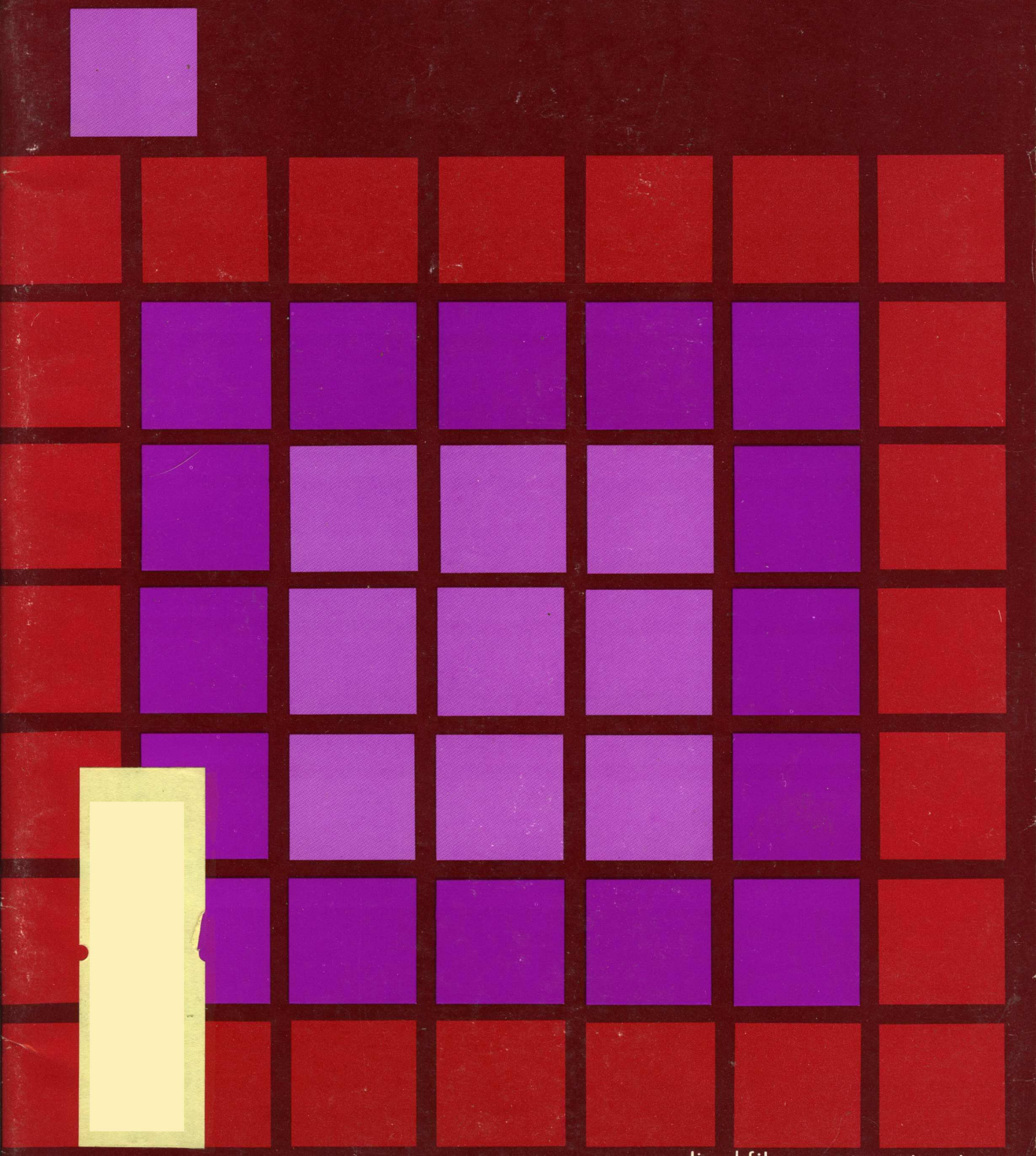
DATAMATION®

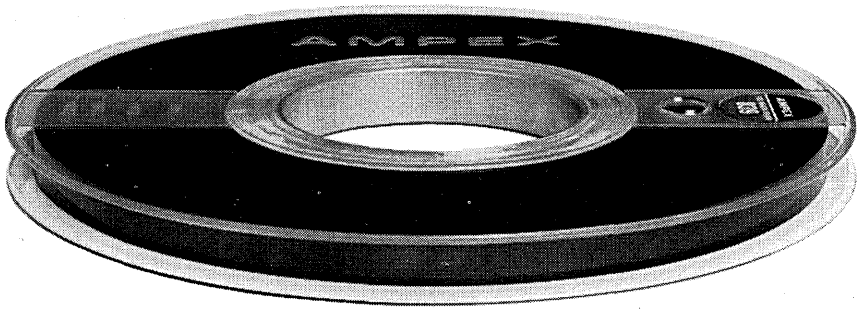
68

January



generalized file management systems

Clean and comfortable



when we ship it

when you store it

Our computer tape is clean and error-free. We think that our superior cleaning process makes it cleaner than anybody else's, but of course we're prejudiced. Point is, to be computer tape at all, it has to be clean and free from dropouts.

But we don't stop at merely making clean tape; we make sure that it gets to you clean and that you can keep it clean. Here's how:

Our exclusive environmental shipper which we call the Tape-Safe keeps dust out and your tape "clean and comfortable." Clean, because the polystyrene foam won't shed like cardboard; comfortable, because it cushions the tape in transit against shock and damaging fluctuations of temperature and humidity. Best of all, it's free with your minimum order of Ampex tape for IBM and IBM-compatible computers.

Then, for the only sure protection in storage, we pack our tape in a unique all-plastic canister. It keeps tape clean because it cannot generate contamination and its positive seal prevents outside dirt from getting in; comfortable because it protects against shock and humidity. This canister is even encased in an airtight poly bag during shipment. From then on, it's up to you.

FREE! If you'd like a few suggestions on how to keep tape clean, write Tape-Safe, Ampex Corporation, 401 Broadway, Redwood City, California 94063, for a copy of our TRENDS Bulletin No. 12, "Care and Storage of Computer Tape."

AMPEX

Career opportunities? Write Box D, Redwood City, California 94064.

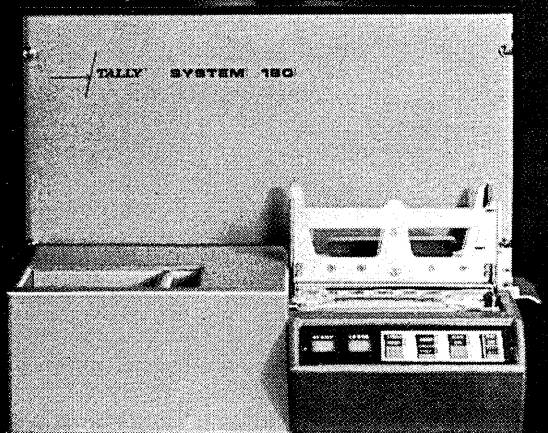
CIRCLE 1 ON READER CARD

So if you think mag tape is the solution to your problem, you can have the Tally data terminal which transmits and receives data at 1200 words per minute over ordinary phone lines. The same unit reads or writes at 1600 char/sec off line for high-speed computer input/output.

Does this grab you? The versatile error correcting Tally 311 send/receive terminal operates over ordinary phone lines at 1200 words per minute. Use it for off line tape duplication and editing, too. Computer compatible mag tape options are available.

