the high cost or unavailability of investment capital. While the capital markets are now in somewhat better shape than during the fall of 1974, there are still significant limitations on both debt and equity financing, particularly for less than prime credit risks and for new ventures. The current problems are as follows:

First, interest rates for most companies are still at high levels and the demand for capital from all sectors of the economy remains strong. Any easing of this demand during the current economic recession is likely to be more than offset by requirements to finance record federal deficits.

Also, stock prices, while above their 1974 lows, are still not high enough to make new equity financing attractive.

Finally, the availability of capital, either debt or equity, is virtually nonexistent for start-up companies. Even the venture capital firms have drastically reduced, almost to zero, their level of investment in new companies.

It is tempting to hope that these problems are temporary in nature, but to be realistic we must recognize that as long as substantial inflation persists, the capital markets will remain under pressure. Further, there appears to be an imbalance occurring between the supply and demand for capital. The base case model in a 1974 economic study released by the New York Stock Exchange* indicated a $650 billion shortfall in savings between now and 1985 based on forecasts of gross private domestic investment, net government requirements, and business and personal savings. The shortfall merely indicates the tremendous competition for new capital in the years ahead.

The availability of funds in the communications industry is of major importance because of the capital intensive nature of the business. Unlike many other industries, including data processing, communications companies typically require $2-3 of capital for every $1 of annual revenue. In 1973, for example, the ratio of capital to revenues was 2.53 for AT&T, but only .81 for IBM. Since the communications industry revenues presently represent approximately 2% of the gross national product and are growing much faster than the GNP, the capital requirements are substantial.

In 1972 we forecast capital expenditure plans and trends of the communications industry through 1980. Our original projections, showing the amount these expenditures would have to be financed in the capital markets, are reproduced in Table 1, (Page 51). Now, midway through the decade, it is enlightening to look back on these projections to see what is actually happening. Several general points can be made.

**The Capital Needs and Savings Potential of the U.S. Economy Projections Through 1985,* The New York Stock Exchange, Sept. 1974.

1. The telephone companies have been and will continue to be the dominant demanders of communications capital. Major efforts are being made by the telephone companies to increase the proportion of construction funds which can be generated internally, but total external requirements for the decade should still exceed $60 billion as inflationary pressures increase total expenditures.

2. The Western Union and domestic satellite projections are on target and can be added together in the 1971-75 period since Western Union had the only domestic satellite system.

3. Cable television and the special service common carriers (such as MCI) started the decade with accelerating capital demands. Uncertain regulatory conditions and lack of profitability, however, have lately all but shut off the flow of capital to these sectors. To some extent this merely postpones capital expansions into the period 1976-1980, although it is unlikely that CATV will be able to attract more than $2-3 billion more in the remainder of the decade.

As an order of magnitude, $75 billion remains a valid projection of communications' financing requirements in the '70s. More than $50 billion of this must be supplied between now and 1980. This amount represents 15-20% of total corporate demand, and will be forthcoming only to those sectors of the communications industry which can maintain or improve their financial integrity.

Competition

Communications which historically had been thought of as a basically monopolistic industry, is being increasingly subjected to the forces of competition. The competition is arising in three fields: long haul transmission, from the special service, value added, and domestic satellite carriers; station equipment, from the manufacturers of terminals, telephone sets and private switching equipment; and telecommunications hardware supply. In the latter case, there has always been extensive competition among manufacturers of equipment for the independent or overseas telephone markets, but now these manufacturers are starting to compete more vigorously with Western Electric for supplying the Bell System.

In general, competition in communications is a product of several factors including the growing and diversified demand for communications services, the inability of traditional carriers or suppliers to fully and efficiently meet this demand, and regulatory and legal developments (to be discussed later).

While competition is a new concept in many sectors of the communications industry, it is relatively advanced in data communications in terms of: modems, multiplexors and concentrators; computer controller switching; and less restrictive policies on multiuser sharing of transmission facilities.

Competition impacts communications in two ways. First, it can be expected to spur technological development and lower prices in many industry sectors. A second, less obvious effect is the impact competition has on the rate structures of the existing carriers. These structures have traditionally been constructed on the dual principles of rate averaging and cross subsidization. While communication tariffs often look unduly complicated because of the many services provided, at least each intrastate or interstate service is usually priced at a single rate reflecting an often wide variety of underlying costs. For example, a private line between New York City and Washington, D.C., would be priced at the same rate as a line of a similar length between two remote locations in the Pacific Northwest. On average, the rate would be designed to yield a specific profit on that type of private line service.

Cross subsidization occurs when the rate of return on one service exceeds the return on another service. In the broadest sense, this subsidization applies to two areas. Technological developments over the past decade have steadily reduced the circuit mile cost of long distance transmission, but costs in local distribution and switching have risen. This cost shift, however, has been only partially reflected in long distance and local telephone rates by letting the long distance revenues support an increasing amount of the total telephone plant investment.

As an example, in recent testimony in California, the Bell System reported that 27% of its long distance revenues were being used to support their local plant investment. A second form of cross subsidization that has been used is to charge more for business services than for residential services so as to hold down the rates to the general public. Similar California testimony on this subject indicated that residential revenues generate only 52% of the revenue requirements.

In the absence of competition, the existence of rate averaging and cross subsidization can be argued on various social and political levels. But when competitive firms enter the communications market to sell specific services to business customers some very real economic problems arise. First, the new firms can often provide service at a very reasonable price by not selling in the high cost situations included in telephone cost averages, and by not attempting to subsidize other services. In the telephone industry, this type of competition is called "cream skimming."

A second problem is that as the telephone companies lose market share to their competition, they must make up those portions of the revenues that were previously subsidizing residential services, presumably by higher charges to their residential customers. It is for this reason that many state public service commissions, led by North Carolina which is trying to ban interconnect equipment, are opposed to the rise of competition. With inflation pushing up the cost of communications in general, the states, if only from a purely political viewpoint, would rather increase the business subsidy, rather than have it eroded by competition and force the residential consumer to pick up a disproportionate share of rate increases.

Competition, however, once introduced into the communications industry is not likely to diminish. The existing common carriers will have to restructure their rates accordingly. The recent introduction of "hi-lo" private line rates, for example, represents a major departure from rate averaging. Under this plan, the telephone companies charge less for a private line between high density centers, where they have transmission economies of scale, than they do between low density centers. Another rate response to competition is the trend to more usage sensitive pricing and increases in installation charges, both of which are designed to make up for costs on services which are subject to competition. Higher installation charges also help minimize capital requirements.

Overall, business will be the major beneficiary of added price and technological competition among various communications providers and the gradual reduction in the subsidization of residential services.

Communications technology

Many of the same technological forces at work in data processing are also at work in communications. The results are predictable. In long haul transmission, for example, engineers are packing more and more information onto wire or radio circuits. Advances in waveguides and optics now being tested promise order of magnitude costs improvements. Switching systems, which are still to a large extent mechanical monstrosities, are being replaced by

what are essentially special purpose computers—Electronic Switching Systems (ESS).

Unlike data processing, however, the effects of technological change in communications are only gradually realized by the user. This occurs for several reasons. First, because of the capital intensive nature of communications and the correspondingly long depreciation schedules for equipment, technology changeovers are evolutionary, requiring each new generation to be compatible with earlier generations. Second, a traditional concept of common carrier services is that their provision should not discriminate among potential users. Thus, until a new service can be made broadly available, its provision is severely restricted. A final reason is that technical improvements in local distribution have been lagging other communications developments, acting as a drag on total system improvement.

As the pace of technology and competition quickens, we can expect to see a shortening of depreciation periods, more frequent departures from traditional policy, and hopefully some solutions to local distribution problems. All this will speed the evolution of new communications services.

Two trends are already well established, the first being the increasing use of digital, rather than analog transmission plant. The Bell System, started installing T-Carrier digital plant in the early '60s and by the end of the decade had 9.5 million circuit miles in place representing 2.6% of their total transmission plant. By the beginning of last year, this had risen to 32 million circuit miles or 5.6%. A new high capacity digital carrier system, L5, is nearing implementation. For the data communications user, the proliferation of digital plant obviously bodes well. Not only does it serve as a base for special data services, such as the new Dataphone Digital Service, but as the volume and pervasiveness of digital voice transmission increases, the data user can expect continuous improvements in the availability and efficiency of digital data communications.

A second trend in evidence is the increasing sophistication of the communications user—a trend which I believe has developed in large part due to developments in data processing and data communications. In the past, data communications was treated as the orphan of the general communications industry, all but abandoned in favor of traditional voice communications. As a result, data communications was adopted and nurtured by the data processing industry. Today, a data communications user has more options and flexibility, in terms of user controlled switching and multiplexing, to design and manage a data network than does the voice communications user.

To an increasing degree, communications managers are recognizing the inequalities between voice and data and are demanding increasingly sophisticated total communications services. This demand may explain the timing of the introduction of competition in communications. Here, also, the data processing industry, by its acceptance of plug compatible peripherals, will ease the market acceptance of competitive communications services.

EXTERNAL FINANCING AS PROJECTED IN 1972
(Billions of dollars)

	1971-75	1976-80	Total
Telephone	$28.0	$34.5	$62.5
CATV	1.4	4.3	5.7
Special Service Common Carriers	.5	.7	1.2
Western Union	.4	.7	1.1
Domestic Satellite	.4	.4	.8
	30.7	40.6	71.3
Refinancing	.5	4.8	5.3
	$31.2	$45.4	$76.8

Total Est. Annual Requirements
1975 $ 7.0 Billions
1980 10.0 Billions

Source: Salomon Brothers' estimates.

Table 1.

Regulatory and legal developments

A variety of regulatory and legal forces are at work in the communications field primarily impacting competition and rate structures. In the case of competition, these forces can either encourage or retard its development.

On the encouragement side, the Federal Communications Commission espouses a policy of regulation through competition. This has led to the 1968 Carterfone decision which allows the connection of non-telephone company equipment to the telephone network, and to the 1971 Specialized Common Carrier decision which permits competition in interstate, long haul private line communications. The U.S. Department of Justice renewed its interest in competition last November when it filed an antitrust case against AT&T alleging unfair competition in long haul transmission, interconnect equipment, and telecommunications supplies. Similar allegations have been made in a series of private antitrust suits against AT&T and, in one case, against General Telephone.

On the other hand, there have been a number of actions taken to slow the introduction of competition or to prevent competitive responses by existing carriers. In brief, these actions can be categorized as follows:

- legal and regulatory defenses taken by the existing carriers seeking to strictly limit the range of competitive services.
- legal and regulatory defenses instituted by the new competition to prevent the existing carriers from reducing prices and/or offering new services
- roadblocks to intrastate competition made by state regulatory commissions concerned with the potential elimination of revenue subsidies for residential services

Overall, the weight of regulatory and legal action can be expected to continue to favor the development of more competition. The pace of regulatory and judicial action, by its very nature, however, will be slow and deliberate.

The effect of competition on rate structures has already been discussed, and this restructuring cannot, of course, take place without regulatory approval. Another factor contributing to the need for rate restructuring is inflation, which is forcing the regulators to approve continual rate increases in line with escalating operational expenses and plant expenditures and with the increasing cost of capital.

In an attempt to minimize these rate increases, or at least to make them more politically palatable, the telephone companies have suggested a number of rate structure alternatives which are increasingly being accepted by the regulatory agencies. These alternatives fall into two broad categories. First, the rates on labor intensive services should be increased so as to push demand into less costly substitutes. In this line, AT&T's recent interstate rate case proposes to further increase the cost differential on operator assisted

calls versus direct dialing. Second, usage sensitive pricing should be used to more closely relate rates to costs and to place the burden of specific services on actual users. Examples of these alternatives are the higher installation costs, discussed previously, and directory assistance charges first tried in Cincinnati last year and now being extended elsewhere.

Conclusion

The preceding discussion of the many forces at work in communications provides a broad framework of projecting the coming shape of the industry in terms of who the participants will be, how the price structures will change, and what trends will develop in service offerings.

Participants: The participation of companies in the communications industry, particularly as providers of transmission services rather than as equipment suppliers, will be limited primarily by capital constraints. As a result, the telephone companies will retain a dominant position in the industry for the foreseeable future.

Despite the head start of start-up companies like MCI and Datran in the specialized common carrier long haul transmission market, the full exploration of this competitive market will require participation by better capitalized companies. This is already starting to occur. In the field of terrestrial microwave systems, the two best capitalized companies which have expressed an active interest are Southern Pacific and ITT. The small, marginally capitalized companies are being, or will be, forced either to sell out or to at best link up and interconnect with other carriers.

In the case of domestic satellite systems, Western Union has a significant head start which, with its substantial cash flow, it should be able to maintain. While several of the other announced satellite proposals have or will be withdrawn, the Comsat system for AT&T is on track for 1976, and one additional system appears feasible within the next few years. On the basis of announced plans and capital sufficiency, the third company could be either RCA or, subject to FCC approval, some form of an IBM-Comsat General joint venture.

In general, any major new participation in communications transmission must come from the ranks of the large, established, well financed companies. If there is to be any participation by new or small companies, it must be in less capital intensive parts of the business. In particular, innovations are likely in the following types of value added networks utilizing the transmission facilities of other carriers:

- packet switching
- extended time sharing service networks
- special purpose, application sensitive, multi-user networks (e.g., credit card verification, reservations, point-of-sale, etc.)

Rate Structures: Because the telephone companies will continue to be a major factor in most user communication budgets, and because telephone rates will also tend to set a pattern for competitors' rate structures, several points can be made about the changing structure of communications rates.

The first point is that communications is going to be subjected increasingly to front-end pricing. This will take the form not only of higher installation charges on leased services, as previously discussed, but may eventually involve purchase options for terminal equipment and on-premise switching. The user's response to this type of change will have to be a more modular approach to systems design.

A second point, also briefly discussed above, is that there will be a gradual elimination of rate averaging and a continued move to more usage sensitive, cost related pricing. The overall effect of these changes will be to reduce business communications costs. For the data communications user there will be pluses and minuses. The recent interstate toll rate filing, for example, which lowers the initial connection charge from a 3 minute minimum to a 1 minute minimum should reduce the costs of certain inquiry-response applications. On the other hand, data communications users have frequently benefited from the rate averaging techniques which offset their high usage patterns with the predominantly lower usage of voice users. The elimination of this type of averaging may boost data communications charges as, for example, occurred in 1974 when WATS rates were changed to penalize users whose connect times averaged less than one minute.

Services: With the exception of inflation and selected problems of rate restructuring, all the many forces discussed are creating an environment for the development of faster, better, more cost efficient communication service for data and general business customers alike.

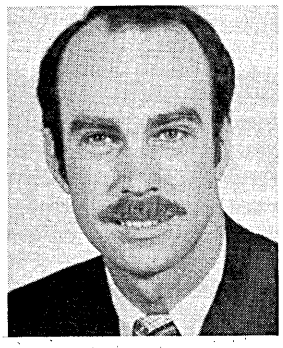
Without attempting to forecast specific services, I believe we can look to the broad history of data communications to see how the total communications process is evolving. In the first phase of data communications, intelligent computers were linked with dumb terminals through an essentially passive communications network. We are now in a second phase featuring distributed processing in which the link is to intelligent terminals.

Logically, the next phase is the development of intelligent networks as all the forces we have been discussing push both users and providers into a more flexible and efficient use of terrestrial and satellite transmission facilities.

The telephone companies would probably point out that they already have an intelligent network with alternate routing and a growing use of electronic switching. In one sense they are correct, and their network will continue to become smarter. The real essence of the intelligent network as forecast here, however, is that it will provide the individual communications user with programmable control over such options as:

- selection of alternative transmission facilities and services
- facility queuing for selected grades of services
- error detection and correction
- detailed usage statistics

The data communications user has been in the forefront of an evolution that is improving all communications services. In fact it is ironic to think back to the early days of data communications when the existing carriers, claiming that there was no difference between voice and data, were slow in meeting the demand for flexible data services. It is only now that voice, in a digital form, is becoming more like data, that this early claim begins to make sense and that "data" services can be developed to the benefit of all communications users. □

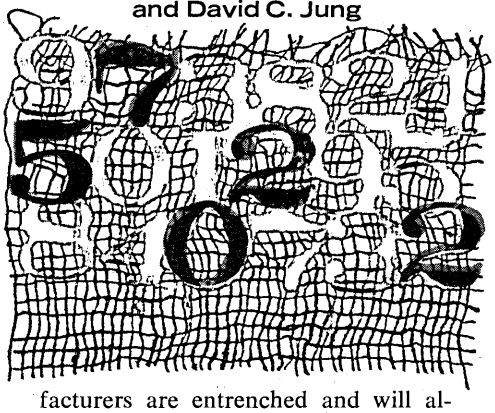


Mr. Himsworth is comanager of the technology group at, and a communications security analyst for, Salomon Brothers, members of the N. Y. Stock Exchange. He previously specialized in broadband and data communications with New York Telephone Co., and worked for IBM in systems engineering and marketing.

The business is continuing to change from small, general purpose service bureaus to nationwide operations with specialized offerings.

SPENDING FOR SOFTWARE AND SERVICES

by William R. Roach and David C. Jung



PROCESSING AND SERVICE FEES paid to outside vendors now account for 20% of all dp related expenditures by end users. By 1980 this share is expected to increase to over 25%. Users include smaller firms who have traditionally relied upon computer services vendors for all their data processing. Also included are users with large in-house installations, users who now account for well over 50% of all computer services expenditures.

Nationally the growth of computer services expenditures is almost 20% per year and this will continue at least to 1980. Several individual computer services, such as time-sharing, are growing at almost 30% per year. These growth rates compare to installed equipment rentals and total user expenditures, which are growing at 15% and 16% per year, respectively.

There are several reasons for this increased use of computer services. First, the industry has grown and matured to the point of offering a wide variety of user applications. Several large national vendors are now established and have replaced some of the prior user image of small "Mom and Pop" service bureaus operating in local markets.

Second is the emergence of network information services.

Third, vendors have invested considerable sums in developing industry or application oriented specialty services which solve and reduce user problems. Previously, vendors often just sliced up computer time, and offered little added value.

And fourth, some users are attracted by the emergence of large, financially stable vendors willing to take on a user's total data processing operations through facilities management.

A combination of these and other trends has resulted in a dramatic increase in user acceptance of computer services. As a result, the ultimate potential market for computer services is not just the 20% of all dp expenditures. It also includes most of the other 80%. It will never reach 100% because IBM and other computer manufacturers are entrenched and will always maintain a substantial market share. But increasingly, as service vendors offer total application solutions to end users, the penetration will increase.

Definitions

Definitions of the individual computer services are very specific to help clarify what has been confusing. There are 10 computer service categories. Five of these are called data services. These have to do with actual data processing or software directly related to that processing.

Network Information Services (NIS) refers to any connection of the computer with a terminal located remotely. A *batch service* is just the opposite: Work is carried in by hand or by courier to the computer. *Facilities management* is the takeover of an existing computer installation, or the installation of a turnkey system, in a situation where there was no computer in the past. *Software products* refers to the sales value of systems and applications software that has been written and marketed as a standard package to do a specific job. *Software services* refers to contract programming.

Support services have to do with the operations in a computer installation that are not directly related to processing.

The computer services industry was born in the late '40s, along with the delivery of the first commercial computers. Even then it was apparent that the high capital investment and operating expenses involved in computer usage could be shared by those whose processing needs were not large enough to justify their own systems. Government agencies were early computer service customers.

Market data on the computer services industry was first available in 1960. It was estimated that computer services revenues in 1960 reached $115 million. Of this total $50 million was accounted for by software services offered primarily to the federal government and large industrial firms involved in the aerospace industry. In addition, another $50 million consisted of batch service bureau services offered by between 300 and 400 small, local service bureau operators.

By 1967 the total computer services market had reached almost $1 billion in annual revenues (see Table 1, page 54). The largest computer service was batch services at $500 million, over half of the total. Software was still in second place at $200 million, but facilities management, a relatively new computer service, had moved up to third position at $110 million.

Between 1967 and 1971, the computer services industry grew at an annual rate of 35%. By 1971, the largest computer services were third party leasing, batch services, and facilities management. In 1968 and 1969 many of the leasing companies were formed, so this service really went from nothing to a very large size in just two years.

In the data services part of the industry, network information services emerged in 1964 as the newest and fastest growing computer service. General Electric, Keydata, and IBM were the first companies to offer time sharing services in 1965. NIS revenues grew from $5 million in 1965 to $766 million in 1973. From 1969 through 1973 NIS revenues grew at a compounded annual rate of over 40%.

Total user dp expenditures will grow from over $20 billion in 1972 to almost $50 billion in 1978, an annual rate of 16%. (Total dp expenditures include in-house dp salaries, equipment

rentals, outside service expenditures, communications costs, and supplies.) In 1972 computer service expenditures totaled $4.3 billion, representing 21% of total dp expenditures. By 1978 the total computer services expenditures will be over $11 billion and will account for 24% of total dp expenditures (see Table 2). The data services market will grow 20% annually, from approximately $2.9 billion in 1972 to $8.4 billion in 1978. Both large and small users will contribute to this growth. Large users will contract with outside vendors for assistance in operating their complex in-house remote computing systems, while small users, lacking technical capability, will subscribe to outside services for system design and software development—or full dp services.

Within data services, NIS and software products will grow the fastest at annual rates of 27%. Just behind these, facilities management will grow 25% annually, reaching $3.1 billion in 1978. This growth stems chiefly from the proliferation of more complex applications, primarily communications-based, which medium and small companies often are not equipped to implement because they lack experience with sophisticated operating systems.

Support services will grow at 10%, a less rapid rate than data services due primarily to the noncritical nature of support services relative to information processing functions.

Individual services

With the arrival of NIS in the late '60s, the death knell was supposed to have been sounded for batch services. This service was supposed to die because it was going to be taken over by NIS. However, this didn't happen, and batch services have continued to grow. In fact several submarkets within batch services, such as payroll, CPA processing, and accounts receivable processing, have growth rates that nearly equal those of the rapidly growing NIS market.

Smaller, local batch vendors who are undercapitalized and have weak product lines have some difficulties ahead. But the underlying strength of batch vendors has to do with marketing. These owner/managers have a good grip on the local markets and they will hold out for a long time.

Larger batch service bureaus, such as Automatic Data Processing and United Data Centers, have begun to develop industry and application specialties which will lead to good growth despite the overall slow expansion of batch services.

The Network Information Services (NIS) market will continue growing at about 27% per year. Those vendors that have national networks, such as GE, Control Data, Tymshare, and Cyphernetics, are particularly strong right now.

Generally the mode of the NIS business is changing. Initially, NIS was primarily interactive communication with the computer. Now we see the industry switching gradually to remote batch, which by 1978 will account for approximately 40% or more of the market. The industry will also begin to serve more transaction oriented applications in various industries, such as retail and finance and banking. In banking, for example, NIS will gradually be used in on-line teller systems that will be able to update accounts automatically and do centralized accounting for customers.

Facilities Management (FM) is growing very rapidly. It is a tool by which vendors can address a user's entire dp expenditures—100% instead of just focusing on the 20% or 25% that might normally go to outside services vendors. FM also has appeal as a marketing strategy, provided that the vendor selects an industry specialty, as opposed to taking over just any installation with a computer. Hit-or-miss takeovers generally are not successful, since they build no leverage value in transferable applications. FM's rapid growth is supported by a high contract renewal rate, particularly among banking and insurance users, where FM has been very strong.

We see major growth ahead among large agencies. Current contracts with the Environmental Protection Agency and the Federal Energy Agency have implemented and supported large scale data base management systems with remote data entry and inquiry from hundreds of high and low speed terminals located all over the U.S. Generally, regulatory agencies have not had this sophisticated level of dp. The FM approach allows those systems to be quickly brought up and placed into use.

In the software market, application packages will get more and more attention from the users. Packages already have been very strong in the banking and insurance sectors. But we'll see it happening in manufacturing, retail and wholesale, and state and local government, where there is some free exchange now.

COMPUTER SERVICES MARKETS

COMPUTER SERVICE SECTOR	DP EXPENDITURE BASIS (MILLIONS OF DOLLARS) 1967	1971	AVERAGE ANNUAL GROWTH RATE %
Data Services			
Facilities Management	110	645	56
Network Information Services	45	430	77
Software	200	467	24
Batch Services	500	650	7
TOTAL DATA SERVICES	855	2,192	27
Support services			
Education	60	50	—
Third Party Leasing	50	775	99
Used Computer Equipment	25	225	74
Third Party Maintenance	3	45	97
TOTAL SUPPORT SERVICES	138	1,095	68
TOTAL	993	3,287	35

Source: Quantum Science Corporation

Table 1.

COMPUTER SERVICES MARKETS FORECAST

SECTOR	1972 ($ Billions)	1978 ($ Billions)	Average Annual Growth Rate (%)
Data Services			
Facilities Management	0.8	3.1	25
Network Information Services	0.6	2.4	27
Software Products	0.3	1.2	27
Software Services	0.4	0.6	7
Batch Service Bureaus	0.8	1.1	6
Support Services	1.4	2.7	10
TOTAL	$4.3	$11.1	17%

Table 2.

Who's a user?

We've looked at the computer services industry and an exciting future growth based on end user needs. But who are the users? Who's going to spend all this money on dp services?

Not surprisingly, the industries that are the largest users of computer equipment are also the largest users of computer services, e.g., discrete manufacturing, process manufacturing, finance and banking, and government. Both data and support services are

used extensively.

By size of user we get a little different perspective. (We'll call a company with less than $15 million annual revenue "small," with between $15 and $150 million "medium," and over $150 million "large.") Even though for many batch service bureaus the small user might account for 70-80% of the business, he accounts for only about 15% of the total computer services expenditures. This share will decline slightly as NIS makes deeper penetration into commercial on-line processing for small business in manufacturing, wholesale, retail, and finance industries.

The breakdown of total computer services market by size of user is as follows:

- Small users—NIS, Batch (15%)
- Medium users—NIS, FM, Software (25%)
- Large users—FM, Software, NIS, Support (50%)
- Government—Software, FM, Support (10%)

An in-house computer certainly is no barrier to using outside computer services. In fact, it's a big stimulant among medium and large users.

Who are the vendors?

There are four major groups of vendors offering computer services:

- Independent vendors
- Computer manufacturers
- Corporate spin-offs
- Government agencies

The first three of these groups have been the major competitors in the computer services field for the past 10 years, while government is an emerging competitor group.

Independent vendors are the largest group, and will have the capacity to do the service if the growth forecast is to be achieved. The vendors consists of four subgroups:

- Dedicated computer service vendors
- Banks which provide computer services
- Dp spin-offs which have achieved independent status
- Other vendors, including CPA firms and common carrier subsidiaries.

Independent vendors now provide almost four-fifths of all computer services. This strong competitive position will be maintained because of the emergence of large, independent service companies such as Electronic Data Systems, Automatic Data Processing, and Optimum Systems, together with spin-off vendors who achieve independent status. IBM, although restrained from actively participating in batch services or NIS for another four years, is still the largest services vendor, mostly in software. We believe IBM will continue to lay the groundwork for future market participation in all data service areas.

Other large vendors (see Table 3) include Control Data, Computer Sciences and McDonnell Douglas Automation Co.

Multiservice vendors (MSVs) have steadily emerged and have proven the most stable and prospering of computer service vendors. By 1978 almost all computer service vendors will conduct themselves as MSVs.

A MSV provides at least two of the data services and may provide one or more support services. An example is Computer Sciences Corp., a major FM vendor, supplier of software services,

MAJOR SERVICE FIRMS' U.S. REVENUES ($ MILLIONS)

	1972	1973	% GROWTH
IBM	248	355	43%
Control Data Corp.	132	156	18%
Computer Sciences Corp.	119	135	13%
Boeing Computer Services	115	125	9%
McDonnell Douglas Automation Co.	109	121	10%
Electronic Data Systems	103	118	16%
Automatic Data Processing	70	100	43%

Table 3. Seven computer services companies topped $100 million in 1973.

VENDOR PROFITABILITY ANALYSIS

(Income Before Taxes and Extraordinary Items / Revenue)

	1970 (%)	1971 (%)	1972 (%)	1973 (%)
Automatic Data Processing	17.0	18.8	17.0	18.7
Bradford	22.7	26.6	14.7	16.2
Computer Sciences Corp.	9.8	7.6	d	d*
Datatab	d	7.0	6.4	3.6
Keydata	d	0.5	1.9	4.7
Tymshare	0.5	3.4	7.4	12.4
United Data Centers	5.0	7.0	8.4	8.3

*CSC's figure for 1974 is plus 1.6

(d = deficit)

Table 4.

PROFITABILITY—RETURN ON EQUITY

NI = Net Income / Stockholders' Equity
IBT = (Income Before Tax and Extraordinary Items) / Stockholders' Equity

		1970 (%)	1971 (%)	1972 (%)	1973 (%)
Automatic Data Processing	NI	12.9	14.9	14.1	15.7
	IBT	25.4	28.6	30.4	30.7
Bradford	NI	13.8	12.9	5.8	8.2
	IBT	33.0	35.9	14.3	19.7
Computer Sciences Corp.	NI	13.0	11.1	d	4.3*
	IBT	26.3	20.7	d	d
Datatab	NI	d	4.1	4.4	d
	IBT	d	7.7	8.4	4.9
Keydata	NI	d	3.5	7.6	14.9
	IBT	d	2.2	3.1	7.9
Tymshare	NI	1.2	6.8	14.9	22.9
	IBT	1.3	7.9	19.4	34.9
United Data Centers	NI	8.7	9.2	20.9	22.2
	IBT	8.7	11.1	28.0	28.7

*CSC's figures for 1974 are NI:14.2 and IBT:22.4

(d = deficit)

Table 5.

Tables 4 & 5. There are a number of ways to assess the profitability of a firm or an industry. One way is to measure the income (profit) before taxes and other extraordinary charges, as a percentage of total sales (revenues). Table 4 shows this for certain computer service vendors. This is a fair measure of the relative performance of particular companies in an industry, but it does not measure particularly well how management has performed for a company's stockholders, or how the industry as a whole compares with other industries. A better measure is to compare the income to shareholder investment. Table 5 shows return on equity. Two figures for each company are given, net income (after taxes and all other charges) as a percentage of stockholder equity, and income before taxes and extraordinary charges, as a percentage of stockholder equity. As a comparison, IBM's net income was 17.9% of stockholder equity in 1973, whereas income before taxes and other charges was 33.4% of stockholder equity.

and NIS vendor. CSC obtains a large share of its business from government, primarily from federal agencies. It has also developed specialty service capabilities in banking, utilities, and insurance industries.

A prime characteristic of MSVs is that their product is no longer selling just sliced-up computer time. The vendor who can hook up 300 terminals to its computer system and provide a general service is no better off—in fact is probably worse off—than the vendor who can hook up only 50 terminals to its system but can solve a user's problem. This is true whether the problem is a particular application in a large company or the total processing in a smaller company. MSVs will grow and expand because they solve problems for users, not because they sell time more cheaply than a competitor.

Financing vendor growth

Despite the favorable prospects for the computer services industry and the vendors who will serve it, a major problem looms ahead. The vendors will require substantial amounts of investment capital to meet the growth needs of the industry. We estimate, for example, that $1 of current revenue required 25-50¢ to be invested two to three years earlier. Internal cash flow can provide about one-half of this requirement at current profit levels. The rest must come from outside capital markets.

However, capital markets are in disarray in general, and investment attitudes in the computer services industry are very poor. Some of this attitude is based on the overinflated expectations for time-sharing in the late '60s, which led to numerous failures and disappointments. This state of affairs places privately financed vendors in an advantageous position, especially where the vendor is affiliated with a major corporation. McDonnell Douglas Automation Co. and Boeing Computer Services are vendors in this position.

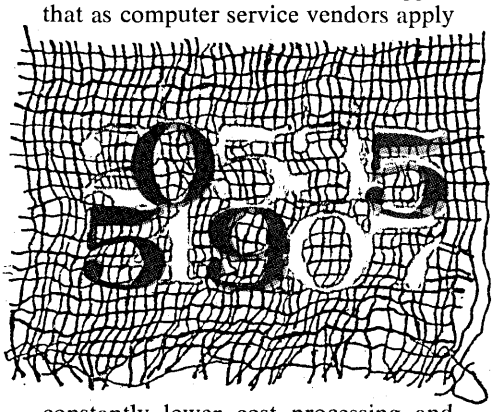
Whatever the source, the forecast above assumes that sufficient capital will be available to the computer services industry. We think this assumption is valid for several reasons. First, *profitability*. Computer services vendors have at least the potential for very high profitability—

- 15% net margin after tax on revenues
- 15% net return on assets after taxes

These are levels you might think common on IBM's financial statements, but little elsewhere in the computer industry. However, several public computer service vendors are now reaching or exceeding these levels (see Tables 4 and 5, page 55) and the more vendors who follow the industry-oriented, multiservice vendor strategy discussed above, the more highly profitable vendors we'll see.

Second, *financial assets*. The computer services industry is noted for a lack of hard assets. IBM has computers on lease, plants, and machinery, but computer service vendors usually have only talented people, software programs, reputation, and good will—mostly soft assets with no salvage values. Computers often are leased, not owned. However, increasingly end users are signing long term (three to 10 years) processing contracts with vendors, which supports future revenue forecasts. Also, more vendors are using profits to purchase computer and communication equipment. All this contributes to vendor financial stability, which in turn creates a better environment for the acquisition of capital.

Third, *economies of scale prospects are finally achieved*. Few markets have as much potential for achieving benefits of economies of scale as computer services. Data now available suggest that as computer service vendors apply



constantly lower cost processing and communications technology, they will achieve substantial improvements in labor productivity. By combining processing work from many users, lower costs can be achieved than are achievable by individual users. Even where the cost is the same, the vendor offers a variable cost approach more favorable than the fixed cost, in-house approach. Capital markets will not ignore this relatively unique set of circumstances.

Fourth, *where else to invest in services?* Professional and business service industries are growing faster than manufacturing sectors. Yet few opportunities exist for investors. Law and accounting firms prohibit public ownership. Only a few ad agencies, and brokerage and consulting firms are publicly owned. Computer services represents one of the few opportunities to invest in the services industry growth.

Recession impact

It is important now to look at the impact of the current recession. Earlier we forecast a nice picture and everything is rosy. However, whatever the long term prospects, the recession will cause end users to cut back expenses on dp—both inside and outside. We think the net impact on services generally will not be as severe as on the equipment side. Here is a breakdown for several key service categories.

We think that NIS market growth probably will fall by about half over the next six to nine months, and then recover very quickly. One obvious recession impact will result from fewer transactions, so it is those firms that have a lot of transaction-related services that will suffer directly. Also, users will tend to postpone new commitments to NIS applications.

On the positive side, however, some users are going to increase the use of computer services as an alternative to making additional commitments for in-house systems. They will in effect buy computer time, applications, and user vendor support as needed, while waiting to see what happens to the economy.

Batch services will follow the same track as NIS. Software products will benefit as users seek tried and proven software packages to meet immediate needs. Where recession-based, cost cutting pressures are severe and there isn't time for in-house system development, an outside package is the only answer.

Facilities management will be increasingly explored by end users whose dp problems go deeper than software and cannot be solved by purchasing packages alone.

Among support services, education will no doubt suffer a bit, but computer leasing and used computer sales should benefit as users seek more cost effective computer capacity.

Conclusion

Historically, the computer services industry has been very decentralized, consisting mostly of small or medium size vendors offering data processing services within a local area. Of the 1,600 to 1,700 computer service vendors in the U.S. today, for example, over two-third, or 1,200 firms, have revenues of less than $2 million per year. In addition, only seven vendors have revenues of more than $100 million.

However, with the development of communication-based remote computing systems in the late '60s, vendors emerged who had a national and even

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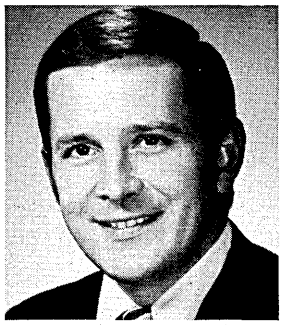
an international outlook. In addition several entrepreneurs formulated plans for very large computer service companies based on aggressive acquisition plans, or concentration on very large facilities management contracts for health care or government agencies.

Since the late '60s it has become clear that, in addition to large size, successful business development in the computer services industry is highly dependent upon service specialization. Leading computer service vendors now are fully committed to specific industries or cross-industries, such as payroll, text editing and econometric planning. The vendors also will offer standardized service packages which can be satisfactorily adapted to individual user environments, and are capable of offering their expertise via different modes of processing.

As a result of these trends, we expect more and more users will look toward computer service vendors, and the highly optimistic forecasts for growth in this segment of the dp industry will be met. □



Mr. Roach is executive vp and corporate secretary of Optimum Systems Inc. He has 13 years experience in accounting, finance, and administration, and is a CPA.

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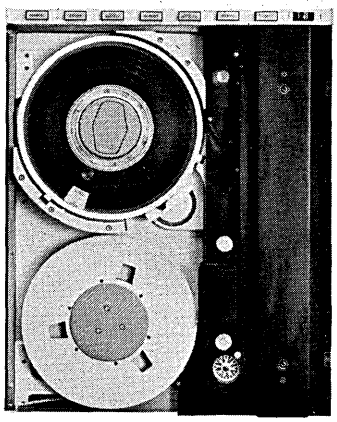

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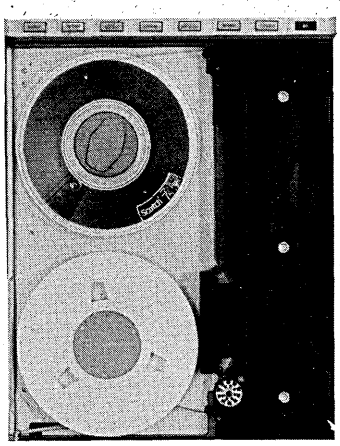

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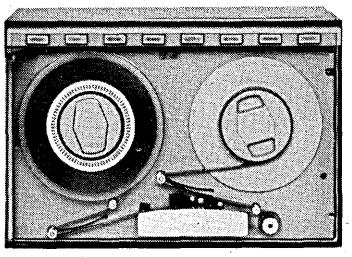

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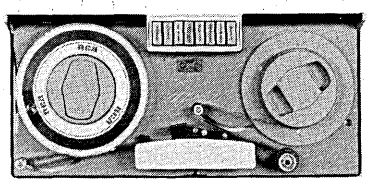

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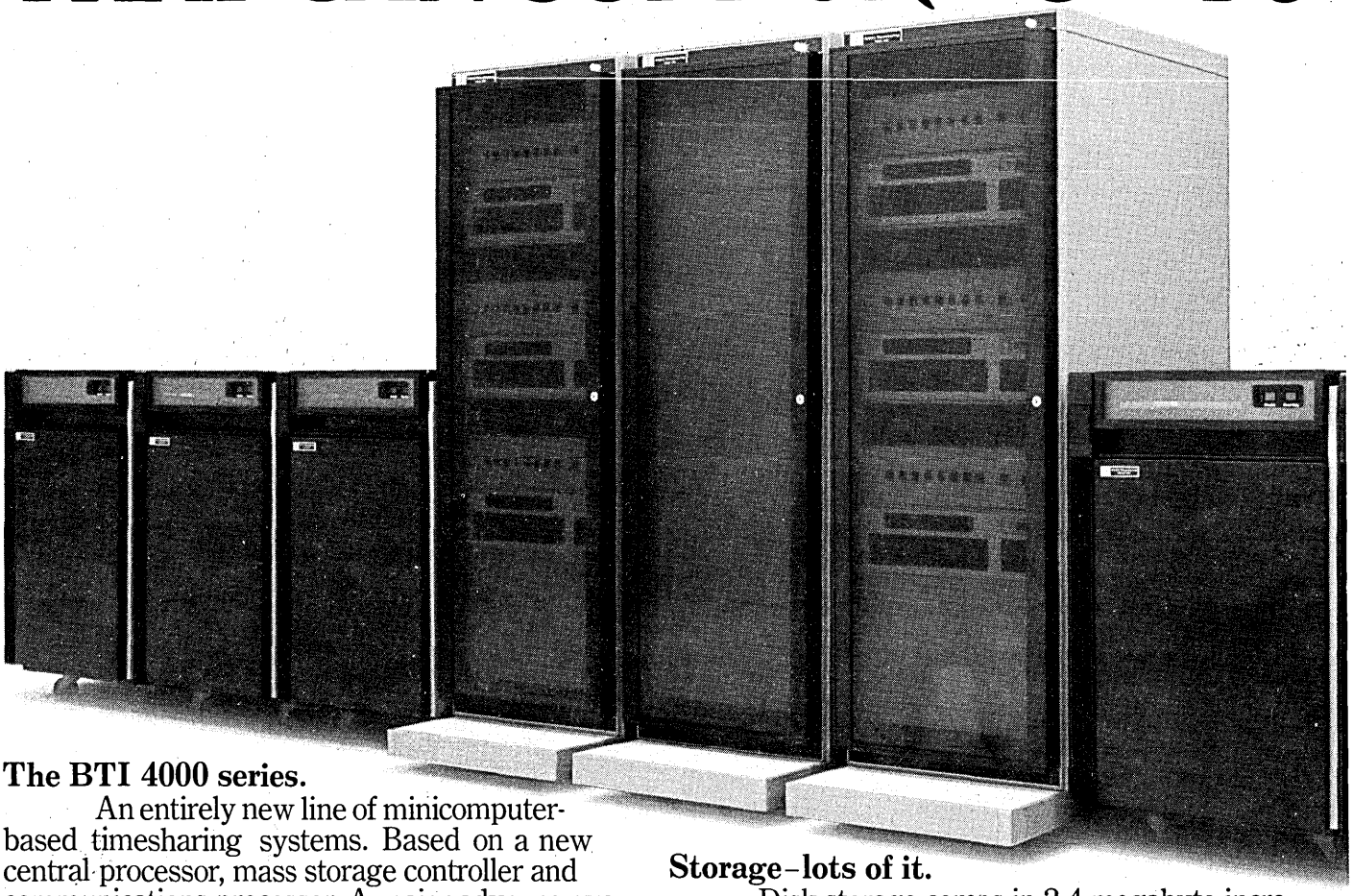


The BTI 4000 series.