TALLY®

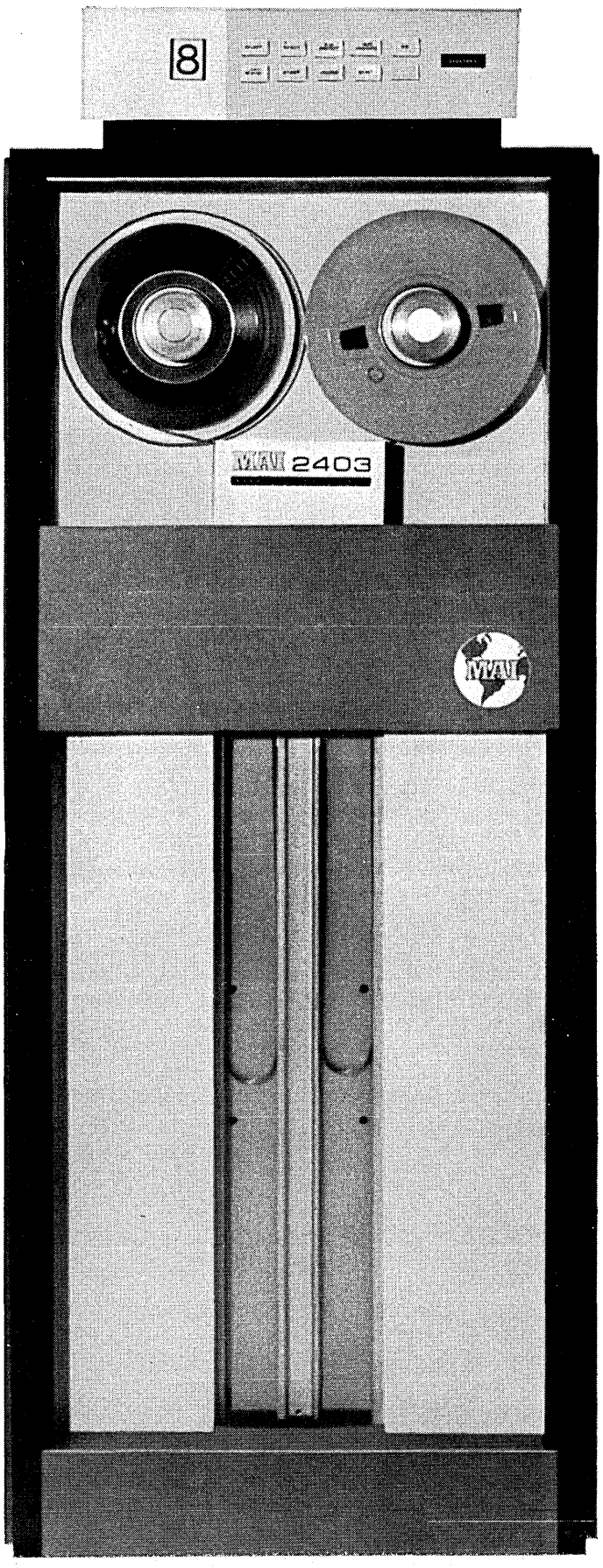
You won't need bifocals to eyeball this solution to the card transmitter problem. The Tally 180 transmits punched card data over ordinary phone lines at 42 cards per minute. Field selection and automatic error indication are standard.



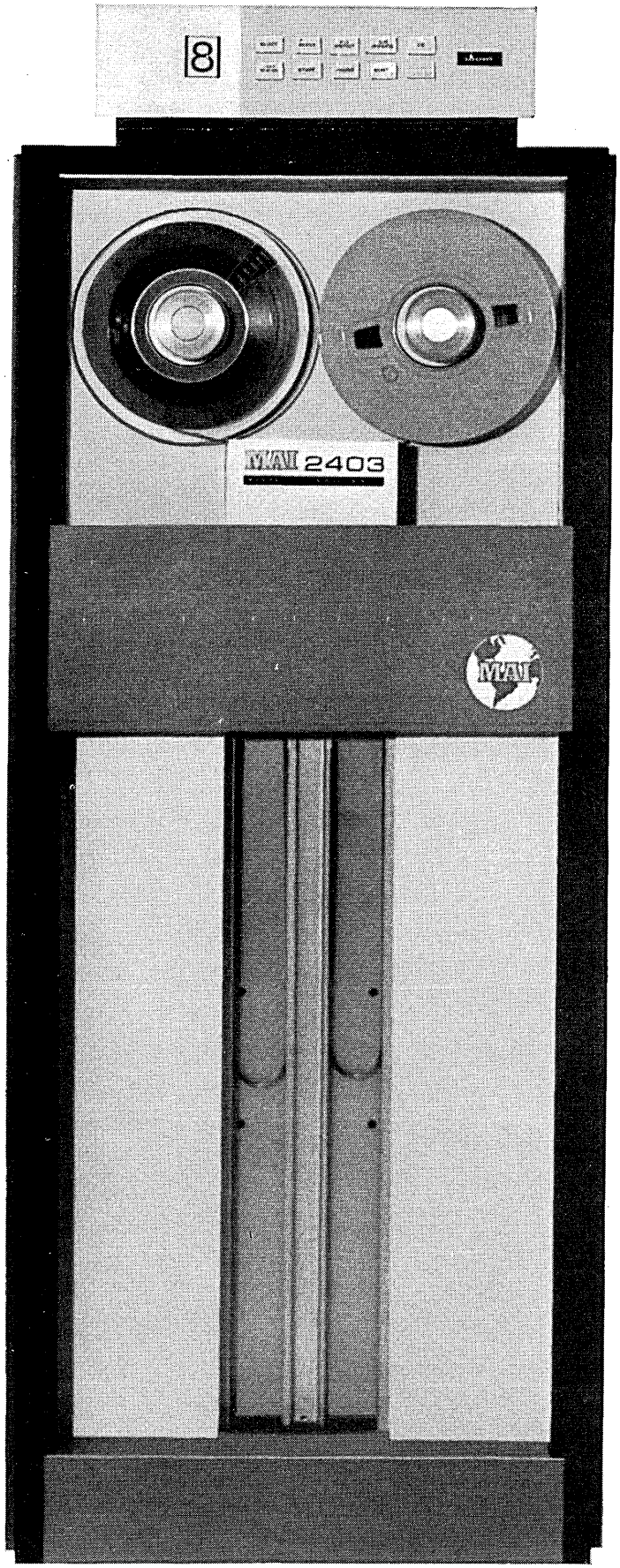
A little schizo about data communications are you? Relief's at hand. Tally systems transmit all three media... paper or magnetic tape or cards!

How about that? Now you can use Tally systems to transmit, receive, and store data in any form you want or in any combination of ways. For the diversity of Tally systems lets you go tape-to-tape, card-to-tape, mag-to-perforated tape and so forth. So before you see your analyst, see your Tally data communications consultant. For his name and complete information on Tally data terminals, please write Robert Olson, Tally Corporation, 1310 Mercer Street, Seattle, Washington 98109. Phone: (206) MA 4-0760. In Europe and the U.K. address Tally/APT, Ltd., 6a George Street, Croydon, Surrey, England. Phone: MUN 6838.

CIRCLE 4 ON READER CARD



You can buy it and save $6,000 to $24,000.



Now you can rent it and save 15 to 20% on rental costs.

You've probably heard about the long-term advantages of purchasing an MAI Magnetic Tape Unit—how it pays for itself in 2—3 years in direct savings.

Now you can get comparable short-term financial benefits with an MAI rental plan.

First, you save a flat 15 to 20% over your current monthly rental costs.

Just as important, you get unlimited use at no extra cost. (You pay no more for running an MAI unit 720 hours a month than 176 hours.)

But either way—purchase or rental—you have a tape unit that's directly interchangeable with your 729/2401 units on a plug-to-plug, reel-to-reel basis. You have a unit that, dollar for dollar, will outperform anything in this market.

A new kind of tape unit. No tape wear and tear from pinch-feed mechanisms on this tape unit. Its *single capstan* drive mechanism handles tape the way it should be handled. Gently.

During operation, the recording surface of the tape touches only the read-write station. And that retracts to eliminate tape wear during loading and rewinding.

A new kind of systems reliability. Because the unit's design is so simple, you improve systems reliability. Read-write reliability equals or exceeds that of your present tape units. Downtime *has* to go down because the MAI unit is so easy to maintain. (It requires no mechanical adjustments, and a minimum number of electrical adjustments.)

So, if you purchase, you'll save on an MAI maintenance agreement too. And without worrying about quick service. MAI has branch offices in 45 principal cities from coast to coast.

For more information, call your local MAI branch office, or write us.

MAI EQUIPMENT CORPORATION
300 East 44th Street, New York, N. Y. 10017

CIRCLE 5 ON READER CARD

DATAMATION

january
1968

volume 14 number 1

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This issue 76,786 copies

Cheap mass storage for small computers and how to get the most out of it

For some people the only limitation of the small computer is the price of the extra memory. What's needed is low-cost mass storage, and lots of it. For filing data. For quick and convenient program manipulation.

DIGITAL, the leader in small computers, has a low-cost disc and unique magnetic tape unit tailored for the small computer. Now, new software is available to take even better advantage of this low-cost memory.

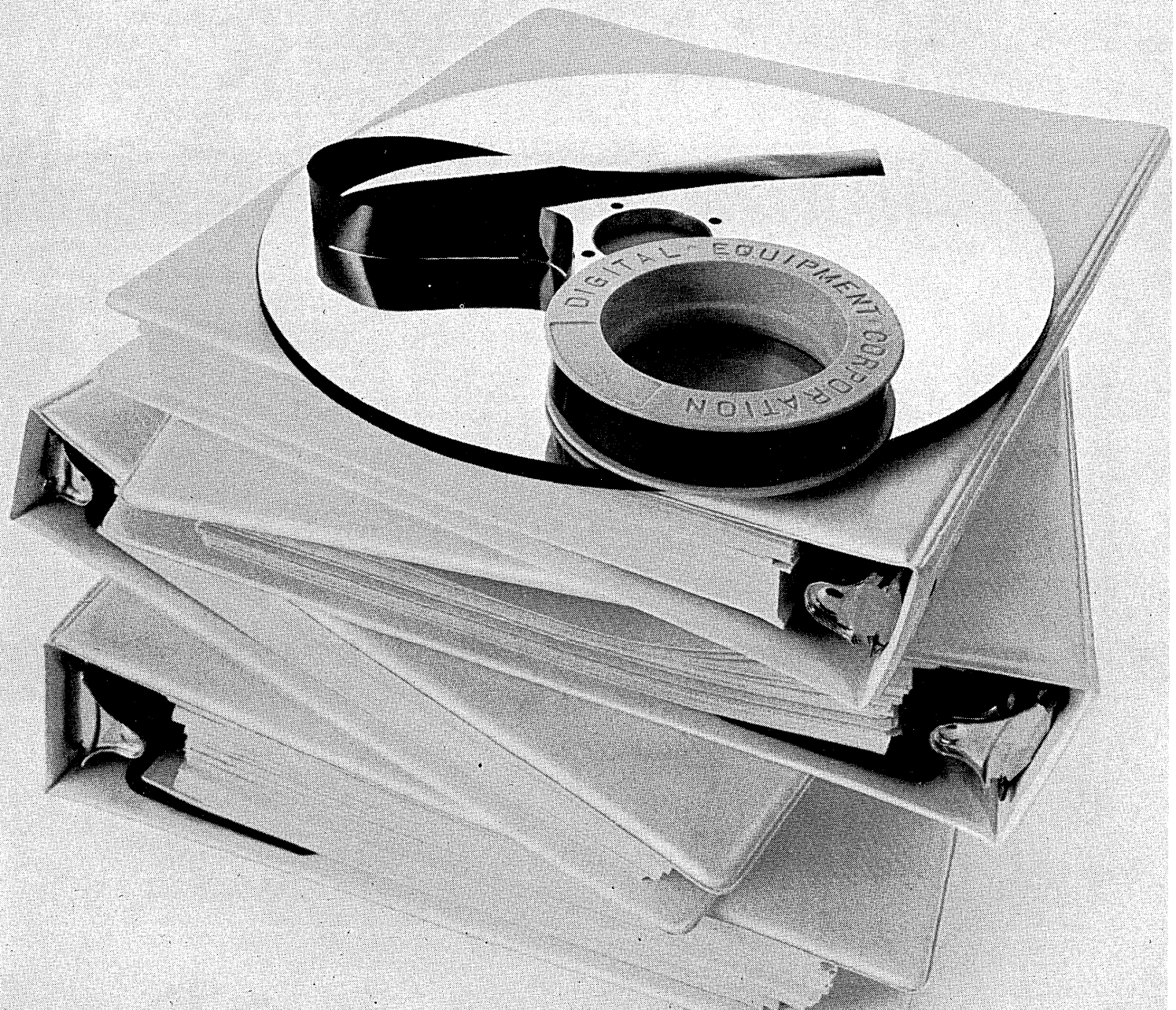
DECdisc adds 32,768 words of memory for $6,000. Additional expander discs (up to 3) can be added at $3,000 each. That means a total of 131,072 words of disc memory for $15,000.

A full scale PDP-8/S computer with 36,864 twelve bit words of memory, for example (4k core plus disc), costs $18,500.

DECtape, Digital's unique fixed address magnetic tape system, provides over 200,000 words of storage on a 3½-inch reel. It's the lowest cost mass storage available anywhere. You can edit and debug programs on line. Then you can put your programs in your pocket and take them away until you want them again.

New keyboard monitor software all but eliminates the laborious use of paper tape and cards. You edit from the keyboard, compile from the keyboard, assemble, load, store, debug all from the keyboard. What might have been hours or days in getting the computer ready for use, is now just minutes.

Available now. PDP-8/S off-the-shelf. PDP-8 in one month. PDP-8/I in the spring. DECdisc and DECtape immediately available. Send for our new Small Computer Handbook. It's free.



digital
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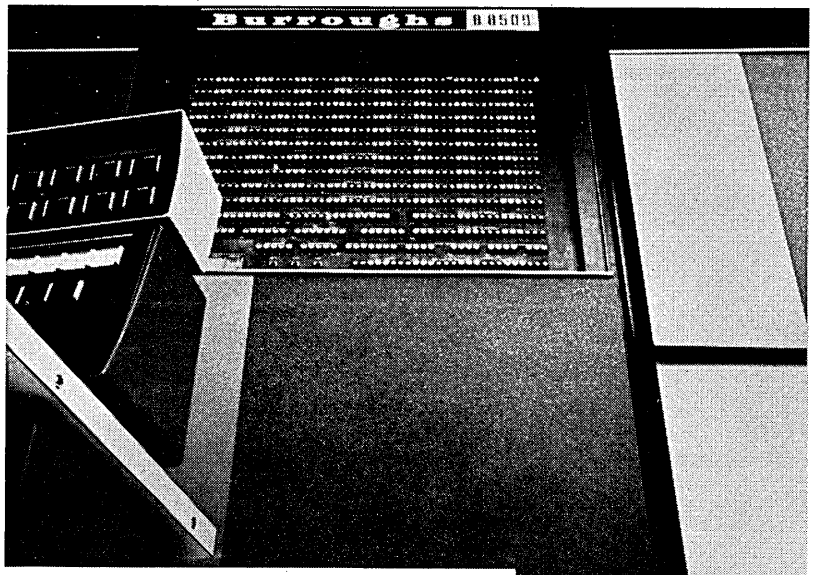
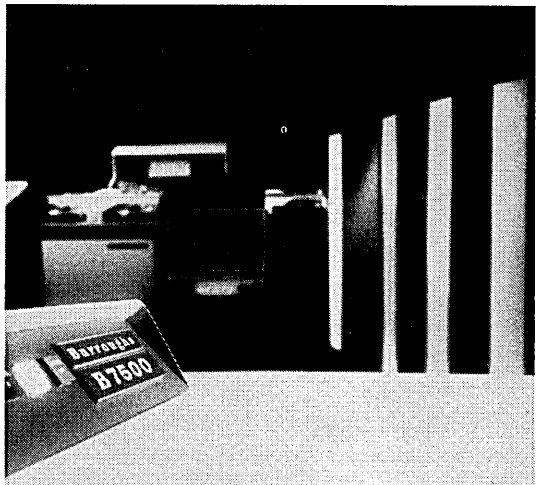
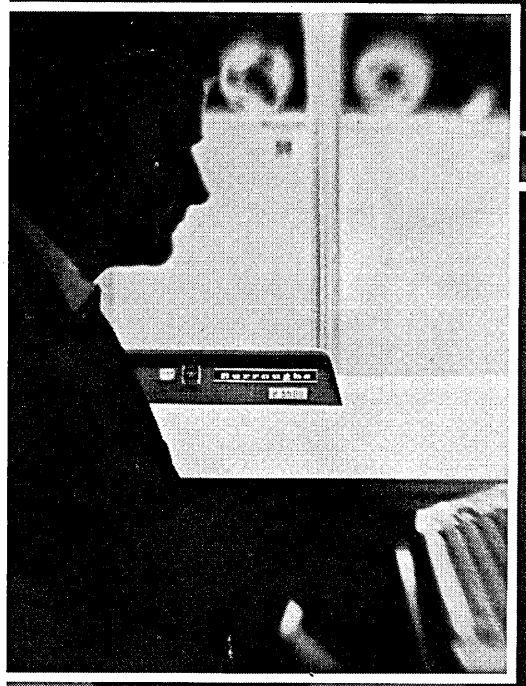
CIRCLE 7 ON READER CARD