An entirely new line of minicomputer-based timesharing systems. Based on a new central processor, mass storage controller and communications processor. A major advance over the proven 3000 series.

With a revolutionary new idea.

A single 4000 system supports up to 32 concurrent users, with many new features for the system manager and user. But we didn't stop there. Up to eight 4000 systems can be "clustered" to allow sharing of central processor and disk storage facilities. That means as many as 256 users can access a clustered 4000 system—and to each user it looks like one system.

Start now. Grow later.

If 256 ports are too many for you right now, that's okay. Just start with a single system, or two, or exactly the number you want. And add more capacity as you need it.

BTI's 4000 system grows as you do—so you're never paying for more system than you want, or trying to get along with less system than you need.

Storage–lots of it.

Disk storage comes in 2.4 megabyte increments for smaller systems, and in 36 or 73 megabyte increments for the bigger applications. And if your needs are bigger yet, you can have almost 5 billion bytes of on-line storage on your 4000 system.

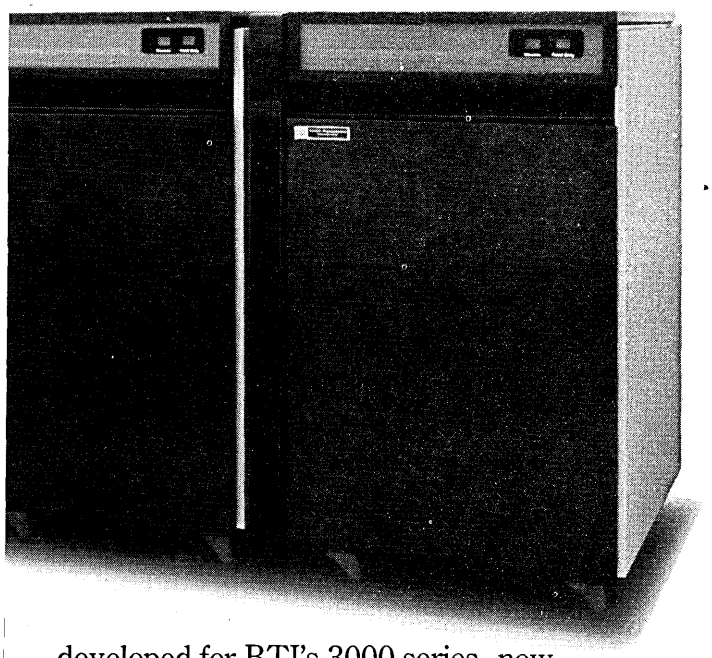
No hibernation.

You don't have to put a 4000 system to sleep to load or dump data, or to back-up your software. Selected portions or the complete contents of disk packs can be "mounted" or "dismounted," on-line. Files can be loaded from or dumped to magnetic tape—on-line. And a SNAP back-up allows you to copy the entire contents of a disk pack for safekeeping, with individual user activity suspended for a few minutes.

BASIC-X.

The 4000's user language, a superset of BASIC, greatly extended for more user power in business and scientific applications. BASIC-X,

TIMESHARING SYSTEM 256 USERS.



developed for BTI's 3000 series, now augmented for the 4000. BASIC-X has string arithmetic, providing extended precision for the accountant; a flexible file-handling structure with powerful features like non-interfering shared read/write access, and many other niceties that make the programmer's job easier and faster.

Uptime.

Because central processor and disk storage facilities can be deployed dynamically, you can pull a CPU or disk drive out of service for any reason, while maintaining system availability to all your users. Something to think about if your application can't tolerate any interruptions.

Fast, all-hours service.

24 hours a day, seven days a week, BTI service engineers are ready to help. Just call and tell us you have a problem. In minutes, a time-share specialist can access and exercise your system over the telephone, just as if he were standing next to it. With the 4000's on-line diagnostic capability, all it takes is a phone call.

Available today.

Our new 4000 series multiprocessor systems aren't ideas waiting for an order to see if they'll work.

Systems are already being delivered. And they're available for a wide array of business, commercial and scientific applications. Like dealer inventory, entertainment ticketing, financial services, real estate transactions, word processing, engineering design, manufacturing control.

The 4000 system offers a high usership capacity for a low cost of ownership, and can be a big money-maker for commercial timesharing firms, a big money-saver for in-house systems.

Representative Prices

Ports	Mass Storage (Megabytes)	Price
16	5	$ 55,500
32	72	89,000
64	219	171,276
128	365	305,686
256	657	561,702

The BTI 4000 series Interactive Timesharing Systems. Call or write for details.

East: Cherry Hill, NJ (609) 795-2334
Midwest: Schaumburg, IL (312) 882-2111
West: Sunnyvale, CA (408) 733-1122

BASIC **Timesharing**

650 North Mary Avenue, Sunnyvale, CA 94086

See a 4000 at the Computer Caravan

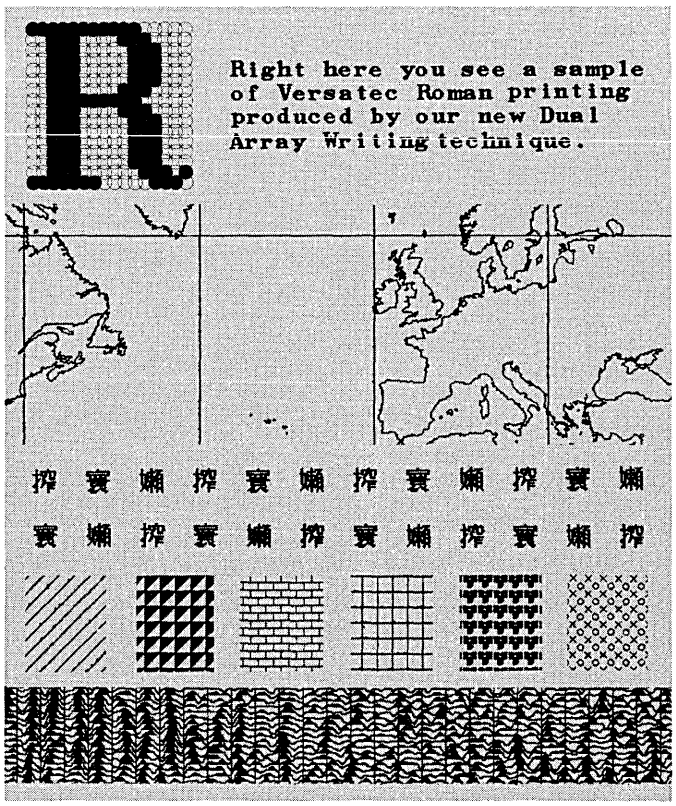
We've made electrostatic writing beautiful.

In 1971 Versatec introduced the first 500 LPM printer/plotter for under $8,000.

"Beautiful," said the computer programmer.

"Beautiful," said the OEM.

"Not so beautiful," said critics who didn't like the 7 x 9 dot matrix, 100 dots per inch printout that put "spots" before their eyes.



In 1973 Versatec turned a corner with high resolution printout: 160 dots per inch. And then—in 1974—we found a way to make the writing bolder, blacker, and even more beautiful at 200 dots per inch.

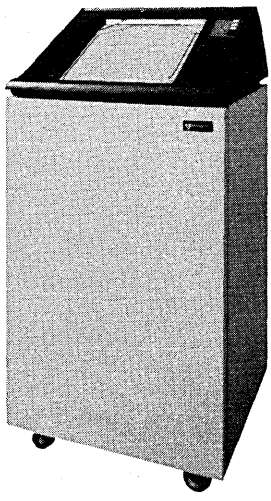
We call our new technique high resolution Dual Array Writing. It gets rid of the "dot look" by overlapping the dots. Samples are shown above.

600 LPM printers are now $4,500.

All this is part of a very handsome package. Our printer prices start at just $4,500, and printer/plotters at $5,900. Our Universal Versaplot Software is the most powerful ever designed for electrostatic plotting and starts at just $900.

We have controllers for over 30 computers.

Now add the fact that Versatec has the broadest product line in electrostatics, the highest resolutions (160 and 200 points per inch), and the largest installed base—more than 2,500 units operating world wide.



It's a beautiful story all around. For details concerning on-line or off-line operation on *your* computer system contact Versatec, Inc., 10100 Bubb Road, Cupertino, Calif. 95014.

Or phone (408) 257-9900. TWX 910-338-0243.

VERSATEC

The leader in electrostatic writing.

The bottom-line figures track the rate of inflation almost perfectly, but there are big changes in where the money will be spent.

1975 DP BUDGETS

by Richard A. McLaughlin, Associate Editor

Pity poor John Upcoder, dp manager for Makeshift Enterprises, Inc. His whole morning started out badly. Eggs without bacon. His wife told him bacon was $1.30 a pound. He missed the taste anyhow. Then he had to wait in line to pay over 60 cents a gallon for gas. He wondered how long he could keep driving his Ford LTD; he'd miss that too.

At work he found a memo from his operations manager saying the shop would be out of four-part forms in about a week if he couldn't speed up the order. His secretary reminded him of a 10 o'clock appointment with the head of applications programming, who wanted to talk salary.

Then came the phone call. It was Robert Upcounting, vp of finance and administration. "John, what in the hell's going on? I just found out that Amalgamated Horseshoe and Automated Manhole both spend less than we do for dp—and they're bigger companies than we are, by a lot. Why don't you come into my office and we'll talk about it. Bring your books."

What can he do? The economy looks bad so the whole company is operating on a "C"-level budget, nearly 20% under where it wants to be. Paper prices are up even more than gasoline. The IBM price increase cost him 8%. And the only way to give any salary increases at all may be to let a couple of pretty good people go.

The big-ticket items

According to a DATAMATION survey of dp budgets in several hundred installations across the U.S. and Canada, there may be many, many managers in John Upcoder's not-so-hypothetical situation. Inflation is hitting dp shops hard in the three areas where they spend the biggest portions of their budgets: people, hardware, and supplies. Salary budgets for 1975 are up more than 14% over 1974 expenditures in the average dp shop. Hardware expenditures are expected to go up more than 12%. Supplies and accessories are budgeted for almost a 25% increase, mostly due to the recent increases in forms and card stock.

Since these three factors, people, hardware, and supplies, make up fully 97% of the average dp budget, it is no surprise that dp budgets are up about 13% overall. In fact, if you could eliminate entirely all those other dp budget items — communications lines, software, service bureau charges, contracted personnel, security expenses, power supplies—that 13% increase would fall only to about 11%.

The fact that the increase in dp budgets follows puppy dog-like in the steps of inflation does not mean that nothing is changing. Big changes are being made in where the dollars are being spent. For instance, the average dp shop is continuing to evolve toward teleprocessing and distributed processing. Still more money is being earmarked for software and computer output microfilm. And the money spent with service bureaus is being shifted from time-sharing and batch to remote batch and film processing. And there's more.

The few decreases

There were 31 separate budget items for which data was collected. Of these, only five were budgeted for fewer dollars in 1975 than in 1974, in the average shop. One was "auxiliary equipment"; that's no surprise since most shops now own their eam equipment and can cut down on things like tape certifiers without too much pain. Another was "contract programming," down 12.7% in shops that budget for it and a likely place to start cutting.

Service bureau charges for time-sharing and batch were down 25.9% and 18.6% in budgets where they appeared. Since the data processing installations represented in the tables are those shops with their own computers to do most of their processing, the cuts in time-sharing may represent cuts in back-up service. Three installations polled indicated they were bringing the time-sharing in-house; in a few other cases, the time-sharing users might have to switch to in-house batch processing. The "cuts" in batch processing are directly related to a 73% increase in remote batch processing.

The only other overall reduction was in an item marked "remote site hardware: other," and even we aren't very sure what that stands for. Most likely this is a direct parallel to central site "auxiliary equipment," which also dropped.

The many increases

Everything else went up. Paradoxically, though hard-nosed dp managers were sometimes able to cut the *amount* of a commodity used, the *dollars* for that item were driven up. A good example is paper. Printer forms and card stock have been the most visibly increasing expense items in recent years, and fully 30% of the shops polled planned to increase consumption in 1975. Budgets for "media, supplies, and accessories" were still up 24%.

Most of the shops trying to cut paper consumption are going to do so by eliminating some copies of reports and

by consolidating reports. Others are shifting the load to on-line inquiry terminals. A few shops, only a few, will go as far as printing on the back of used forms or setting printers at 8 lines/inch. The magic solution to the paper problem, in the eyes of many budget-setters, is in increased use of microfilm output. An average of 18.5% more money will be invested in computer output microfilmers, an average of 20.8% more in film readers and related gear.

The big COM money is going to COM service bureaus, though, an average of 40% more funds than last year. And nearly twice as much money will be spent on COM service bureaus as on in-house COM units. Oddly these changes don't signify that that many more users will switch to COM, only 8% more sites will have COM devices and there is no change in the number of sites with contracts for outside film processing. The numbers indicate instead an increased use of film by sites already set up to handle it; COM is an avenue being taken only by those for whom the step is easy to make.

If paper consumption is the most obvious place to make reductions, people expenses are the most effective. Dp installations spend far more on people than on any other commodity, yet managers are extremely reluctant to cut staff sizes, especially when workloads show no sign of diminishing. Also, while some managers plan to let attrition take its toll, people dollar amounts still rise because employees are feeling the pinch of inflation too, and they expect raises. The upshot is that 10% of the shops will reduce staff sizes but 30% are committed to increases. The arithmetic yields an average net change of plus 14.1% in dollars and plus 5.6% in numbers of employees. The managers are building in a pad of sorts, though, by setting aside 23% more for "temporary help."

Hardware is tougher to cut than employees. It stays. In fact, the industry seems so well convinced of the effectiveness of teleprocessing and distributed processing that those items are billed for big expansions. We found a 49% increase of terminals, 39% for

DP BUDGETS BY INSTALLATION SIZE

(Determined by yearly hardware expenditures)

	to $25,000	to $100,000	to $250,000	to $500,000	to $1 million	over $1 million	"average"
PERSONNEL EXPENSES							
Salaries & fringe benefits	57.03	48.78	50.92	49.84	52.07	48.11	51.12
Training	0.62	0.38	0.52	0.33	0.45	0.57	0.48
Conference attendance	0.85	0.34	0.22	0.23	0.04	0.22	0.32
Other personnel expenses		0.01	0.07		0.00		0.01
HARDWARE & MAINTENANCE	33.32	38.15	36.87	39.16	37.90	41.35	37.79
MEDIA, SUPPLIES, & ACCESSORIES	7.35	9.30	8.50	6.18	7.08	5.28	7.28
PACKAGED SOFTWARE							
From mainframe vendor	0.65	0.53	0.47	0.55	0.49	0.51	0.53
From independent	0.17	0.33	0.54	0.51	0.43	0.59	0.43
COMMUNICATIONS LINES							
For data		0.30	0.46	0.93	0.64	1.26	0.60
For voice		0.07	0.07	0.19	0.24	0.04	0.10
OUTSIDE PERSONNEL SERVICES							
Consultants		0.64	0.24	0.05		0.19	0.19
Contract programming		0.28	0.24	0.52		0.46	0.25
Temporary help		0.21	0.41	0.09	0.22	0.07	0.17
OUTSIDE DATA PROCESSING							
Time-sharing		0.13		0.39		0.29	0.13
Batch processing		0.03	0.21	0.02	0.19		0.07
Remote batch processing		0.06		0.02		0.01	0.02
Microfilm processing		0.11	0.10	0.76		0.44	0.23
OTHER COSTS							
Physical security		0.15	0.03	0.02	0.01	0.07	0.05
UPS and power generators		0.12				0.09	0.03
Miscellaneous		0.08	0.13	0.20	0.26	0.45	0.19

DP HARDWARE SPENDING BY INSTALLATION SIZE

(Determined by yearly hardware expenditures)

	to $25,000	to $100,000	to $250,000	to $500,000	to $1 million	over $1 million	"average"
CENTRAL SITE							
Data entry	3.24	11.56	10.86	8.94	4.05	6.84	7.58
Computers & memory	82.69	36.45	46.41	42.46	33.46	37.30	46.46
Peripherals	13.25	46.11	34.56	33.40	38.25	35.66	33.54
Computer Output Microfilm			0.07		1.32	0.57	0.33
Film readers, etc.				0.16	0.07	0.27	0.08
Auxiliary equipment		1.63	1.64	1.14	3.58	0.64	1.44
Communications equipment		1.68	0.94	6.52	6.97	2.76	3.15
Other	0.83	0.27	0.70	0.36	2.37	1.32	0.98
REMOTE SITES							
Computers		0.22	1.03		4.14	0.79	1.03
Terminals		1.26	3.35	5.53	4.85	13.23	4.70
Communications equipment		0.08	0.18	1.02	0.06	0.62	0.33
Other		0.73	0.26	0.47	0.90		0.39

HOW BIG IS DATA PROCESSING?

	Manufacturing: Machinery	Retail Trade	Manufacturing: Paper Products	Manufacturing: Chemicals	City/County Government
As a % of gross revenues	0.7%	0.9%	1.0%	1.1%	1.2%
% change in budget 1974-1975	17.7%	18.8%	6.9%*	16.0%	17.6%

*wouldn't you know it?

	Banking (Small)	Education	Medical & Health Care	Wholesale Trade	Average Over All Industries
As a % of gross revenues	2.6%	2.7%	2.7%	3.1%	1.6%
% change in budget 1974-1975	18.2%	5.8%	15.7%	13.8%	12.9%

remote computers, and 47% for data communications lines. Then there's 51% more for central site communications hardware and 33% for remote site communications boxes.

Other hardware items slated for increased expenditures are data entry (up 13.5%), cpu and memory (up 9.4%, maybe partly for virtual storage support, but most likely just for increased charges), and peripherals (up 26.0%, we'd guess in discs for data base support).

Some users are attempting to hold off expansions of one sort or another. One way they may be delaying hardware expansion is by increasing the amount of remote batch processing they do through service bureaus. As mentioned earlier, over 73% more dollars are so earmarked.

Buying it cheaper

Other than staving off expansion or converting a few big peripheral-gobbling programs to run a little slower on a little less equipment, the most likely-sounding method of cutting hardware costs is to pay someone less for the "same" equipment. This can be done without declaring bankruptcy by switching to peripherals from independent manufacturers, longer-term leases from the same vendor, or converting to a third party lease. Some of that is going to be done this year by those firms which have been fighting rather than switching.

About 4% of the respondents in our 112-name main sample are switching to independent peripherals, 9% are changing leases for better terms, one site is going to a third-party mainframe, and another 4% are considering making one of those changes.

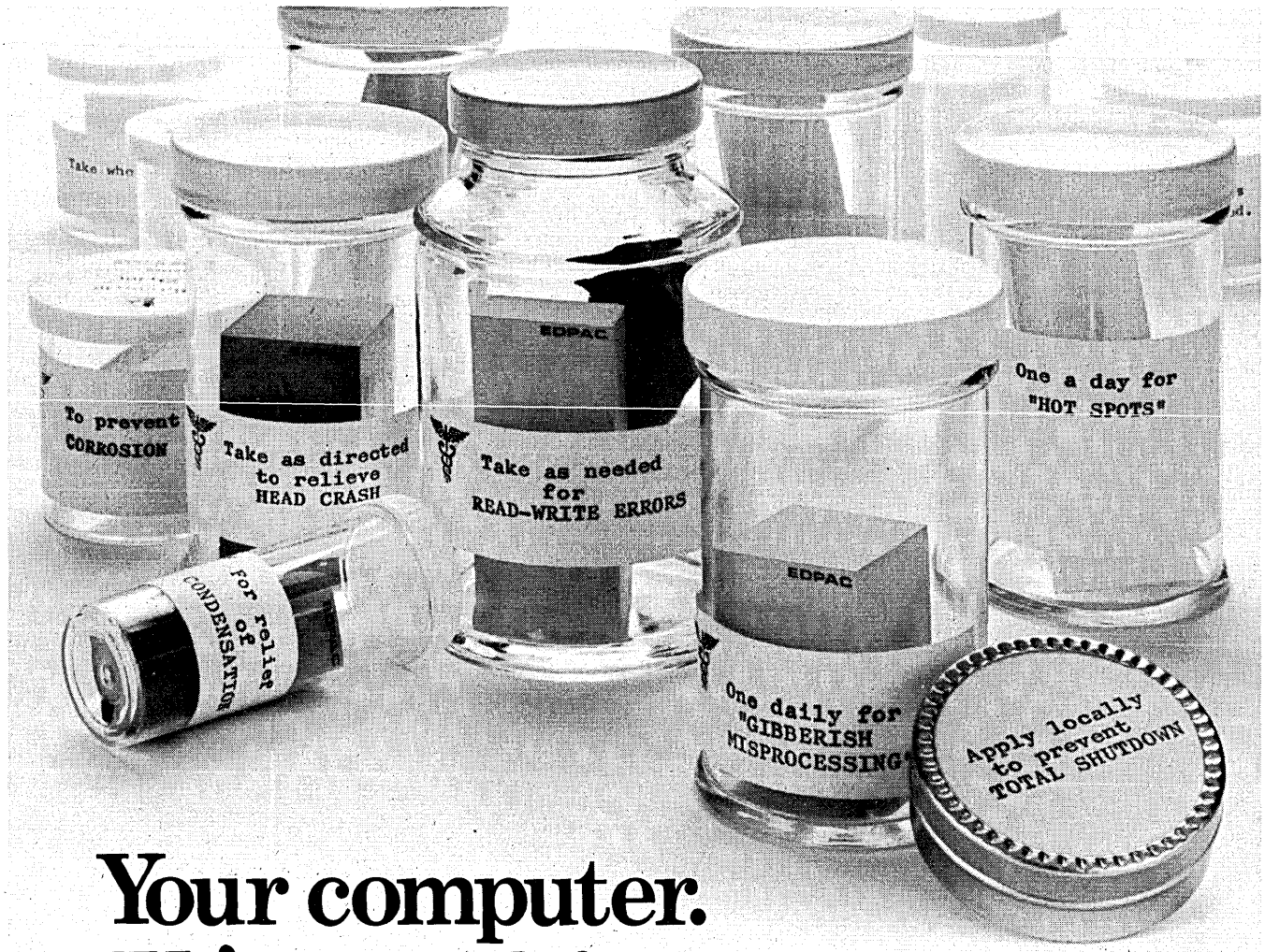
Individually those percentage numbers are small, but collectively they stand for up to 18% of the population changing over in a single year. And that 18% does not include installations that decided to purchase the equipment they had been renting or leasing. It looks like one out of every five data processing centers is likely to change the manner in which it acquires some of its hardware in 1975. That's a big

AVERAGE DP BUDGETS FOR SELECTED INDUSTRIES

	Wholesale Trade	Banking (Small)	City/County Government	Manufacturing: Paper Products	Medical & Health Care	Manufacturing: Machinery
PERSONNEL EXPENSES						
Salaries & fringe benefits	55.09	54.40	52.39	50.74	46.92	46.75
Training	0.25	0.55	0.39	1.10	0.74	0.33
Conference attendance	0.07	0.47	0.15	0.19	0.55	0.53
Other personnel expenses						
HARDWARE & MAINTENANCE	32.29	30.84	36.85	35.53	41.23	42.31
MEDIA, SUPPLIES, & ACCESSORIES	11.32	10.81	5.78	11.18	7.69	6.88
PACKAGED SOFTWARE						
From mainframe vendor	0.16	1.53	0.25		1.66	0.36
From independent	0.18	0.41	1.51			0.17
COMMUNICATIONS LINES						
For data		0.63	0.54	0.21	0.01	0.94
For voice			0.04			0.14
OUTSIDE PERSONNEL SERVICES						
Consultants			0.96	4.20		0.07
Contract programming			0.19			0.26
Temporary help		0.17	0.05	0.17	0.10	0.13
OUTSIDE DATA PROCESSING						
Time-sharing						
Batch processing						
Remote batch processing						
Microfilm processing	0.33		0.04		1.09	0.87
OTHER COSTS						
Physical security			0.65			
UPS and power generators	0.59					0.01
Miscellaneous		0.20	0.20	0.19		0.24

	Manufacturing: Chemicals	Retail Trade	Education	Service Bureaus	Average Over All Industries*
PERSONNEL EXPENSES					
Salaries & fringe benefits	46.63	45.62	44.39	41.40	51.12
Training	0.37	0.33	0.11	0.12	0.48
Conference attendance	0.16	0.24	0.26	0.08	0.32
Other personnel expenses	0.04				0.01
HARDWARE & MAINTENANCE	38.13	41.86	46.04	42.36	37.79
MEDIA, SUPPLIES, & ACCESSORIES	9.36	8.25	7.19	10.09	7.28
PACKAGED SOFTWARE					
From mainframe vendor	0.52	0.53	0.20	0.41	0.53
From independent	0.47	0.36	0.18	1.91	0.43
COMMUNICATIONS LINES					
For data	0.98	1.50	0.43	1.99	0.60
For voice	0.10	0.38	0.05		0.10
OUTSIDE PERSONNEL SERVICES					
Consultants	1.77	0.24	0.01		0.19
Contract programming	0.77		0.08		0.25
Temporary help	0.24	0.03	0.77	0.30	0.17
OUTSIDE DATA PROCESSING					
Time-sharing					0.13
Batch processing	0.06		0.03		0.07
Remote batch processing		0.07	0.18		0.02
Microfilm processing	0.01	0.54	0.06	0.58	0.23
OTHER COSTS					
Physical security	0.01	0.06		0.04	0.05
UPS and power generators				0.17	0.03
Miscellaneous	0.37		0.01	0.55	0.19

*from other chart



Your computer. We're good for what ails it.

One of the main causes of computer downtime has nothing at all to do with the way your computer is built.

It's the environment your computer has to work in. If it's too humid, too dry, too warm, too cool, or too dirty, no computer will put up with it for long.

The result can be anything from gibberish to total shutdown — and this can cost a fortune!

More often than not, the trouble begins with an environmental system that has been designed to keep people comfortable but that can't keep either the people *or* the computer comfortable.

The problem can easily be prevented by creating and maintaining a precise, controlled environment for optimum computer operation.

The technology to achieve that precise environment does not exist with comfort air conditioning.

It does with *process cooling.*

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To learn more about remedying your own computer room climate control problems, fill out the prescription below. We'll rush you a copy of "Process Cooling for the Data Center Environment." And the name of your EDPAC specialist.

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Please rush me your prescription for computer room climate ills. And the name of my nearest EDPAC specialist.

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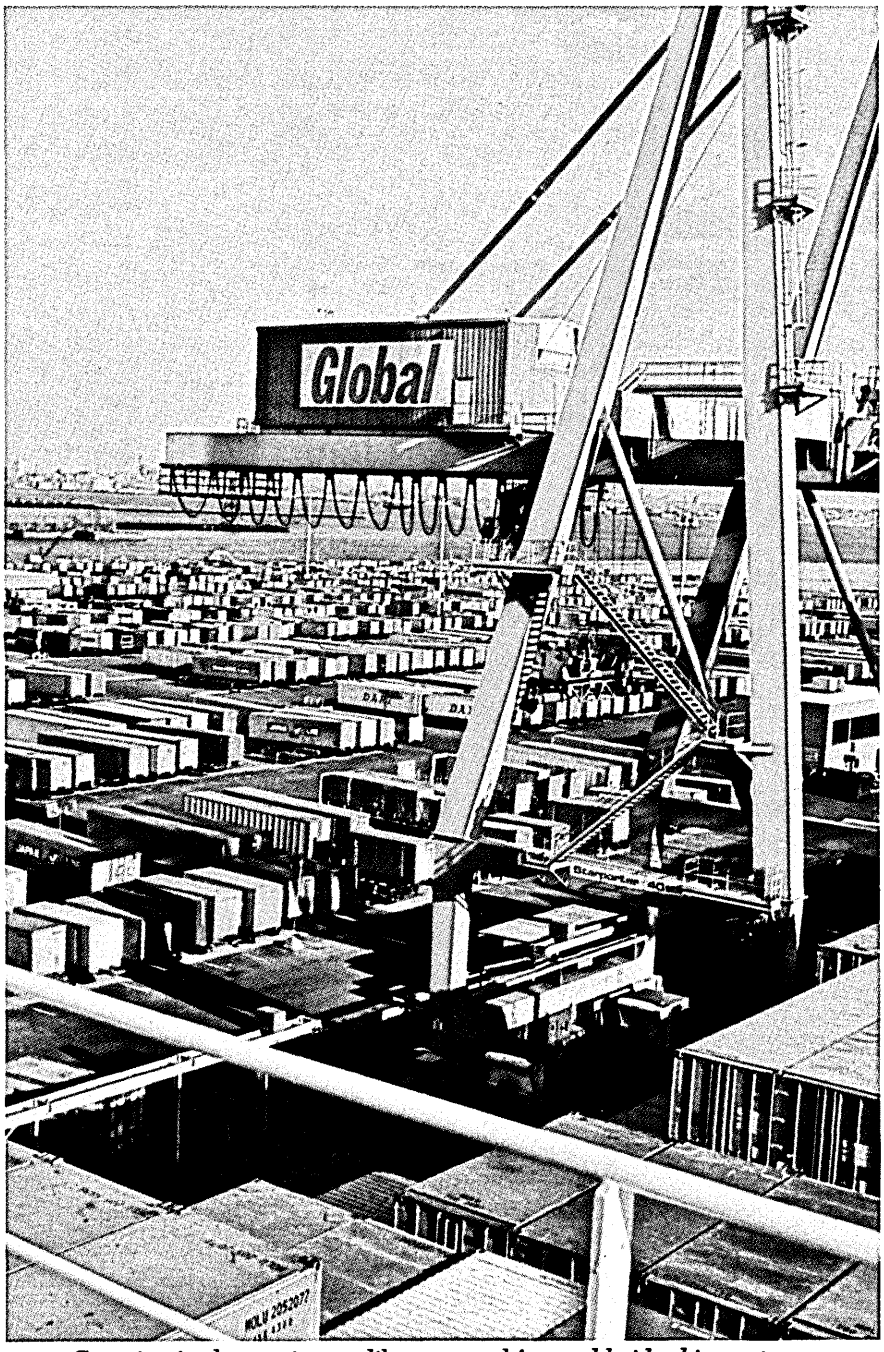
DP DIALOG

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



Containerized cargo is speedily processed for worldwide shipment at Global's Jersey City terminal.

Containerized Cargo Dispatched by Computer

Picture a shipping terminal filled with thousands of huge cargo containers. Some are stacked on trailer beds waiting to be picked up by truckers trying to meet tight delivery schedules. Others are being lifted by giant cranes from these trailers into a ship's hatch at the rate of one every two minutes. Hundreds of containers are moved from one location to another within the yard during each day.

Keeping track of over 100,000 containers a year is difficult enough. But at the 90-acre facility of Global Terminal & Container Services, Inc. in Jersey City, New Jersey, these containers are dispatched with ease all over the world. And the schedules of over 150 arriving vessels belonging to eight shipping lines are met each year. Despite the heavy traffic, individual containers can be located in a matter of seconds.

Global is able to accomplish this impressive organizational feat with the help of an IBM System/370 Model 135 computer which is linked to 12 on-line 3270 Information Display Systems located strategically at control points around the terminal.

"Each time a container is moved we must process information regarding its identification number, size, height, cargo, owner, final destination and location inside or outside the terminal," notes Thomas Minero, director of data processing at Global. "We could never handle that volume of data without the computer.

"The cargo-handling speed made possible by the container concept is much faster than manual paperwork or even batch processing can handle.

"For example, it is entirely possible

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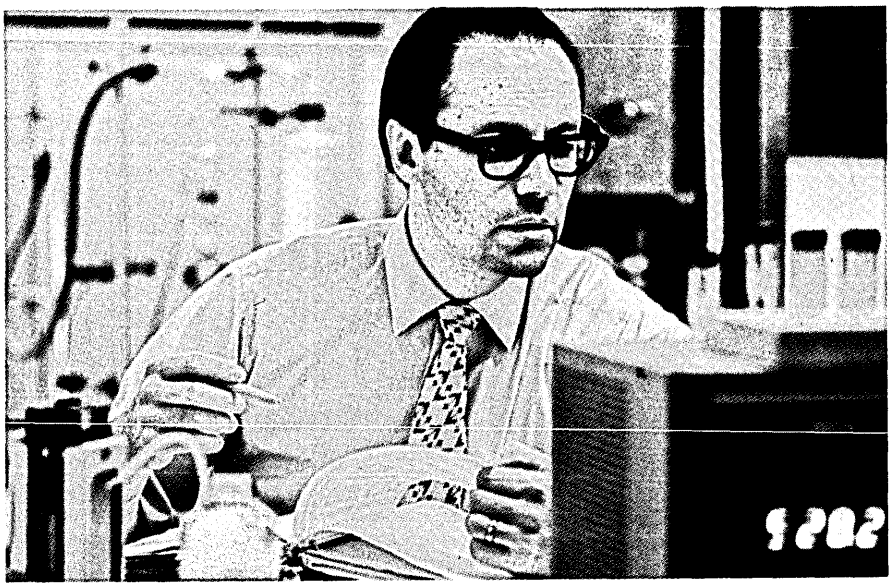


Dr. Bowman in Dow's thermal laboratory where many computer simulations are verified.

Problem Solving at Dow Chemical U.S.A.

As computers have become faster and larger, specialists in management science and operations research have been able to solve increasingly complex problems. Two areas in particular where the computer has helped extensively in recent years are optimization and simulation.

Optimization techniques are today applied to a broad range of problems, from refinery and animal feed blending to production planning and scheduling. Simulation methods are used in equally diverse areas, from the study of capital investment and inventory systems to the analysis of consumer behavior.

One organization that is effectively applying these and other problem-solving techniques is Dow Chemical U.S.A. "This has been possible to a large degree because of Dow's Computation Research facility at Midland, Michigan," says Dr. Carlos Bowman, Research Director.

"It was formed in 1956 to help make better use of its computer capabilities and to fully exploit the potential of data processing in research and development. Since then, it has become the center here for problem-solving assistance."

Dow's research facility uses an IBM System/370 and a large library of advanced computer programs designed to solve a range of problems, from data retrieval and statistical analysis to optimizing mathematical models. Such programs as the General Purpose Simulation System (GPSS), the Continuous System Modeling Program (CSMP) and the Mathematical Programming System Extended (MPSX) have all played an important part in solving complex problems at Dow.

Problem solving within the Computation Research facility is the main concern of the Mathematical Applications Group, headed by Dr. Richard Klimpel. Says Dr. Klimpel: "We want to promote better decision-making by using mathematical methods. We can do this with the help of the computer."

Recently, the group used GPSS in evaluating the market potential of a new industrial chemical which, it was hoped, would displace competitive products. The problem was in seeking an expanded share of an established market, rather than creating a new one.

The evaluation, which took only a few days, would previously have taken several weeks of programming effort, according to Dr. Klimpel. "But with GPSS, we quickly formulated a straightforward simulation model containing a combination of deterministic and random elements. The model made it possible to qualitatively predict the effects of marketing decisions and to answer key questions about the marketing organization, the pricing policy and the production facilities that would be needed to meet the marketing goals on a financially sound basis. GPSS proved to be a real timesaver."

When it comes to dynamic simulation, the mathematics group uses CSMP. "With CSMP we can 'build' a part, a piece of equipment, or a complete system within the computer," says Dr. Klimpel. "We can 'create' a product, a process or an environment. Then we can observe performance in terms of time and varying conditions. We can modify, re-evaluate, and optimize—all within a time span measured in hours and without any investment in manpower development or money."

Other problems confronting Dr. Klimpel and his staff include linear programming, which he explains is helpful to plant managers in pinpointing the most profitable product mix, as in setting production levels to optimize the use of available raw materials. MPSX enhances linear programming approaches by simplifying problem structuring and solution formation.

"Technological growth is a way of life here," he emphasizes. "With the help of computer analysis, we can grow at a faster pace. IBM Program Products have contributed because of their versatility and availability. With them, we are solving important problems with a degree of timeliness and accuracy that was not possible before." **IBM**

Containerized Cargo...

(Continued from first page)

for us to unload a container in the morning, empty it, dispatch it for new cargo in the early afternoon and have it reloaded on a ship by evening. Under these conditions, we need on-line computing to follow the cargo very closely," adds Minero.

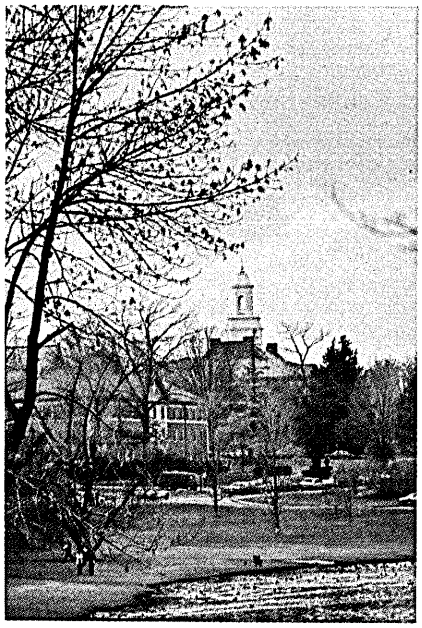
When a trucker delivers a container, he gives all of its "vital statistics" to the person at the terminal gate. The information is passed to the command center where it is immediately entered into the computer's data base along with the drop-off location assigned to the container. It can be relocated for a later pick-up by keying in its identification number on a CRT. The computer also tracks the containers on the road and a print-out "flags" overdue containers, charging the trucker on a per diem basis.

Some containers carry the smaller cargoes of several shippers bound for the same destination. In this case the computer calculates the cubic volume used by each shipper and bills him proportionately.

Finally, Global keeps a record of all documents necessary to clear cargo through customs. In the case of mixed shipments, several bills of lading may be needed for every container. A print-out helps identify customs requirements of each.

"Great strides have been made in the efficient transfer of cargo," Minero says. "With the on-line capabilities of our Model 135 we can match that speed in processing our paperwork." **IBM**

Computers Help Make NASA Technology Available To Public

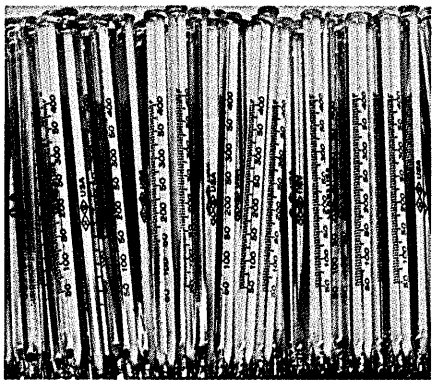


NERAC is part of the University of Connecticut at Storrs, Conn.

"What's the most suitable ceramic ink to bake on a thermometer—and how should we work with it?"

That's the kind of question that NASA—the National Aeronautics and Space Administration—might have researched at some time in learning to fly men to the moon. The Space Act of 1958, which created NASA, required that its technological discoveries be made available to the public. As a result, non-restricted NASA data has been entered into computers at six non-profit industrial applications centers across the country.

One of them, part of the University of Connecticut at Storrs, is the New England Research Application Center (NERAC), established in 1966. In addition to NASA material, the center's IBM System/370 Model 115 computer also stores data gathered by numerous technical societies, adding some 100,000 new items each month. A staff of specialists in various fields of science and engineering responds to requests, which are accepted from fee-paying industrial clients and from state and local governments.



The scale and degrees are baked in ceramic ink on these H-B industrial thermometers.

For example, a specialist in chemistry discussed the question quoted above with the client, H-B Instrument Company of Philadelphia. Then he worked out a retrieval strategy involving a search of two million items in the NERAC files. In total, the computer ran nine major searches on related questions and produced a list of 200 relevant documents; about 25% of them came from NASA research.

Having first sent the list to the client, the specialist then borrowed the desired documents from the libraries indicated by the computer (some papers were at the extensive University of Connecticut library itself) and forwarded them to H-B Instrument. They provided precisely the information the company wanted in order to simplify its production process.

"The NERAC data enabled us to eliminate five manufacturing steps and thus double our output of thermometers. If we had done the research on our own, the costs would have been prohibitive," reports Edward Hiergesell, secretary of H-B.

Virtual storage and multiprogramming on the Model 115 have made possible enlarged and expedited data searches, according to Dr. Daniel Wilde, director of NERAC. "We can be doing a search for one company and simultaneously be updating the data base, editing, and printing results for other clients.