An evolutionary answer to data processing expansion.

Now there is a family of electronic data processing systems which can't be outgrown. The Burroughs 500 Systems family—the broadest line of EDP equipment you can find.

There's a basic computer, the B 2500. And a powerful medium-scale machine, the B 3500. Higher capacity large-scale systems like the B 5500, B 6500 and B 7500. And the B 8500 supercomputer.

So you can start off with a system that matches your company's present EDP needs, yet can grow in step with your changing requirements. You can add components and capabilities to your Burroughs 500 computer at any time. Or move up to a larger 500 system. Develop a combination of systems. A network of systems. And you can do this without the prohibitive cost of rewriting your computer program libraries. That's because you communicate with all Burroughs 500 Systems computers in the same standard scientific or business-oriented languages.

Your Burroughs representative has more good reasons why you should meet the 500 Systems family. Ask him.

Burroughs

Detroit, Michigan 48232

CIRCLE 8 ON READER CARD

DATAMATION 68®

january
1968

volume 14 number 1

automatic
information
processing
for business
industry & science

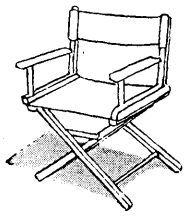
datamation departments

if you think the story is spectacular wait till you see the picture

As the complexity of CRT displays increases, and as the need for user manipulation of the picture increases, it is more and more the case that the central computer cannot provide the required on-line processing — or that communication lines cannot handle the high throughput rates. The graphics I/O terminal itself must include the necessary display-processing capabilities. That's why every Adage Graphics Terminal has its own Ambilog 200 computer with special arrays for high speed coordinate transformation.

Hybrid techniques exclusive with Adage provide extraordinary image-processing power and make possible dynamic 3-D displays which move with full six degrees of freedom. Objects containing over 5000 lines can be presented without flicker even with frame-to-frame dynamic changes. And pictures are always bright and clear, thanks to scope-driving circuitry that's way ahead of its time.

Starting with the AGT/10 at $60,000, standard models are available with either 2-D or 3-D capability, perspective generation, three-dimensional windowing, and intensity-modulated depth cueing. Options include dataphone interface, joystick control, analog tablet input, hardware character generation, and photographic hard-copy output. Complete systems software is provided with every terminal for local image control, for console I/O, and for communicating with the central facility.



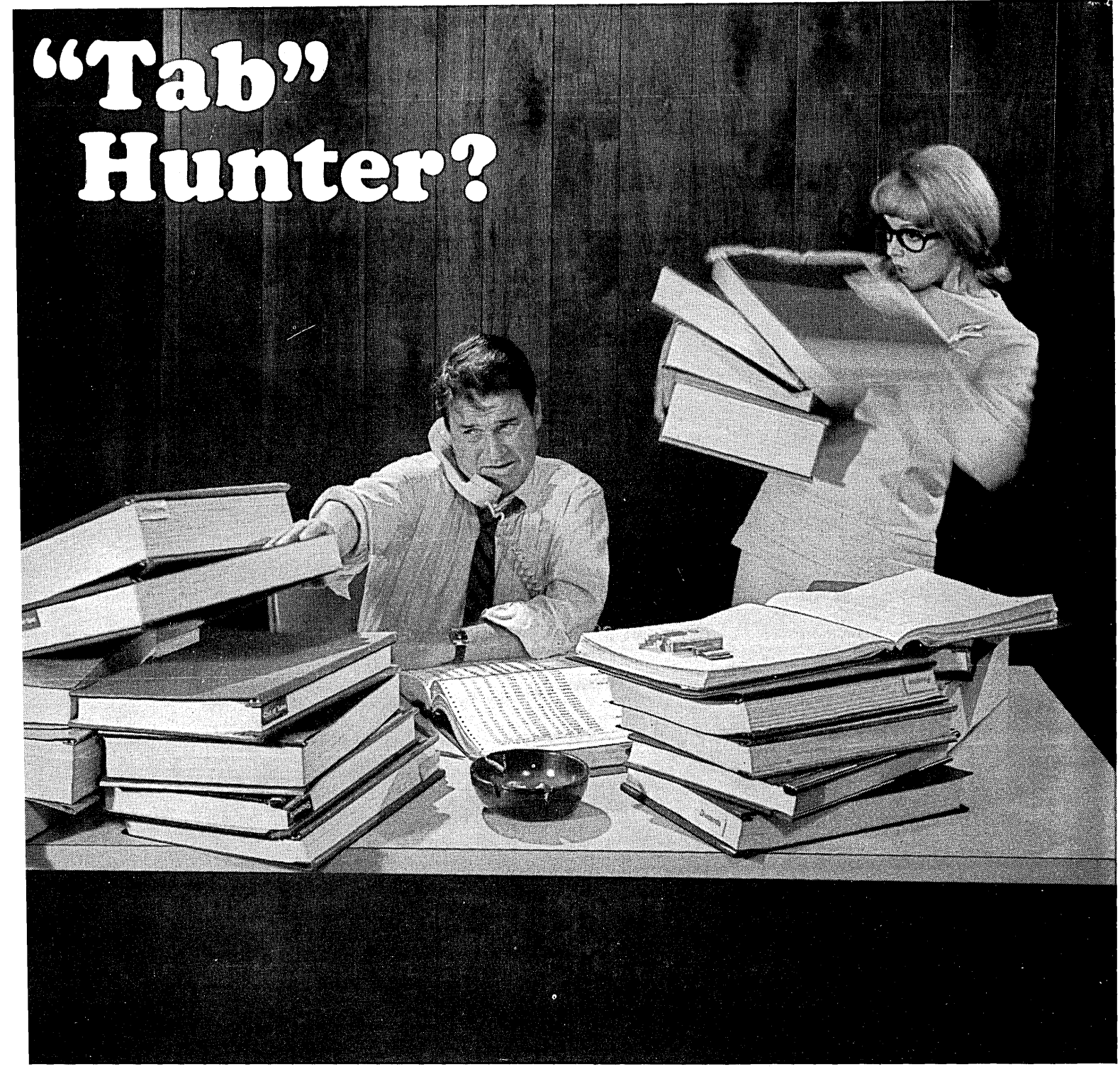
Now that you've read the story, don't miss the picture. A free 16mm demonstration film of the Adage Graphics Terminal in action is yours just by writing on your company letterhead to David Sudkin, Manager of Marketing Services, Adage, Inc., 1079 Commonwealth Avenue, Boston, Mass. 02215

Adage INC

CIRCLE 9 ON READER CARD

calendar

DATE	TITLE	LOCATION	SPONSOR/ CONTACT
Feb. 7-9	Honeywell COBOL Users' Meeting	Disneyland Hotel Anaheim, Calif.	H. Roach, Univ. of Southern Calif., 1020 W. Jefferson, Los Angeles 90007
Mar. 14-16	Sixth Annual Symposium on Biomathematics & Computer Science	Shamrock Hilton Houston, Texas	Univ. of Texas, Div. of Cont. Educ., P.O. Box 20367, Houston, Tex. 77025
Mar. 18-29	Course: Systematic Methods for Computer Aided Design of Computers. Fee: $375	Univ. of Calif. Los Angeles	Eng./Physical Sci. Ext., 6532 Boelter Hall, UCLA, Los Angeles 90024
Mar. 20-22	Symposium on Critical Factors in Data Mgt. Fee: $75	As Above	As Above
April 3-5	Numerical Control: Tomorrow's Tech. Today	Marriott Motor Hotel, Philadelphia, Pa.	Numerical Control Soc., 44 Nassau St., Princeton, N.J. 08540
April 8-10	Users' Meeting: Small IBM Computers	Pick Congress Chicago, Ill.	COMMON/Laura Austin, Admin. Div., General Motors Inst., Flint, Mich.
April 16-18	Second National Symposium on Law Enforcement Sci. & Tech.	IIT Research Inst. Chicago, Ill.	IIT Research Inst., 10 W. 35 St., Chicago 60616
April 23-25	Fourth Annual Conf. on Data Processing	Sheraton-Chicago Chicago, Ill.	NRECA, 2000 Florida Ave., N.W., Washington, D.C. 20009
April 26	Ninth Annual Southwest Systems Conf.	Del Webb's Townhouse, Phoenix, Ariz.	Systems & Procedures Assn./ R. K. Braithwaite, Valley Nat'l. Bank, 141 N. Central Ave., Phoenix 85004
April 30-May 2	Spring Joint Computer Conference	Convention Center, Atlantic City, N.J.	AFIPS
May 1-3	Annual Convention	Ft. Worth, Tex.	Assn. for Educational Data Systems
May 3-4	Fifth Annual Nat'l. Colloquium on Info. Retrieval	Univ. of Penna. Philadelphia	Dr. D. Lefkowitz, Moore School, Univ. of Pa., Philadelphia



WILSON JONES "DATA-RACK"™ brings new

Have you only gone half way in modern methods of housing, referring to and retrieving the data on your marginal-punched sheets? If so, you are not taking full advantage of your Nylon Post Binders.

"Data-Rack" uses the suspension principle to file Nylon Post Binders in the easiest to-get-at and easiest to-refer-to system ever developed.

"Data-Racks" come in two sizes. They hold binders with 14⅞" x 11" sheets—burst or unburst—or any smaller size. 162 Wilson Jones Nylon Post Binders of more than 20 sizes can be adapted with inexpensive, easy to insert or remove, hanger sets for "Data-Racks" in less than a minute.

"Data-Rack" Outfits consist of a rack and movable floor stand. 6 Hanger Sets with each rack. Racks are available without stands for counter or desk top use. Handsome beige finish. All steel construction. Ball-bearing casters.

WILSON JONES

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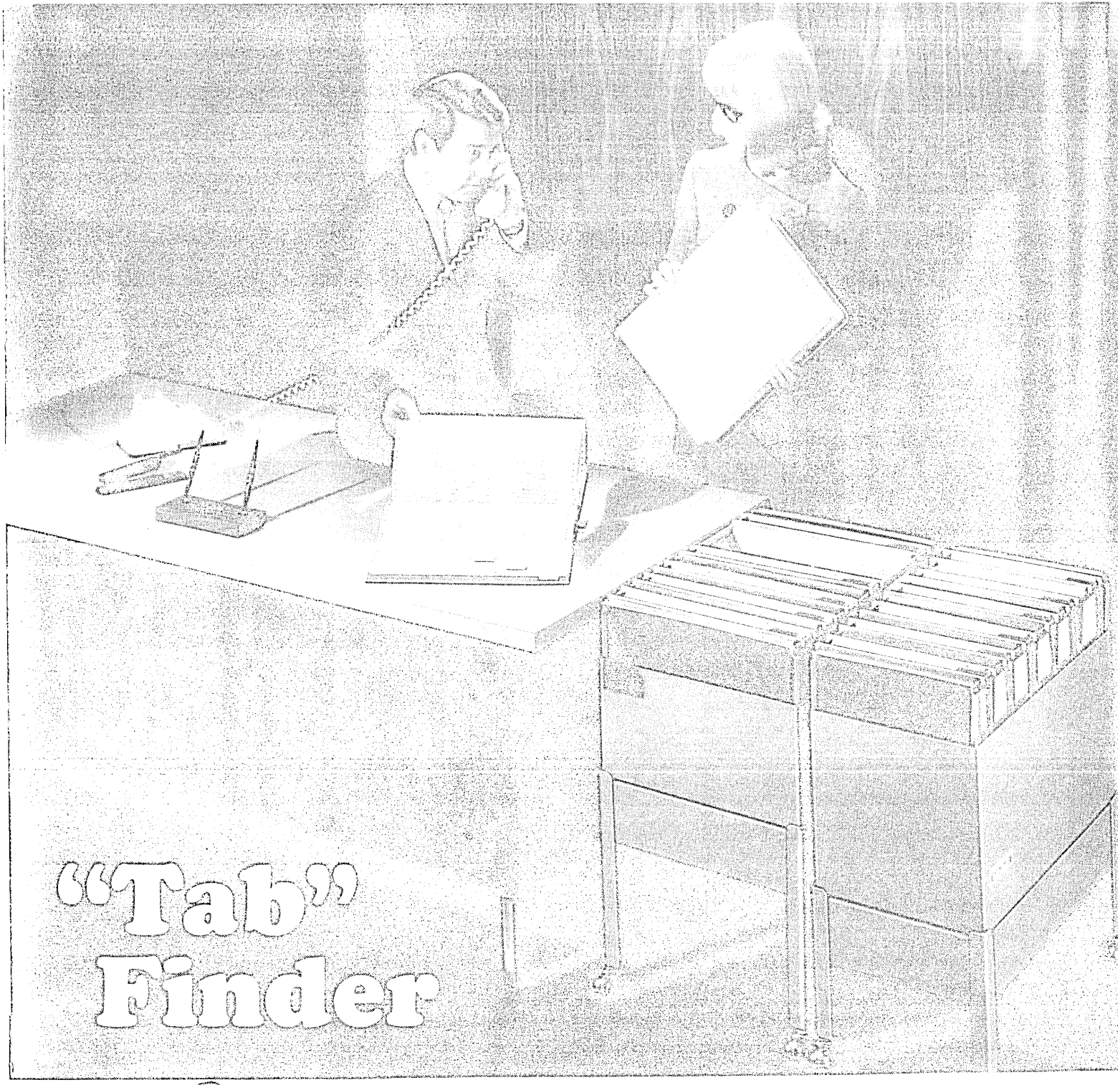
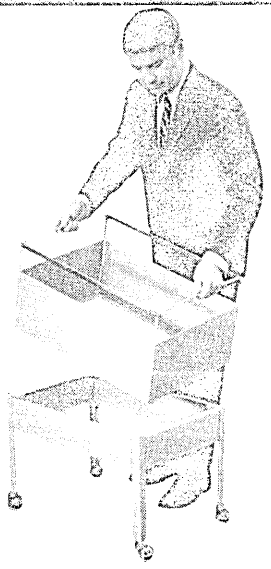




Ask your office or "tab" supply dealer for full information today ...or mail this coupon.