"We encourage our clients to ask as many questions as possible, so if one approach fails, another might be productive," says Dr. Wilde. "This is feasible because the Model 115 is dedicated to this application and we take advantage of its advanced capabilities." **IBM**

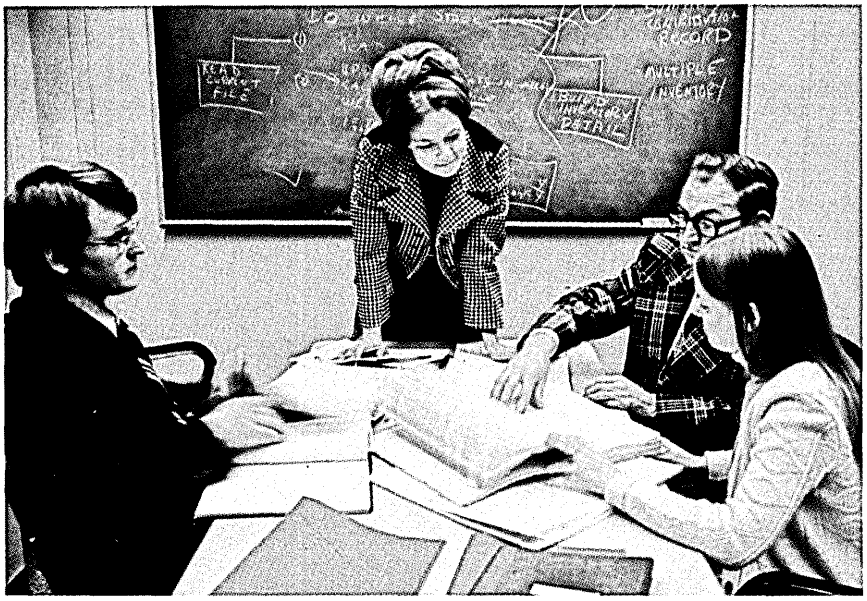
Toward More Effective Smog Control

Most people who have ever lived in an urban center which is plagued by photochemical smog agree on two things—it is very unpleasant and ought to be eliminated. One problem is that the complex chemical reactions which produce smog are poorly understood.

Last summer, scientists Heinrich Hunziker and H. Russell Wendt took a step toward understanding at least part of the process. Working at IBM's San Jose Research Laboratory, they developed a method which identified the frequencies at which a key smog component—called the hydroperoxyl radical (HO_2)—absorbs infrared light. This gives researchers, for the first time, an unmistakable way of identifying the presence of the radical, and thus may help in elucidating the reactions which create photochemical smog.

At present, other IBM scientists are using a Model 195 computer to predict the properties of HO_2 and related smog components, helping to build a better scientific basis for smog control. **IBM**

At IBM's San Jose Research Laboratory, Dr. Heinrich E. Hunziker uses a test cell to measure hydroperoxyl's specific absorption frequency.



At a structured walkthrough at Marathon's Findlay, Ohio headquarters, a knotty point is unraveled. Left to right are Marv Steckschulte, advanced programmer; Sharon Bonner, programming supervisor; Ralph Ellerbrock, senior programmer; and Martha Stearns, associate programmer.

Improved Application Development Pays Off At Marathon Oil

"Program maintenance time on new systems cut significantly . . . changes to new systems easier . . . systems kept more up to date . . . increased programmer productivity . . . more challenging job assignments."

Talk to the data processing people at Marathon Oil Company and these are some of the things you'll hear them say about their use of improved programming technologies.

Nearly two years ago, Marathon took the first steps to implement technologies such as structured programming, top-down development, HIPO (Hierarchy plus Input—Process—Output) design and team operations. Today they're standard procedure at Marathon's Findlay, Ohio dp complex.

"We wanted to make our programming easier to follow, revise and implement so our people could spend more time on new applications and less on routine maintenance jobs," says Wayne Sink, manager of Marathon's programming department. "With the improved technologies, we've been able to reduce time spent on maintenance of new systems. Now everyone has more time to work on challenging new applications."

The effect of the new technologies is to make programming development more of a science and less of an art, according to Sharon Bonner, programming supervisor. She became enthusiastic about the technologies following a presentation at a GUIDE open session in May, 1972.

"Structured design and programming, together with HIPOs, force people to think in terms of functions. Then their thinking becomes easier to follow and to implement," she says. "As a result, we can create project teams—ideally of three to five programmers—under the guidance of a lead programmer, whose assignments can be more or less interchangeable. Everyone can follow the progress of the project—it's all out in the open. This in turn makes possible periodic group reviews of work accomplished, called walkthroughs."

And Ralph Ellerbrock, senior programmer, cites the reduced time to code and debug a program as a major benefit.

"We used to work from the bottom up—we'd start with the leaves of the tree, so to speak, and work back along the branches to the trunk. This involved cumbersome testing and integration devices that ate up valuable programmer and computer time.

"Now we use top-down development. We begin with the highest levels of logic, those that govern the program as a whole, and work down to the more detailed segments. This allows us to implement and test in stages, at the same time that we are coding. It's a far more efficient way to work."

Six Improved Programming Technologies

IBM and other organizations use improved programming technologies in their development work. The technologies can be used separately or in any combination, although maximum benefit will probably be realized by using all of them together.

1. *HIPO documentation* is a design and documentation technique. Using HIPO throughout the development process, documentation is produced as a by-product, eliminating the need for later documentation.

2. *Top-down development* imposes an architectural discipline on the sequence in which code modules are written, following previously identified functions. It reduces integration testing difficulties and promotes more orderly system development.

3. *Structured programming* does for programs what sentences, paragraphs, pages and chapters do for books—makes them easier to read and understand. This allows other programmers to maintain them and modify them with greater facility.

4. *Team operations* is a concept which assigns a team to each project. The team usually consists of a chief programmer, a backup programmer, a librarian and additional programmers and analysts as needed. This permits better definition and assignment of responsibilities, facilitating job interchanges.

5. *Structured walkthroughs* are conferences or reviews conducted by groups with the same objectives, but excluding management personnel. They are intended to analyze design, detect errors, develop test strategies and promote the interchange of knowledge and viewpoints.

6. *A development support library* is controlled by a librarian who assumes the administrative and clerical tasks now imposed on programmers and managers. It provides up-to-date information on programs and test data as they are developed, both in computer-readable and human-readable form.

Further information is available at local IBM branch offices.

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

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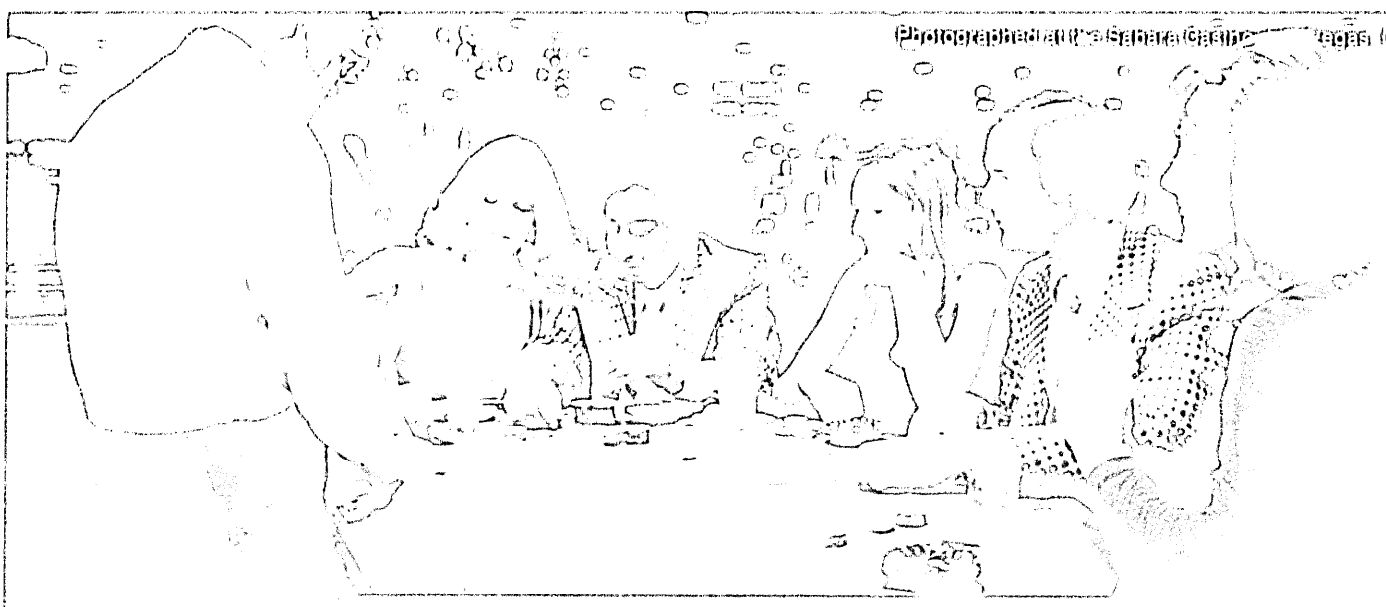
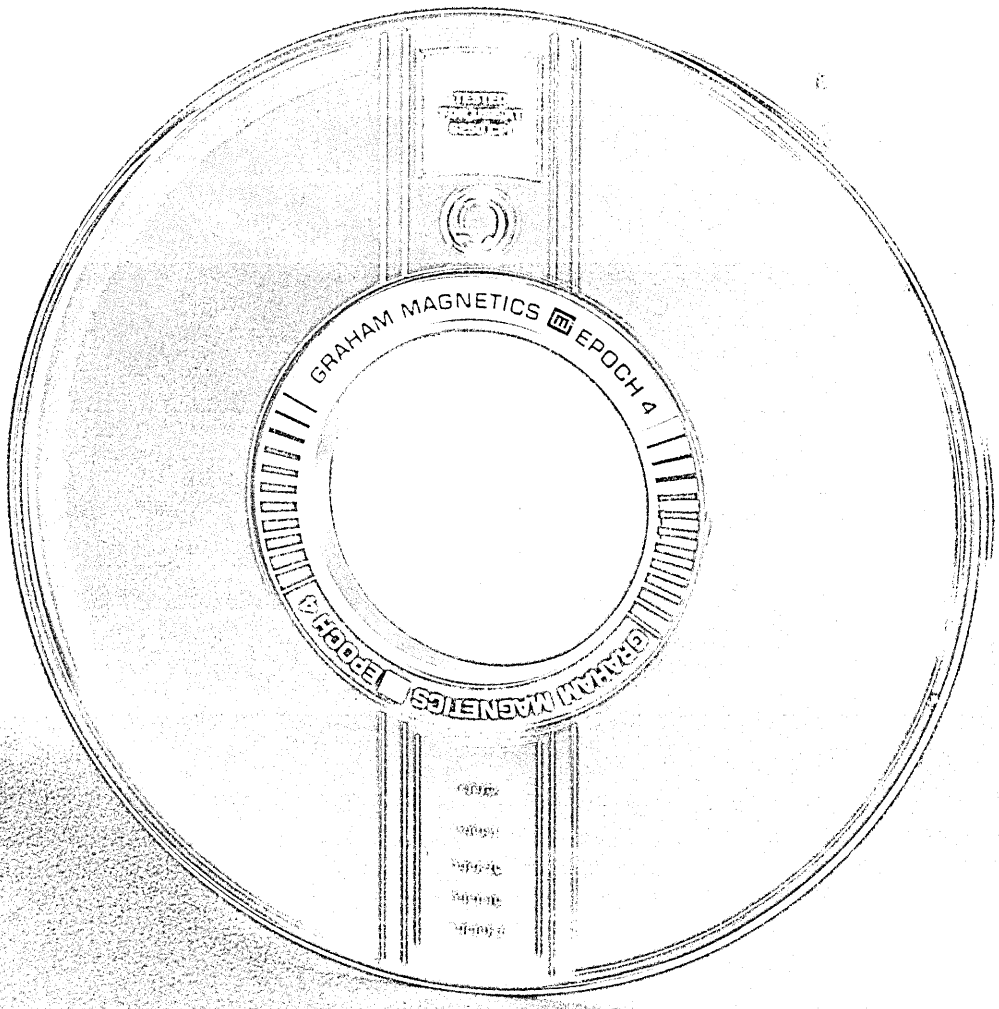


Running a computer operation should not be a game of chance



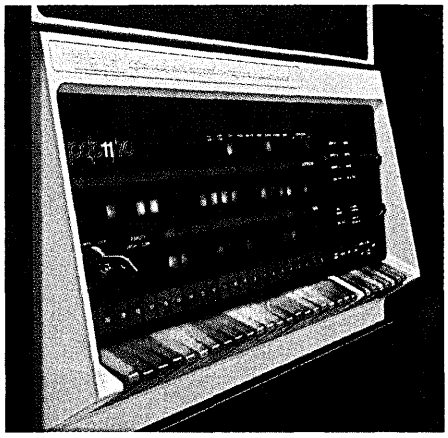
Digital introduces PDP-11/70. The system all other 11's have been leading up to.

Not just fast, completely fast.

The System is here from Digital. It's PDP-11/70—and it's fast beyond anything of its size or price ever built.

This complete system is designed for speed inside and out. Not just the CPU, but the software, the cache memory, the I/O channels, the disks, the peripherals—the entire package.

The 11/70, with its 32-bit



architecture, is a real-time system, a batch system, and a timesharing system simultaneously. And the incredible low price—from under $100K—means that enormous computer power is about to appear in places it's never been before.

System processor speed. The heart of the PDP-11/70 is a 300 nanosecond central processor connected to system components by high-speed 32-bit data paths (that perform automatic parity checking on both data and address transfers). And by adding a double-precision floating point processor, you can divide two 64-bit numbers in just 9 microseconds.

System memory speed. The integral memory management unit provides memory relocation, protection, and expansion to 2 million bytes of extremely reliable core memory. A standard 2K-byte, 240-nanosecond bipolar cache memory acts like a high-speed buffer between main memory and the processor. The result: an effective memory cycle time under 400 nanoseconds, but at core memory prices.

System peripheral speed. High-speed peripheral controllers plug directly into the central processor using high-speed 32-bit data paths for fast data transfer. Disk transfer time, for example, can be as fast as 4 microseconds for 32 bits. Disk capacity, using the high-speed interface, can be expanded to 700 million bytes of on-line storage.

Complete system software. The PDP-11/70's new multifunction operating system, IAS (Interactive Application System), allows concurrent timesharing, real-time and batch. IAS supports a mix of languages including ANSI-74 COBOL, extended BASIC, Macro assembler, and a powerful ANSI standard FORTRAN IV-PLUS that's

designed for the fastest execution time possible.

And for dedicated timesharing applications the popular RSTS/E system has been enhanced to accommodate 63 simultaneous BASIC-PLUS users with concurrent batch COBOL operation. For real-time applications, field-proven RSX-11D provides multiprogrammed real-time operation with concurrent batch in the background.

The System is here from Digital. PDP-11/70. Completely fast. For full details contact your local Digital sales office or send the coupon below to Digital Equipment Corporation, Maynard, Mass. 01754. (617) 897-5111, Ext. 2540. European headquarters: 81 route de l'Aire, 1211 Geneva 26. Tel: 42 79 50. Digital Equipment of Canada Ltd., P.O. Box 11500, Ottawa, Ontario K2H 8K8. (613) 592-5111.

digital

☐ Please have a Digital sales engineer call on me.
☐ Please send me literature on the PDP-11/70.

Potential application_____

I am considering a new ☐ or replacement ☐ system.

Other system(s) now performing on this application_____

Other system(s) in my company or organization_____

Name_____

Department_____ Organization_____

Address_____

City_____ State_____ Zip_____

number.

Software and "miscellaneous"

Though slightly *fewer* installations had budgeted money for software packages this year, the dollar amounts are way up. An average of 80.5% more is obligated to software packages from the mainframer and 69.2% more for packages from independents. The sites that aren't buying this year are generally the "smaller" ones, those spending under $250,000 per year on hardware. New customers are coming from the ranks of shops spending between $250K and $500K.

Rounding out the list of increased expense items are "security" (up 20.8%), uninterruptible power supplies and power generators (up 33.3%), training (up 27.1%), conference attendance (up 33.6%), other staff expenses (up 22.4%), and good old "miscellaneous" (up 63.9%—but always "up" in budgets because things that were paid for out of last year's "miscellaneous" show up in other categories in last year's expenditures).

Knowing the industry-wide average percentage figures for budget items and the average percentage increases is helpful in feeling the trends at work, like the trend toward teleprocessing. For poor John Upcoder, however, faced with explaining or justifying his expenses to a corporate personage of higher rank, the overall averages are not sufficient. What he really needs is a breakdown of budgets for other installations of his size, preferably for other installations in companies which compete with Makeshift Enterprises in whatever business it is in.

That breakdown he needs is almost impossible to provide, but we can come close. We can group the installations represented in our survey by budget size within certain broad ranges. We can then regroup them by industry—communications, transportation, education, etc.—and compile the budget figures for those selected industries where we have a large enough sample to give us some confidence. If that amount of data is insufficient to actually convince the vp, it may be enough to at least confuse him and make him sorry he asked.

Less than $25K/year

Bringing home $25,000 per year might make you a hero or heroine to your family, but spending that sum on dp hardware doesn't buy much. It will get either a mini like the DEC PDP-11/15, some 1130s, or some small System/3 model 10s (with card gear). There are a few items in the budget at that level, but increased spending is seen for data entry (up 27.9%) and peripherals (up 55.0%). Only one shop budgeted for vendor software and software from independents, but planned to spend six times as much this year. The big increases, especially in these categories, suggest these are start-up shops, a fact supported by the appearance of three S/3s in the nine-item sample.

This group has the highest budgeted increase for people (18.4% in dollars, 13.9% in numbers of people). Further, they look like they want to be part of the fraternity; they've upped

Numbers, Numbers Everywhere

Approximately 200 data processing managers across the U.S. and Canada cooperated in our survey. Many of their budgets do not appear in the tables, but have been used to cross-check the numbers which do appear.

From the 200 or so returns, we selected those questionnaires which appeared to represent "normal" shops. We purposely excluded service bureaus and service bureau customers. We also excluded budgets for installations which were clearly going through massive upheavals, like tripling their hardware expenditures. Those budgets from companies which owned their computers were used if the dollars being amortized for hardware were somewhat close to rental or lease figures for the same machines; we carefully culled those where only maintenance charges or minimal dollar amounts were shown for equipment we knew to be far more expensive.

For a time we also segregated Canadian computer users, until we found they looked just like shops south of their border.

The sample we finally settled on fell into this order based on yearly hardware expenditures:

Less than $25K/year	9
$25K to $100K	41
$100K to $250K	31
$250K to $500K	18
$500K to $1M	6
Over $1M	7
	112

In addition we had nine questionnaires from users who spent more on outside services than on their own hardware, and four from service bureaus.

The number of returns from service bureaus was too small to use as an industry category because there was too great a disparity between them, but several industries were represented in sufficient number to show with confidence. Specifically, the sample split as follows:

Small banks	6
Education (schools & univs.)	13
Government (city & county)	9
Manufacturing, chemicals	9
Manufacturing, machinery	9
Manufacturing, paper products	6
Medical and Health Care	4
Trade, retail	6
Trade, wholesale	6

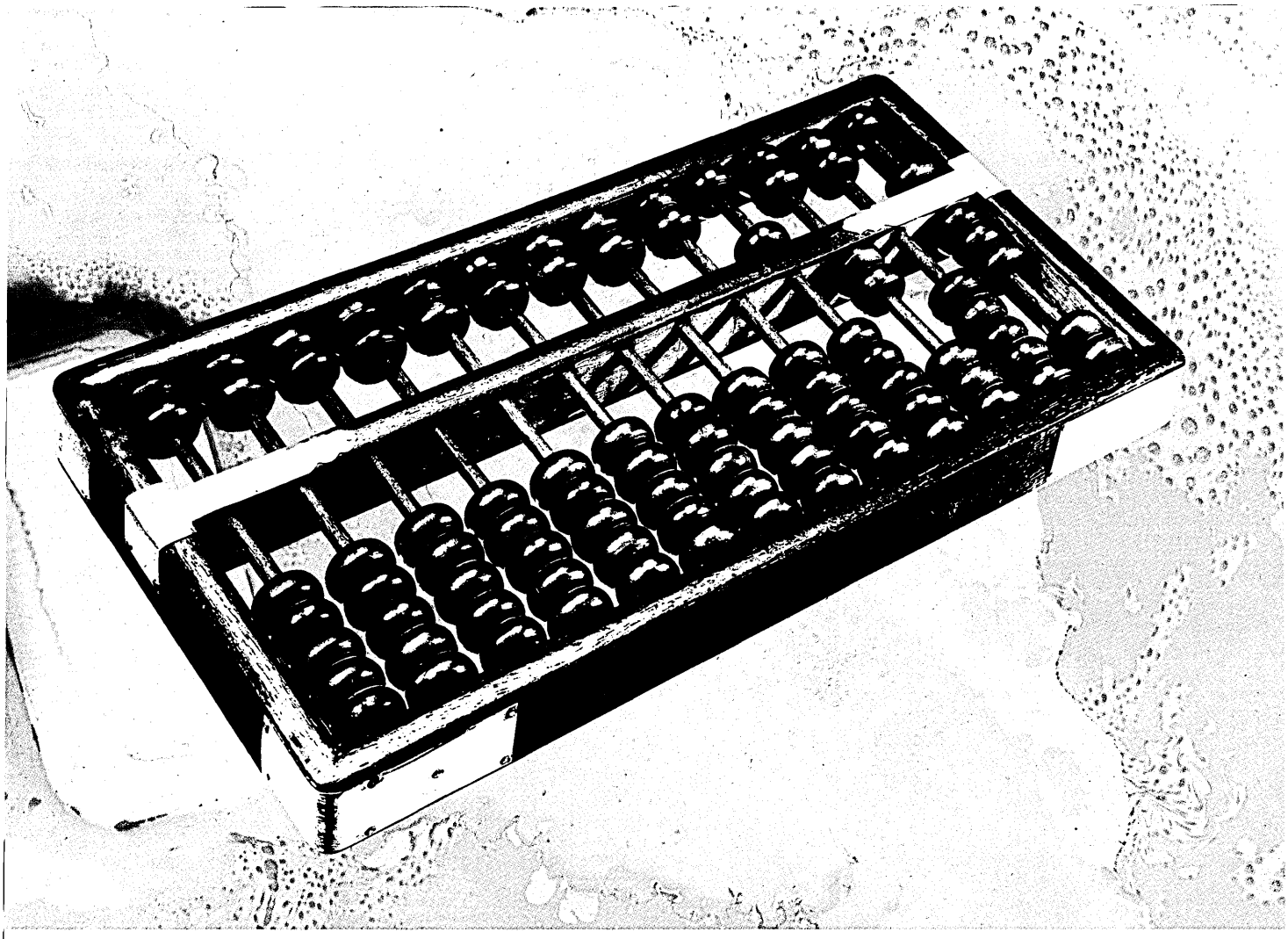
Processing the sample

The easy way to figure percentage figures for percentage of budget or percentage change is to add up the total dollars and calculate the percentages once. Unfortunately, this allows one very big shop to unbalance the contributions of 10 smaller ones. It is especially misleading with small samples. Therefore, we did things the hard way—we calculated the percentage of budget and percentage change figures for every budget item, then averaged the percentages.

There is one right way to interpret the figures this article and these charts present. The percentage increases or decreases alluded to in the text are changes in average dollar amounts allocated to each item *by computer installations which budget for those items.* Computer departments which don't budget for those items don't affect the percentage changes.

In contrast, the percentages shown in the tables are average percentages for all computer installations in that subset. Departments which do not budget for an item *do* act to reduce the average percentage.

We believe that the "easy" way of calculating the percentages is of most use to vendors, who are, after all, interested in the market total and want to know how many dollars will be spent in each segment. The percentages we used instead actually should be of more interest to the users, who can relate their own budgets directly to those in the tables. □



The abacus appeared in the first century B.C.

Thirteen centuries later, man accepted it.

As an early computational device, the abacus was an important link in the evolutionary chain leading to the digital computer. Subsequent developments occurred with a far greater compression of time.

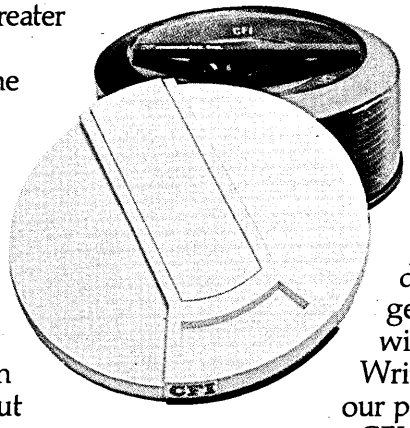
In 1642, Blaise Pascal devised the first calculating machine.

Dr. Herman Hollerith pioneered punch card statistical tabulating in 1890.

The ENIAC computer, using 18,800 vacuum tubes, was completed in 1946.

Dr. Jay Forrester's coincident current core memory was used in the Whirlwind computer at about the same time the transistor was announced in 1948.

Ten years later, the NCR 304 computer was installed, with some 4000 transistors and 8000 diodes.



A parallel development in increasing data storage was the use of disk packs and cartridges, pioneered in 1961. These removable units gained popularity by providing a compact, secure, economical file for data. Experts agree that these rotating memory devices will be with us for at least the next decade.

Today, CFI Memories, Inc. supplies disk packs and cartridges for the current generation of computers, while working with the OEM on products for the next. Write or call for current information on all our products.

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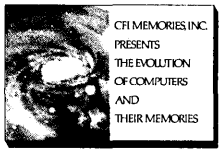

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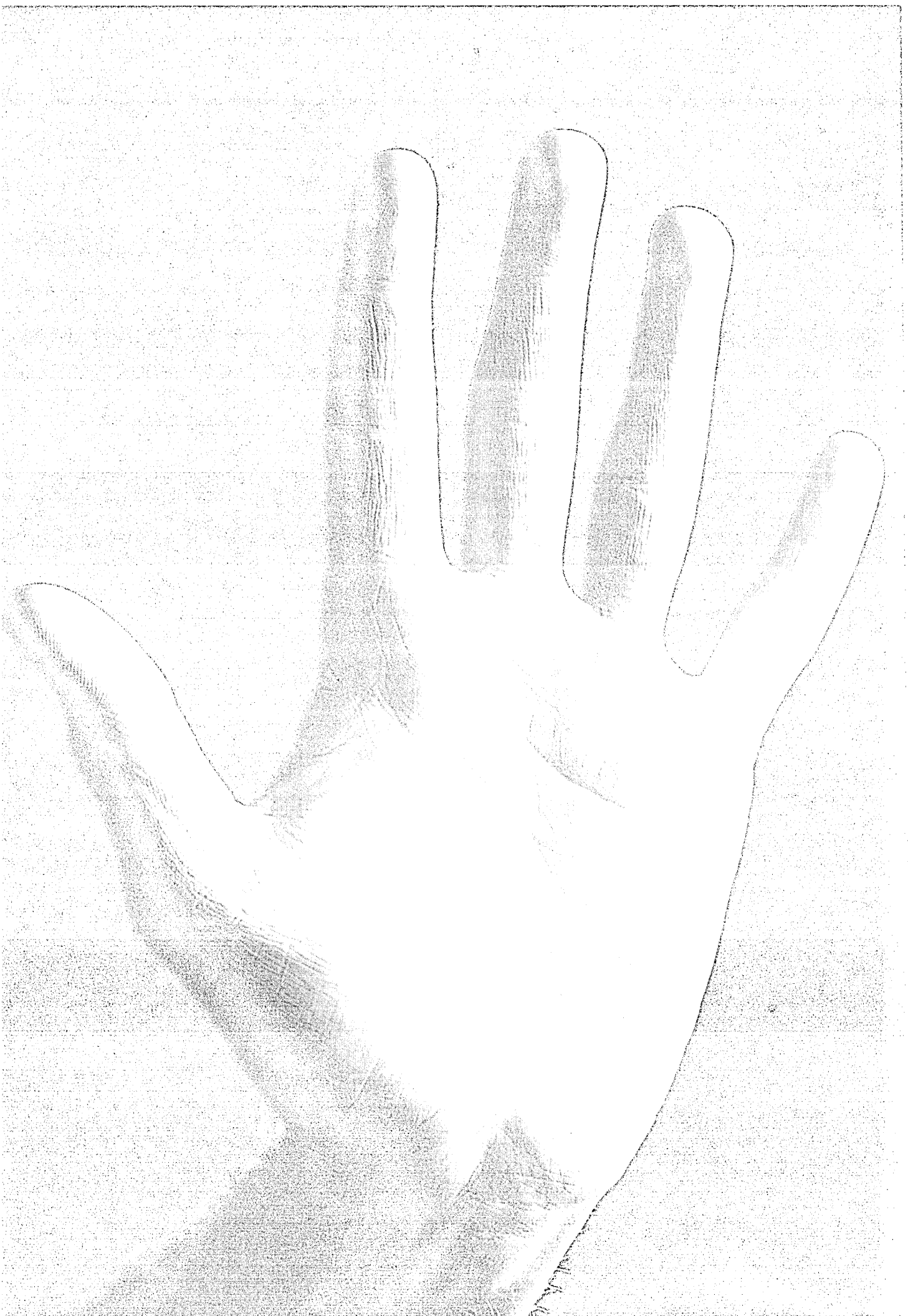

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the conference attendance pot by 45.8%.

Less than $100K/year

This category includes far and away the majority of general purpose computers. It is populated by small Honeywell machines (115s and 2020s, mostly), NCR Century 101s, 360/20s, and the bulk of the IBM System/3 model 10s with discs. By the way, the System/3 may mean "small scale computing" to most of us, but the total budgets associated with running an S/3 model 10 can easily reach $200,000.

These shops, and the ones in the next bigger category, are characterized by cutbacks. Fewer shops are buying auxiliary gear, software, outside batch services, or personnel services. Still, very few items are seeing decreased spending overall—those shops which are still buying are budgeting more.

Big dollar increases are slated for data lines (up 120.3%), software from the mainframe vendor (up 49%) but not from independents, communications hardware (up 104.8%), terminals (up 48.4%), contract programming (up 61.1%), training (+51.4%), and conference attendance (+41.5%).

They seem to be production shops as they have a higher percentage of their budget dedicated to media than any other subset of installations. They also spend more on consultants, perhaps because they are too small to have much depth in terms of number of people on staff.

Less than $250K/year

This category is the second most populated in terms of a census, and it shares with the previous category the distinction of being characterized by cutbacks. Fewer shops are spending on software, services, or contract help. However, increased payments by those still spending again makes the average percentage change a positive one.

The most common machines in this yearly price range are the 360/30, 370/125, and NCR Century 100s and 200s.

Communications hardware spending is up sharply (49.8% at the central site), as are terminals (+90.8%), and peripherals (+39.4%). Consulting (+80.6%), media (24.0%), training (+57%), and conferencing (+55.9%) are also big winners. The only big loser is contract programming (down 38.9%).

Second only to the under-$100K installations in terms of money spent on media, these too are production places. The major difference is that a much larger proportion of these are supporting remote sites.

Under $500K/year

The majority of shops spending over $250K/year support terminals and buy software both from their mainframe vendor and from independents. Unexpectedly, fully half of them contract for outside microfilm processing services.

About two-thirds have more than one computer. Machines installed are likely to be from the 370 series, either a 135 or 145. If our sample is indicative, this is a group of installations IBM has almost all to itself. Of 18 installations, only a couple had non-IBM mainframes.

In some senses these shops are very self-sufficient. They spend little of their budgets on outside services or contract labor. Their budgets are up for training (+73.8%), conference attendance (+33.2%), outside film processing (+60%), software (79.9% from the vendor/ 34% for independents), central site communications gear (32.3%), and, of course, media (+24.5%).

Less than $1 million/year

The most striking thing about these shops, at least on paper, is their near perfect stability. They are budgeting for the same number of items they budgeted for last year, and in nearly the same amounts. Though our sample size was small (only six installations), we found a zero percent change in number of employees, for instance. (They also spend more, in absolute terms, on people than any other shop but the <$25K group.)

Like the next size smaller shop, two-thirds of these are multiple-cpu installations. Some single computers, including 370/158s and a B3500, appeared.

These sites are budgeting big increases for peripherals (+28.6%), central site communications hardware (+23.9%), terminals (+32.9%), independent-supplied software (63.7%), media (+33.7%), and temporary help (+66.7%).

Over $1 million/year

Though only a tiny fraction of all computer centers spend more than $1 million per year on hardware alone, their combined spending weight is big enough to equal any other category. We used seven installations spending "over $1M/year" on machinery, and the seven averaged total dp budgets of over $5¼ million per year. That gives them a lot of leverage.

These are most often multiple machine sites—Ford, GM, the Pentagon, etc. Still, a lonely 168 can easily put a big spender in the game.

These shops can afford to be self-sufficient, but often don't act that way. As a good example, most of them have COM units but one-third contract for outside film processing anyway. Half of them pay consultants and temporary help, and they spend a good deal on contract programming. All support remote sites, but only one of the sample supported a remote processor.

Money for terminals and communications gear is up strongly: terminals (+61.8%), central site commo hardware (+45.4%), remote site commo gear (+61.1%). Money for vendor software is up (+35.5%, perhaps for vs) and for media (31.5%).

Still they spend less than any other size shop on media, presumably because they are doing on-line work instead. They also spend less on people than any other shop, and more on hardware, reinforcing the impression that these are central hubs in very large companies where much of the expense for people is absorbed by user departments with their own dp budgets.

What does it prove

John Upcoder will have one good argument to use in explaining why his budget for dp is larger than Amalgamated Horseshoe's. The industry the company belongs in makes a big difference in dp expenditures. That makes sense, considering that Continental Airlines' seat reservations systems has altogether different dp requirements and costs from those of a university's batch-oriented dp center. Some of the disparities appear in the table of budgets by industry (which has been ordered by salary expenditures to better highlight the relation between industries).

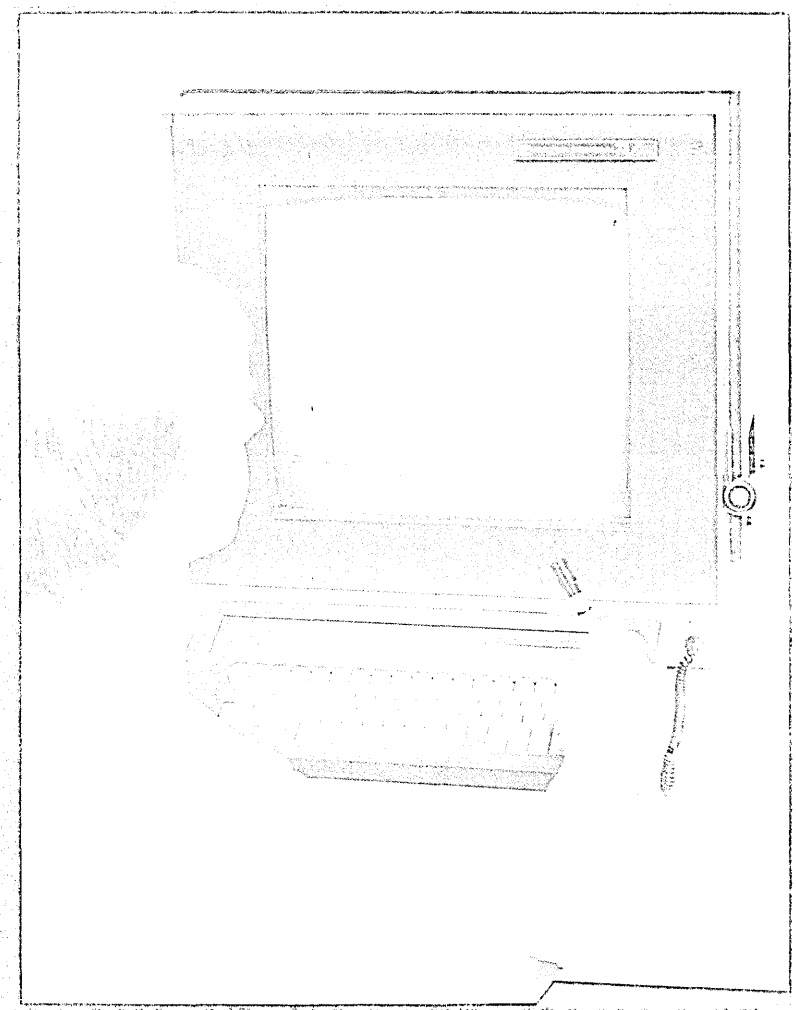
Finally, though table-building can easily go too far, we've constructed one more to show another figure dp managers have often requested: the dp expenditure as a percentage of gross sales or revenues.

Data processing expenditures *are* related to installation size and to the industry supported. The size relates to the complexity and diversity of processing; the industry relates to the mode of operation—on-line, batch, or whatever.

The averages provide at least a benchmark for measurement. Companies may vary from these marks, but if they do, they should know why. These averages may move some managers to search for reasons for their shop's differences. If that is the only purpose these averages serve, the survey will have done enough. □

Quick!

Name the company that's shipped the most* high-speed, direct-writing Interactive Graphics Terminals since 1972.



Many people would guess IBM. But they would be wrong.