CIRCLE 11 ON READER CARD

DT-1

Wilson Jones
6150 Touhy Avenue
Chicago, Illinois 60648

Gentlemen:

Please send me complete information on the brand-new "Data-Racks."

Name_____

Company_____

Address_____

City_____ State_____ Zip_____

letters

acronumbs

Sir:

Considering the plethora of ADD instructions on the System/360, for example: AR, A, AH, ALR, AL, AP, ADR, AD, AER, AE, AWR, etc., and considering the list of suggested 360 instructions you published (Jan. '66, p. 120), may I suggest one for the next list:

AN—Add Nauseam

ROBERT HIGGINS
Detroit, Michigan

the computer in society

Sir:

Copyright legislation now before Congress and Mr. Freed's article "Computer Law Searching: Problems for the Layman," (Oct., p. 38) call attention to the fact that certain basic principles need to be stated regarding the interaction of the computer with various aspects of our society. Four such principles are:

1. Society and its laws should be equitable in their treatment of the computer and the user, neither favoring nor discriminating against them, in considering the computer as one of a number of comparable (if not actually equivalent) alternative means by which a given objective may be accomplished.
2. Since the computer will remain in a dynamic state of rapid development for some time to come, society and its laws should provide for automatic and periodic review of policy by committees representing appropriate spheres of influence.
3. Society and its laws should distinguish between the use of a computer for information storage and retrieval, and its use to produce a substitute for goods (e.g., copyrighted material) or services (e.g., legal services).
4. Society and its laws also should distinguish among: input to a computer, with its potential uses; operation on the input by a computer, with its operationally-restricted uses; output from a computer, with its output-

restricted uses; and utilization of output from a computer, with its actual uses.

ARNOLD GOODMAN
Huntington Beach, California

The author replies: You suggest that laws applicable to computers and computer users should be equitable and should take into account the dynamics of computer technology and its different uses. Fortunately, our legal system will satisfy your suggestions automatically in large measure, if not completely. You will recall that, since we use the common law system along with the British, a major source of our legal rules is the decision of courts in individual cases. Although courts indicate that they are influenced heavily by precedent, in actual fact they are able to achieve substantial dynamics by distinguishing cases at hand from prior situations. The problem you advert to probably is experienced when legislative bodies undertake to adopt statutes applicable to the new technology. Although it is generally difficult to anticipate, for legislative purposes, what future situations will be, it is almost impossible to do so with respect to the new technology.

toward democracy?

Sir:

Dr. Sapolsky's "Technological Change and Politics" (Oct., p. 47) may be the first work intended for publication to mention "electronic referendum devices," although Dr. Frank Stanton, president of CBS, spoke of ". . . looking forward to electronic plebiscites . . . for the guidance of our government . . ." in his commencement address at the California Institute of Technology, circa 1965. In neither case did the possible implications of such devices receive proper attention.

For some three years now I have been tryng to direct attention to this matter. Computer professionals will recognize that with the state of the art today (or tomorrow, surely) it would be technically almost simple to design hardware capable of polling the entire electorate in something like sixty seconds. If this prospect did not intrigue a broadcasting executive, it still might have been expected that its revolutionary potential would have been baldly obvious to a political scientist.

Our current political method, parliamentary democracy, was the institutional solution to a technically unsolvable information processing problem besetting direct democracy, the task of measuring the distribution of citizens' opinions. Unable to count many ballots quickly and cheaply, it was essential to reduce the number of ballots to be counted; hence the citizens' votes were used to choose delegates to a parliamentary body small enough to be handy under 18th Century technology.

The costs of this "solution"—alienation, apathy, anomie, pressure groups, the convertibility of wealth to political power, etc.—are not yet recognized as attributable to the central fact of delegating power. Political science has yet to learn to see political systems as if

DYNAMIC MEMORY LOCATION *NEW YORK, NEW YORK*

Midtown Manhattan, from the East River. On the other side, in the middle of Long Island, stands the Brookhaven National Laboratory. □ Early in 1965, an SDS 920 computer and a Digital Development Corporation Model 12500 drum memory made time sharing a reality at Brookhaven's High Flux Beam Reactor. The system enables conversational dialogue via user keyboard terminals. Complete control is provided over nine independent spectrometer experiments. Each user is permanently assigned 500 words of fast memory and the use of 3500 words of auxiliary drum storage during his computational "turn." □ If you're planning an advanced computer application requiring high performance rotating memories, contact Digital Development Corporation, a subsidiary of the Xebec Corporation, 5575 Kearny Villa Road, San Diego, California 92123, Phone (714) 278-9920.

DIGITAL DEVELOPMENT CORPORATION

CIRCLE 12 ON READER CARD

they were information systems, which they are, and to recognize the importance of such technological determinants upon the gross form of political structures.

It also needs to be stressed that the interaction of a technology and a culture is more strongly determined by the latter; hardware does not bear within it the seed of any *necessary* impact, *vide* the ancient Chinese, who discovered the magnetic compass and gunpowder, but unable to challenge their assumptions, used the former to point out magic rocks and the latter to frighten away evil demons.

Dr. Sapolsky's assumptions may be apparent in his choice of "electronic *referendum* devices . . . ," the referendum being a feature of the parliamentary variety of democracy, whose last reason for being is eliminated by these devices. I prefer to call them "vote boxes."

Put one in every home, and with the techniques of dissemination now at hand a Town Meeting can be attended by 200 million people. It is to be hoped that the political scientists can now be attuned to the possibilities offered by our machines and so led to take a fresh look at their area of specialty.

But inquiry is wasted that asks the wrong questions. Just as we do not now expect a mechanical engineer to devote his life to the further refinement of horse-drawn vehicles, I for one would not like to see political science spend much more time on the complex of socio-political organizations and institutions that have grown up around the now obsolescent parliamentary structure. The question is not what will be the impact of technology upon democracy; the question now is what new institutions, designed to take best advantage of the technology, ought we be innovating in order to *create* a democracy.

FRED I. WHITE
Pacifica, California

Ed. note: Another interesting view on this concept was presented in a speech recently by broadcaster David Brinkley (DATAMATION, Dec., p. 85).

the british market

Sir:

In the October World Report (p. 137) a comment was made to the effect that a proposed merger between English Electric Computers Ltd., and International Computers & Tabulators Ltd. "would give EEC a larger marketing organization and the overseas sales outlets which they sorely need."

It might not have occurred to you that seen through other eyes the report might have been written: ". . . the rumoured merger would give ICT the extra funds to capitalize on their already successful marketing of the 1900 series, orders for which exceed $300 million with installations of some $150 million. (By comparison EEC has orders for some $70 million for System/4 machines with installations of about $5 million.)"

With extra capital ICT could be expected to increase its share of the British, European, Commonwealth, African and Asian markets as well as expanding its market application sectors.

Money seems to be the key to this expansion since ICT already has a wider product line—from the $100K 1901 to the $6 million 1906A—and with more software already written than any other European manufacturer (and a good many U.S.-based companies, too!).

The real point is not the implications of a merger between two British companies, but whether there should be created one British or one larger European computer manufacturing organization. There are many obvious problems associated with the implementation of either grouping, but of

key significance in both cases is ICT's marketing and product superiority compared with other European computer manufacturers.

It is thus suggested that both Britain and Europe must look first to ICT to lead the marketing and product development operations of a non-U.S.-based worldwide computer corporation.

J. ANDREWS
London, England
M. A. WAKEFIELD
Staffordshire, England

fee or free?

Sir:

I must take issue with some of the remarks made by Dick Tanaka in "Fee or Free Software" (Oct., p. 205).