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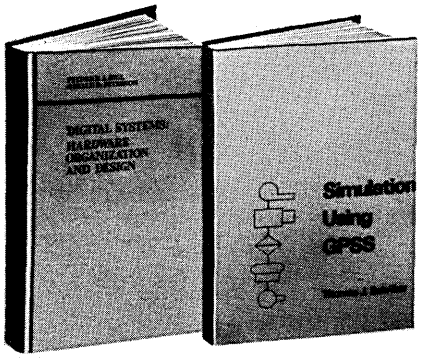

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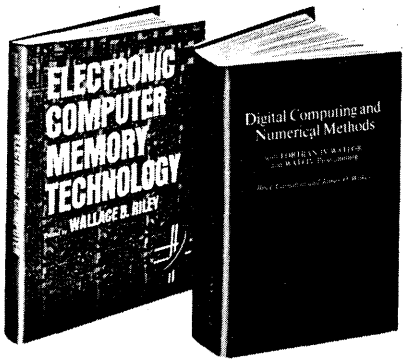

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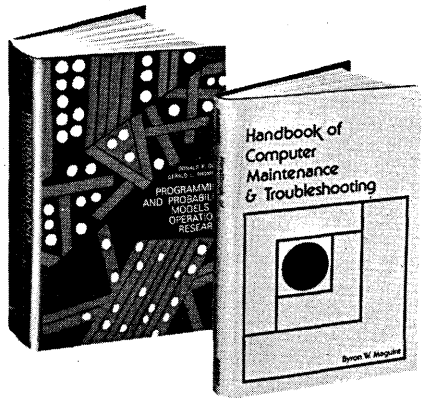

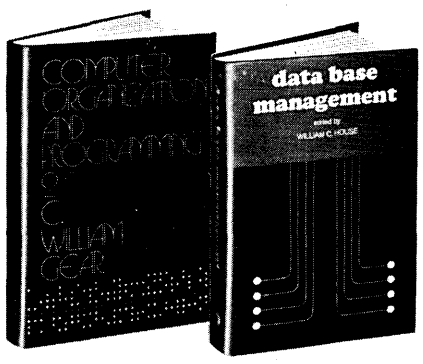

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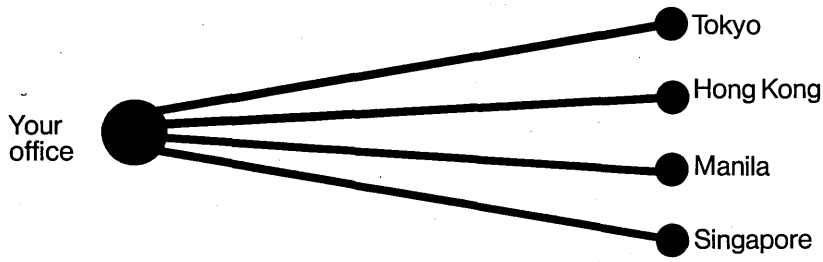

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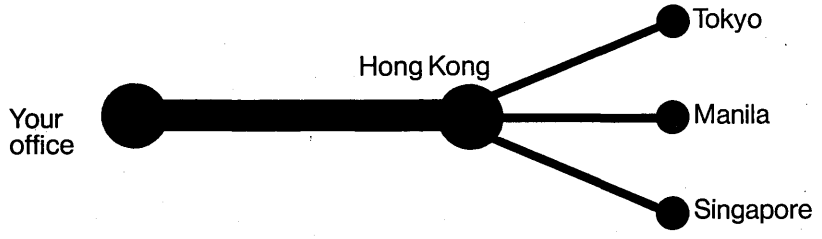

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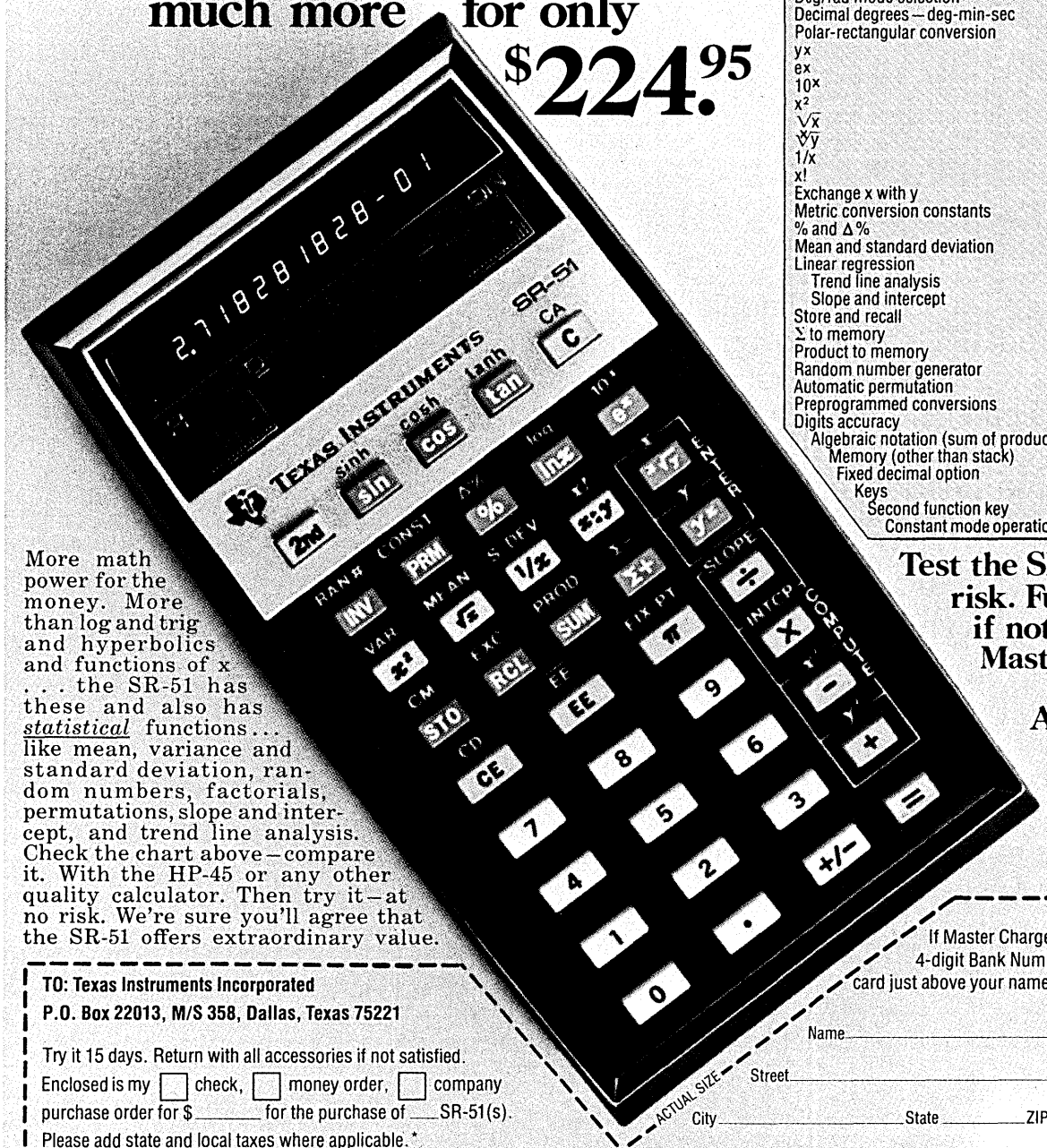

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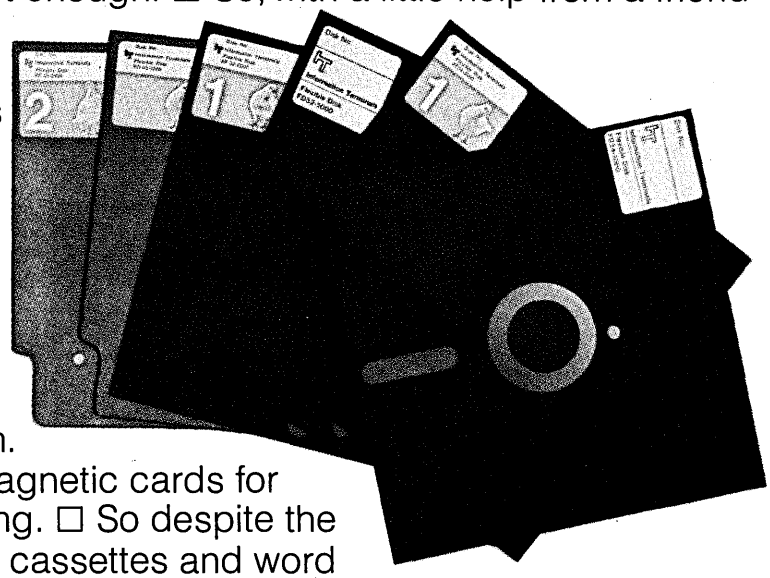

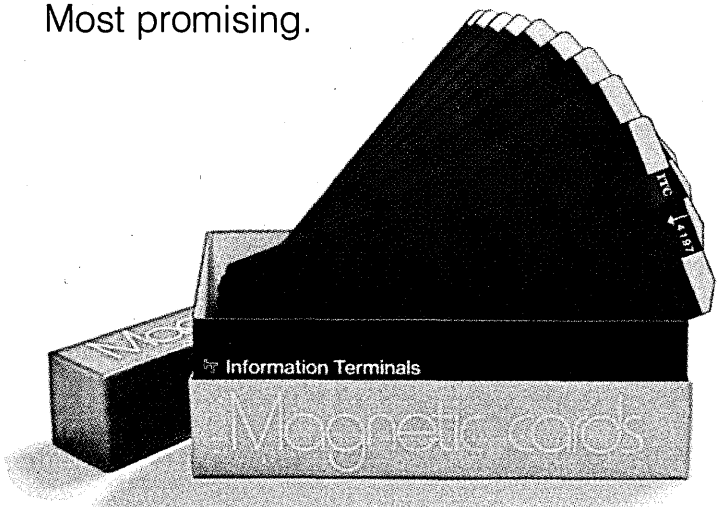

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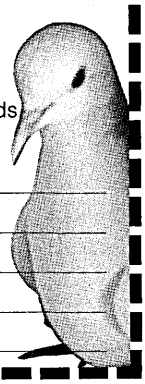


In data processing, the only thing we can rely on is unreliability.

LAWS OF UNRELIABILITY

by Tom Gilb

Our profession has been challenged to prove the existence of "computer science" or even of a pragmatic "software engineering." Those who express doubts that these things exist note that "science" and "engineering" are characterized by laws, principles, measuring methods, and measuring instruments. Certainly there is no insurmountable difficulty in starting to develop these things, but a vicious circle comes into play: we are too busy simply "producing" to have leisure or capacity to spend on learning how to be more productive.

Being neither a research worker nor an academic, or independently wealthy, I can offer no positive solution. However, recalling the excellent examples of Parkinson (whose Law states that the amount of work expands to fill the available capacity), Peter (known for the Principle which states that a person tends to rise to a position of incompetence), and Townsend (who wrote *Up the Organization*), it struck me that the problem in computer science may not be simply of a scientific nature. It may lie—as it does in the business world—in getting people to think, more specifically to think *differently*.

Therefore I have patterned some "laws" after the works of those gentlemen. I have included an explanation with each law for the few who are new to dp and do not immediately find the point; they should not be forced to learn everything by bitter experience, even if *we* still insist upon doing so.

1. Computers are unreliable, but humans are even more unreliable.

The frightening myth of the computer's infallibility, of its ability to check itself in any error, was for awhile so powerfully projected on the public that it is with great relief that the newspapers can print headlines such as:

COMPUTER CALLS 106 YEAR OLD LADY TO FIRST GRADE

Yet even this "newsworthy" exception only serves to impress upon us that computers don't normally make such stupid errors. If a *person* made this error, then I doubt it would be reported at all.

The very source of this example's problem, and the source of almost all the forms of computer harassment which we have experienced or soon will (depending on how "advanced" one's country is) are completely within the sphere of human control. It is cowardly to hide behind the skirts of a computer in avoiding blame.

A corollary to this Law may be stated:

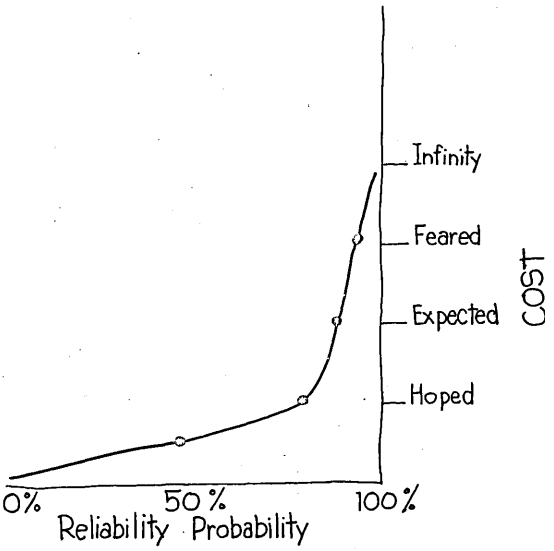
At the source of every error which is blamed on the computer, you will find at least two human errors, including the error of blaming it on the computer.

If the computer is "not reliable," then a human made a bad decision to use it. If he made that decision to use it in spite of a known tendency to err, then that also is a human decision. He should be honest and say: "That error is one of the 0.03% we estimate it is cheaper to allow to occur and be discovered by the taxpayer than to use a few million dollars of those same taxpayers to avoid."

The price of perfect reliability is infinite cost.

2. Any system which depends on human reliability is an unreliable system.

Human reliability is the weakest link in a system, although human common sense may be one of the strong points. Those who design inadequate systems, that is, those who have been careless in



The price of perfect reliability is infinite cost.

their consideration of human unreliability, often blame the human element for their failure. The assignment of blame is slightly misplaced. The designers have the primary responsibility for any system unreliability; it is their job to foresee worst case problems.

A system cannot be designed with some "ideal" person in mind. The real world is filled with fools (from a system designer's point of view) and the designer must live with them. Fortunately he has, at his fingertips, an instrument which can be so flexible, so tolerant of human weakness—and all at a practical cost—that he can compensate for the weak human reliability part of a system using this instrument.

Decades of tradition with automatic dp devices of more primitive nature—punched card electromechanical tabulators, overdimensioned bookkeeping machines and the like—have conditioned us to think in terms of Garbage In/Garbage Out. GIGO places the blame on human inputters and has been successfully used for years by computer manufacturers, dp managers, system designers and others to avoid taking responsibility for their own faults.

No system should be designed so that it depends on human ability to be reliable. It is not necessary.

3. The only real difference between the fool and the criminal who attacks a system is that the fool attacks unpredictably and on a broader front.

The trade press and the popular press is filled with material regarding some form of criminal deception in relation to computers. Naturally this is sensational, exciting—and of great interest to all professional practitioners.

I, for one, have learned a lot of useful techniques which could come in handy if the Norwegian tax rate increases above its present highly uncomfortable level (so high that a poll showed that 4 of 5 citizens would gladly cheat if they had a chance; the others presumably either need to avoid suspicion, don't ever feel they will get a chance, or are lying).

In any case, all this attention seems to me to be missing the real danger: "the fool." Fools don't make for sensational spy stories but there are enough of them in contact with present computer systems to be of considerably more interest than is currently given them. It is, for example, unlikely that criminals can find financial gain in an air traffic or ship traffic protection system, or in a post medical operation patient analysis system except for "hijacking" threats. But since my life literally would depend on the critical functions performed by these systems, I for one am far more worried about their reliability than about any bank being robbed, or any spy getting a few more "secrets," or any computer "hijacker."

The "fools" may be operational personnel in contact with the system and they may be underqualified system developers, which most of us admittedly are at present. In any case they are a clear and present danger to our lives *and* to our financial account status.

It is worth noting that if we gave the necessary degree of attention to the problem of the "unpredictable" fool, then we would at the same stroke have solved 90% of the "criminal" problem, perhaps more. Let us begin to recognize the most important problem (the fool) in spite of the fact that it is professionally embarrassing. If we don't, somebody else will.

4. A system tends to grow in terms of complexity rather than of simplification, until the resulting unreliability becomes intolerable.

In the short run it is very convenient —perhaps even necessary—to correct inadequate system design by "patching" a system. There is rarely motivation, opportunity or ability to "redesign" the system to include the needed change in an optimal fashion.

The change becomes thus a less-than-optimal addition to the system. It threatens efficiency. It threatens reliability. It may threaten system portability. It adds to the complexity. It may defy systematic verification.

Insufficiently planned hardware systems and software or application systems (surely we all have some examples from our own experience) thus grow and increase their complexity of structure and complexity of logic. The probability that *something* must finally come crashing down with a loud bang increases geometrically with the number of changes.

A vicious circle of insufficient talent and time to make system changes and test them sufficiently will continue to grow from the point at which it began: the initial system planning.

If the system is in a competitive situation, then the competition will recognize the impending disaster and, with the advantage of hindsight (combined with the buyer's growing awareness of his problem and consequent willingness to believe that anybody who will *admit* the problem exists must have solved it), will enter the market, steal an uncomfortable amount of business, and force the market-ruler to release the new versions of his next system even more prematurely than the previous one—thus starting a new cycle.

If the system is a user-application system the user will select an incompatible new computer system (incompatible, but from the same manufacturer) which will force complete redesign and reprogramming of all present applications and thus allow him the opportunity of repeating the cycle. Or perhaps his successor as manager will be the scapegoat in the next round, the previous manager having suffered a lateral arabesque (see Peter).

5. Self-checking systems tend to have a complexity in proportion to the inherent lack of reliability of the system in which they are used.

Put more popularly: the more a manufacturer stresses the reliability features, the more suspicious I get that he needed them more than his competitors. Rolls Royce never discussed the reliability of their motor vehicles; it was quite unnecessary from everyone's point of view.

In a different line of application of this law: the complexity of some of the self-checking number systems which I have seen (the Norwegian national identity number with its two check digits is incomprehensible even after several written explanations, for example), is a clear warning of the dangers of working with long abstract numbers.

Looking at still another application of this law: a data processing system which consists of a complex series of organizational units to "assure" accuracy (initiator, coder, checker of code, puncher, verifier, test run, corrector, correction verifier, output checker, etc.) is really just an indirect way of demonstrating the fact that somebody designed a lousy system since only one (initiator) of those processes should actually be necessary.

Self-checking systems are a desirable goal. The unfortunate fact, however, is that they all too commonly are reflections of an attempt to compensate for weaknesses which should never have been designed into the system in the first place. Thus this law is primarily designed to make us *wary*.

A reliable system would probably have little need for self-checking system components but would carefully include them in defense of Murphy's Laws ("If anything can happen, it will," etc.)

6. The error-detection and correction capabilities of any system will serve as the key to understanding the type of error which they can not *handle.*

Again, this "law" is intended to warn us, to serve as a stimulator which will arouse our critical senses when presented by, for example, computer

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suppliers with an imposing list of reliability capabilities in their dream system.

We could easily be "drugged" into a sense of false security. Yet the possibility of error is so infinite that all the error detection and correction techniques which we presently master are but a hundred sand grains removed from a vast beach of possible errors.

The number of computer people who believe that simple parity checking systems (one bit per word for example) "detected" all machine errors is surprisingly high. In that case, 10 of the approximately 11 parity bits per IBM 370 word (32 data bits) are wasted, and the purchaser should complain and insist on using them for data storage purposes.

The number of computer people who "believe" in the self-checking number or the card verification process is also shockingly high. No wonder we have reliability problems if that is the level of our understanding. (Both these techniques have contributed heavily to hardware sales so there is a vested interest in not pricking that balloon.)

To quote Murphy again: "Nature is on the side of the hidden flaw" and "If everything seems correct, then you must have overlooked something."

7. Undetectable errors are infinite in variety, in contrast to detectable errors, which by definition are limited.

The comments on Law 6, above, are highly applicable here too.

Detectable errors are those which are *actually* detectable in a given system, *not* those errors which are theoretically detectable. (If you can define an error you should be able to devise a means of detection; thus all errors are *theoretically* detectable). You must have made a decision to spend effort and other scarce resources on building detection systems into your system before a class of errors is really "detectable."

Since the variety of errors is limitless for all practical purposes, even in moderate size real systems, then full protection would never be practical. We would never actually finish developing such a system in our lifetime.

Thus we are forced to recognize that as a practical necessity we must identify the error causes most likely to create problems and weigh them in relation to the alternatives and costs for detecting them. This should produce a priority list of ways of improving system reliability by adding detection elements up to some point where it is not considered worth more time and effort to improve our ability to detect.

8. All real programs contain errors until proved otherwise—which is impossible.

As Djikstra points out, it is certainly possible to construct simple programs in such a way that it is possible to "prove" the *logical* correctness of those programs.

But as he also recognizes, the scale of the "proof" problem rises exponentially with the number of components of the program. This rapidly leads to the result that a "normal" computer program for practical interesting purposes does not easily lend itself to such proofs with present techniques. Nor is it likely in the near future that we will understand the methodology for constructing large programs capable of a practical "proof," and even more unlikely is it that we will convince practitioners to take the energy to *construct* programs in the required manner.

And even if these miracles of insight, method and cooperation should one day come to pass, then it should be noted that we will at best have proven the "logical" correctness of a program.

We still have several interesting stages to go before we are able to prove the "reliability" of that program. The quirks of compilers, data representations, hardware logic, and reliability still would stand as formidable hurdles —so formidable that the effort needed to achieve logical correctness proofs would likely be more profitably spent in other areas of reliability. Correctness proofs would in fact only serve to limit our field of inquiry to these other less well structured problems.

By the time all these problems are solved, you and I will be retired, at least. Thus for immediate practical purposes we must face living with programs and systems which cannot be proved to be without "bugs." The only defense then is to build a sufficiently strong barricade of such things as "detection," "prevention," "correction," and "recovery" components into the system, and finally, to admit that some errors are simply cheaper to "let happen." Perfection costs, infinitely.

9. Investment in reliability will increase until it exceeds the probable cost of errors, or until somebody insists on getting some useful work done.

There is an optimum level of investment in building reliability into a system. If we do not achieve this optimum, we are by definition either wasting resources due to overinvestment, or wasting resources due to unnecessarily high operational costs (unreliable systems). Either way we lose.

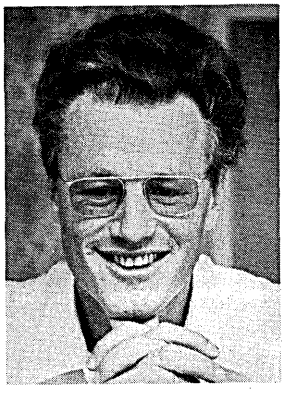
Whether or not we can achieve this optimum level depends on our engineering ability, that is, our knowledge of the effect and cost of introducing a particular set of reliability components into the system.

Our engineering ability in turn is dependent upon our measuring ability, our ability to measure, with an interesting level of accuracy, the level of reliability achieved and the change in that reliability level due to changes in system reliability components (or any other component for that matter). An accuracy of at least 1%, and probably far better, would seem to be necessary to effectively control system progress near the level of "optimum" reliability.

Naturally, since we have practically no such engineering ability, knowledge, or measuring accuracy, we are forced to use the "shotgun" method of hitting the barn door. We are highly unsophisticated but by duplication or triplication of all equipment and other parts of the system (triplication is a great principle since "voting" systems can be used to determine the wrong thing to do automatically) we can achieve certain minimum levels of reliability in the most vital or profitable applications (the rest must wait, it seems).

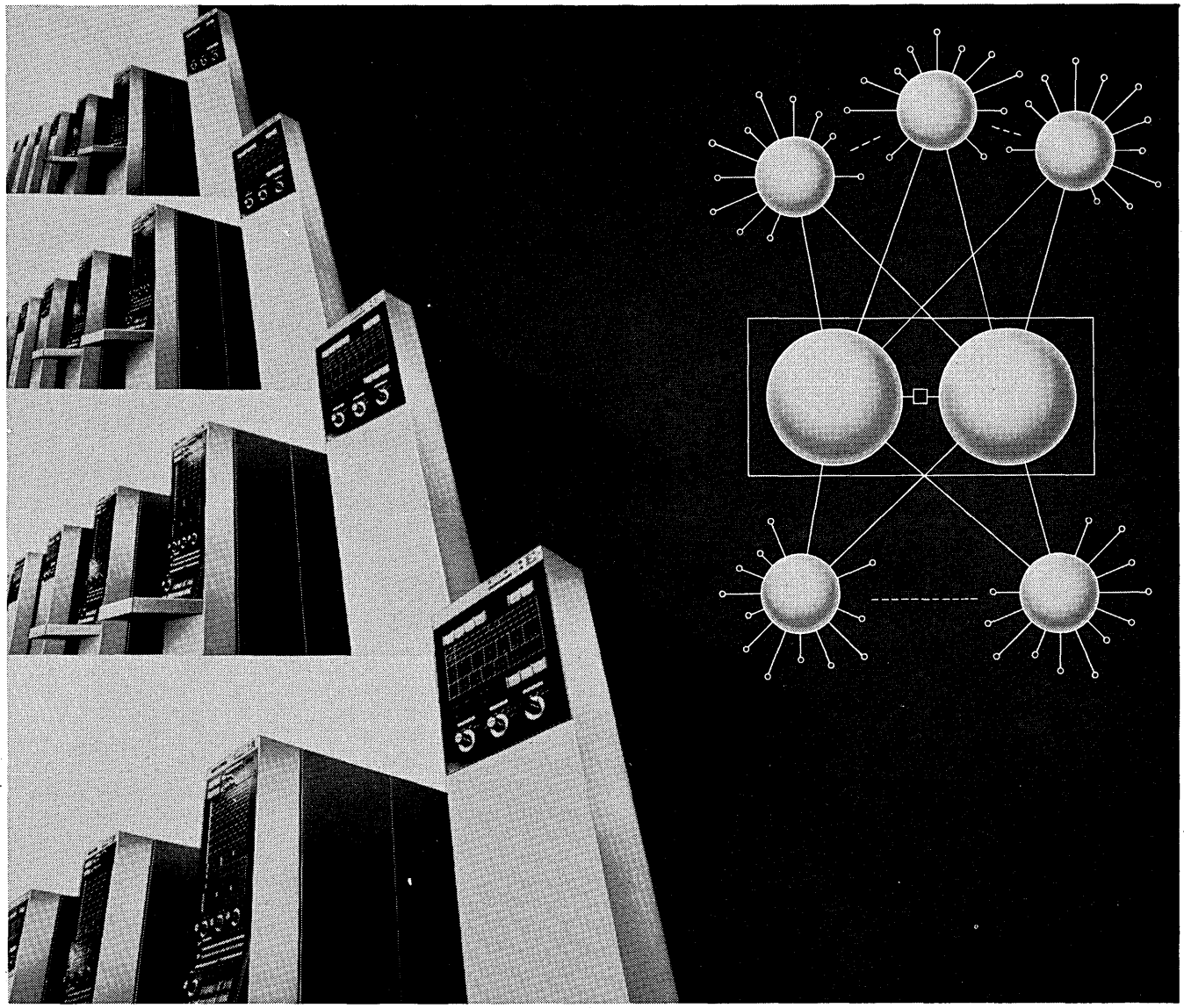
Some day some person or group without a vested interest in triplication of systems will undertake the research needed to develop the above mentioned engineering tools. The result of course will be a significant expansion of the possible market for data products.

Those are the laws. Academically inclined readers are encouraged to attempt quantitative formulations of them. This will make the laws even more believable. □



Mr. Gilb is an independent consultant in Norway, an American citizen who has lived in Europe since 1956. He has been chief of software support at an IBM service bureau and chief instructor at IBM Norway. He has also served as the president of the Norwegian Computer Society.

How 89 Different Banks, with 7,200 Branches, Carry on Exchange.



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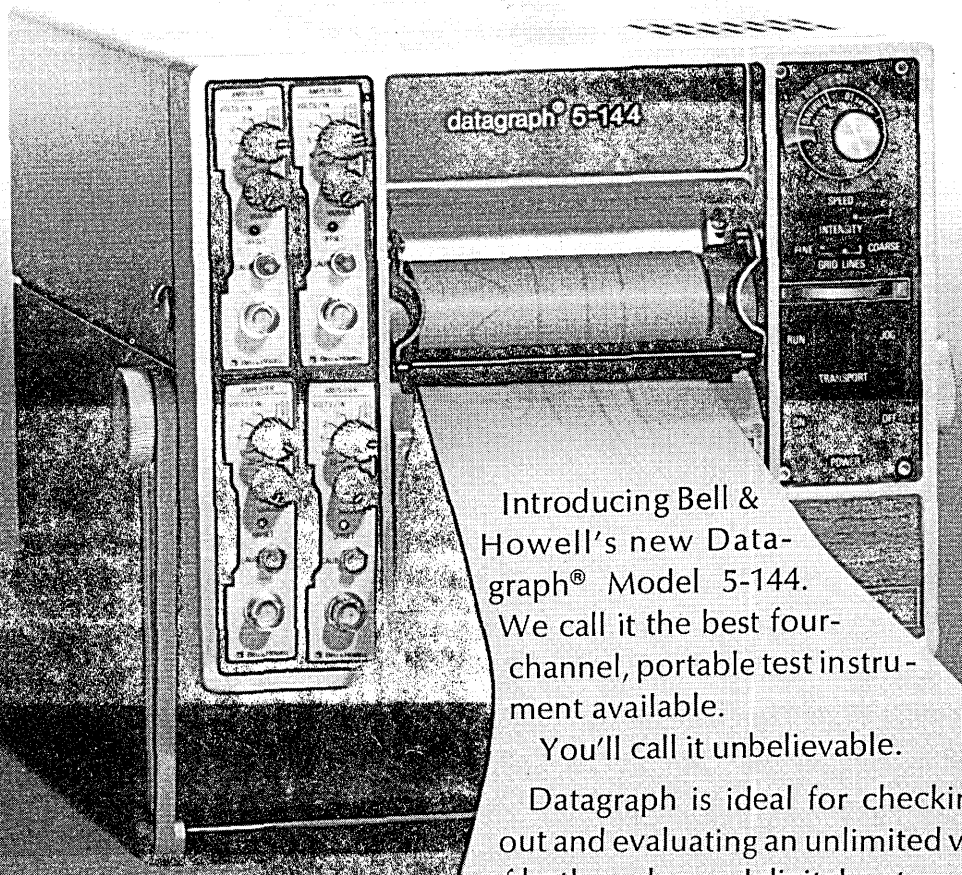

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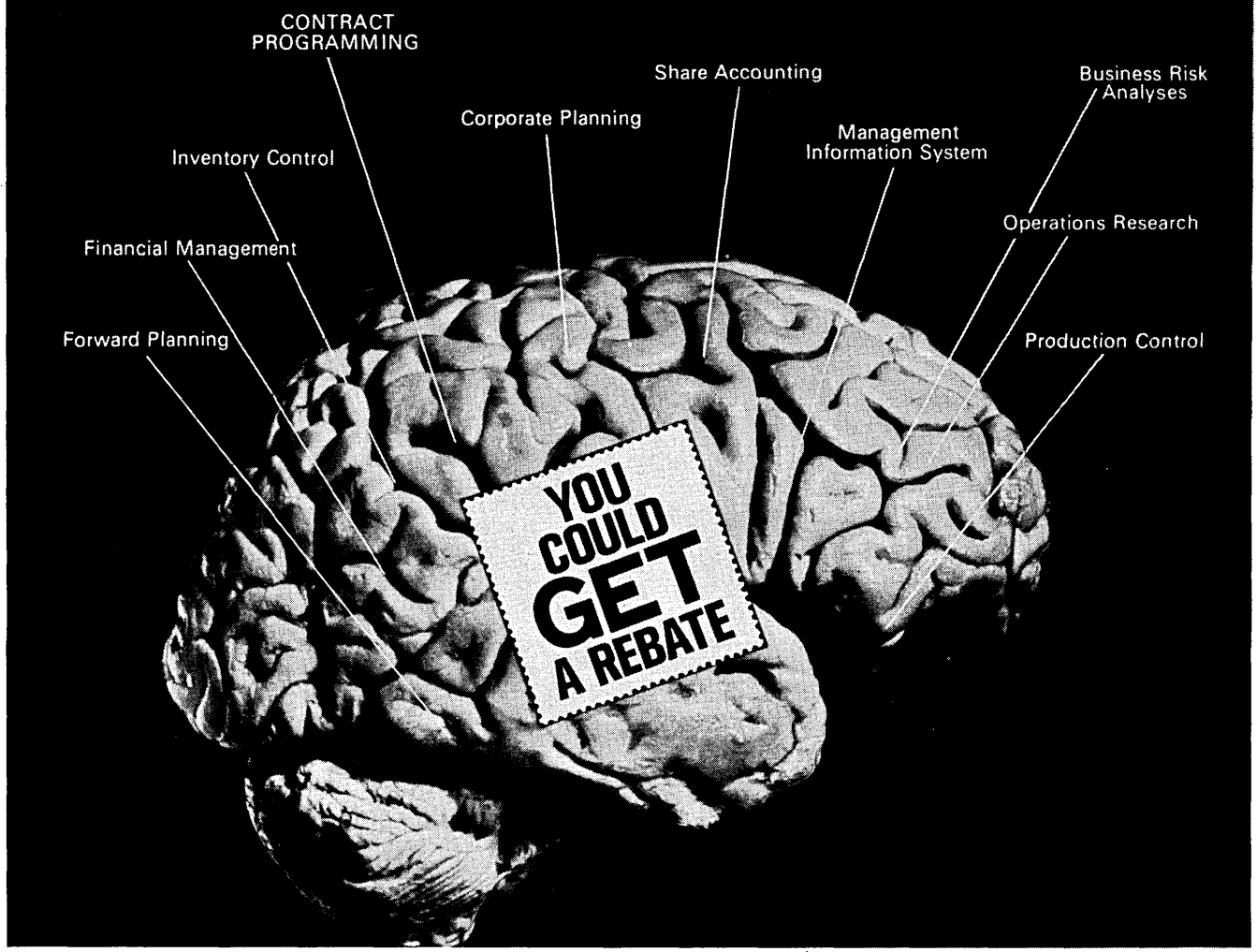

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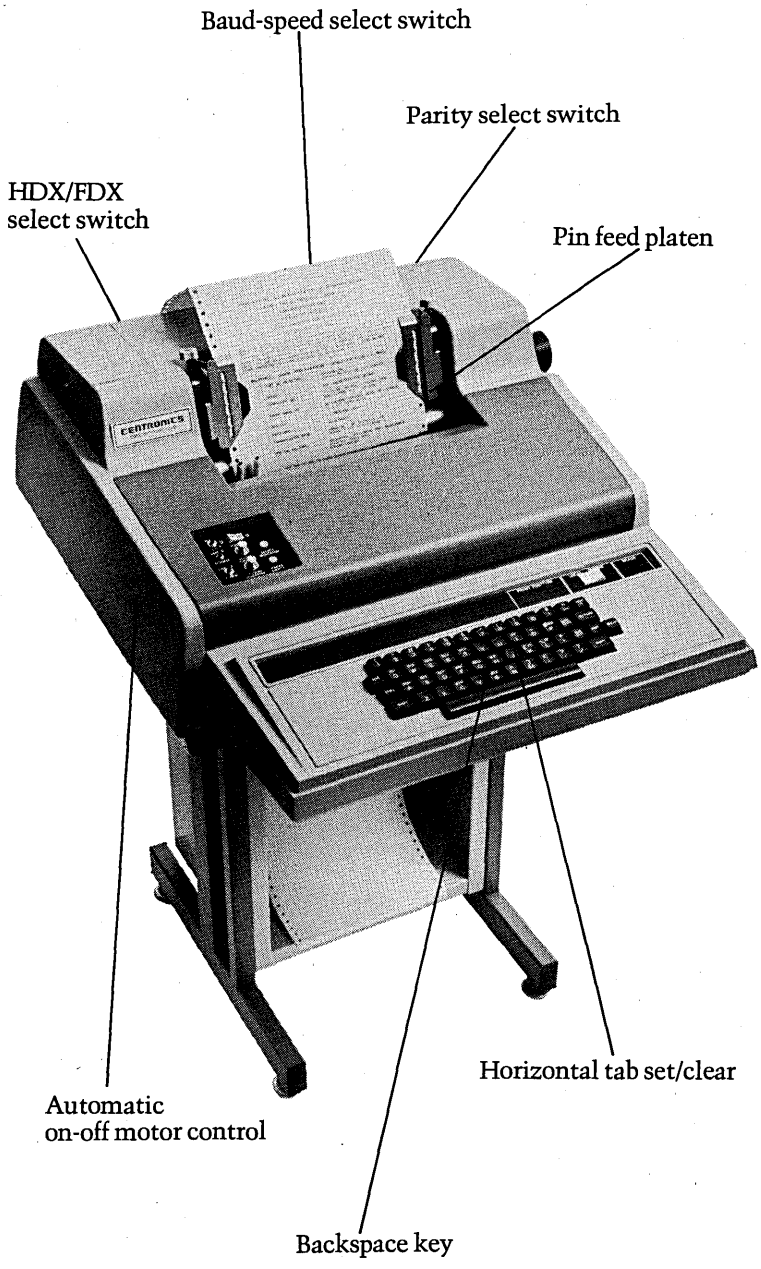

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The presence of
hand-held calculators in the classroom,
welcome or not, is becoming a fact.

CALCULATORS IN THE CLASSROOM

Webster's Seventh New Collegiate Dictionary defines a computer as "one that computes; *specif.*: an automatic electronic machine for performing calculations." According to Webster, at least, hand-held calculators (HHCs) are computers (and indeed offer some provocative questions about the effect HHCs may have on public attitudes toward and relations with edp). According to marketing people, HHCs are the answer to a sales manager's most cherished fantasies. And according to educators, HHCs are a pain in the curriculum.

When the final figures for 1974 are in, they are expected to reveal that some twelve to fifteen million HHCs were sold in the U.S. last year. How many of these found their way into the eager palms of students, however, is unknown; clearly, many of the machines were purchased as gifts. Charles Krakauer, president of Bowmar/ALI, told me: "One of the best selling seasons is the back-to-school season." Last fall, Casio, Inc., began a nationwide sales campaign featuring a television commercial in which a teenager informs the viewer: "Dad said to concentrate on school, not girls. So he bought me a Casio calculator." HHCs are becoming so evident at all levels of education that the question of whether they should be allowed to intrude is moot; the real problem is what to do with them.

Educational institutions are placed in the uncomfortable position of having to cope with a phenomenon over which they have little control, because most HHCs are acquired by the students themselves. Some half-hearted attempts are being made to incorporate calculators in classroom activity, but that requires fairly heavy funding that is simply not available. Thus, HHCs are creating a mass of questions and problems for educators, to which there are pitifully few answers and solutions.

In some colleges, for example, as many as 75% of the engineering, science, and business students own HHCs. Some college bookstores—acknowledged by HHC manufacturers as a prime market—rent calculators to students who cannot afford to buy them. That introduces one of the more obvious problems: students with an economic advantage may be buying an academic advantage. Professor Russell Hardwick, who oversees UCLA's freshman chemistry program, has prohibited the use of HHCs during his department's examinations. He has estimated that the students who use the machines have a ten-minute advantage over those who use slide rules. "I felt," said Prof. Hardwick, "that until all of our students could have access to calculators, none could." That time, however, may not be too far off. A visit to almost any major department store—or, for that matter, a well-stocked college bookstore—will quickly reveal that the price differential between an expensive slide rule and an inexpensive calculator is diminishing at a rate that must be striking terror into the hearts of slide rule manufacturers.

Philosophical questions introduced by HHCs are of minor significance at the college level. If a student has to know the square root of a number to solve a scientific problem, it makes little difference whether he looks it up in a table, works it out with a slide rule, or pokes a few buttons on his little machine. The point is that he presumably knows the mathematical principles and concepts behind square roots. In grammar schools and high schools, however, it is quite another story.

A pupil may be able to come up with the correct answer to a square root problem by manipulating a machine without having the vaguest notion of what a square root is or why it is important. That kind of possibility has raised serious questions. So far, the answers to those questions are few.

Tedium eliminator

For the student with a solid understanding of mathematical theory and function, the HHC is a useful tool because it eliminates a couple of annoying obstacles. "Ordinarily," claims Henry Mullish, of New York University's Courant Institute of Mathematical Sciences, "the major source of errors is the writing down of intermediate results." HHCs remove that "major source" very handily indeed (while striking another blow against the slide rule industry).

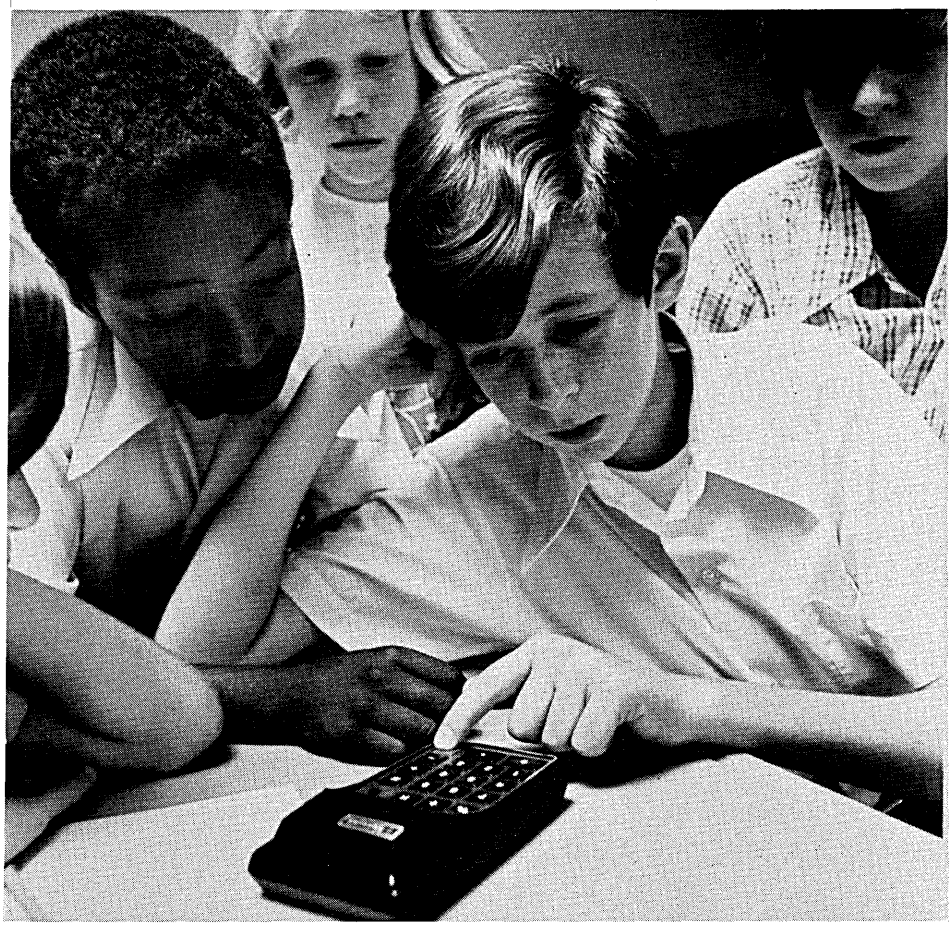
Even more important, however, is the ability of the calculator to relieve the drudgery of computation. Once a student understands, for example, the basics of long division, there is serious doubt as to the necessity of his having to plow through an arithmetic problem like 417.4 divided by 61.331. (The answer is 6.8056936; I worked it out on my calculator.) HHCs seem to be particularly effective in the hands of slow students, who can become so enmeshed in the complexities of computation that the basic mathematical principle, on which they had only a tenuous grasp to begin with, slips away entirely.

A classroom experiment

The impact of HHCs on education has been so swift and so forceful that only now are there any significant attempts to measure their value—or hindrance—in the classroom. In September, 1973, what had promised to be a useful and interesting experiment was begun in upstate New York. Bowmar supplied HHCs to two sixth grade classes for the students to use for a year. So far, only "A Brief Report on an Educational Project" is available, a vague, hedging, and generally inconclusive document. Still, it reveals some interesting results. Ray Barrett and Michael Keefe, the teachers who wrote the report, claim that "the calculators permit in-depth exploration of many mathematical topics which are inherently interesting but which require computation. . . . The calculator is especially suited for verbal problems because *the hardest part of a word problem is knowing what operation to use, not the actual computation. Thus, the progress of the lesson is not slowed by computational activity.*" (Emphasis added.)

The teachers sought creative ways

by Marvin Grosswirth



With calculators, one group of students experienced the joy of individually discovering the decimal placement rule in multiplication, taking an average of 20 minutes to do so. More frequent pedagogical use is to verify answers obtained by hand computation. The question remains, however, whether or not students will now learn the basics when answers are a pushbutton away.

to use the machines not only as aids in computation, but as teaching devices. One of the classes, for example, was given a series of multiplication problems which, for the first time in the pupils' experience, included decimals. They were instructed to record the answers accurately from the calculator in an effort to discover the rule for decimal placement in multiplication:

> "The first child to discover the rule (about 17 minutes) was very excited and most others followed suit in 18 to 23 minutes. Similar success was experienced in seeking rules for divisibility. (How can we tell when a number has 3 as a factor?)"

Barrett and Keefe were also aware of some of the problems they might have faced:

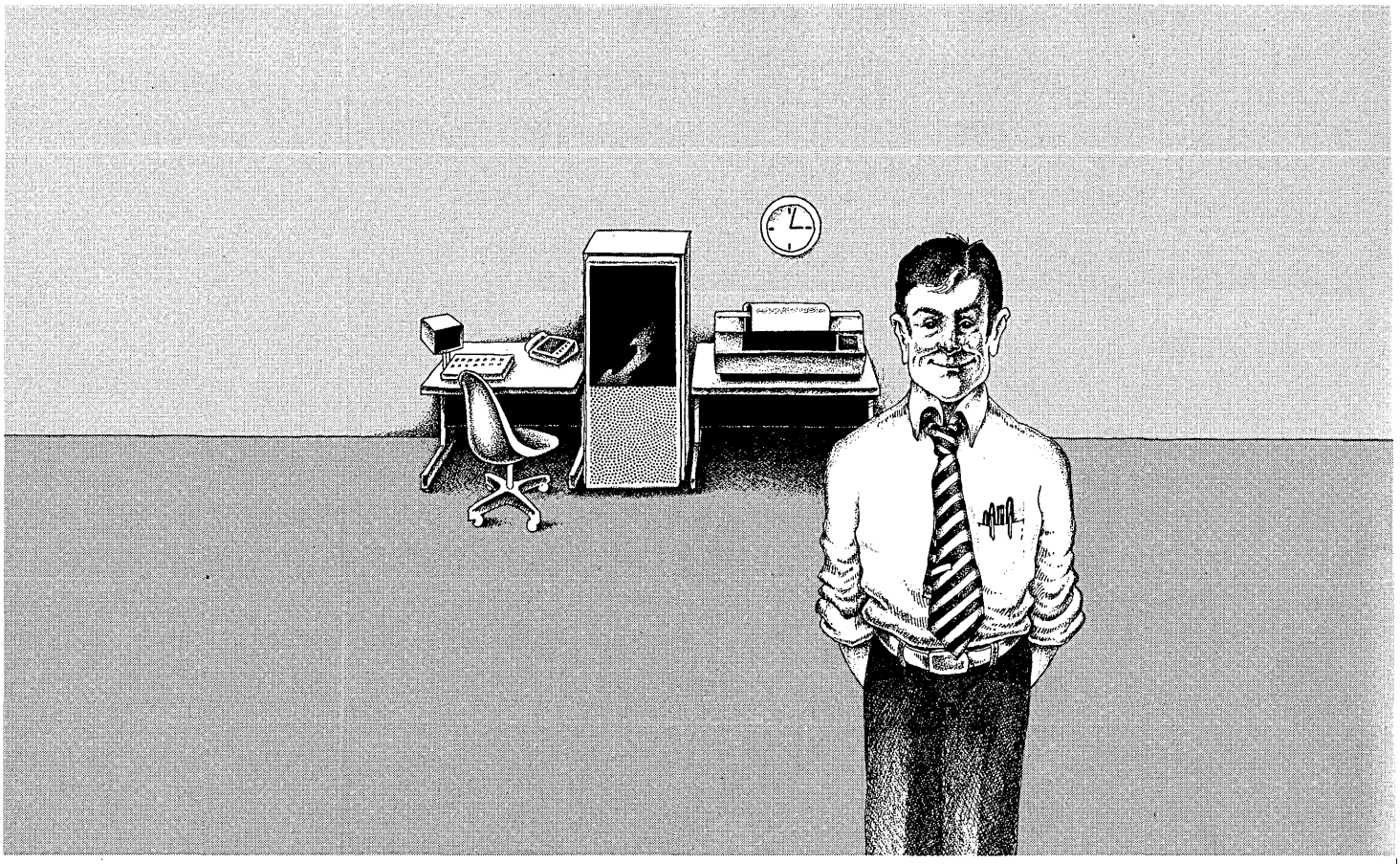
> "It was feared that children would become dependent on calculators—helpless to do ordinary arithmetic without them. We do not know if this is likely to happen but in this project we were determined to use the calculator to help develop understanding of mathematical concepts and basic computational skills. Positive direction insured that the children would not become dependent on the calculators."

In school districts where no formal policy has been established regarding the use of HHCs, many teachers are using their own versions of "positive direction," the simplest of which is allowing the pupil to work out his answers by traditional methods and then verify them on the machine.

While insisting that calculators alone do not a mathematician make, Barrett and Keefe acknowledge that they "seemed to promote and encourage study of mathematics. . . . The pupils' interests were sustained during the year. . . . They accepted the calculator as a tool to help them become more independent and proficient in math classes."

Other educators tentatively reinforce that conclusion. Although the State of Illinois has not conducted any formal research, Michael J. Bakalis, Superintendent of Public Instruction, has gotten some reaction from teachers. "There appears," he says, "to be evidence that students who have a history of difficulty in conceptual understanding profit from the use of calculators because of their mechanical nature." Alice R. Kidd, Mathematics Consultant for the Texas Education Agency, reports: "Feedback from those schools in which the calculator . . . is being used indicate that they provide motivation, understanding of place-value, and other concepts for the student who has had difficulty with mathematics."

Still, these conclusions are—well, inconclusive. The New York State experiment conducted by Barrett and Keefe, the most comprehensive study so far, covered a relatively short period of time and included a mere 58 students from one given cultural and economic environment—a small town in an Eastern state. Furthermore, despite the rapidly declining costs of HHCs, economics is still a major factor. Some HHC hucksters insist that in the classroom of tomorrow, calcu-



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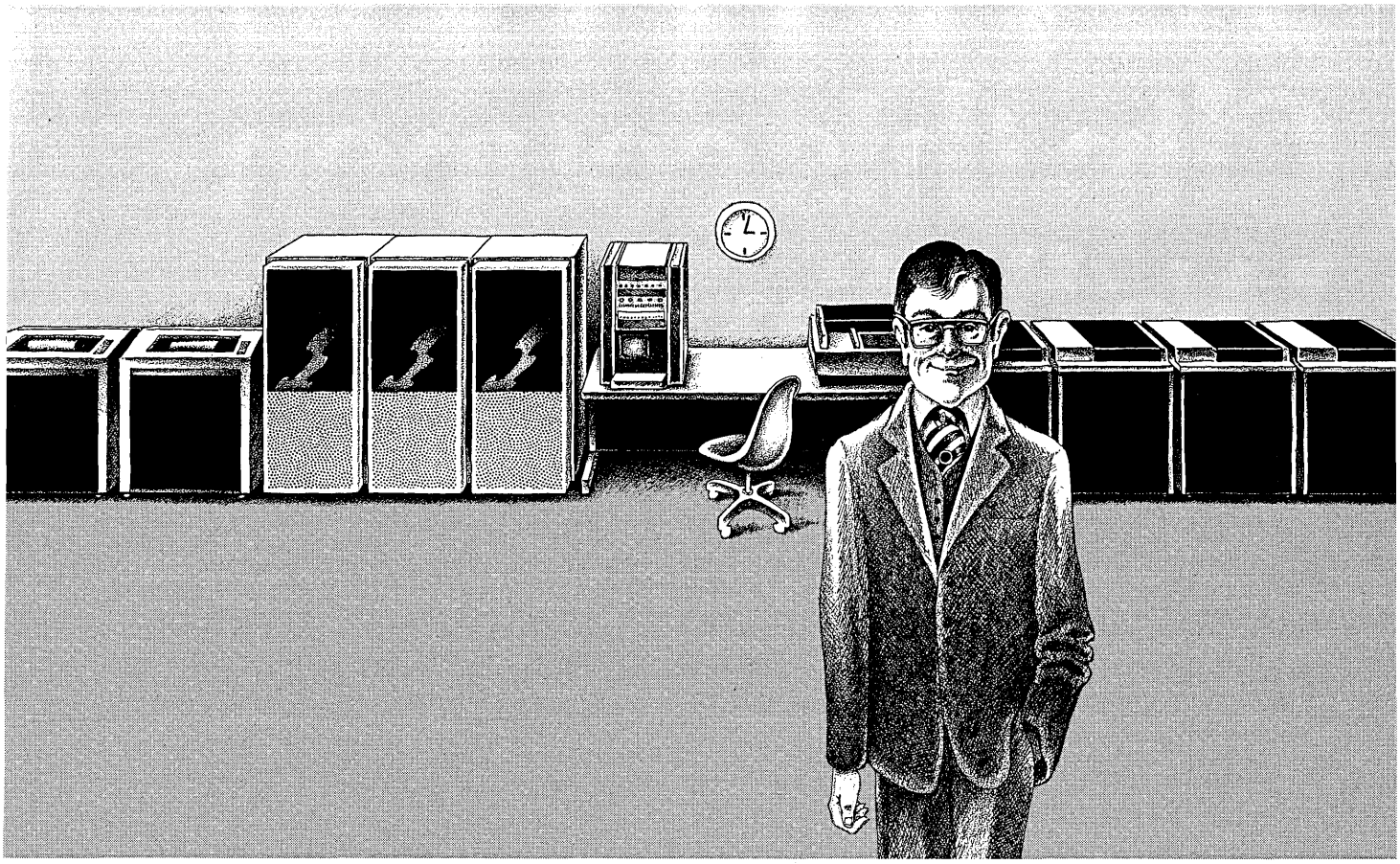

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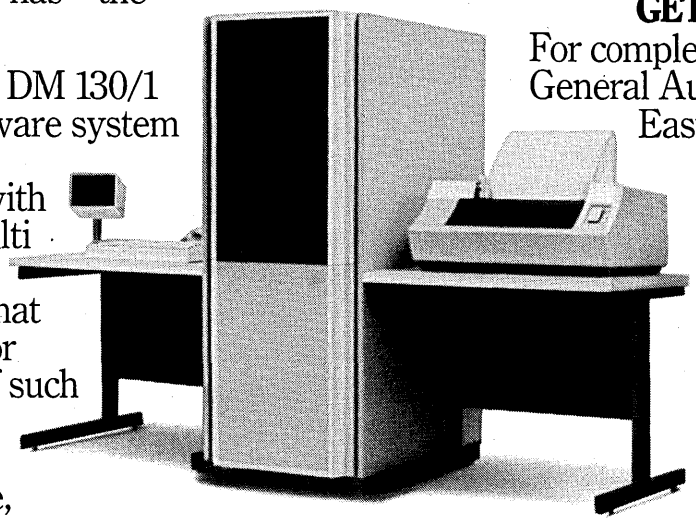

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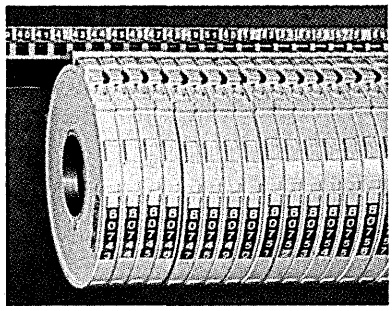

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lators will be built into the desks. But that tomorrow is a long way off. Federal, state and municipal funds are becoming increasingly scarce and school systems can barely meet the costs of textbooks, let alone gadgetry. For the time being and for a long time to come, only those students whose parents can afford HHCs will have them. If HHCs do "promote and encourage study of mathematics," then educators must face the real possibility that kids in middle-class schools will be better educated mathematically than their ghetto counterparts. It is merely another variation of an old theme.

Still another question that HHCs raise is that of possible influences on a child's future. In Germany, Olympia began an eighteen-month experiment in 1972. One group of elementary school students was given HHCs; another group was given typewriters. Again, the elapsed time is too short to formulate any hard data, but indications are that those children who were given the calculators tended to develop interests and skills in mathematics, while those given the typewriters tended to gravitate toward the liberal arts. The questions, as yet unanswered, are disturbing: Did the machines make it easier to choose a path that the students would have chosen anyway? Or did the students choose the path *because* the machine can smooth the way?

These questions have some fascinating ramifications. Perhaps HHCs in the classroom will be instrumental in determining who will staff the edp departments of the future. An aptitude for a Bowmar Brain, a Casio Mini, or a TI-1500 could indicate an aptitude for an IBM 370. Even if children who use HHCs do not become dp professionals, their use of the machines could rationalize the typical person's attitude toward edp. Having used a little computer in school, and having seen the importance of his own input in causing that little computer to function, a pupil could grow up less in awe of "The Computer" than his parents did. He could assume that foulups and mishaps are the fault not of a computer but of the people controlling it. That may have a somewhat undermining effect on the mystique and charisma of the dp profession, but it will certainly do tomorrow's consumer no harm.

If HHCs tend to reinforce favorable attitudes toward computers, the converse may also be true. Alice Kidd, the Texas math consultant, says: "There are many schools in Texas that have placed calculators and programmable computers in their classrooms. These are located in special education classes, mathematics classrooms and laboratories, and in vocational classrooms." In Texas at least, the HHC is seen as nothing more than part of an educational philosophy and curriculum that employs computers as tools for studying other subjects. "There are some schools in Texas," Ms. Kidd advises, "that are planning to use a Computer Assisted Instruction (CAI) program for skills development; however, most schools are using the computer as an aid rather than as a total program." She believes that "the use of these machines will probably be increasing as funds are made available to buy such instructional aids."

But other educators are far more equivocal. Illinois Superintendent Bakalis does not "anticipate prohibiting the use of hand-held calculators in the schools of Illinois. The decision on their use will be determined by each school district." Erwin A. Decker, of California's State Department of Education, reports that his department "has not conducted any research as to their [HHCs] value and has formulated no firm policies in regard to their use." Neither, apparently, have most other educational authorities. A typical attitude is that of Alabama: "The Alabama State Department of Education neither encourages nor discourages the use of hand-held calculators in the classrooms," says Lloyd M. Crook, Chief Education Specialist (Mathematics and Science). He is, however, "cognizant of favorable reports from teachers who allow the use of calculators for creating and promoting interest, checking calculations, and organizing problem-solving processes and techniques. Our services are available to teachers who wish to develop instructional programs around the use of calculators."

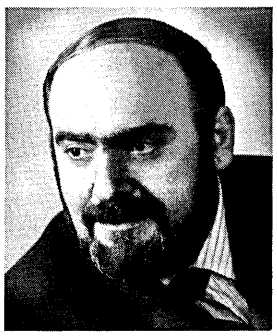
Needed: educators' decisions

Such evasive policies that include passing the buck to individual school districts and even to individual teachers will soon have to be replaced with some firm decisions. Those decisions will be based on observation, either formal or informal, but the proliferation of HHCs is making the need for answers to all the questions increasingly urgent. There are, however, some assumptions that can be made from the data already available:

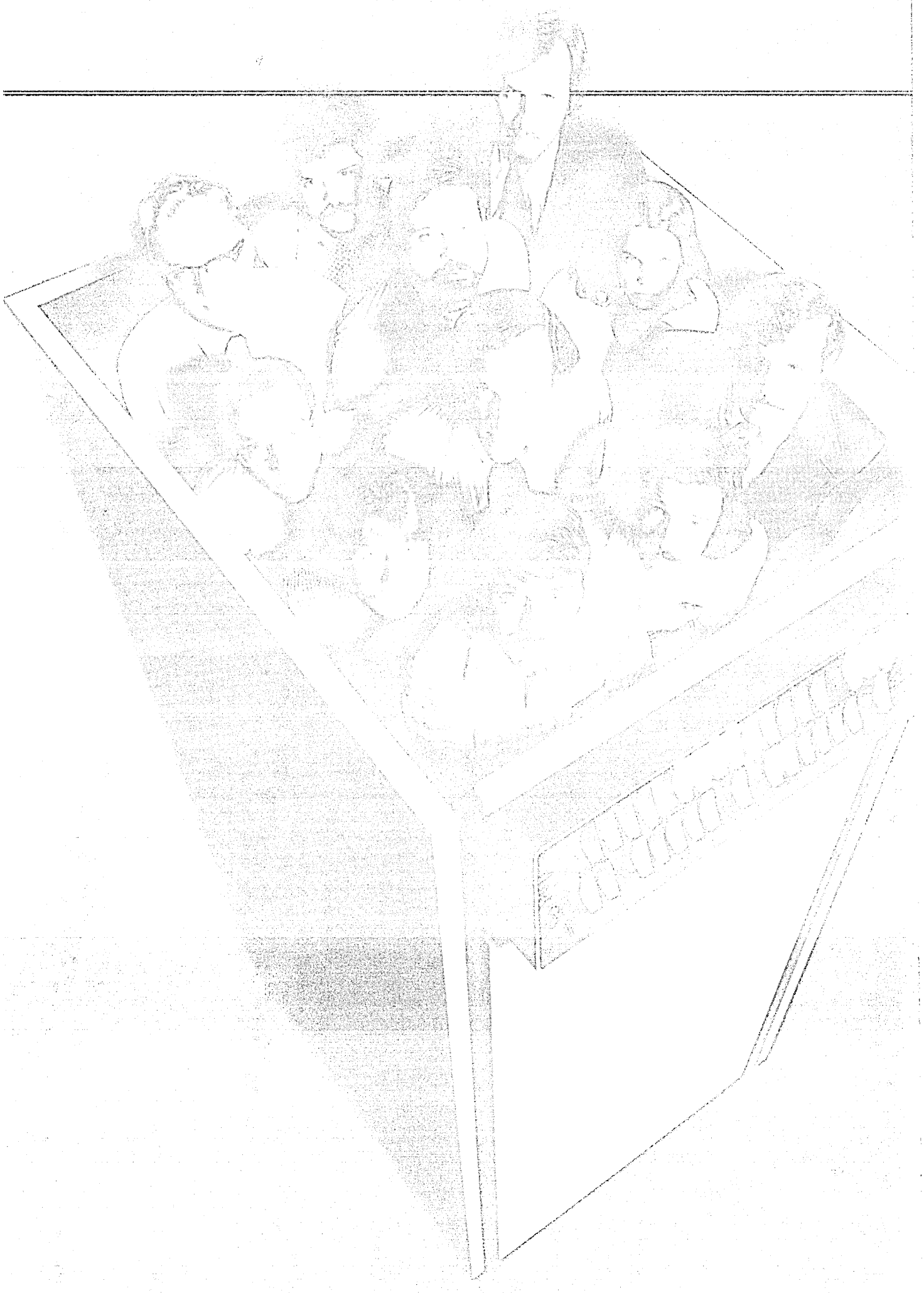
- HHCs cannot be ignored. They are not a fad or a gimmick but a serious factor with which educators must contend. The likelihood of HHCs becoming part of standard classroom equipment seems remote, but many students own machines and unquestionably are using them for homework, if not for classroom work.
- In general, HHCs appear to have a positive effect on the study of mathematics. Teachers report that they motivate students, help to maintain a high level of interest, help good students advance more rapidly, and aid poor students in grasping mathematical concepts.
- Unless their use is carefully monitored by teachers and parents, HHCs can become a mathematical crutch on which poor or lazy students lean, to the detriment of their intellectual and mathematical development.
- The use of HHCs has some implications for the data processing field in terms of career selection, attitudes toward dp, and the increasing use of computers of varying degrees of sophistication as educational tools.

These are, of course, basic and fairly early conclusions. The need for precise data is becoming increasingly urgent. Just how urgent was brought home to me a few days ago. Through a rather efficient grapevine, the director of a major university press which specializes in education publications learned that I was researching this article. He asked for a copy when it was published, and when I wanted to know why, he told me that his organization was in the midst of preparing standardized math tests for grades 3 through 12. The educators working on the project were bogged down because they had no idea whatsoever as to whether or how HHCs should be considered in the preparation. There is a paucity of available information and he hoped that this article might offer some help.

I hope so, too, but ultimately, the data will have to come from the education community, and the consensus seems to be: the sooner the better. □



Mr. Grosswirth is a freelance writer, the author of three books, and a member of the Society of Magazine Writers, Authors League. He is also the national chairman of Mensa.



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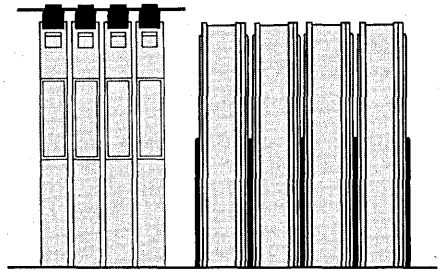

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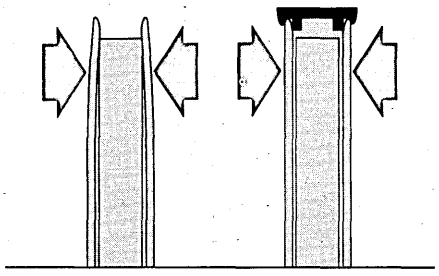

Self-threading Cartridges also offer greatly superior protection than canisters, but because of the need for running clearance they cannot provide the maximum protection of Tape-Seal Belts. They do, however, offer increased handling speed at the drive since they do not have to be removed.

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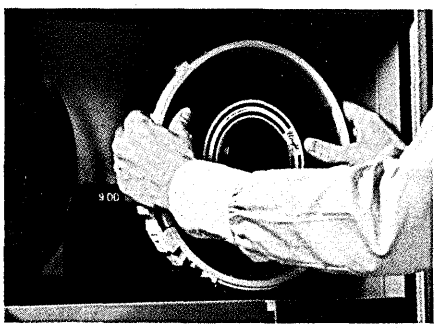

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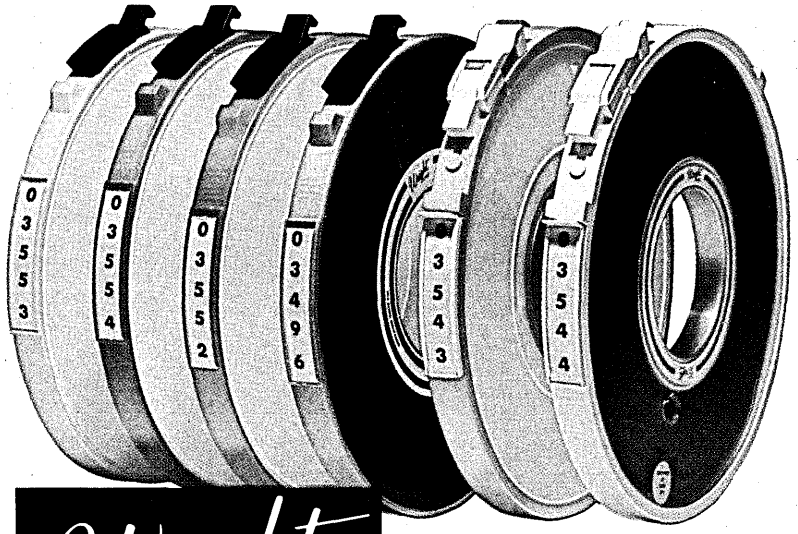

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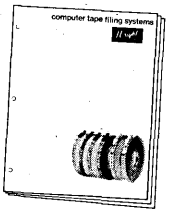

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Antitrust

Denver Judgment Weakens Most Cases Against IBM

Appeals court agrees with IBM market share and interface arguments

Lawyers like to speak of precedents. But there was no precedent for IBM's stunning victory over Telex in the federal appeals court in Denver.

IBM's victory was virtually total, maybe final, possibly ominous. The decision relieved—at least temporarily—what was beginning to look to outsiders like a bunker mentality in Armonk and while there weren't any champagne bottles popping at IBM headquarters at Armonk, an elated Frank T. Cary, IBM's chairman, did at least allow as how he was "very pleased" with the decision.

Meanwhile, in Tulsa, the reclusive but impulsive Roger Wheeler, Telex' chairman, was publicly silent. Privately, however, Wheeler and his lead attorney, Floyd Walker, were planning to take the case to the Supreme Court after Telex exhausts its final legal appeal before the U. S. Court of Appeals for the Tenth Circuit, which issued the decision in late January.

Seldom if ever before has an entire industry been in suspended animation for so many months waiting for a court decision and, partially for this reason, IBM's triumph represented a tremendous psychological victory. Moreover, if the decision holds up in the Supreme Court, it will not only strengthen IBM's position in its antitrust suits with other firms and with the Justice Dept., but an affirmation of the Telex decision by the Supreme Court could emasculate the arguments of those additional suits.

The concrete is mixed

While the initial 221-page Telex-IBM decision by Judge A. Sherman Christensen was written in a measured precise manner and displayed Judge Christensen's understanding of the complexities of the computer industry, the 94-page appeals court decision was a more generalized, sweeping document that was at times somewhat vague on the intricacies of the computer industry and how the law relates to the industry. There was nothing vague about the Denver court's judgment, however. The decision carries enormous force and while the findings and judgment of the appeals court are not yet cast in concrete, the Denver judges have at least mixed the concrete for the Supreme Court.

What did the decision say?

Essentially two things: That IBM committed no predatory acts against its competition in the peripherals business, and that IBM's market share in the edp industry in general and in the peripherals area in particular was small enough that IBM had no monopoly power.

At the heart of the decision was the issue of market share. The appeals court ruled that Judge Christensen had erred on the issue of market share. Of Christensen's decision, the appeals court stated: "The court's very restrictive definition of the product market in the face of evidence which established the interchangeable quality of the products in question, together with the existence of cross-elasticity of demand, must be regarded as plain error."

Relevant market

While Judge Christensen found that IBM possessed monopoly market power in the IBM plug compatible business, the appeals court did not look so narrowly at the IBM plug compatible market as a separate and distinct market, but rather said that the relevant market was really the market of "all peripheral products, those compatible not only with IBM CPUs but those compatible with non-IBM systems."

This judgment, of course, opened up the relevant market to a much larger entity and one in which IBM's market power is diffused and, thus, not as likely to carry monopoly market power. In arriving at this conclusion the appeals court judges relied heavily on the judgment that all computer peripheral products "are fully interchangeable and may be interchanged with minimal financial outlay."

The appeals court placed great emphasis on the precedent of an important antitrust decision concerning market share. In the so-called DuPont decision, DuPont was held not guilty of monopolizing the cellophane market because there were other flexible wrapping materials that were "reasonably interchangeable" and thus easily substituted for cellophane.

What to argue

Other peripheral manufacturers with antitrust suits against IBM are zeroing in on that aspect of the Denver appeals court decision, arguing: first, that it is extremely difficult to build peripheral interfaces for IBM equipment; and second, that peripherals manufactured for non-IBM mainframes aren't "reasonably interchangeable" or "fully interchangeable" with IBM mainframes because they aren't compatible with IBM equipment.

In addition, the appeals court's upholding of IBM's trade secrets counterclaim case against Telex is expected to be used by plug compatible firms in arguing against the main case. (In the counterclaim case, the Denver court ruled that Telex must pay $18.5 million for damages to IBM for pirating IBM trade secrets in the peripherals case.) The question here is how the appeals court could, in one case, rule that "peripheral products are easy to make and may be interchanged with minimal financial outlay" while, in a companion case, rule that Telex pirated IBM's peripheral products trade secrets causing damages against IBM of several millions of dollars. What was not clear to plug compatible firms was how Telex could be charged with misappropriating something the court itself had found to be easy and inexpensive to make.

On the subject of market share statistics, a census of the computer industry

that IBM initiated for use in antitrust cases took on a new importance as a result of the appeals court decision. Telex and other firms which have instituted antitrust proceedings against IBM have counted upon their ability to use IBM's internal records and actual business working documents on market share.

Indeed, Judge Christensen argued that the IBM plug compatible peripherals market was a separate market in part because IBM's internal documents and records looked upon it as a separate market. But, the appeals court skipped over the IBM internal documents as the court built its case against a separate IBM pcm market. Also, the appeals court discounted other incriminating IBM documents and, if similar reasoning is utilized by the Supreme Court and the other courts presiding over IBM antitrust cases, then those cases will be weakened considerably.

The census was taken for the IBM-Control Data case (which ended two years ago in settlement) and some 2,700 firms responded to the census. That number was whittled down to 1,786 firms and today, with the weight of the appeals court decision behind it, that figure stands as the number of firms competing with IBM, which is listed as having a 35.1% share of the computer systems industry. That percentage, of course, is considerably smaller than the 70% that others have long argued is the percentage of the computer systems market possessed by IBM.

The appeals court found that there were some 100 firms competing with IBM in the IBM plug compatible market and 250 firms in the entire peripherals market. The appeals court ruling that the relevant market was *all* peripherals products meant that IBM's market share dropped significantly—for instance, to 45% of the tape market, 30% of the disc and memory market, and 38% of the printer market.

If the Supreme Court upholds the appeals court, then the census would gain credence as a finding of fact in the Justice Dept. case and in other antitrust cases with IBM. In addition, any of the 1,786 IBM "competitors" could then become candidates for competitive action similar to that which IBM employed against the plug compatible firms. The feeling is that IBM would be free, for instance, to engage in selective price cutting against any of the 1,786 competing firms, such was the sweeping exoneration that IBM received from the appeals court.

Hunting license

"The appeals court has given IBM a hunting license to take whatever competitive action it deems appropriate on an industry segment-by-segment basis," said A. G. W. Biddle, executive director of the Computer Industry Assn. which represents some 50 companies in the dp equipment and services field.

The appeals court's ruling on market share was also crucial to its judgment that IBM committed no predatory acts against Telex. Judge Christensen said that some of IBM's actions against Telex were normal business practices, but because IBM possessed monopoly power (based on its market share domination of the IBM pcm market) these practices became predatory. Thus, when the appeals court enlarged the relevant market and IBM share of that market dropped, then some actions IBM took against the plug compatible firms were no longer "predatory" but were established ways of meeting competition.

Morever, the Denver judges—Oliver Seth, William Doyle and Robert McWilliams—systematically knocked down Judge Christensen's findings that IBM took actions that were predatory in and of themselves. Originally, Judge Christensen found that IBM had committed predatory acts in price cutting the 2319A and 2319B disc drives, in the implementation of the fixed term and the extended term leasing plans, and in certain pricing policies in which it lowered prices on its memory products and raised prices on its central processing units.

"The 'acts' found by the trial court to be illegal were ordinary marketing methods available to all in the market," said the appeals court. "As to pricing, the trial court found it was used by IBM only to a limited extent, that is, within the 'reasonable' range. The resulting prices were reasonable in that they yielded a reasonable profit. This 'profit' the trial court found to be about 20%."

Faith on Wall Street

The decision had an electrifying impact on Wall Street where the New York Stock Exchange logged record volume on a sustained rally that was powered by the IBM decision. For Wall Street, the decision was proof that there was a God after all and that He had not abandoned them as many on Wall Street had feared. IBM, which is the nation's favorite stock, moved ahead for days after the announcement of the decision.

Telex' stock, however, plunged on the news of the decision and stocks of other peripherals firms dropped on the news as well, many of those firms that considered their antitrust cases against IBM to be one of their biggest assets.

Telex needed some time to collect its wits: It had suddenly lost nearly $260 million in antitrust damages and it owed IBM $18.5 million from the trade secrets

The "Relevant" Market

The list of "manufacturers of plug compatible products," capable of competing in the peripherals marketplace is fascinating. There are many recognized industrial giants on the list like Addressograph, AT&T, Bell & Howell, Bendix, Fairchild Camera & Instrument, General Electric, General Instrument, ITT, and Texas Instruments.

There are also many recognized unsuccessful computer ventures on the list like Cogar, Ovonic Memories Inc., Data Recall, Ex-Cell-O Corp., Redcor, Standard Computer, and Syner-Data.

One of the best known firms on the list, Scientific Control Corp., filed for bankruptcy in 1969 in a glare of publicity. Well-known suppliers of computer peripheral computer products like Control Data, Memorex, Mokawk Data Systems and Telex are on the list but most of the firms are simply not generally recognized as computer plug compatible manufacturers and some, indeed, are not recognizable at all —either as successful or as flops. In addition, a few of the firms are counted more than once.

The listing is understood to have been compiled by IBM. The firm itself is noted in the listing as manufacturing plug compatible products offered for attachment to equipment manufactured by several firms including Bunker-Ramo, Control Data, Honeywell, SEL, Raytheon and Univac. According to a preface to the listing, the compilation was based on a census of the industry (initiated by IBM in pretrial proceedings in the Control Data-IBM antitrust case) and upon various government and press sources. One source, the DATAMATION 1972 Industry Directory, has gone the way of many of the firms listed—it has folded. □

theft case. The Oklahoma firm still has a few months of grace left before it must pay IBM, because no money is due until all appeals have been exhausted.

There is still the possibility that the case could be settled. That course now has sufficient appeal to Telex and even IBM might wish to get the case out of the way to be able to concentrate on the upcoming government antitrust case.

A few days after the decision, Telex announced that it had made a small profit during its fiscal third quarter that ended Dec. 31. Telex reported a profit of $365,000 on sales of $24.5 million. However, the firm still owes a whopping $49.6 million in bank debt and that loan continues to weigh heavily on the firm.

And what of the marketplace?

"The Telex decision is very discouraging to anyone making equipment that attaches to IBM," said Frederick G. Withington of the Arthur D. Little Co. "For the future, this pushes the industry and the competition towards consolidation."

Withington said the decision means that IBM will now be able to "drop prices selectively" provided the firm maintains a profit "as IBM shows it." And, because of IBM's huge volume and its resultant economies of scale, some competitors will find it difficult to battle in the marketplace with IBM.

A case for settlement

The decision could have a big impact on the Justice Dept.'s case with IBM. The feeling is that the government now has its first good opening in several months to settle the case. A settlement while IBM was tainted by the adverse Telex decision would have been difficult. In addition, IBM will surely use the Telex decision in its defense against the government. The Telex decision dropped neatly into an opening in time between a ruling to allow the government to introduce the peripherals case in the Justice Dept. suit, and the planned start of the government trial.

There are still several antitrust cases pending against IBM and at least three of these in the peripherals area were enough removed in issue from the Telex case that they were being pressed forward. These are the cases filed by Sand-

"IBM DID NOT HAVE MONOPOLY POWER"

Excerpts from the appeals court decision issued Jan. 24:

" . . . The number of companies in the electronic data processing business grew from thirteen in 1952 to 1,773 in 1970. Nevertheless, IBM, although originally dominant, steadily declined. It had 64.1 per cent of the electronic data processing revenues in 1952, but only 35.1 per cent of the total revenue in the year 1970. Although IBM was recognized as an industry leader, having more revenue from the industry than any other company, it did not, according to the finding of the trial court, have monopoly power. . .

"In making its finding as to the scope and extent of the plug compatible peripheral, the trial court used IBM documents which found that the original entry into the market was relatively simple and easy because the manufacturer needed only to produce the peripheral device and he could copy tested IBM peripheral products. The number of manufacturers of IBM peripherals rose from two or three in 1966 to approximately 100 as of the time of trial. Telex and some eleven others were the major manufacturers of IBM plug compatible products.. . .

"The main quarrel of IBM with the court's determination of the relevant market is that it is limited mainly to peripheral products plug compatible with IBM's equipment. It encompasses only part of the peripheral equipment marketed by Telex and the other plug compatible manufacturers. It fails to include the peripheral equipment market by systems manufacturers other than IBM. . .

"Over 250 companies manufacture peripheral devices for use in non-IBM computer systems, and 100 of these companies supply peripheral products for IBM systems. Because it is relatively easy to adapt peripheral equipment for installation in another system, most companies (including Telex) market their equipment for installation in more than one system. Thus, the 'plug compatible' peripheral equipment marketed for use in one system is the same as that marketed for use in another system, except for a necessary change in the 'interface.' IBM claims that the cost of modifying an interface so that it can be used with another system amounts to less than 1% of the product's purchase price. . .

"The threshold issue is whether the court erred in its findings as to the scope and extent of the relevant product market for determination whether there existed power to control prices or to exclude competition, that is, whether there was monopoly power. As heretofore pointed out, the court determined that the relevant product market was limited to peripheral devices plug compatible with IBM central processing units . . . IBM had sought a determination that the relevant product market consisted of electronic data processing systems together with the products which are part of such systems or at least that the relevant product market should consist of all peripheral products and not be limited to those currently attached to IBM systems. . .

"Our question is, therefore, whether it was clearly erroneous for the court to exclude peripheral products of systems other than IBM such as Honeywell, Burroughs, Control Data Corp. and others, together with peripheral products plug compatible with the systems and, indeed, whether the systems themselves manufactured by the companies are to be taken into account. It is significant, of course, that peripheral products constitute a large percentage of the entire data processing system, somewhere between 50 and 75 per cent. . .

"We then must inquire whether this market definition was correct in light of the following factors:

"1. Should peripheral products not plug compatible with IBM systems be considered part of the relevant market in view of the existence of easy and practicable interchange of these products by use of interfaces designed for this purpose?

"2. Should not the peripheral products plug compatible with systems other than IBM be considered part of the relevant market because of the admitted competition existing as between system manufacturers on a system by system basis in which the peripherals are a significant part of the system? . . . "The factor of ease of designing interfaces to allow interchange of peripherals was obviously troublesome to the court (Judge Christensen) and this trouble continued after the court had rendered its decision. He was still treating the issue on October 17, 1973, in the post-trial hearing . . . The court's final words on the subject were: 'I'm down to the edge lawn, and I think the best service I can do is to speed the matter to that final determination. If I'm wrong on my market definition, then you (IBM) did what you had a right to do.' . . .

"It seems clear that reasonable interchangeability (of peripherals) is proven in the case at bar and hence the market should include not only peripheral products plug compatible with IBM cpu's, but all peripheral products, those compatible not only with IBM cpu's but those compatible with non-IBM systems. This is wholly justifiable because the record shows that these products, although not fungible, are fully interchangeable and may be interchanged with minimal financial outlay, and so cross-elasticity exists within the meaning of the DuPont decision.

"The court's very restrictive definition of the product market in the face of evidence which established the interchangeable quality of the products in question, together with the existence of cross elasticity of demand, must be regarded as plain error . . .

"The record demonstrates that these acts of IBM are again part of the competitive scene in this volatile business inhabited by aggressive, skillful businessmen seeking to market a product cheaper and better than that of their competitors. To do this, the record shows it was customary for them to study their competitors, all their capabilities, and what may be expected of them when a new product appears on the market. It is IBM's participation in this marketing that the trial court termed 'predatory,' but the record shows this was no more than engaging in the type of competition prevalent throughout the industry. . .

"The judgment of the trial court against IBM must be reversed because it is based upon an erroneous determination of a fundamental element in the case. This element is the 'market' as the term is used in the antitrust laws, and in which the competition, the market shares, the acts, and the identity of the competitors may be evaluated and compared. The trial court's definition of this 'market' was in error as described above.