He is concerned about a shortage of programmers, and wants to make existing programmers more effective by avoiding duplication of effort. His solution is to encourage proprietary packages. It seems to me that a more relevant solution to this problem would be to increase communication about what software is available. I have long contended that charging fees for proprietary packages restricts rather than encourages their use. Encouraging free distribution of programs does not mean that they have no economic worth (as he implies), but that we pay for programs with programs, rather than money. I think we owe a great deal of the growth of the computing industry that Dick talks about to the free distribution of information, and we should be thankful that we didn't start with proprietary packages from the beginning. I don't think they're needed now, either.

BERNARD A. GALLER
Ann Arbor, Michigan

The author replies: I agree with Professor Galler that the free exchange of programs has been important to the growth of the computing industry—and will continue to be. But, presumably, this is already going on, and we are still in trouble. The relationship between the two practices of exchanging free programs and marketing proprietary packages is not symmetric. The availability of proprietary packages does not necessarily inhibit the exchange of free programs; typically, scientific or developmental programs no doubt will continue to be traded this way. Good. On the other hand, viewing "free" software as a *right*, rather than a privilege, makes it hard to justify the investment in preparing proprietary packages, for markets where there is little practical hope that a free exchange will occur. Bad. The barter system works well when the economic implications are minor. But how does one measure the equity of contributions to a pool? Will an exchange occur when one feels he is giving more than he gets? More important, can we expect anyone to contribute programs which give away a competitive advantage? For example, certain programs for financial reporting, process control, computer-aided design, etc. carry vested interests. These will not be shared freely, however Bernie Galler and I would wish that they could be.

balkan controversy

Sir:

J. C. Vorvoreanu's letter (Oct., p. 13) . . . is not substantiated by history. Ancient Transylvania was not inhabited by Rumanians; in the 2nd century it was the Roman penal colony of Dacia. The Hungarians have occupied this territory since the 10th century. The Rumanians lived in Valachia (south of Transylvania) . . .

immigrating later and especially . . . when the Turks occupied Valachia. After the expulsion of the Turks . . . the "Rumanian kingdom" was established with a Hohenzollern prince as king. The Valachi, [and] also those living in Transylvania, began to call themselves Rumanians.
A. KOVATS
Livingston, New Jersey

Sir:
. . . the "ancient and beautiful city of Cluj," [is] also known as Kolozsvar by Hungarians and Clausenburg by Saxons.
D. PASINT
New York, New York

Sir:
. . . The city of Kolozsvar . . . has been the cultural capital of Hungarian Transylvania for many centuries. . .
MICHAEL ARVE
Rochester, New York

the government organizes
Sir:
News Briefs (Nov., p. 96) cited a Federal ADP Council of Northern California and Nevada as the "first of its kind in the country."

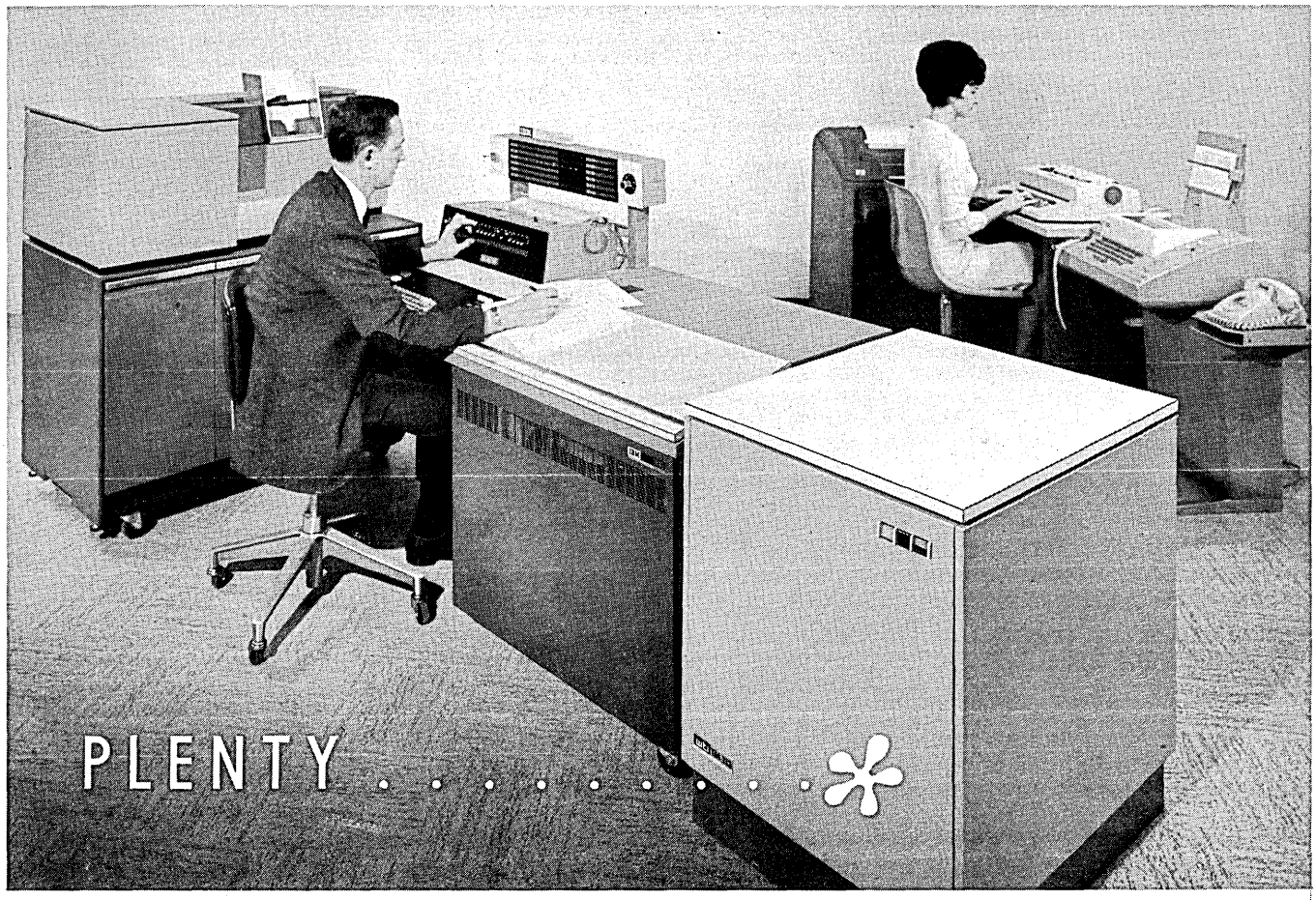
The Federal Government Data Processing Association of Philadelphia, which was established approximately October 1965, is similar in scope, intent and organization as the cited council, and pre-dates the latter organization by about two years.
PATRICK J. WHITE
Dept. of the Army
Philadelphia, Pennsylvania

goof
Sir:
In The Forum (Nov., p. 178), Mr. Bromberg argues for a good cause, but with a wild numeric error. The fraction of ACM membership involved [in U.S. standards activities] is about .5% *not* 0.005%!
HOWARD WRIGHT
Greenbelt, Maryland

●

Datamation welcomes your correspondence concerning articles or items appearing in this magazine. Letters should be double spaced . . . and the briefer the better. We reserve the right to edit letters submitted to us.

WHAT'S NEW IN TELEPROCESSING?



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CIRCLE 14 ON READER CARD

look ahead

AGELESS B5500 WILL GET NEW T-S SOFTWARE

The uniquely long-lived Burroughs B5500, which has sold better each year since its introduction as the 5000 some six years ago, will get further rejuvenation with the addition of new time-sharing software—expected to be ready for release about August.

Main changes are the addition of a Basic compiler, modification of the MCP operating system, and more flexible programming facilities for data communications. For example, many of the restrictions for manipulating files introduced remotely will be removed. Many of the improvements will be available for regular batch use as well—directory search changes, upping the number of jobs that can be handled at the same time.