"The judgment against IBM must also be reversed because, as stated above, the findings of fact as to the 'acts' of IBM made by the trial court when evaluated under the Sherman Act and when set in the context of the prevailing court opinions do not constitute a violation of law." □

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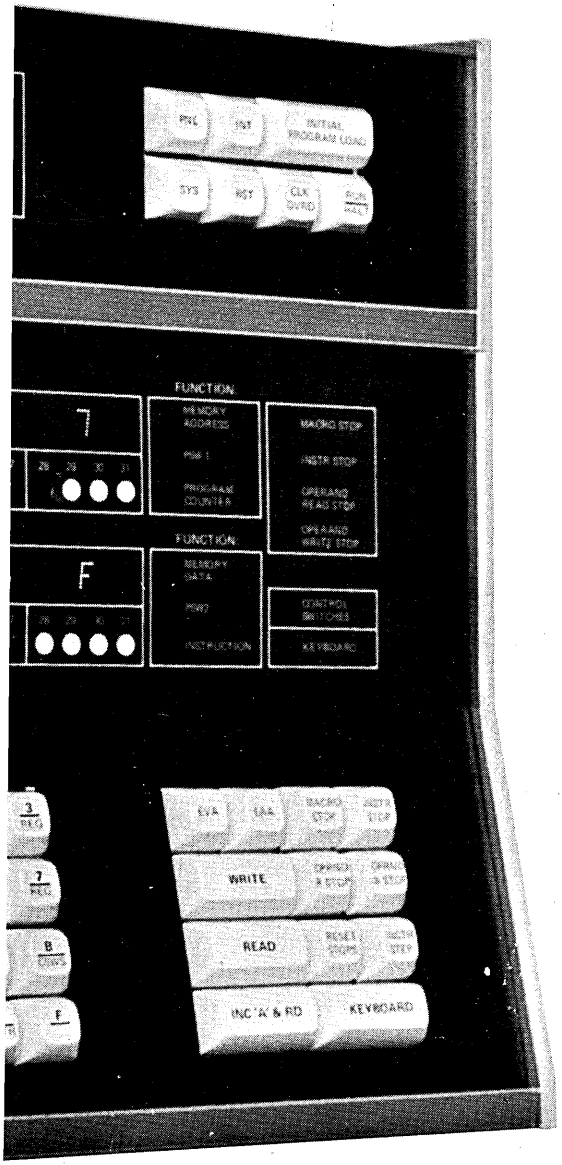

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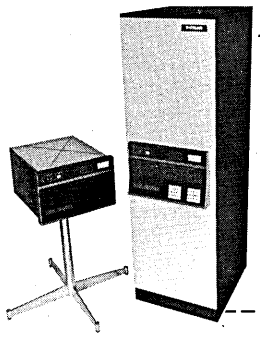

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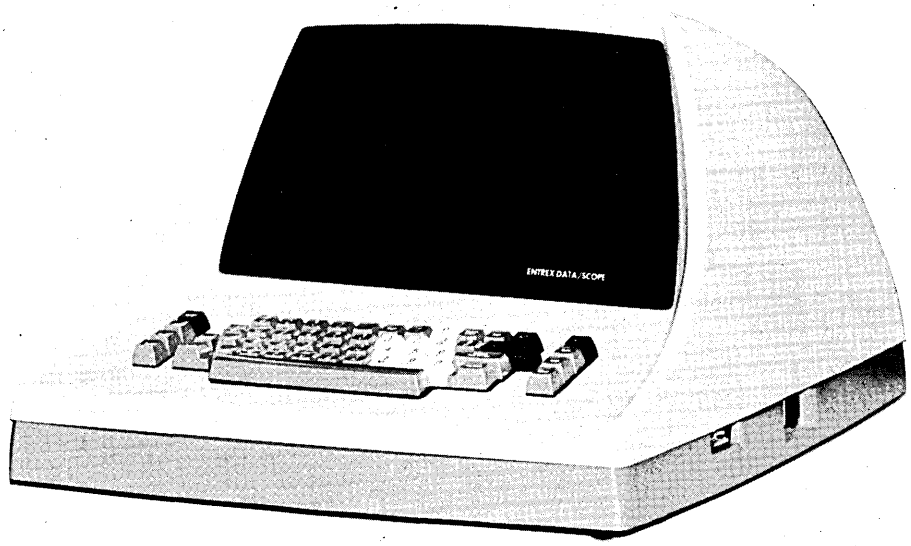

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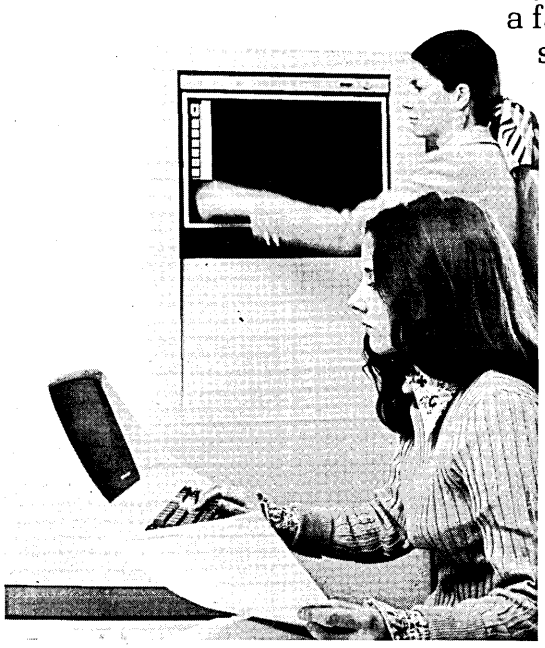

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ers Associates, CalComp and Memorex. All three cases are different, but the Sanders Associates' case will hit one of the rulings of the Telex decision head on: That it is easy to make interfaces for IBM plug compatible peripherals.

At least three antitrust cases against IBM had been modeled closely after Telex' case and the future of those cases–by Transamerica Computer Co., Hudson General Corp., and Marshall Industries, Inc.–was less optimistic.

But, more than anything perhaps, the decision was a tribute to IBM and the firm's famed esprit de corps. After Judge Christensen had humbled "this great organization"–as the Judge called IBM–with his September 1973 ruling that IBM was guilty, the company was initially in a state of shock. But IBM management and its outside lawyers under Thomas Barr pulled themselves together and came before Judge Christensen for appeals motions.

It was what athletes call "a tremendous second effort" and, as a result of IBM's arguments, the judge watered down his antitrust damages against IBM and loosened up on the injunctions he had ordered against IBM. By this time, also, Telex had lost many of its technical experts who had been assisting the attorneys in the preparation of the case and there are those who feel that this slowed the Telex effort.

—W. David Gardner

The Economy

Two for Depression

Three electronics executives on a WEMA panel last month were asked the question: are we in a depression or a recession. Two answered depression. The third answered yes.

The votes for depression were cast by Lester Kilpatrick, chairman and president of California Computer Products, and Patrick Cadigan, president and chief executive officer of the Electronic Engineering Co. of California (EECO). Opting for "yes" was Charles Kovac, vice president and general manager, Microelectronics Device Div., Rockwell International Corp.

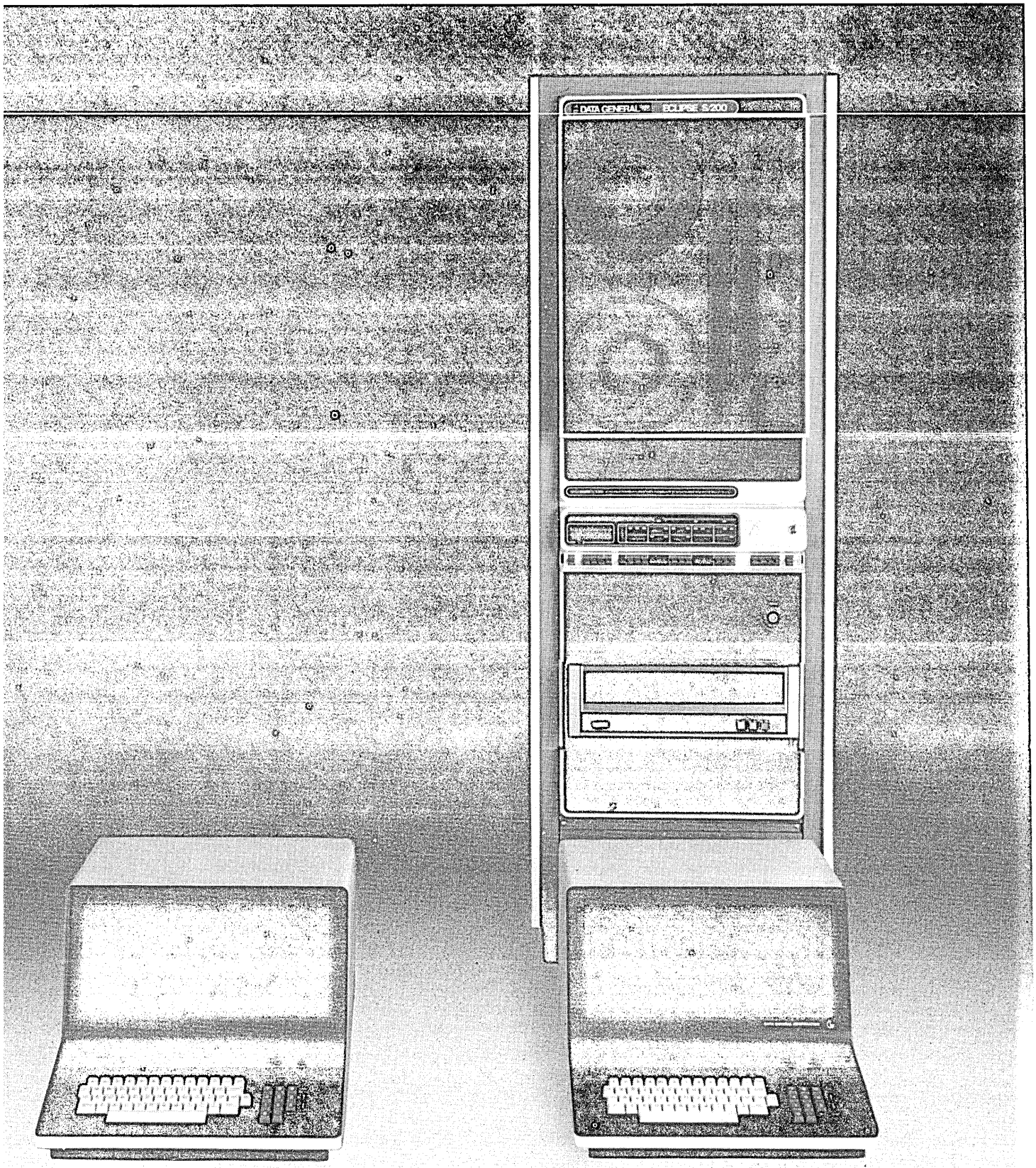
The three were participants in a panel discussion on, "Is Your '75 Business Plan Obsolete" which attracted an overflow crowd to a meeting sponsored by WEMA's Orange County Council. They agreed that almost any business plan made for 1975 has to be obsolete.

"A plan takes the confusion out of running a business," said Kovac. "This year it's more likely you'll confuse your business by trying to run it all year by your original plan."

All three speakers told of slowed down growth and readjusted goals causing one spectator to ask panel moderator, Thomas Werner, vice president and general manager of Remex, "Why didn't you get a speaker from a bankrupt company."

Probably the grimmest picture was painted by CalComp's Kilpatrick whose company, in addition to the depressed economy, is facing an antitrust battle with IBM in a climate that doesn't bode well for plug compatible manufacturers (in the wake of the Telex reversal).

"Last June," said Kilpatrick, "we thought we were doing pretty well and we projected a modest 30% increase in sales–up from $130 million to $155 million–where we had been experiencing



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A Multilingual System.

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A virtual memory Prime 300 is like having up to 15 separate computers in one box. So there's a lot of computing muscle available to tackle just about any mix of applications. Users can develop real-time application software, execute batch command files, use the system as a sophisticated calculator via immediate-mode BASIC, handle data base management, even develop microprograms for the Prime 300's writeable control store or other microprogrammable devices.

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Find out how a Prime 300 virtual memory system can help you fight inflation. Attend a Try It Before You Buy It seminar at the Computer Caravan. In every caravan city, Prime will conduct seminars to help you test and evaluate the Prime 300. Complete details are available from any Prime sales office or by writing to Prime Computer, Inc., 145 Pennsylvania Avenue, Framingham, MA 01701.

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CIRCLE 43 ON READER CARD

increases of 40% to 60% in earlier years. We've done a number of reestimates and each time the numbers got a little bit lower. At the present time we'll be happy to do the same this year as last year and we hope we do as well.

"You'd better get your business in a positive cash flow basis," Kilpatrick warned his audience. Toward this end, CalComp has reduced its work force by 10% and has cut all officers' salaries by 10%. The company also gave all employees a pay-free week off between Christmas and New Year's and will do the same the last week of March, which will be the end of what Kilpatrick expects to be the worst quarter of the current fiscal year. He said these measures will cut costs by $16 million which is equivalent to $32 million in sales from a cash flow standpoint.

All three panelists look for an upturn beginning in mid-1976.

—E.M.

Companies

Data 100: The Poor Get Richer

"The more we sell, the more money we lose," president Edward D. Orenstein said three years ago of Data 100 Corp. which makes remote batch terminals. That was how the Minneapolis firm explained the way business was done in the end-user market in which "96% of what went out the door was on lease" and, despite phenomenal success for its products, the company nevertheless lost $14 million in its first four years.

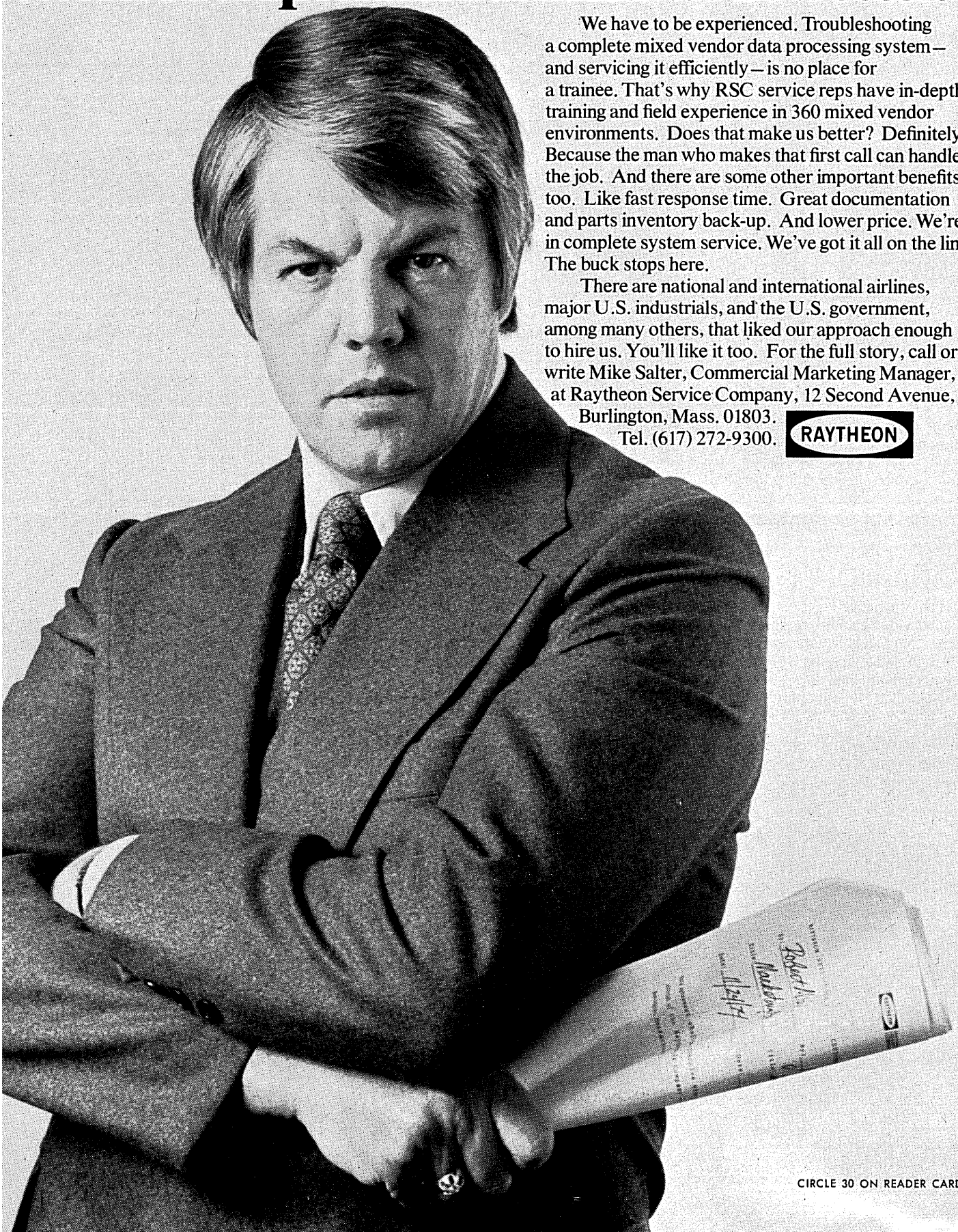
Its predicament was further aggravated by Securities and Exchange Commission rules requiring that it report its manufacturing costs immediately but report revenues for the equipment only as they dribbled in as monthly lease payments. When the company in mid 1973 arranged a $11.5 million financing deal with a private source, Orenstein said, "for the first time, we've got enough money to last more than two weeks."

All of this is behind Data 100 now. It's had back to back profitable years in 1973 and 1974. It's forecasting a 30% increase in 1975 shipments. Its 1975 revenues probably will reach $100 million, compared with $70 million in 1974. It is moving away from its traditional

EDWARD D. ORENSTEIN
". . . When you get it behind you you become a little IBM."

method of selling equipment through third party lessors and will carry its own leases instead.

When you service mixed vendor systems you'd better be experienced. We're experienced. And we're better.



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news in perspective

What is more, it now is able to do what the 43-year-old Orenstein and the seven other former Control Data executives who formed Data 100 in early 1969 have always wanted to do—mix end-user sales with lucrative cash-generating sales to original equipment manufacturers (oems).

That is being done partly through products it has been making for its batch processing systems, partly through an acquisition program that was stalled as the company coped with cash problems in the early '70s and wholly with products that it uses in its end user business.

Line printers

Since late December the company quietly has been building an oem sales organization of some 13 persons, headed by Steve Shamblott, its vp of oem sales. The first product is a series of 125-300 lpm impact printers made by Odec, Inc., of Warwick, R.I. which the company acquired last December. Odec has been making the printers since 1970 and has installed some 6,000, half to Burroughs Corp. which uses them in the lower end of its small business computer line. Odec later will introduce a 600 lpm product to be offered early in '76.

Other oem products will include a 300 to 450 card per minute card reader and two communication products—a communications analyzer to detect line errors and a data compactor—both of which were developed in house six months ago. Rounding out the oem line are minicomputers and minicomputer memories made by Cal Data Processors which the firm acquired a year ago. The minicomputer is a microprogrammable device that emulates DEC's PDP 11 line as well as those of other minimakers. It claims to have installed about 100 of the computers and some 2,000 memories.

The oem move follows a restructuring of the company's marketing operations which involved the formation of a marketing subsidiary, Data 100 Marketing Co., headed by David J. (Jerry) Eckberg. Eckberg, a founder of Data 100, once headed Control Data's successful oem peripherals marketing operation. Eckberg will direct the company's marketing and service organization—it has some 300 maintenence persons in some 200 locations in the U.S. and Europe—for both end user and oem activity. Shamblott, also a former Control Data oem marketing executive, will direct the oem program.

Conservative forecast

Orenstein said he is taking a "conservative" attitude towards the oem activity, estimating that it might account for about $15 million of the company's anticipated 1975 revenues. That would be only slightly higher than the $13 million combined sales of Odec and Cal Data in 1974. Orenstein, however, is excited over another aspect of the oem activity—economy of scale, since what the company sells to the oem market it also will make for its end-user systems. "If we make 1,000 copies of something for oem sales and another 1,000 that we sell to our end user market, we then have the economy of mass producing a total of 2,000 such products."

Says Orenstein of the company's harder times as a cash hungry enterprise locked into a leasing environment, "You struggle and fight it until you get it behind you. And when it is behind you, you find that you've become a little IBM."

It's the case of the once poor, now rich, getting richer.

—Tom McCusker

news in perspective

Privacy

Legislative Push Enters Round Two

The second round has started in the push for legislation to protect the privacy of individuals and the private sector would most definitely be affected by some of the bills now before Congress and a number of state legislatures.

They cover personal information systems maintained by private organizations in addition to criminal data banks and data banks maintained by state and local government. Also affected would be electronic surveillance.

Perhaps the most controversial federal bill is HR1984, which deals with privately-operated data banks. It was drafted by Representative Barry Goldwater, Jr. (California) and Ed Koch (New York), and is similar to legislation they introduced in the last Congress. Goldwater and Koch chose the number purposely, to suggest what could happen if their colleagues don't support it; but a sideline cynic insists the number was chosen "because it will take that long to get the bill passed."

Basically, the Koch-Goldwater bill covers every manual and automated information system that "describes, locates, or indexes anything about an individual," regardless of whether the operator is public or private. The only exemptions are government-maintained criminal information systems, news agency files, and mailing lists—provided the organization maintaining the list voluntarily removes an individual's name upon his request.

Privacy board

To administer a long list of restrictions on the operation of personal information systems, the bill establishes a federal privacy board, composed of five members selected from the general public. This board could inspect "premises where any information system, computers, equipment or recordings for data processing are kept." It also could determine, after holding a public hearing, that the rules have been violated, and issue a cease-and-desist order. If the system operator fails to comply, the board could take him to court. Individuals whose privacy is violated could sue for actual and punitive damages, plus court costs.

Several of the restrictions specified in HR1984 relate to the data that can be legally stored in a personal information system. For example, only the "personal information necessary to accomplish a stated proper purpose of the organization can be kept, and if the system operator disseminates data to outsiders, he must keep a list of those who have "regular access," as well as "maintain a complete and accurate record of every access by persons or organizations not having regular access."

Other major provisions:

No state or local government can require an individual to divulge personal information unless it's authorized by law. Statistical compilations derived from such personal information cannot be sent to outsiders, including the federal government, unless the compilations are also made available to the public.

The federal privacy board must be informed three months beforehand by any organization planning to use a new system or modify an existing one.

Before personal information can be disseminated to outsiders not having regular access privileges, the written

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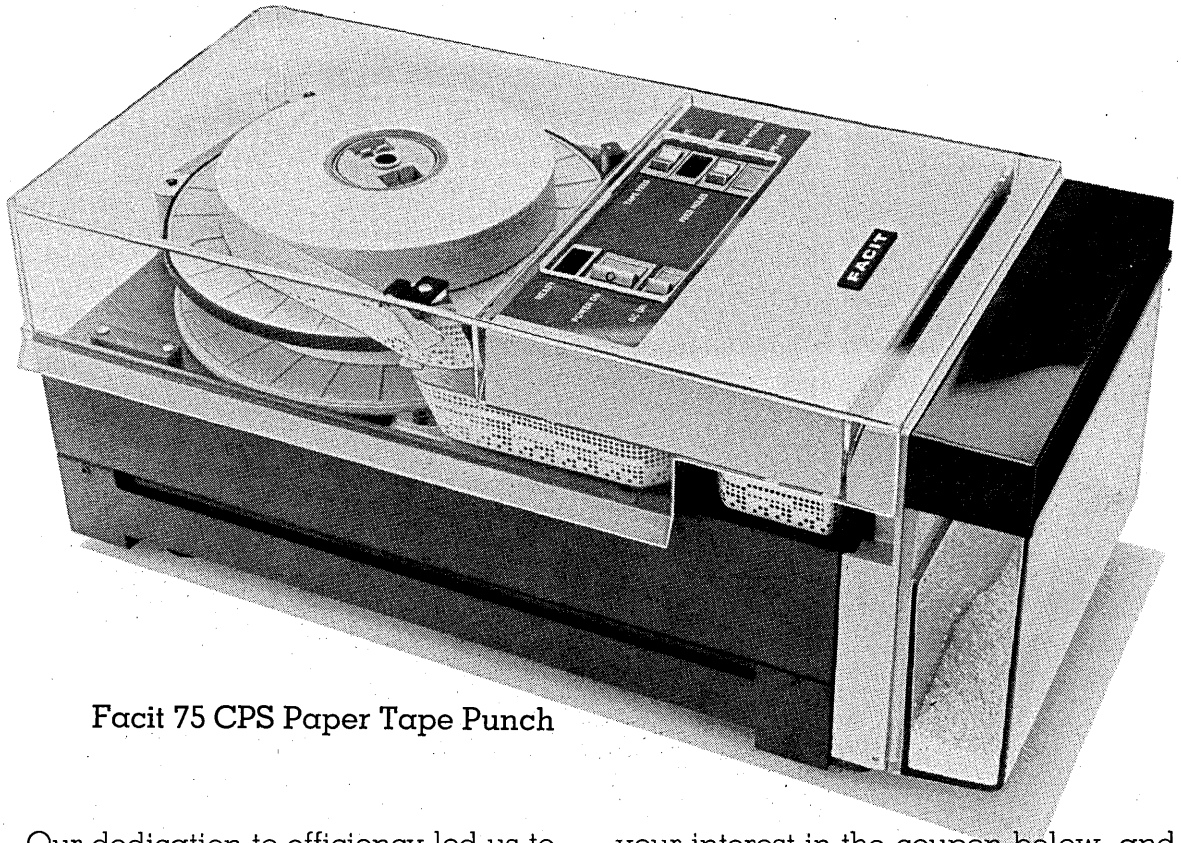

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news in perspective

consent of the "data subject" must be requested, and he must be told the intended use as well as the "specific consequences" of providing or not providing permission. Also, he must be told of requests made by law enforcement agencies or courts.

Nature of the sources

The subject of a record is entitled to see it, and he is also entitled to know "the nature of the sources of information."

The bill sets up an elaborate procedure for challenging and correcting records. If the system operator and the individual can't agree, the latter is allowed to file a 200-word statement of his position, which must be included in every subsequent dissemination of the information. Past recipients of a record must be notified any time the record is corrected or purged.

Each operator of a personal information system covered by the bill must, within two years of its enactment, contact every individual whose record is on file and tell him what information the record contains.

No one can be required to "disclose or furnish" his social security number for "any business transaction . . . or other activity," nor can "any organization" refuse to do business with such an individual "wholly or partly" because he won't reveal the number. The only exception is if federal law requires disclosure of this information. And without "the express authorization of Congress, no organization can develop or utilize a universal identifier common to any other personal information system."

The Koch-Goldwater bill is now awaiting the attention of a House Judiciary subcommittee headed by Rep. Don Edwards (California). This group has also received HR61 and 62; the former is a largely-unchanged version of the Administration's criminal data bank bill introduced in the last Congress, while the latter is identical to a much stronger measure drafted last time by Sen. Sam Ervin (North Carolina), now retired.

Banning surveillance

Several bills banning electronic surveillance have been introduced. Typical is the "Bill of Rights Procedures Act," by Sen. Charles Mathias (Maryland) and Rep. Charles Mosher (Ohio). The key provision requires any federal agent to obtain a court order before conducting any form of surveillance on a private citizen—i.e. bugging, wiretapping, all other forms of electronic eavesdropping, opening of mail, entering of dwellings, and the inspection or procurement of records concerning any private transaction.

And in the states:

Massachusetts has adopted regulations covering CORI, a computerized criminal history system. Significantly, the system isn't scheduled to become operational until next year. Key regulations: no intelligence-type information can be stored in CORI; only law enforcement agencies can access the data; the subject of a record can challenge any entry; if charges are dismissed, his record must be removed; felonies and misdemeanor records must be transferred to off-line storage if the individual is not re-arrested for specified periods; once off-line, these records can be obtained only if they're needed to pursue an on-going criminal investigation, and in response to all other inquiries, the system will report no record exists; name, fingerprints, or other personal identifying information will be needed to obtain any on-line record.

The New York assembly has passed AB356 and sent it to the senate. The bill requires sealing of court records and expunging of arrest records when misdemeanors or minor violations are dismissed, or after six months' probation.

Right to inspect

In California, Assemblyman Jerry Lewis has reintroduced a bill (AB35) giving the subject of a credit record the right to inspect it without charge, obtain a copy for a small fee, know who received reports on him, and have coded data in the record fully explained. Another California assemblyman, Mike Cullen, has drafted AB150, the "Fair Information Practice Act of 1975." Among other things, it requires public and private agencies to secure an individual's consent before disclosing personal information to a third party.

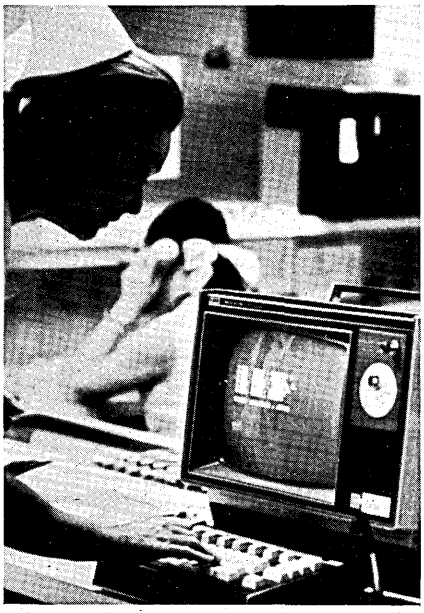
And in Illinois, Sen. Robert W. Mitchler has introduced a similar bill. It requires the individual's consent before data about him is shipped to an out-of-state automated personal data system, and goes so far as to bar libraries from disclosing the names of their patrons or the titles of the books they borrow. Another Illinois bill, HB25, requires private and government data systems operators to notify the public of the existence and key functions of their data banks.

—Phil Hirsch

Wide Variety of Computer Based Systems Available to Hospitals

A growing number and variety of computer-based systems for hospitals is appearing in the marketplace. They offer reductions in the flow of paper within these medical institutions and increases in the speed and accuracy of information that must move between departments. Some noise also has been made about these systems contributing to an improvement in the quality of patient care, even a shortening in the length of a patient's stay.

Such systems have been designed to run on a big computer and on a mini, in batch and real-time environments, are available on both a lease and a purchase-only basis, and also are being offered as a service. Modularly expandable, they generally start with the financial applications: patient billing, accounts receivable and payable, payroll, general ledger, inventory control, cost allocation, etc. From there they expand into patient care, using terminals at service areas and nurses' stations and calling into play data base management systems.



A color crt is a feature of the Spectra Medical system for hospitals, based on a Nova minicomputer. A lightpen and keyboard complete the terminal.

"Hospitals are one of the largest potential markets for computer services, but one that has seen little progress," says Anthony I. Wasserman of the Medical Information Science program at the Univ. of California, San Francisco. He attributes this partly to some early systems failures that hospital administrators have seen, but notes also the threat that computerization poses: changes in organizational structure, job functions, and employment. Wasserman notes, nonetheless, that some 8% of the nation's gross national product (about $100 billion a year) is money spent for all aspects of health care.

But lately there's been an increased emphasis in the medical profession on peer reviews of such things as admissions (is this patient in the appropriate place for the type of care that's needed?), bed utilization (is the length of stay appropriate for his diagnosis/age/sex, etc.?), and general care (did he need the x-ray and all those blood tests?). New federal regulations that went into effect last month call for the establishment on a local level of Professional Standards Review Organizations (PSROS) to conduct these peer reviews. They may boost computer utilization by hospitals.

On the clinical side

One observer says, "I think that just as the Medicare legislation forced hospitals, almost without exception, to use the computer for financial processing, patient accounting, and patient billing, the PSRO type of thing—which will get built on more and more, particularly with national health insurance likely to go in within the next year—will force computerization of the clinical side of the hospital."

Bob Kinch, dp manager at Forsyth Memorial hospital in Winston-Salem, N.C., asked whether the new regulations mean improved patient care, said, "I don't know, but it means they won't be able to do it without a computer."

David A. Woellner, director of the Management Services Div. at Jackson Memorial hospital in Miami, Fla., thinks the new regulations will make the use of a computer mandatory at large hospitals, such as his own. "And it's going to make it very desirable for smaller hospitals to think of some sort of reporting service," he says. "The nature of the reports and the trend analyses and the day-to-day controls that are implied are going to tax anybody's utilization and review staff to the maximum—unless they are supported by a very responsive computer system."

To provide these capabilities, and perform these types of functions, there are outfits like Shared Medical Systems Corp., based in King of Prussia, Pa. At its data center there, SMS has a 370/168 and two 158s, some 60 disc drives and

19 tape drives, and it performs the processing for more than 200 hospitals around the country—57 in California, alone. For all but a handful of them, the six-year-old SMS runs only financial applications. But from this start, and using a variety of terminals on the market, the user can expand into the patient care side of the house, adding incrementally a lab system, pharmacy system, radiology system, medical records, nurse scheduling, utilization review, PSRO reporting, and whatever. Optionally they can be made to run in the batch or real-time environment. In this business, too, are MC AUTO, American Hospital Supplies, and Technicon MIS.

Sharing a mini

Providing a similar type of service, but running off PDP-15 minicomputers from Digital Equipment Corp., is Meditech Inc., based in Cambridge, Mass. It allows hospitals to share a mini, the PDP-15 supporting upwards of 40 terminals, or to acquire their own dedicated, compatible mini. There's not only the usual array of financial and clinical modules, but also an outpatient management system. Meditech is one of the champions of the acclaimed MUMPS language that was developed at Massachusetts General hospital.

A minicomputer-based hospital system is favored by many people, for they see in it not only the obvious economies of scale but also the ability, at relatively low cost, to add a second processor for backup purposes. And the latest to hit the market is just such a system. Long in development by Spectra Medical Systems Inc. of Palo Alto, Calif., it is now running at the 300-bed Mary's Help hospital, Daly City, Calif.

The Spectra 2000 uses a Nova 840 mini from Data General and *color* crt terminals with lightpens from Computer Communications Inc. Nonimpact printers from Versatec are used at those stations where hard copies are required.

A look at this system and the company behind it may provide a picture of the travails of a systems house in this field. Spectra was founded in 1969 and will have no income until this initial system is accepted; it has been operational since late last year at Mary's Help. The company reportedly has invested more than $3 million in the system to date. Spectra has some 40 employees, about a fourth of them being medical personnel—physicians, registered nurses, and medical technologists. Its president, William E. Chapman III is, himself, an M.D.

Frank Parrish, Spectra's marketing vp, says his market is the 200- to 600-bed hospital, of which there are said to be some 1,200 in the U.S. In such hospitals, he says, there would be an average of 40 terminals (total: 48,000), and the typical system would lease for $30-35K/month, depending on the applications they want.

Rewritten for the Nova

The software was initally written to run on the EMR model 60 computer, a processor no longer being made. So it was recently rewritten for the Nova. But with the system, the admissions department can enter patient information through a keyboard. There's a real-time census of the beds, and the business office has access to the patient file to process patient charges. From terminals at nurses' stations, medication can be ordered from the pharmacy, a schedule of medication to be given patients can be

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Executive command language	✓				
Exits to "own-coded" routines	✓	✓	✓	✓	✓
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Macro processed functions	✓				
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produced for each ward, and the nurse can indicate that the medication was, indeed, given. The charge has then been captured. Overlooked or missed charges average $1.50 to $2.50 a patient-day, according to Parrish.

The pharmacist, meanwhile, receives a printout of new medication orders, and is able through a terminal to review a patient's orders and allergies and get information on drug incompatibility. Even medication pricing can be done automatically. Other functions performed include nurse scheduling, staff requirements reports, and utilization review reports.

On paper, these automated functions have an appealing air about them. The idea of pushing buttons instead of a pencil across a piece of paper somehow makes sense to those in the information handling field. But getting medical personnel to use terminals to input and retrieve information doesn't always come off without a hitch. In fact, they often rebel at the idea.

Technicon MIS, Mountain View, Calif., had exactly that experience with its pilot installation at El Camino hospital (see October '73, p. 142, and September '74, p. 138). Nevertheless, following a narrow margin of approval of the system by the medical staff there, the hospital accepted the system. It is now running in three hospitals and being installed in two more.

As a result, these systems allow a physician to continue to write on slips of paper and have a nurse or clerk perform the keying process. But not all nurses can type. A lightpen is one solution. A physician, after identifying himself to the system, can get a display of a list of his patients; with the pen he can stab at one of those names to learn the status of that patient. But some systems, to save money, do away with the lightpen and display, instead, a three-character code that must be keyed in. NCR, in its hospital system announced last October, uses a proprietary bar code for this purpose.

NCR system

NCR's Medics (medical information and communications system) is an on-line extension to the batch processing patient records system that the company has been marketing since 1969. According to vp Gil Williamson, there are close to 300 hospital users of the Century series computers. Now those same users can add an additional 64K Century 101 mainframe, sprinkle some terminals around, and perform on-line data collection, message switching, and handle inquiries in real-time.

On the batch system, then, which also requires a minimum 64K Century 101, there's an inpatient records processing system, a post-discharge accounts receivable system, personnel system, medical audit review and statistical system, and several general accounting packages. The on-line Medics requires another 101. And on a daily basis, the Medics de-logs directly to the inpatient system. Its real-time functions include all admissions, all service orders, communications from nursing stations to ancillary departments, and communications among departments.

For use at nurses' stations is a terminal with a keyboard, back-lit display (not a crt) that can lead an operator through the steps, and a wand scanner that reads a specially developed color bar code. The latter, which NCR has long had for other applications, is used to identify a patient to the system (each patient is given a specific bar code), as

well as to input various hospital services, which are alphabetically listed in a catalog. As the wand is passed over the code, the type of service desired is input and routed to affected departments. On-line, too, are thermal printers.

Still another solution to the data entry problem is taken by Honeywell Information Systems. In its hospital system, called Vital, it uses a crt terminal with buttons arranged vertically to the left of the screen. To select an entry on the tube, one merely presses the button on the same line as the entry. Unlike many other systems, Honeywell has a badge reader, integral with the terminal, that identifies the user to determine what information he is privy to.

Honeywell acquired the system in late 1973 from National Data Communications, Dallas, and has already installed it at about five hospitals. Its philosophy is essentially similar to many other on-line systems that perform the admit/transfer/discharge functions and link the pharmacy, labs, and housekeeping department. It also enables the dietary department to know of patient movements and of orders for tests that affect the meal planning. It runs on the Honeywell 1690 minicomputer.

Sketchy progress

IBM users contacted for this story have made sketchy progress. Without exception they've acquired program packages from the open market or field developed programs from IBM, and then rewritten them to fit their individual circumstances. No one's operation, these users state, is so typical or close to the norm that they can use, without modification, an existing applications program.

At Mt. Zion hospital in San Francisco, they started with IBM's shared hospital accounting system (SHAS), a package that has been available for close to 10 years, for accounts receivable, patient billing, and general ledger accounting. To this they added shared laboratory information system (SLIS), which "has to be one of the worst programs ever written," according to dp manager Mary Mitchell. So they modified it extensively, converted it for the on-line environment, and use it for retrieval and update of information.

Mt. Zion's on-line lab system, the envy of many who have seen it, produces a patient cumulative report that doctors find invaluable. The printout, which becomes a chart copy, shows lab results vertically by topical sequence and horizontally by dates. Currently a lab tech must enter all test requests and results through a keyboard, but the next step, says Mitchell, will be to place a mini in the lab so that test results automatically will be input to their 196K 370/135. Of the six 3270 crt terminals on-line, five are in the lab, one in the computer center.

Mary Mitchell acknowledges the deliberateness with which hospitals move to newfangled technologies, the trepidation with which they make any changes to longstanding procedures and operations. In contrast to this conservative approach, she is forever on the lookout for software to fit her needs, from whatever source. Strongly critical of IBM's CICS, which she considers to be a ripoff to sell hardware, Mitchell acquired instead a teleprocessing monitor formerly called Swift, marketed by GBA International in San Francisco. And after making numerous inquiries among fellow hospital users, she found a package that'll handle the doctor billing in their outpatient clinic. It's called POMS (professional office management system), and is from Occidental Computer Systems Inc., North Hollywood, Calif.

Started with SHAS

At Jackson Memorial hospital in Miami, Fla., they also started with SHAS about three years ago. Jackson, said to be one of the 10 largest hospitals in the country, is also a teaching institution, its staff coming from the medical school of the Univ. of Miami. They are building a health care data base that will relate such factors as patient demographics, disease conditions for which patients are admitted or treated, and an array of standards associated with the admission and the treatment of the malady. According to David A. Woellner, director of the management services division at Jackson, they are equipped with a half-megabuck 370/145 but have only a few terminals.

But the direction that IBM users will take may be illustrated by the turn of events at Forsyth Memorial hospital, Winston-Salem, N.C. About a year and a half ago, they placed into operation an a/d/t system from IBM. Some crt terminals have been installed in the admissions department, in service areas, and in the business office. But patients' charges are updated at midnight in a batch run. Unfortunately, says dp manager Bob Kinch, the a/d/t system has a fixed file definition.

Within a month they should be installing a new IBM health data base system that uses the DL/I data management system. At that time, too, they'll place nursing stations and the pharmacy on-line with crt terminals, and will be able to perform order entry to the lab, as

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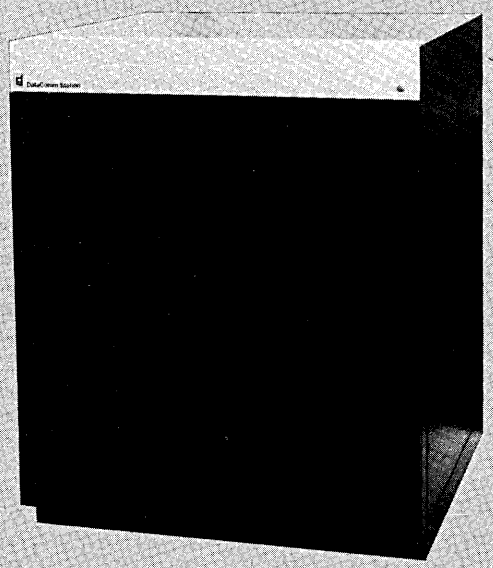

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well, in the 710-bed hospital.

In costing the new system, Kinch takes into consideration both inpatient days and outpatient visits, figuring that outpatients place as much of a load on the system as inpatients. So, for 1975, he figures their cost will be about $1.75 per patient day/outpatient visit.

Unfortunately these systems are expensive. Jackson Memorial's David Woellner says that for them to perform order entry would require a crt terminal and printer at each nursing station at a cost of close to $300/month/station. And they have 43 nursing stations, six of them in the emergency room alone, plus another 20 in outpatient clinics. "And the megabucks are fantastic," he exclaims. This comes at a time when the nation's business press is reporting on the excruciating financial crush being experienced by hospitals.

International Data Corp., the market research firm, reports that hospitals in 1973 spent $375 million for dp, an annual expenditure that will grow to some $1.6 billion by 1980. Among hospital dp types and systems marketeers there is disagreement as to whether the computer has become a mandatory tool for hospitals to meet the increasing statistical reporting requirements of the federal and state governments. Forsyth's Bob Kinch says, "The PSRO thing is going to require that hospitals go to a computer. There's no question about it." He adds, "Anything less than online in the future is going to make it very difficult to administer patient care in a hospital."

—Edward K. Yasaki

Communications

Canada Network Won't Take SDLC Protocol

The Canadian government has officially advocated development of a common user data communications network to support electronic funds transfers throughout the country. The new policy is virtually certain to cause a confrontation with IBM because SDLC/SNA, IBM's new communications protocol, can't be integrated into such a network.

One possible result is that IBM will be forced to support a nonproprietary protocol. That would benefit IBM users in the U.S. as well as Canada—they would find it much easier to migrate to other makes of terminals and front-end processors.

The Canadian government endorsed a common-user network in a lengthy "blue paper" issued jointly by the Departments of Communications and Finance. Entitled "Towards An Electronic Payments System," the statement emphasizes that the net must be connectable to "a wide variety of computer and terminal equipment" through "clearly-defined, publicly-available" interfaces which will "facilitate development of new terminal equipment."

The statement points out that in present systems, "there is a tendency for communications processing and data processing functions to be intertwined so that it is difficult to use the equipment of more than one supplier. In the case of some systems currently being offered, the hardware and software are such that it is particularly difficult to make any use of other suppliers for particular parts of the system."

About 60% of the computers currently operating in Canada were supplied by

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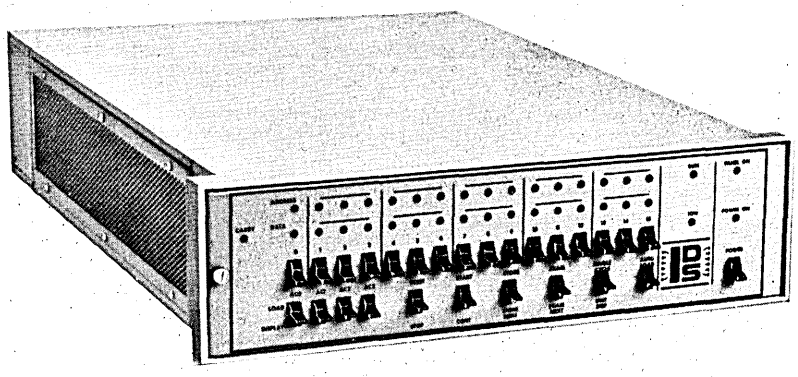

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IBM.

The interfacing problem has become significantly more critical since last October, when the Trans-Canada Telephone System (TCTS) unveiled plans for a nationwide packet-switched network called "Datapac". Although designed for a variety of users, the banking industry is "foremost in our minds," according to a TCTS official. But IBM's SDLC/SNA protocol is incompatible with SNAP, the Datapac control scheme.

The next act in this drama probably will occur shortly, when, an "implementation committee" holds its first meeting. This committee, proposed by the government in its blue paper, will include representatives of equipment suppliers, carriers, and all the other interested parties; it's supposed to agree on technical standards for the common-user network and also will be "responsible for the continuing evolution of an efficient and equitable payments system."

—P.H.

FCC Wants More Partners in IBM-Comsat Satellite Venture; Three in the Wings

IBM may be reconsidering its proposed entry into the communications satellite business. The company last month was reviewing conditions set down late in January by the Federal Communications Commission concerning IBM's joint ownership in CML Satellite Corp. and was expected in mid March to ask the FCC for clarification of order for some other action.

Meanwhile a top executive of Southern Pacific Communications Co. said the company will continue to pursue its offer to join Comsat General and IBM as a partner in CML. He spoke shortly after the FCC denied a bid by IBM and Comsat General, a subsidiary of Comsat, to take over CML on their own. The commission indicated it would change its mind, however, if the two companies found at least one additional partner. CML is now owned by Comsat General, MCI and Lockheed, each with a one-third share. MCI and Lockheed want out because they're short of cash.

Western Union International also is a prospective partner in CML. Like Southern Pacific, WUI made an offer in writing a few months ago. And TRT Telecommunications, another international carrier, made a similar offer shortly after the commission's decision became known Jan. 23.

IBM said it was seriously concerned over certain unspecified language in the FCC's order. "Without satisfactory clarification, that language would be a barrier to IBM's entry into the . . . business, a result we don't believe the commission could have intended."

Bundled price, technology

Many manufacturers of data processing equipment and suppliers of on-line services objected to letting IBM and Comsat jointly offer domestic satellite service on any terms. One of their main arguments, as summarized by the commission in its decision, was that "a system in which IBM participates will be likely to offer a packaged, end-to-end data communications service, bundled in pricing and technology, including therein an offering of data processing services which is compatible with IBM communications systems and/or terminal equipment *only*. (FCC's italics).

The other major complaint was that IBM, using this same package approach, would be able to capture, unfairly, the communications business of its existing customers—by offering equipment discounts, for example, to those customers who contracted for the satellite service.

While recognizing that IBM "substantially dominates, technologically," the dp market and is in, a position to "largely influence" any related telecommunications network in which it participates, the commission nevertheless felt that the benefits of letting IBM go into the domestic satellite business outweighed the disadvantages—mainly because IBM's "participation in the provision of domestic satellite communications services holds promise of bringing to the public new and better . . . data communications . . . "

To minimize the risks, the commission said IBM must:

—Agree to interconnect the CML network with any customer-provided communications system and/or terminal equipment, as well as any other FCC-authorized satellite system or earth station. The interconnect terms and conditions must be "reasonable and nondiscriminatory," and must be submitted to the commission for its approval before CML can be licensed. Also, the interconnect terms and conditions must "be

news in perspective

at least as liberal as those offered by AT&T terrestrially."

—Agree to market CML services only through a separate, arms-length subsidiary, which must *"not be a mere division of IBM."* IBM is allowed to buy communications service from this subsidiary, the latter is allowed to use IBM systems, and each is allowed to exchange *"essential"* technical information with the other, as well as make arrangements for *"essential"* financing, but "each company must . . . show, upon request . . . that any contracts or arrangements relating to exchange . . . of technical data, financing, or equipment are . . . fair and reasonable and involve no over-reaching on the part of either party." (FCC's italics)

Find another partner

Also, IBM and Comsat General must restructure their proposed joint venture. They must find at least one more partner, and none of the parties can have "less than a 10% ownership interest or more than a 49% . . . or otherwise be in a position whereby it could exercise de facto control."

Alternatively, IBM and Comsat General can operate domsat systems independently of each other. In that case, Comsat can be either a sole proprietor, or it can join with other (non-IBM) partners, and offer service to the end user. Under this option, the commission explicitly invited IBM to enter the comsat business independently on its own, but said nothing about a partnership with others, which may mean that the former arrangement is preferred.

Go-ahead predicted

Even as IBM was raising doubt that it would enter the business under the FCC's conditions, one source was predicting it would go ahead. And he said the FCC decision "could very easily signal the death of competition in the domestic satellite industry five to 10 years from now." The source, who is widely known in the telecommunications field and has years of regulatory experience, insisted on anonymity.

His basic point was that regardless of the restrictions imposed by the FCC, IBM and Comsat will go ahead with their proposed joint venture, and even though each of these companies must now accept a smaller share, CML will still have "overpowering technical and financial muscle." The result will be to dry up the money market for CML's competitiors, "particularly Western Union and RCA." Asked how the commission could have prevented this and still allowed the two companies to become partners, this source said, "you've just answered the question."

He also said the commission's recent decision doesn't address the question posed by IBM's proprietary SDLC/SNA communications protocol.

"The decision bars Armonk from offering contractual inducements to IBM users which would have the effect of locking them into CML's satellite network. But if CML adopts SDLC/SNA as its protocol, the effect may be the same. To satisfy the FCC's requirement for 'reasonable and non-discriminatory' interconnection, IBM probably would have to make SDLC/SNA technical specs available to other suppliers, and if they, as well as other datacom networks adopted the protocol, IBM customers would appear not to be locked in. However, IBM would still be the leader of the band. SDLC/SNA could be kept in a constant state of technical flux, by developing new versions and announcing them through a continuing series of releases —as is now done with new IBM hardware and software. Non-IBMers would have trouble keeping up with these changes because, aside from the engineering expense, they would probably be unable to get their products modified as quickly as IBM. Thus, most users would almost certainly prefer to do business with number one."

The way to solve this problem, according to the source, "is for the commission to require that CML adopt a non-proprietary communications protocol. Alternatively, CML could be allowed to operate on SDLC/SNA provided the specs covering modifications were made available to IBM competitors sufficiently ahead of time so they could come out with upgraded equipment concurrently with IBM."

—P.H.

International

Univac's Swedish Joint Venture

Ever since it sent youthful John C. Butler over to head its European operations two years ago, Univac actively has pursued computer acquisitions. No major computer company was counted out of its plans, the 41-year-old Butler said in an interview last summer (August '74, p. 96). "We make no bones

about it. We think a European-American computer partnership would be a good thing."

Its first such agreement, to be signed this month with Sweden's automotive giant Saab-Scania AB, is to merge Univac's Scandinavian operations with part of the operations of Saab-Scania's computer subsidiary Datasaab. Univac's parent Sperry Rand would own 49% and the Swedish company 51% of a new company, Saab Univac AB, that would come into existence in April.

What Univac doesn't acquire, and was understood to be seeking during 18 months of negotiations, is the minicomputer and terminal business which the Swedish company has pursued with such success in recent years.

Instead it will acquire the company's larger computers and about 200 persons who already build and maintain them. Univac would contribute its Scandinavian forces to the combination as well as the new company's managing director, Olof Von Bulow, a Swede who heads Univac's Nordic Region. The chairman will be Marcus Wallenburg representing Saab's interests.

Under the agreement, Saab Univac will establish new subsidiaries in Scandinavia, giving the partners an opportunity to tidy up predecessor organizations that cross national boundaries carelessly. Univac has a Swede running organizations in Denmark and a Dane heading its Swedish operations. Datasaab's head man in Denmark is a Finn. The new company would be capitalized at 155 million Swedish kroner (a little over $35 million).

Foothold for Univac

Both partners seem to benefit by the move. Univac gets a badly needed foothold as a "European" company and takes advantage of a growing "buy Swedish" trend in Swedish government policy. Saab unloads some 90 old computers that no longer fit into its applications-oriented thrust in the minicomputer/terminal business, plus one new computer that still is in an embarrassing state of infancy. The old computers are the models 21, 22 and 223, widely dispersed over the thousand miles of Sweden's length, seldom in easy-to-reach places.

Its new computer, the D-23, is said to be in the 370/145 scale. It is Datasaab's most ambitious entry in the mainframe sweepstakes, but software problems that plague such new 145-scale mainframe ventures have been clear and visible. The first model was delivered to Sweden's Defense Ministry in January and a month later Datasaab lost a lawsuit in a squabble with the government users and was fined five million kroner (more than $1 million —and about equivalent to giving them the next one free).

Two more are due for delivery before May and another nine are on order. Though Datasaab stoutly maintains that the others on order will be delivered, there are observers in Sweden who suggest that a polite solution to the D-23 problems may be to deliver Univac machines with Saab Univac labels instead.

"Build our own way"

After nine months of rumors, says a Datasaab spokesman of the Univac agreement, "now we can be a bit more open, and go on to build the company our own way." He referred to the applications-oriented terminals and minicomputers which it aims primarily at timber and paper mills, the textile industry and the banking industry. Banks have bought or ordered more than 10,000 units, based on its D-5 minicomputer. Its 1974 acquisition of Facit-Addo's terminal and peripheral lines has given the company an office-oriented, worldwide sales organization.

News in Perspective

BENCHMARKS . . .

Not ALL The People's Choice: 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) has met with less than unanimous support from other dp organizations. The general reaction has been . . . "not yet." The Institute for Certification of Computer Professionals (ICCP) said "the data processing profession does not (yet) have generally accepted definitions of job functions which could be licensed nor has the profession agreed upon the knowledge and skills which a given individual should have to practice in those jobs." The Data Processing Management Assn. (DPMA) has said it is not opposed to certification or licensing but, it said, "Licensing, as proposed by SCDP, is a very serious matter with far reaching implications." DPMA strongly recommends that proposed licensing legislation should be developed, not in a vacuum, but under the aegis of an organization which spans the data processing profession and whose very existence is built upon this specific expertise." Nothing specific has been heard as yet from the Association for Computing Machinery (ACM) but indications are it too will take a "not-yet" stand to be expressed officially probably next month.

Trade Secrets No More: The last of the four remaining defendants charged with stealing trade secrets from the IBM plant in San Jose, Calif., was convicted. Of those four, two confessed their guilt to reduced charges, and two have been found guilty—one with and one without a jury. There originally were 11 defendants in the case. In June 1973 they were charged variously with involvement in the theft of plans and drawings of IBM's 3330 and 3340 disc files. Charges against six of the defendants were subsequently dropped, leaving five to be tried. The guilt of four of them has been established. That now leaves one, a Wesley G. Powers, fifty-ish, never arrested in this case, and believed by authorities to be living in Europe.

New Lease on Life: Financially troubled Computer Machinery Corp. reached life-saving refinancing arrangements with its U.S. and European banks. Security Pacific Bank, Los Angeles, and First National City Bank, New York, agreed to extend the key-to-disc manufacturer's domestic line of credit through 1976 to $25 million from $17 million. The European banks agreed to increase the firm's credit to $26 million from $21 million. The U.S. banks, Computer Machinery said, made their increased lines of credit dependent upon completion by the company of a $2 million sale of customer-leased equipment to a leasing company and a $2.5 million sale and leaseback of customer-leased equipment. Both transactions have been completed.

Victory for Tymshare: Motions by Tymshare, Cupertino, Calif. for summary judgment and dismissal of claims made against the time-sharing firm and its directors by Allen-Babcock Computing, Inc. were granted by the U.S. District Court, Central District of California. Basis of the court's ruling was that no violation of federal securities laws by Tymshare or its directors had been established, and therefore, federal jurisdiction of the remaining claims was no longer appropriate. Allen-Babcock had sought compensatory damages of $3,160,000 and punitive damages in its complaint which arose from Tymshare's determination in September 1973, not to proceed with a proposed acquisition of Allen-Babcock. Dismissal of the suit by the federal court is without prejudice to Allen-Babcock's pursuing the non-federal claims in state court.

Suit Settled: IBM and William Marion Co. of Hackensack, N. J. settled out of court an antitrust suit filed against the giant by the New Jersey rebuilder of IBM punched card equipment. Marion had charged that IBM unfairly refused to continue offering maintenance contracts for equipment rebuilt by Marion unless only IBM-made parts were used in the rebuilding. Under the out of court settlement IBM agreed to continue providing maintenance contracts for certain machines containing non-IBM parts and Marion agreed to stop using certain disputed non-IBM parts.

Future For Forms: Business forms manufacturers don't expect much from 1975. At an International Business Forms Industries' Chief Executives Conference, IBFI research director, Edwin Masten, predicted "a steep decline in real output will be evident into the second quarter of 1975." For all of 1975, he said, "real growth is expected to be zero—with the real possibility of a negative growth rate." Executives at the conference termed the current downturn more severe than the 1970-71 decline and estimated it will worsen during 1975 before returning to normal growth in mid-1976.

User Group Group: An organization of executives of user groups in the data processing industry has been proposed by the Iomec Users' Assn. Iomec manufactures minicomputer peripherals. Glenn Lutat, executive director of IUA, said objective of the proposed organization would be to exchange information on the activities and plans of each user group in order to better serve the user population. "Our contention is," he said, "that while companies in the industry who sponsor user groups may be head-on competitors, the user will benefit by the type of information exchange program we are proposing." He stressed, "at this point, the idea is still exploratory, and we are wide open for ideas and suggestions from all interested parties."

A Dangerous Precedent: The Association of Data Processing Service Organizations (ADAPSO) believes the Comptroller of the Currency set a "dangerous precedent" when it allowed Chase Manhattan Bank to acquire a controlling interest in Interactive Data Corp., a time-sharing company. Under a 1971 ruling known as Regulation Y, the Federal Reserve Board is supposed to approve such acquisitions after a public hearing. The regulation applies to bank holding companies rather than operating banks like Chase Manhattan but ADAPSO contends that the comptroller violated the spirit of the FRB rule, circumvented the Fed's jurisdiction and authority, and "has now made it possible for other national banks to make similar acquisitions in this indirect fashion."

On Incremental Marketing: The Association of Data Processing Service Organizations (ADAPSO), long concerned with incremental marketing of computer services by banks, government agencies, and common carriers, has turned its sights on certified public accountants. ADAPSO has asked the Securities & Exchange Commission to study the commercial marketing of computer services by CPAs to client companies whose accounts they also audit. In addition to possible anticompetitive effects from incremental marketing, ADAPSO is concerned in the case of the CPAs that "auditing objectivity can be impaired when the same firm is furnishing a commercial data processing service."

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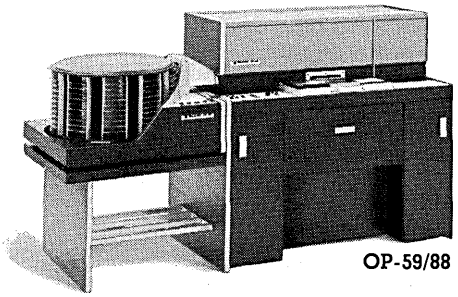

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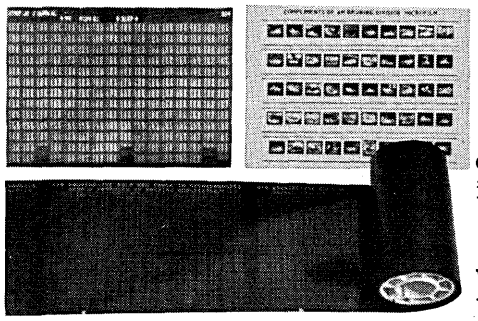

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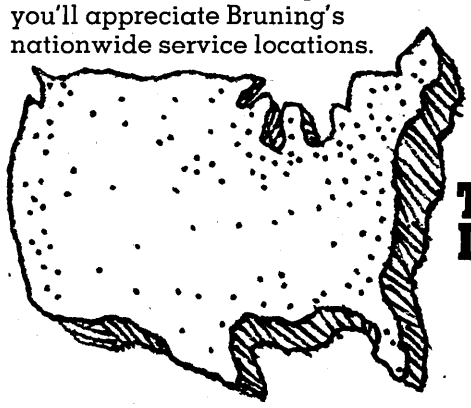

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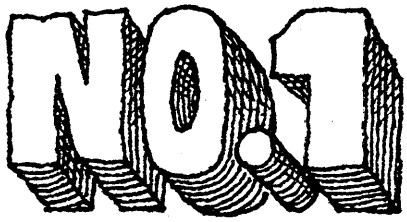

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LOOK AHEAD

(Continued from page 18)

that is a mathematical algorithm and software that is a machine process. In the Benson/Tabbot decision, the Supreme Court appeared to rule that the software in question was simply a mathematical process and, thus, not patentable (December '72, p. 97). The Johnson software, however, is more of a machine system and, if the Supreme Court upholds the lower court decision, it would likely spur the growth of the independent software business.

OVERPAID PROGRAMMERS

Pity the poor programmers who work for California's Ventura county -- at least over the next three years. That's the period over which increases in the programmers' salaries would be severely scaled down if the Ventura County Taxpayer's Assn. has its way. The association conducted a seven month study which it said showed that most county employees were being paid considerably more than people in similar jobs in private industry and that the greatest disparity was in the classification of programmer. The study said the average programmer working in private industry earns $880/month whereas the Ventura county programmers earn $1,285/month -- a disparity that gives the government worker $4,860 a year more in salary than his counterpart. The association proposes the three year scaling down to bring wages and benefits in line with private industry. If this happens and the programmers are unhappy, they can always move to San Francisco and become street cleaners. They're due for a raise to more than $17,000/year this June.

NO LICENSE TO STEAL

To promote its data processing licensing proposal (p. 126), the Society of Certified Data Processors in December circulated a proposed magazine article that begins with: "Thieves, using a computer system, defraud the City of Los Angeles of $902,000...." It continues that this is "a clear indication that the taxpayer is being bilked via computer in six-digit figures." Although advised that this was not the case--an investigation showed that a computer system was used to detect, not perpetrate, a stolen checks incident (January, p. 103)--the society in late February had yet to issue a corrected version of the article.

A USERS GROUP FOR SYSTEM/32

One of the first to order IBM's low end System/32 is the National Association of System/3 Users (NASU) which also is forming an association of users of the new machine. Irwin Cohan, president of the 3,700-member NASU expects to take delivery this month on a $914 a month model of the System/32 which he ordered early in the morning on the day of the new line's announcement Jan. 7.

The association, headquartered in Las Vegas, said it is calling the new organization "International System/32 Users" (ISU) whose principal activity will be to issue a monthly publication on educational subjects and on computer programs for users. It said it thinks IBM will sell the new machines "in the tens of thousands."

RUMORS AND RAW RANDOM DATA

HEW has defined a group to study the future data processing needs of the Social Security Administration, which seldom has had time to run a "tight shop" because it always is trying to keep one step ahead of the new national programs bestowed upon it by Congress. It recently told of a plan to acquire 19 IBM 370/158s. Now, we hear, that study group can't get started until it finds an 18,000 sq. ft. facility to house the 150 persons it hasn't hired yet...A manufacturer of computer output microfilm (COM) said that the time between a proposal and customer decision used to be 12 to 14 months. Now, after the rise in paper costs, users are demanding their COM units within 30-60 days...Since there is no data processing union by name, dp personnel are coming under a variety of bargaining jurisdictions. Dp people in the Los Angeles Dept. of Water and Power are being formed into a bargaining unit by the Engineers & Architects Assn., leading one involved employee to quip to another, "I wouldn't want you to design my house."

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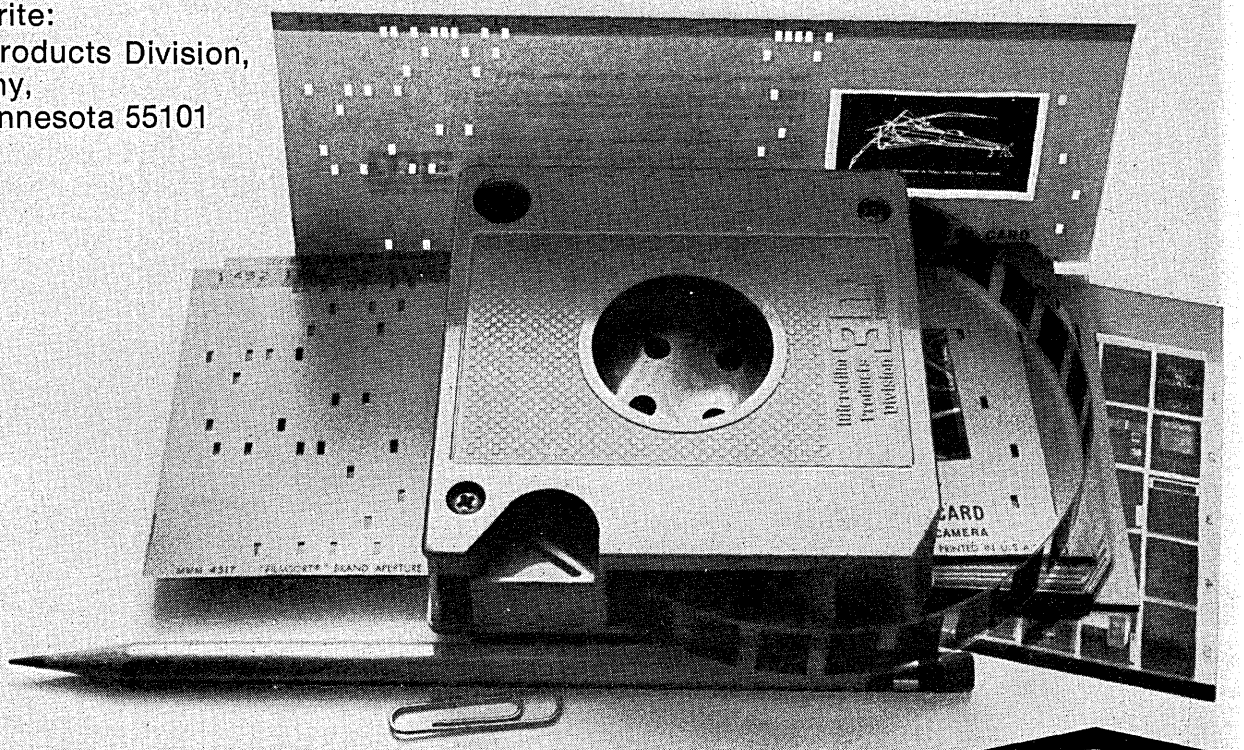


The age of microfilm is here...

3M BUSINESS PRODUCTS CENTERS

CIRCLE 53 ON READER CARD

hardware

Off-line

The name of the game in memory is miniaturization, and Intel claims to have moved ahead a notch by announcing the world's smallest commercial 4K random access memory. It would take about 50 of the new chips to fill one square inch, but that inch would hold 200K bits. That doesn't yet compare with disc, since discs can now hold more than 2 million bits per inch and, according to a Pertec spokesman, are destined for more than 6 megabits per inch by 1980.

Apparently the old will live along with the new for awhile though. Decision Data, Horsham, Pa., has announced the delivery of its 15,000 Data Recorder, a sophisticated keypunch. The firm wasn't even founded until 1969, some 80 years after Hollerith put his punched card to work.

If the world won't give up punched cards, it seems to have done so for Memorex computers. A batch of still new 48K models are being offered by American Used Computer Corp., in Boston, for $9,500 each (down from $25K). The original price, not that long ago, was $130,000.

Still alive and well are some little used languages which originated in America. No, not Autocoder and IBMAP, but the Athabascan languages, including Navajo and Apache. IBM just announced Selectric typewriter elements for them.

There will be a lot of liveliness in some parts of the computer business this year, too. According to a recent Datamation survey, teleprocessing will boom in spite of the rest of the economy. Nearly 50% more money has been budgeted for TP across the board this year -- for terminals, communications processors, multiplexors, and data lines. Other results of the survey are elsewhere in this issue.

Can't put your finger on where the money is going? Calspan Corp., of New York, has a device called Fingerscan which might help. An access control system, Fingerscan reads fingerprints and compares them against those on file. Calspan says it lets less than 1% of the bad guys through the door and admits over 95% of the good guys. Presumably the 5% "goods" who can't get in find new jobs or new fingerprints.

Portable Terminal

There have been a number of 10-key terminals announced in the last year that were small enough to fit into a shirt pocket, but here's a terminal weighing only 3.8 pounds just slightly larger than a telephone with full alphanumeric capability. The MCM gen-

erates a full ASCII character set and control codes in full- or half-duplex modes at 10 cps. Incoming data can be stored on a standard voice-grade cassette recorder. The 3.8 pound figure even includes the modem, acoustic coupler, and rechargeable batteries. A 32-character light-emitting diode (LED) display is the key to getting the price of the MCM down to $1,200 each, or $850 for orders of 100. Deliveries begin this month. MICON INDUSTRIES, Oakland, Calif.

FOR DATA CIRCLE 223 ON READER CARD

Nova Graphics

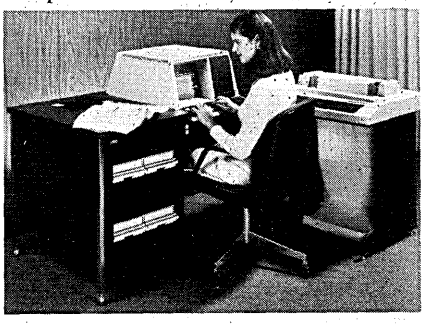
The speed of the Data General Nova minicomputer series gets it into a lot of graphic applications, and this firm has developed a video display generator for the Nova totally contained on a single pc board. The model 200 graphics display features two modes, an 18 line by 80-character alphanumeric mode, and a graphics mode that provides 61,440 individually addressable points. The display uses standard video monitors and is supported by software running under the RDOS, RTOS, and SOS Data General monitors. The software is FORTRAN callable and provides character generation, vector generation, graphic display, and selective erase of any part of the display. The pc board-based system is priced at $2,595, with availability quoted at 30-60 days ARO. Significantly, this firm is one of the few Boston area hardware firms to start up within the last several years. LEXIDATA CORP., Lexington, Mass.

FOR DATA CIRCLE 224 ON READER CARD

Small Business System

DEC's latest small business system announcement, the Datasystem 310, is the second major development to hit this field this year, coming close on the heels of IBM's System/32 unveiling. The mini giant is essentially saying that, in case you choose to get involved with your system by doing your own programming, here's a set of proven PDP-8 based hardware to do it with at a startlingly low price. For only $12K, a user can get a 16K word (12-bit) system, expandable to 64K, a 960-character video terminal with keyboard and (optionally) an electrolytic copier, a dual flexible disc drive providing 260,000 characters of on-line data, and a choice of printers ranging in speed from 30 cps up to 300 lpm. Options include 2780 line discipline and increased floppy capacity.

Software for the 310 is DEC's Commercial Operating System, upward compatible with other DEC Datasystem



models. The operating system uses part of the floppy disc, and supports application programming in DIBOL, Digital's version of COBOL.

The 310 will probably move well in two market areas: to large, sophisticated firms embarking on extensive decentralization/networking projects, and to systems houses for development into a very capable competitor to IBM's System/32. DIGITAL EQUIPMENT CORP., Maynard, Mass.

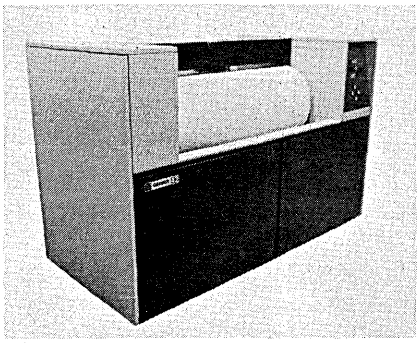
FOR DATA CIRCLE 225 ON READER CARD

High-speed Plotter

Naming its latest plotter development the model 42 Superplotter may seem a little immodest for Gerber, but the unit's specs are impressive, and so is the claim that the firm will match this plotter against all comers, including flatbed plotters, based on throughput performance. It's claimed that where flatbed plotters might outperform the 42 doing straight lines, Superplotter will clobber them doing detail work, such as alphanumerics.

hardware

The accuracy of the new beast is ±0.004 inches and a repeatability of ±.002 inches. The model number comes from the speed of the unit, 42 ips, a speed capability no doubt bolstered by the unit's ability to accelerate the paper under the pens at 2.8 G!



Drawings ranging from A size to E size (36 x 48 inches) can be done on the 42. A variety of drawing devices, including wet ink, ballpoint pen, scribe, and rubylith knife can be used. Basic plotter prices start at around $30K plus interface for on-line use to a number of popular computers. A complete stand-alone system is priced at $64,500. THE GERBER SCIENTIFIC INSTRUMENT CO., South Windsor, Conn.

FOR DATA CIRCLE 226 ON READER CARD

Dispersed Data Processing

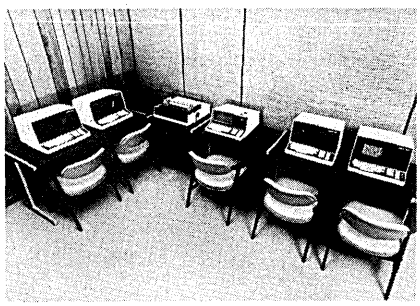
Datapoint is a company that a terminal built. In fact, the name Datapoint was originally the name of the terminal, which became so popular people forgot the real name of the company. In the past several years, in moving into the small scale commercial dp business, the firm has had trouble shaking the "terminal-maker" image, and that trouble is compounded by its building computers that look like terminals. Its latest announcement is a good example of what goes on.

Included in the announcement is the Diskette 1100, a floppy disc version of an intelligent, mag tape-based, crt terminal. The 1100 has up to 16K words of memory, plus up to four discs of 256KB each, a display, and keyboard. It has software for data entry and communications, plus emulators for IBM 2780s, 3780s, and 360/20 HASP workstations. With one disc and 16K it rents for $214/month plus $40 for maintenance on a two-year basis.

The 1100 looks very much like its now-ubiquitous 2200 predecessor. It also looks just like the new Datastation 3600, which is a terminal for the firm's Datashare business time-sharing system (a system the firm refers to as offering "dispersed" data processing rather than "distributed", but then, they've always been a little different). The 3600 has a 1,920 character display, keyboard, direct cursor positioning by the cpu, full-duplex communications at up to 9600 baud (local or remote) and a $1,950 price tag. It is also available for $70/month including maintenance on a two-year basis.

The cpu previously offered in the Datashare system was the 2200, the same one which entered the world as a terminal. Now however, the user can opt for the 5500 processor, Datapoint's most powerful, without disturbing the face he's grown accustomed to. The 5500 allows for connecting 16 simultaneous users instead of 8, can have up to 64K of memory, and allows for selectively restricting the use of shared files. Also, in addition to the line printers and card or tape gear, the 5500 will support the 20MB discs not offered with the 2200.

The big cpu, with 16-terminals and two big discs, is being priced at just under $3K/month. It seems like a lot of computer for the money for running RPG II and BASIC, but there doesn't



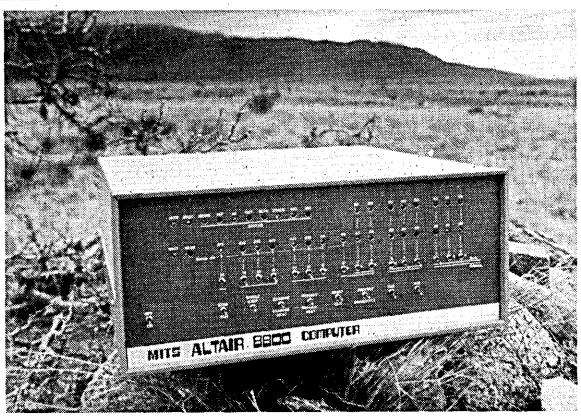
seem to be much of a list of finished applications packages, business system or not. Maybe it's one of the world's best do-it-yourself kits. DATAPOINT CORP., San Antonio, Texas.

FOR DATA CIRCLE 233 ON READER CARD

Minicomputer Graphics

Having previously done graphics interfaces for the Data General Nova and DEC PDP-11 minis, this manufacturer now offers the same capability to users of the Computer Automation Alpha-16/LSI unit. The BP-732 pc board interface makes it possible to turn any ordinary laboratory oscilloscope or X-Y monitor into a full vector graphics display. The unit contains its own semiconductor refresh memory, vector generators, and intensity control cir-

product spotlight



$439 Minicomputer

The $595 crt terminal this firm introduced last year (see July 1974, p. 149) seemed like a tough act to follow, but the little Albuquerque firm has done it: a true, 16-bit (parallel 8-bit processor) minicomputer with 78 mnemonic instructions for less than the crt! In kit form the Altair 8800 sells for only $439, or $621 assembled. That's *before* the oem pricing schedule is referred to.

Standard interface cards and a sophisticated bus structure on the 8800 allow direct addressing of up to 256 I/O devices, and the memory complement can be expanded to 64K on the 2 usec machine. There's even a lengthy list of peripheral options, including three serial and one parallel I/O cards, static and dynamic memory, mass memory devices (including disc controllers and disc drives), vectored interrupt structure, real-time clock, a variety of terminals, numeric displays and ASCII keyboard line printer, direct memory access controller, PROM programmer, and more.

Only 4-6 weeks is being claimed for delivery time on the system, which is significantly named for one of the brightest stars in the sky. For very price sensitive applications, the Altair 8800 may turn out to be Cloud 9 for oem buyers. MITS INC., Albuquerque, N.M.

FOR DATA CIRCLE 222 ON READER CARD

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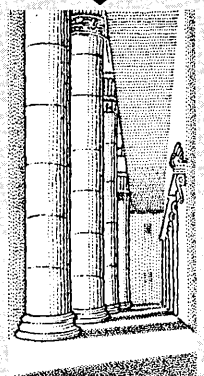

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CIRCLE 29 ON READER CARD

hardware

cuits to ensure flicker-free displays of points, vectors, and alphanumerics at a 50 Hz refresh rate. Memory can be expanded from 256 vectors/points to 1024 vectors/points. X-Y resolution is upgradable from 8 bits to 10 bits. Prices range from $1,295 for the 256 vector/point 8-bit model to $2,195 for the 1024 vector/point, 10 bit model. MEGATEK CORP., San Diego, Calif.

FOR DATA CIRCLE 229 ON READER CARD

Oem Printer/Terminal

Interdata has taken an interesting turn in its corporate development with the introduction of a 30 cps terminal to joust with competition from the likes of Xerox's Diablo subsidiary, Teletype, and General Electric. The Carousel looks like a very fit competitor from what the specs reveal. The unit uses an interchangeable print cup, available in several fonts, an integral microprocessor controller with cycle time of 1.5 usec and 128-character bugger, digital high-speed stepper motors, two paper paths for cut forms and continuous 6-part multiforms, independently-addressable horizontal and vertical print positions, etc. The fingers of the print cup are designed to withstand a minimum of 1 million strikings each, and the print quality is said to rival IBM's Selectric.

If the unit is reliable, it should sell like hotcakes, as the pricing schedule is certainly no deterrent: $1,478 in quantities of 50. Both the basic print mechanism and a terminal version of the Carousel will start coming off the production lines in May. INTERDATA, INC., Oceanport, N.J.

FOR DATA CIRCLE 227 ON READER CARD

Microfiche Reader

The COM 150F microfiche reader has been designed using a convection cooling process that eliminates the need for a fan, making the unit a good candidate for duty in quiet office environments. It features an 11¼ x 8½-inch screen and drop-in lenses with magnifications from 18-54X. Though the illuminating bulb is not cooled, it's still rated as having a lifetime of at least 1,500 hours. The reader is priced at $187. MICRO DESIGN, INC., Hartford, Wisc.

FOR DATA CIRCLE 228 ON READER CARD

Medium-scale Systems

Honeywell has introduced two additional models into its Series 60 line. Probably the most interesting aspect about the 66/10 and 68/60 models is that they represent the lowest cost models that support GCOS and MULTICS operating systems, respectively.

The 66/10 comes with 327-524K bytes of 1.4 usec memory to support time-sharing, transaction processing, local and remote batch processing, interactive remote job entry and execution, direct program access, message switching and on-line document entry, all using a common data base. A typical configuration with 393,216 bytes of MOS main memory, four mass storage units, five magnetic tape drives, a 1,050 cpm reader, 100 cpm punch, 1200 lpm printer, operator console, and Datanet 6600 front-end communications processor with 48K of its own memory for supporting eight communication lines, leases for $20,042/month on a five-year lease, or $976,963 on outright purchase. A starter configuration of this model comes in at $13K/month, or $646,160.

The big attraction of the 68/60 is Multics, a relatively secure operating system with transparent virtual memo-

ry operation features. Up to two cpus and up to four megabytes of 750 nsec MOS memory can be attached to the system to achieve performance levels roughly two-thirds of a similarly configured model 68/80, says Honeywell. A one megabyte system with 160 megabytes of disc storage, three tape unit, and same capability peripherals as those listed above for the 66/10 rents for $46,766/month on a five-year lease. This system can be purchased for $2,386,164. HONEYWELL INFORMATION SYSTEMS, Waltham, Mass.

FOR DATA CIRCLE 230 ON READER CARD

Magnetic Tape

New, proprietary methods that result in the most critically certified tape available to the industry are the claims made for this manufacturer's new "Premium Certified Total Surface Computer Tape," or PC for short. Certified for use with drives capable of recording densities up to 3200 flux changes per inch (or equivalent), the tape is priced at $17 per reel in low quantities. SYNCOM INC., Orchard Park, N.Y.

FOR DATA CIRCLE 231 ON READER CARD

Time-sharing System

The model 4000 interactive time-sharing system is the most powerful introduced to date by this firm. Its major advance over predecessor systems is that the systems can be clustered, sharing central processor and disc storage facilities. A clustered system with eight processors can support up to 256 concurrent users and nearly 5 billion bytes of on-line disc storage, it's claimed. The software is a derivative of BASIC called BASIC-X, extended for business and scientific applications. The 4000 also features the ability to have itself tested by a remote service engineer over a dial-up telephone line. A basic system 4000, model 10 with 16 ports and one 2.4 megabyte disc drive is priced at $49,500. A larger model 30 with 16 ports and one 73 megabyte disc drive is priced at $69,900. BASIC TIMESHARING, Sunnyvale, Calif.

FOR DATA CIRCLE 232 ON READER CARD

Top-of-the-Line Terminal

Pity the IBM 3775 terminal. Its stay at the top of the IBM 3770 line lasted about three months. Its position has been usurped by the 3776, which is much the same only faster and more expensive.

The 3776 is designed for medium-speed remote job entry. It has a 230lpm printer which uses a 64-character print belt and which can be cranked up to run 300lpm with a 48-character set. It can also have card readers good for up to 300cpm, a card punch, and either one or two floppy discs.

One of its features is an innocuous looking switch which takes the terminal from a binary synchronous network mode into a 4800 baud SDLC mode, another example of how easy IBM intends to make that transition for the user.

Never a firm to be reticent about its terminal prices, IBM has shoved the top of its 3770 pricing umbrella to about $760 on the 24-month extended term plan (for a unit with one diskette, a 50 cpm card reader, a mag stripe badge reader security feature, and some communications features). The rental for that relatively modest model is pegged at $900, and the purchase price $30,000. For that much, a person should be able to get a terminal, a disc, a card reader, *plus* a small computer—but it might not talk in SDLC. IBM, White Plains, New York.

FOR DATA CIRCLE 234 ON READER CARD □

'75 NCC PREVIEW

A PROGRAM OF HIGH RELEVANCE

As preparations for the 1975 National Computer Conference, May 19-22, reach the final stage, one thing is clear: this will be the most comprehensive and relevant data processing conference and exposition ever held on the West Coast. More than 400 industry leaders and experts will probe a wide range of topics with special emphasis on problems and solutions as they impact current technical, economic, and social issues.

As detailed in the '75 NCC Program Booklet, some 90 sessions will cover critical topics in three major areas . . . Data Processing Methods and Applications, Science and Technology, and Interaction with Society. In the Anaheim Convention Center's 230,000 square feet of exhibit space, thousands of products and services will be displayed by more than 250 organizations, permitting on-the-spot "hands-on" evaluation and comparison.

The conference opens May 19 with the NCC Keynoter, Prof. Jay Forrester of MIT, discussing computer modeling of social systems with special reference to forces underlying current inflationary trends. The program and exhibits, featured speakers, special events, and social activities will make this year's NCC an imperative for data processing specialists, computer scientists, users, administrators, and educators.

A SPECTRUM OF PRODUCTS AND SERVICES

Virtually every type of data processing technology, product, and service will be represented in displays and demonstrations at Anaheim. More than a thousand technical, marketing, and management representatives will be on hand to answer questions and supply technical and commercial data. NCC will be a showcase of mainframes, minicomputers, data communications systems, displays, terminals, memory systems, software systems, test equipment, time-sharing services, and much more . . . many shown for the first time.

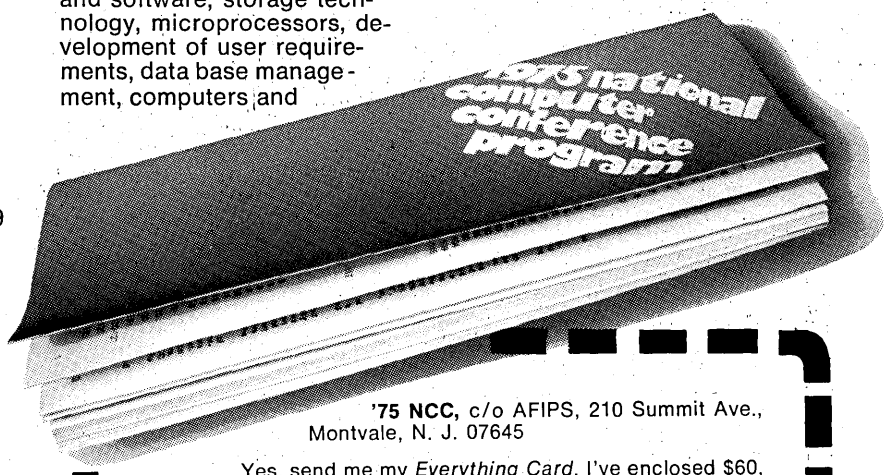
NCC PROGRAM: CHALLENGES AND SOLUTIONS

Rapid advances in computer technology and interaction of these developments with users and society will be analyzed during the '75 NCC program. The program will cover such relevant areas as the interaction of computer hardware and software, storage technology, microprocessors, development of user requirements, data base management, computers and management, health care, banking, and computer-communications networks.

Detailed information on these program areas and others, plus additional aspects of the conference, are covered in the '75 NCC Program Booklet, available in advance to all full-conference preregistrants. Included are abstracts of each session, lists of chairmen and participants, a pullout schedule of sessions and events, a rundown on special activities, and general NCC information.

ROUNDING OUT THE PROGRAM

A variety of high-interest special sessions and activities will round out the NCC program. These will include a special Pioneer Day program on Wednesday, May 21, to honor the team that was associated with Dr. John von Neumann at the Institute for Advanced Study, Princeton, N. J., presentation of SHARE's SILT Report describing projected demands on the data processing industry for 1980-1985, plus featured speakers, luncheons, a special NCC night at Disneyland, and others.



REGISTER NOW

Mail this coupon prior to May 1, 1975 to preregister for the full '75 NCC and to obtain advance information on the NCC program. Full-conference advance registration entitles you to your gold **Everything Card**, representing a $15 saving over full-conference registration at Anaheim, plus advance information on a special NCC travel package providing savings of up to 30 percent, conference luncheon discounts, advance housing arrangements, and the '75 NCC Proceedings.

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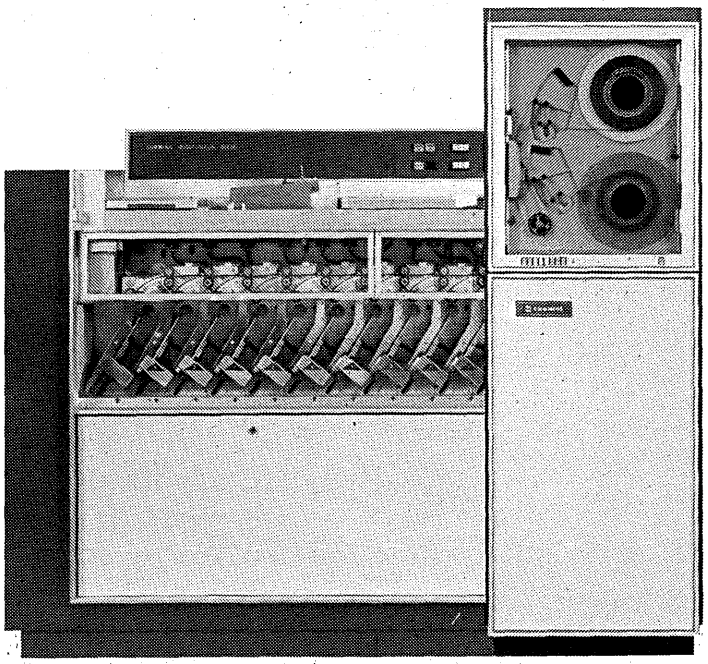

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software & services

Updates

While most of the dp industry frets over the outcomes of the U.S. vs. IBM case and any Telex appeal, a few outfits are finding ways to make money from the situation. Two of these are Base, Inc., New York, and International Business & Data Services, Greenwich, which have teamed to offer on-line and batch reporting of the once-confidential IBM data made public as a result of the trials.

Access to the nearly two million page database will be through Boeing Computer Services.

Of course there is money in the ecology business too, as Bruce Howlett, Inc., a small environmental planning firm in New York, has found. The company uses a Computer Sciences package to analyze the impact of proposed utility routes, finding ways around homes and even duck ponds, they say.

Something similar is being done by AeroVironment, Inc., of Pasadena, Calif., and Systems, Science & Software, of La Jolla, Calif. The firms monitored, measured, and modeled air quality in (so far) relatively unpolluted Richmond, near San Francisco.

Their findings? According to a report released by the Calif. Dept. of Transportation, freeways can actually improve air quality. The EPA will never believe it.

According to Datamation's 1975 dp budget study in this issue, rising costs have most dp managers up against the wall. One way out was found by Unigard Insurance, of Seattle. The firm added VS enhancements offered by Programming Methods, Inc., cut cpu time for teleprocessing in half (49% to 22%), and is selling the extra time. Sounds awfully "salesy," but that's the user's claim, not PMI's.

And also according to that survey, there are good times ahead for software vendors and for some service vendors. Dp budgets are way up for software packages -- up over 80% for software offered by the mainframe suppliers, and up nearly 70% over 1974 spending for products from independents.

The service bureaus coming out ahead are those offering remote batch (budgets are up over 73% for users contracting for back-up service) and COM film processing (up nearly 40%). Looks promising.

Partition Balancing

The developers of LIBRA have taken a different approach in designing a package for balancing partition performance in IBM DOS/VS systems. Instead of a straight time slicing method —said to involve relatively high overhead and possess dubious capability for actually redirecting the cpu's attention —LIBRA performs its balancing act by monitoring the cpu usage of each partition and reordering priorities. Cpu-bound jobs are given the lowest priority in order to liberate the cpu for I/O bound jobs. A byproduct of this kind of monitoring is a lessening in the concerns of the scheduler, who no longer has to assign cpu-bound jobs to low priority partitions. LIBRA also features operator override capability, and the option of specifying high priority partitions that are not to be balanced. A one month trial for LIBRA costs $75 and is applicable to the $1,500 purchase price. DATACHRON CORP., New York, N.Y.

FOR DATA CIRCLE 214 ON READER CARD

On-Line Savings and Loans

NCR is now offering small and medium-sized savings and loan associations a communication package pilot tested at Home Federal Savings and Loan Association of Columbia, South Carolina. Called FAPS (Financial Application Preprocessing System), the package basically coordinates communications between a number of terminals and additionally processes the data for entry to a central computer. In the Home Federal system, 17 NCR 270 terminals were installed in 10 branch offices, with one branch 140 miles away from the home office. The package is offered by itself under the product number 775-500 for $800/month, or $25K on purchase. More likely to be sold is a total

software spotlight

Calculus Programming

PROSE, a high level language designed to allow direct calculus level programming, just might be the most significant step in the evolution of software since structured programming discipline was introduced several years ago. The language, a FORTRAN derivative developed to support the Apollo spacecraft program, has now been honed for commercial use. It's already installed as a batch system in a number of *Fortune 500* companies, and the time-sharing version now being introduced will undoubtedly reach many other companies doing calculus problems, including the commercial sector.

The claims made for the language are impressive. Potential customers have thrown practically unsolvable problems at PROSE which have been solved within a matter of hours. The language provides automatic evaluation of first and second order derivatives, with no limit on the number of independent or dependent variables or on the complexity of their relationships. PROSE also evaluates the maxima and minima of functions with no limit on function complexity or dimensionality; solves systems of equations, including both algebraic and ordinary differential equations, whether they be implicit or explicit, linear or nonlinear; solves process-identification problems, boundary value problems, and optimal control problems; and performs linear and nonlinear programming subject to arbitrary combinations of linear or nonlinear equality and inequality constraints. As hairy as these problems can be, one of the first things a user types in at the terminal is whether he or she classes himself as an expert or a novice at this sort of thing, receiving various degrees of explanation and help in working through the problem. It would seem that the power of the PROSE language comes very close to realizing the old dream of having analog computer speed and accuracy truly available from a digital computer.

PROSE is implemented on CDC computers using the KRONOS 2.1 operating system. The charges for using include a $3K fee plus $965 month for unlimited, single-site usage. The developers are considering developing versions for the DecSystem series and IBM's 370 line, the latter made more complicated by the variety of operating systems offered. PROSE, INC., Los Angeles, Calif.

FOR DATA CIRCLE 213 ON READER CARD

software & services

package of hardware and software that includes a Century 101 computer with 64K of memory that rents for $5,830/month and sells outright for $232,475, including FAPS. NCR CORP., Dayton, Ohio

FOR DATA CIRCLE 215 ON READER CARD

System Productivity

If bundling is dying, it's a slow, lingering death. "Resource" is the third software package recently offered to Memorex customers willing to buy the "hardware"—in this case a year's supply of their disc pack or computer tape requirements. Resource is applicable to most IBM 360 and 370 operating environments, requiring a tape drive, disc or tape sort work space, card reader, printer or spooled equivalents, and runs in a partition or region of approximately 100K memory, depending upon accounting file block size and amount of main memory allocated to sorting at run time.

The package, available in COBOL and assembler, produces three reports of a day's activity pertaining to the system. A daily run of jobs executed in chronological order lists run times, cpu-consumed time, and various factors pertaining to memory allocation versus usage. Tape drive, I/O block counts, and the dollar value of the run charges are shown. Graphic displays show activity averaged during five minute intervals, the number of jobs run concurrently, cpu busy time, memory allocation, and usage. Summary statistics are calculated pertaining to both the daily report and graphic displays. Memorex states that similar program products have sold for approximately $5K in the past. MEMOREX CORP., Santa Clara, Calif.

FOR DATA CIRCLE 216 ON READER CARD

Program Scanning

KwicScan (Key Word in Context Scanner) can be used in a variety of ways to aid programming in IBM OS and VS installations, including program development, debugging, documentation, and inquiry. Any assembler or higher level language program, or an entire library of programs can be scanned for character data, starting with either alphabetic or numeric characters, in any sequential file for user-specified information. The package can also be used to cross reference an entire system, producing a report showing all references of a symbol or symbols specified in the scan. A symbol can be any user-specified character string or partial character string, up to 40 bytes in length. KwicScan is priced at $3,250 including installation, supporting documentation, and a one-half day training course.

FOR DATA CIRCLE 221 ON READER CARD

A related product, SuperSnap is a package for systems personnel engaged in difficult debugging circumstances. It consists of one macro and two modules said to lessen the time needed to pinpoint and resolve various programmer errors. The LIST macro traces specified data regions and registers, producing a report of the programmer data in a format corresponding to his or her requirements. LIST can also be used as a report writer. DynaSnap is a region dump that produces a formatted dump of all storage in a region. The TaskSnap is a snap dump module that produces a dump of the object data set without aborting (ABENDing). SuperSnap is priced at $3K, including the same support as the KwicScan package.

Both packages together sell for $5K. FRANKLIN COMPUTER ASSOCIATES, INC., New York, N.Y.
FOR DATA CIRCLE 217 ON READER CARD

NCR Labeling

"Labeller" is a generalized load-and-go program that allows NCR Century computer users to make 1, 2, 3, or 4-up (the number of labels that can be printed simultaneously) label runs. Using "fill in the blanks" style control cards, the package can be instructed to perform fairly sophisticated printing tasks, such as RECORD LOCATION _____ CONTAINS _____ CHARACTERS WHICH IS A KEY (X). WHEN KEY CHANGES, PRINT '_____' ON LINE ___ AT POSITION _____. Other controls provide for controlling the number of lines per inch, label positions, file names, Nth record printing, backup points after every specified number of pages, and selected record location printing. The 16K program is priced at $300. L/V ASSOCIATES, Auburn Hts, Mich.
FOR DATA CIRCLE 218 ON READER CARD

System/3 File Maintenance

LIBFIL is an extention of IBM's $MAINT for performing file storage or maintenance on the System/3 computer. It allows the user to copy programs and procedures from the libraries onto 5444 or 5445 disc files; copy new or modified programs and procedures from the 5445 or 5444 files into the libraries; copy user libraries without copying the system functions; store production programs and procedures on the same 5445 pack as the related files; and use a single 5445 pack in place of several 5440s to back up production programs and procedures.

There are two versions. The basic LIBFIL supports the 5444 disc user on either a model 6 or 10 and is priced at $90. LIBFIL/45, which includes the $MAINT extension, supports the 5444 and 5445 on the model 10. It's priced at $140. GROUP/3, Canoga Park, Calif.
FOR DATA CIRCLE 219 ON READER CARD

1401 Emulation

This vendor is offering yet another escape route for firms still emulating second generation IBM equipment (the 1401 system) on 360 and 370 equipment. The solution? Buy a Data General Nova minicomputer with the RDOS monitor, and this software package, dubbed E/1401. Performance is said to have been benchmarked against both 1401s and the 370 1401 emulator and found to offer comparable throughput. It's also claimed that 1401 programs can be run without modification using E/1401.

Compatible with the 1401 instruction set, the system emulates 1311 discs and the Advanced Programming Package special feature instructions. Magnetic tape is available as an option, as is an add-on package which expands the emulator to include the full 1440 instruction set. The basic system, including installation, 1311 support, documentation, and one-year warranty, including all updates, is priced at $10,800. SYSTEMS TECHNOLOGY, INC., New Haven, Conn.
FOR DATA CIRCLE 220 ON READER CARD

●

A robot liked liquor a lot,
but whenever he took a good shot,
it rusted his wires,
provoked his desires
but marred his performance somewhat.
—Gloria Maxson

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INFOTECH

source data

(Continued from page 30)

courses

On-site IMS Courses

One stumbling block to dp education is often that those who need instruction must go to Podunck Junction for a seminar. This three-course curriculum is brought to you, and is tailored to reflect your own applications. Course one takes three days to cover Data Language/1, from the ground level through IMS/VS data base enhancements. Course two takes two days to hit IMS data communications from nucleus structure and control block generation to application programming design. Course three is on IMS data base design, and includes DL/1, access methods, and data base organization. The price for the presentations is $400/day plus expenses, presumably no matter how many employees attend. DATA BASE MANAGEMENT, INC., Vernon Professional Bldg., Vernon Circle, Vernon, Conn. 06066.

Home-study DP

A nontechnical 10-assignment home study course has been prepared for those who need an introduction to data processing. Aimed at business owners and managers, the course does not require a strong math background, and is designed to impart a knowledge of the vocabulary, as well as the selection, design, and use of computers. UNIV. OF WISCONSIN—Extension, Independent Study, Dept. of Business & Mgmt., 432 N. Lake St., Madison, Wisc. 53706.

DP Sign Language

Four films of sign language signals for dp terms have been produced by the Calif. State Univ. at Northridge under a grant from IBM. Each film covers 30 terms, ranging from "accumulator" to "variable," and the most common 30 are on the first reel. The films run six to nine minutes, depending on the projector speed, and are in color. The English letters for each term are shown, as well as two views of the sign, and the person on screen is seen saying the word; there is no sound track. The films are available for the cost of reproduction, about $28 each. CALIF. STATE UNIV., NORTHRIDGE, Office of Public Affairs, 18111 Nordhoff St., Northridge, Calif.

A Score of Courses

Through the year Brandon offers what looks like a continuing roadshow of dp related seminars and workshops. Generally these are held in New York, Chicago, Washington, and San Francisco, but sometimes a few other cities get into the act too. Courses for '75 include: structured programming, security, standards, networks, planning, systems analysis, career structures, software packages, and many others. Prices vary depending on the number of days of instruction, generally running from $200 to $400. Fixed fee schedules for instruction at user sites are also available. BRANDON APPLIED SYSTEMS, INC., 1611 North Kent St., Arlington, Va. 22209.

periodicals

Scientific Reviews

A multidisciplinary guide to review articles, *Index to Scientific Reviews,* starts publication with its April issue covering 1974 literature. The major advantage of this index to researcher and librarian alike is that references to review articles in more than 100 disciplines, including physics, agriculture, social and behavioral sciences, etc. as well as those crossing disciplinary lines, can now be found in one place. For the dp minded, many IEEE journals, *Communications of the ACM, Control Engineering, IBM Systems Journal,* a publication called DATAMATION, and others, are represented. A softbound, semiannual issue covering January to June appears each September and a hardbound annual cumulation appears the following April. Subscription: $250/year, with multiyear discounts. INSTITUTE FOR SCIENTIFIC INFORMATION, 325 Chestnut St., Philadelphia, Pa. 19106.

Data Processing Digest

Happy 20th birthday to *Data Processing Digest,* now one of the oldest computer publications in the business! Published by Margaret Milligan, this monthly prints summaries of articles, selected from more than 200 periodicals, on computer technology and its application to operations and management. Subscription: $51/yr. DATA PROCESSING DIGEST, 6820 La Tijera Blvd., Los Angeles, Calif. 90045.

source data

(Continued from page 28)

associated with this work from its beginning and are well known for their significant research contributions to the development of computer networks. The first half of the book covers basic material on such topics as Data Transmission, Digital Multiplexing, the Telephone Network, etc. While well presented, this material is really nothing new and can be found elsewhere. However, the last seven chapters represent the first presentation in a widely published text of the basic principles of packet switching network design. The chapters cover message switching systems, data switching principles, network structure for packet switching, protocols terminals and network monitoring, network geography, reliability and routing, the software of packet switching systems, and the review of the design principles of data networks.

This book is a must for any technologist in communication networks.

—Lynn Hopewell

Mr. Hopewell is vice president, Washington Operations, for Network Analysis Corp., an architectural consulting firm specializing in the planning, design and testing of computer communications networks.

BOOK BRIEFS . . .

Controlling the Computer

by Tom Gilb
Studentlitteratur ab, Magistratsvagen 10, Lund 1, Sweden, 1974
79 pp. $4.50

An entertaining "guide for non-specialists and line managers," this import uses cartoons and an easy-to-read format to discuss "tools for gaining control over computer usage."

Computer Careers

by John Maniotes and James S. Quasney
Hayden Book Co., 1974
192 pp. $4.95

This practical handbook covering "planning, prerequisites and potential" for working in dp fields offers a "broad overview" of the subject, plus detailed school information and job-hunting procedures.

Data Analysis for Scientists and Engineers

by Stuart L. Meyer
Wiley & Sons, 1975, 513 pp. $16.95

This seems to be a complete text, filled with formulas, tables and graphs to help demonstrate "all the statistical methods, concepts, and analysis techniques" that will enable the student and professional to deal with data.

DP Standards Manual (Tailored for IBM System/3)

by Brian Gilbert
Clear Computer Services Ltd., 13 Wolseley Gardens, Chiswick, London W4 3LY, England, 1974.
£2 (Approx. $2.80)

Like the System/3, this book is small in size (4 x 6 inches). It covers everything from operator aptitude testing to programming conventions and documentation.

Games, Tricks and Puzzles for the Hand Calculator

by Wallace Judd
Dymax, 1974, 91 pp. $2.95

The author, with a background as teacher and consultant, has introduced a fun-and-games approach (called "recreational mathematics") to the use of the hand calculator, fast becoming a sophisticated toy as well as a useful tool.

Travels in Computerland

by Ben Ross Schneider, Jr.
Addison-Wesley Publ. Co., 1974
256 pp. $5.95

An English professor's witty account of his adventures in turning an "idea to reality via computer" while transforming an 11-volume directory of London stage performances into a computer-accessible information system.

Introduction to Optimization Methods

by P. R. Adby and M.A.H. Dempster
Halsted Press, 1974, 204 pp. $7.95

Claimed to be "suitable for undergraduate and postgraduate courses in mathematics, the physical and social sciences, and engineering," the book is filled with worked numerical examples and advanced algorithms.

Data Processing Systems Analysis & Design

by Robert J. Condon
Reston Publ. Co., 1975
286 pp. $11.95

An elementary, well illustrated book which seems to be clearly written and presented. Numerous diagrams, sample memos, mini-cases, and glossaries dot the text and give it a practical, job-related immediacy.

Queueing Systems, Volume 1: Theory

by Leonard Kleinrock
Wiley & Sons, 1975,
417 pp. $19.95

Intended for both student and professional, this book, though full of equations, is said to be "a long-needed alternative both to highly mathematical texts and to . . . simplistic or limited" ones. Volume 2, to be published later this year, covers computer applications and is supposed to present material never before collected. □

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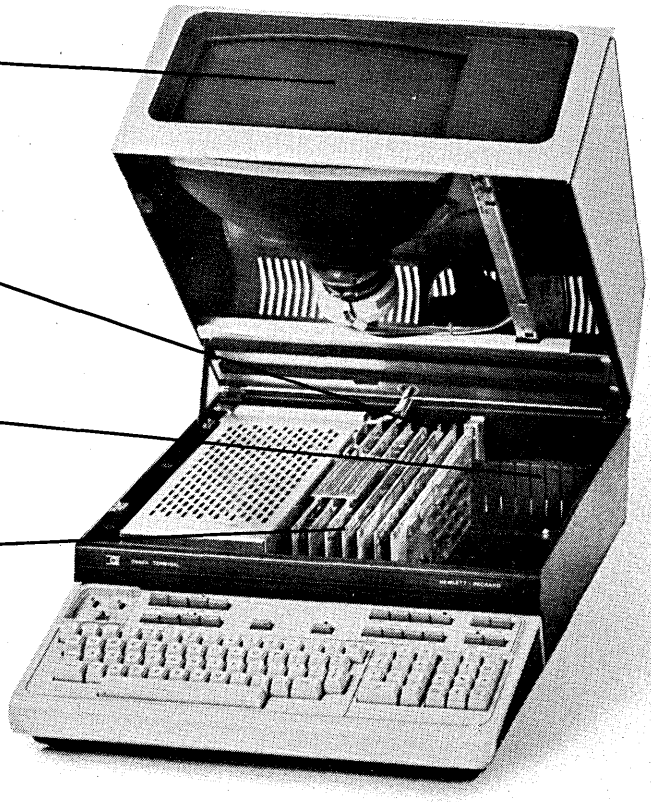

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letters

(Continued from page 8)

experience, assured that she will perform as well as a man with similar qualifications, companies do not consider the female keypunch clerk or office clerk for promotion in the same manner as the male I/O clerk. (If inadvertently I have applied sexist categorizations, I apologize; these jobs have existed where I have worked.) Negative attitudes towards promotions of such women are all too prevalent in today's society as it is. A policy of "the blind eye" towards ads and articles that are discriminatory in publications such as yours becomes in effect blatant prejudice.

DEENA ELIOSOFF
Montreal, Quebec

Department of Unjustice

Your article "How Justice Thinks The User Was Harmed" (Dec. 1974, p. 113) was most interesting. As a user of dp equipment for the past 27 years, covering four generations of computers, I cannot agree with the Justice Dept. evaluation of the user situation.

From the appraisal, as reported in your article, it appears that the Justice Dept. feels that the user is not capable of operating his business in the past or present environment. The users are characterized as being:

1. incapable of objectively assessing price
2. lacking a basis for adequately evaluating data processing needs
3. totally reliant and dependent upon IBM for all facets of their data processing operations

This evaluation of the users' ability is sheer nonsense. The long line of successful data processing installations results from the users' ability to make good use of the equipment leased or purchased, not from a sales effort.

This nonsensical evaluation of the users' situation continues, stating that the users believed they were getting something "free" in the form of services. Simply because services are not "charged" on an extra basis in no way implies that they are free. Anyone in business knows that he pays for what he gets and that nothing is "free."

It appears that the Justice Dept. believes that the user is some sort of ignorant neophyte incapable of making decisions and managing his department. I respectfully submit that the Justice Dept. unjustly evaluates the user position. Perhaps it should check with users before making evaluations.

L. H. RHOAD
Director
Data Processing Division
Wieboldt Stores, Inc.
Chicago, Illinois

Mythical manpower

Dr. Brooks' article ("The Mythical Man-Month," Dec. 1974, p. 45) is expert testimony in support for the concepts I propose as "Fried's Law":

There is an inverse relationship between effectiveness (production) and group size in complex technical projects.

The productive time of a group may be derived from the formula:

$$P_t = K(T[.55-.0001\left\{\frac{K(K-1)}{2}\right\}])$$

Where:

P_t = productive time
T = individual employee hours per work period
K = the number of people in the group

Solved for 90 people working a standard 40-hour week (a total of 3,600 available hours) the result is 538.2 hours.

Weinberg, in his book *The Psychology of Computer Programming,* recognized the same phenomenon, for which he provided a "rough rule" that, as the size of a staff is trebled, the productivity is doubled.

Dr. Brooks' contribution is a substantial addition to the support of both Weinberg's Rule and Fried's Law.

LOUIS FRIED
Vice President
Title Insurance & Trust Co.
Los Angeles, California

More Wandering

I disagree with Kenneth R. Wander's letter on mnemonics in mathematical notation, "Still in Dark Ages" (Dec. 1974, p. 161). The chance of errors in coding have been reduced greatly by the use of mnemonics such as .EQ., .NE., .GT., etc. rather than their mathematical counterparts $=$, $\neq$, $>$. As for using unfamiliar symbols to replace certain keywords, I feel that trying to comprehend another programmer's source statements is difficult enough without having this added burden. It's true that printers can accommodate the mathematical symbols needed, but at an extra cost to the user, whereas the mnemonic symbols are made up of standard letters found on any printer.

The time used to translate a mathematical symbol is usually equal to (".EQ."), if not greater than (".GT.") than for a mnemonic symbol. As for the compiler developers not considering programmers—actually, most compiler developers are programmers.

Speaking from this programmer's point of view, mnemonics have been a great help, not a hindrance.

JOHN PULLINS
Lead Programmer
Abex Corporation
Mahwah, New Jersey

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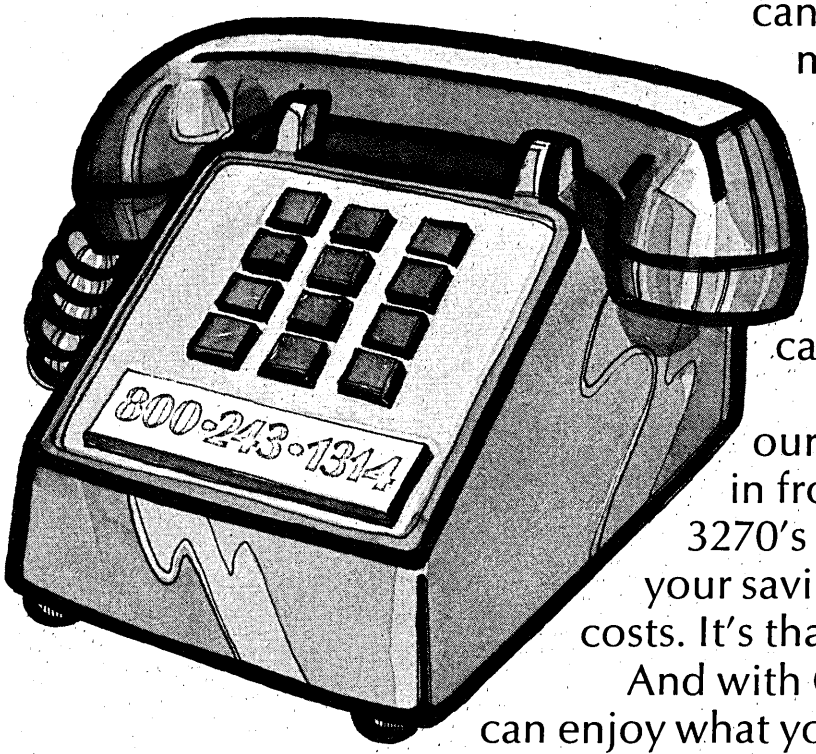

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CIRCLE 9 ON READER CARD

This forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

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WHY NOT STRUCTURED DATA PROCESSING?

In the past we have seen a lot of work done to transfer applications from one computer generation to another without much synchronization with the needs of the users. Worse operations and higher costs have resulted from converting systems that would have worked well if just left unchanged.

Still we continue to convert more applications. If the size of the computer staff is to be limited to a reasonable part of the company's total personnel, ways to extend the lives of acceptable applications must be found so that the staff can work on new implementations or specific changes to existing applications which may be required by laws, labor agreements, new procedures for external data exchange, etc.

The point is that the life of systems should be prolonged as long as functionally and technically possible. Thus the present five-to-seven year depreciation time should on the average be doubled, and conversions turned into redesigns or total exchanges of system.

Much has been said about structured programming, which is a way of splitting up an application or a project into manageable units or modules. Perhaps this technique can solve some problems in data processing. Let us see if the structuring approach can be extended also to computer operations, and call it "structured data processing." (We may also keep in mind that someone once said, "Structuring means dividing an inconceivable entirety into many incomprehensible units.")

In my opinion Structured Data Processing could have the following characteristics:

1. Applications should be split into moderately sized, manageable and understandable logical modules; let's call them AMs (for application modules). The size could be limited in terms of development manpower for the module, e.g., one man-year.

2. It should at least be theoretically possible to process any AM on a dedicated computer with its own power system, computer hardware and software, data bases, etc. This does not mean that AMs should be processed on dedicated computers, but that they should be processed in such a way that they could be broken out of a larger system and put on a dedicated one.

3. In principle the environment around an AM should be either real-time messages or batch files in a strictly formalized way.

4. The main reason for using a large data base has been to avoid double storage of the same information. It is no longer imperative to save storage because storage is now getting cheaper. It is more important that the same data not be entered into the system more than once because this

process is still expensive. Consequently AMs should be designed to accept and check input data once, and then to broadcast that same data to all other AMs which would need it.

5. The data and the modules need a measure of independence and fail-soft ability. Each AM should be independent of the functions of other AMs, and designs should allow AMs to work partially if necessary data does not arrive. Similarly, if for some reason a module cannot accept real-time messages, those messages should be automatically saved and submitted later when the whole AM is in operation.

6. Each AM must contain protection against erroneous, unauthorized, wrongly addressed, duplicated, incomplete, and redundant messages. They should also be protected against overload due to multiple entries of erroneous messages, such as the consequences of loops in other applications.

7. Each AM must protect other modules from such antisocial behavior, as mentioned in item 6 above.

8. Each AM must protect the data it has once accepted and conform to recovery standards. These standards should be such that no data can ever get lost without notification to the systems supervisor, and that recovery will be possible.

9. Within a large computer system, the data flow between AMs could be in the form of internal messages on channel connections or communication interfaces, or of batches on magnetic cassette tapes or ordinary tapes.

10. An AM could consist of a purchased package which by means of a "ring of middleware" around it, will serve as an AM. An example: If a purchased package needs a lot of nonstandard input, there should be an input editing program to change input in standard format to the nonstandard input required by the purchased package.

11. It should be possible to trace and recover messages which pass between AMs. The standard for message reliability would be similar to the recovery standard that no message should be lost without notification to the system supervisor who would then trace the message.

12. Some means of logging the data flow is necessary. It is more essential to map and manage the information flow between AMs than to map and manage each individual data base centrally. A sort of data flow management package is required.

13. AMs can—and even should—to a large extent use common facilities for communication, data base management, recovery procedures, supervision of operating facilities, etc.

14. The location of computers and data bases is a function of economy and security. Thus if communication costs are high, there is good reason to decentralize computers. However, future memories with high initial costs and low or neglectable data storage costs will lead to centralization of data bases. The potential risk for labor conflicts and strikes will also be considered, as sooner or later the dp people will realize what outstanding opportunities they have to rub out well computerized companies.

15. There should be a standard format for dumps of data bases and logging facilities. At least the media for such information should be readable by the same processing unit. This is a prerequisite for efficient handling of MIS.

16. Each AM should be processed on the best suited type of computer, i.e., communication on minicomputers, bookkeeping on sequential conventional computers, large-scale number crunching on associative computers with parallel processing capabilities, etc.

The discussions concerning MIS have usually dealt with huge physical data bases on large, centralized systems. The conversion problems have been touched upon very little.

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This also goes for the development and debugging problems, as well as for security, the reliability and the testability of systems.

We will in the future encounter sporadic explicable and inexplicable problems in operations due to component faults, software faults, acts of God (or the Devil), strikes, etc. Structured data processing could be the alternative to the large centralized, superadvanced supercomputer; it might be less sensitive and less vulnerable.

With structured data processing, it will still be possible to keep a reasonable overview of the entire dp activity.

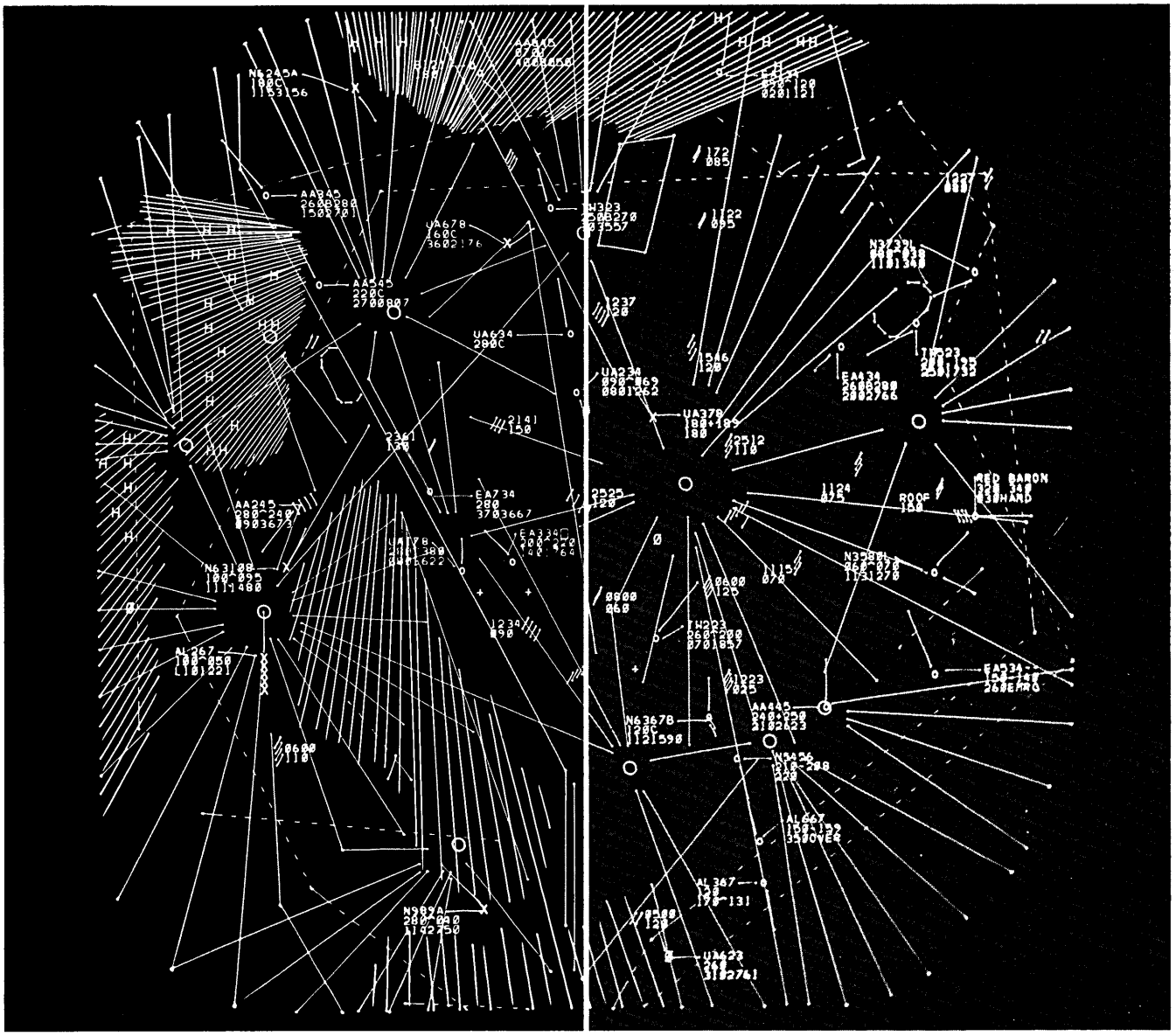
I am afraid that very few computer manufacturers would back up the above philosophy; the trick of obsoleting computers in an artificial way would be more difficult to perform if users were in control to this extent.

On the other hand, this approach would certainly be supported by producers of applications and reasonably costly dedicated computers, which might be healthy for the industry.

Structured data processing cannot be achieved on a five-year basis; but we could hope for success within 10-15 years. We could also set it as a goal, say, for 1990.

Maybe the goal might change in the meantime, but it is not likely that heading toward structured data processing would bring you to a dead end.

—Bertil Martinsson
Mr. Martinsson is technical manager for Integrated Computer Systems AB, Stockholm, Sweden, which represents several U.S. computer interests in Scandinavia. He has also worked on computer and communication systems for Scandinavian Airlines.



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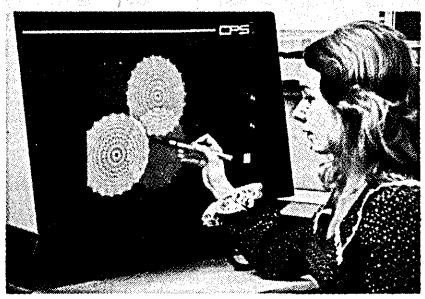

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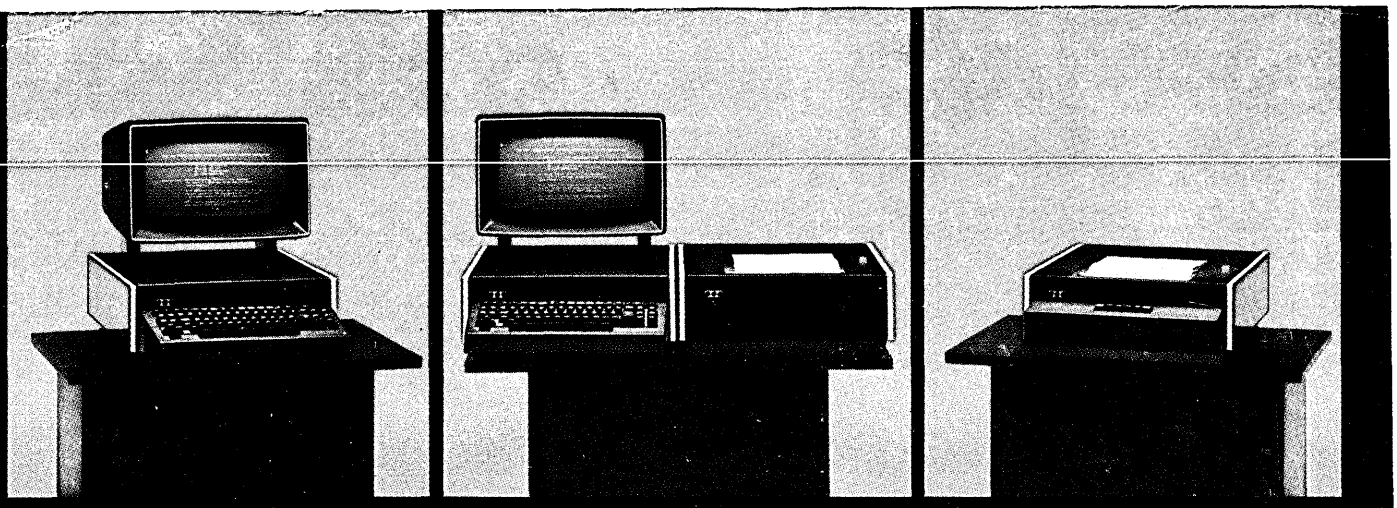

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