Maximum number of terminals that can be serviced is not yet set—but one potential customer who wants to use 48 was told this would be no problem. It may be worth noting in this connection that one current non-T-S user has the facility to deal with 200 remote inquiry stations.

I BEFORE E EXCEPT AFTER C

How do you like your keyboards arranged? Hot controversy has arisen over proposed standards for OCR and USASCII-coded keyboards, now in ballot before X4. If both are adopted, a user wanting to do these functions plus regular correspondence would need two or three different typewriters and face the problem of training typists on each keyboard. Some opt for a single standard for both OCR and ASCII, using ASCII's arrangement for the basis, and adding at least two more keys to accommodate OCR symbols. Opponents to this say it still leaves the retraining problem, and the addition of two keys would create havoc in type alignment on machines of many manufacturers.

Options: redo the ASCII arrangement so that it's closer to the long-standing electric typewriter standard; accept the two proposed standards; or go for the universal ASCII-based standard, and with it, change the electric typewriter standard so it's based on logical bit-pairing, as the ASCII arrangement is.

X4 is very concerned; the balloting due to close by March 31 may be extended or stopped. A symposium at NBS to discuss the problem has been proposed, as has an IEEE human factors group workshop.

FILES VANISH FROM SLIPPED DISCS

An L.A.-area credit firm is getting ready to sue a well-known service bureau over its alleged failure to return basic files used in billing for some 100 small retailers.

The credit company switched to the service bureau, at the same time gave them a contract to develop a program to convert their accounts

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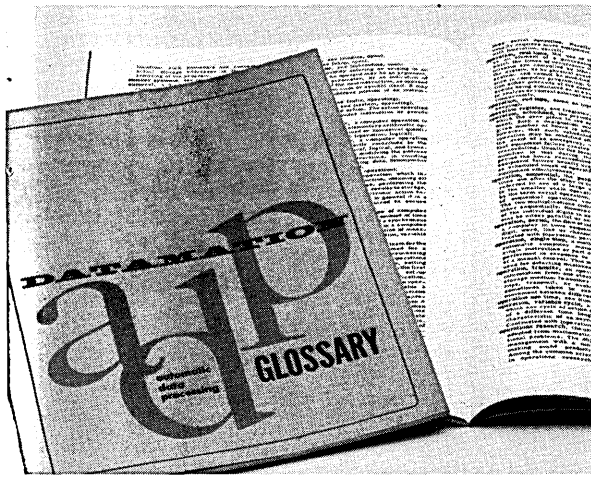

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receivables from 1400 series to the 360. The 360 program, however, was so full of bugs that the first billing for 25,000 statements had to be eyeballed for errors, and many hand-changed.

Understandably concerned, the credit firm asked that its historical Age Trial Balance files (given to the service bureau on discs) be returned, so they could be run on a 1400 at another bureau. But the discs had been wiped out when the bureau converted the files to tape, which it at first promised to return. Reversing itself, the bureau then said it would not return the tapes unless the client promised no legal action.

The credit company sought an injunction to have the tapes returned, but was overruled by the court. Since then, the company has had to re-keypunch over 80,000 accounts at a cost of more than $9000.

NEW DIRECTION FOR RAYTHEON COMPUTERS

Raytheon acquired the Packard Bell computer operation a little over three years ago. Since then, they've undoubtedly been looking over their shoulder at ex-PB-er Max Palevsky, wondering what went wrong in Orange County. Still trying to find the answer, Raytheon has brought in a new man to head up the commercial computer activity in Santa Ana, Calif.

He's Andy Huson, who most recently headed up Benson-Lehner before it was acquired by University Computing. Like the gm before him, Joe Ricca, Huson starts off with assurance of corporate support, despite rumors that Raytheon boys back east say "they" (Raytheon West) are in the computer biz, not "we."

For starters, Huson has indicated the division will emphasize the 703, beef up the sales force, back off some of the special systems activities (such as an on-line inventory control prototype in Canada which was to lead to more orders) pushed by Ricca. And we hear some heads have rolled. Future emphasis will be on small systems computers.

Meanwhile, Ricca has formed Ricca Data Systems Inc., in Santa Ana. The new company will specialize in special systems for commercial applications.

THE SWEATS AND SWEETS OF PHASE II

If Congressman Jack Brooks' comments are any indication, at least part of the Hill is satisfied with Burroughs' selection for the Air Force Phase II contract. "Despite problems in the early stages of this procurement, the Air Force has an excellent dp equipment selection and management system," said Brooks. Although some of the protests on the original IBM selection involved the benchmarks, Brooks also implied that these tests are the way to go—throughout the government.

Both IBM and Honeywell also met AF requirements in the second go-round. IBM, stung by the reversal of the original award, bowed to the decision although it felt it did the best job on the benchmarks, and added that its second price was lower than the original one of $114 million. Honeywell was at least pleased that its protest had resulted in a savings to the govt; (the AF figures savings of $36 million, when the cost of delay is included). Burroughs will draw about $60 million for equipment, $20 million in maintenance, for 100-160 B3500's. The Friden 7311 terminal will be used throughout.

(Continued on page 129)

Anyone can promise you time-sharing software.

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CIRCLE 17 ON READER CARD

editor's readout

DURING THE NEW YEAR . . .

GO PLACIDLY AMID THE NOISE & HASTE, & REMEMBER WHAT PEACE THERE MAY BE IN SILENCE. As far as possible without surrender be on good terms with all persons. Speak your truth quietly & clearly; and listen to others, even the dull & ignorant; they too have their story. ✓ Avoid loud & aggressive persons, they are vexations to the spirit. If you compare yourself with others, you may become vain & bitter; for always there will be greater & lesser persons than yourself. Enjoy your achievements as well as your plans. ✓ Keep interested in your own career, however humble; it is a real possession in the changing fortunes of time. Exercise caution in your business affairs; for the world is full of trickery. But let this not blind you to what virtue there is; many persons strive for high ideals; and everywhere life is full of heroism. ✓ Be yourself. Especially, do not feign affection. Neither be cynical about love; for in the face of all aridity & disenchantment it is perennial as the grass. ✓ Take kindly the counsel of the years, gracefully surrendering the things of youth. Nurture strength of spirit to shield you in sudden misfortune. But do not distress yourself with imaginings. Many fears are born of fatigue & loneliness. Beyond a wholesome discipline, be gentle with yourself. ✓ You are a child of the universe, no less than the trees & the stars; you have a right to be here. And whether or not it is clear to you, no doubt the universe is unfolding as it should. ✓ Therefore be at peace with God, whatever you conceive Him to be, and whatever your labors & aspirations, in the noisy confusion of life keep peace with your soul. ✓ With all its sham, drudgery & broken dreams, it is still a beautiful world. Be careful. Strive to be happy. ✓ ✓

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GENERAL PURPOSE SOFTWARE

relief in sight

by DONALD H. SUNDEEN

There has recently been increasing user interest in general purpose software packages, especially those not requiring that the user be a computer programmer. This interest in generalized systems has, to a large extent, been stimulated by the critical shortage of qualified programmers, which is being aggravated in various ways. First, the explosive proliferation of third generation hardware has resulted in a significant reduction in the number of qualified programmers per installation. Secondly, there is a certain amount of natural programmer attrition through advancement into staff and management positions.

Another important factor is the more complex architecture of third generation machines. This complexity lengthens the time to write and check out programs and makes the difficult task of converting from second to third generation equipment extremely costly.

The shortage of skilled programmers is going to worsen appreciably before it gets better. Accordingly, it is this author's opinion that the demand for general purpose or "canned" software is going to be expanded sharply in the next few years. The majority of computer users are becoming increasingly disturbed by the "programming bottleneck," realizing that the elapsed time to implement a new application by conventional methods is going to be—at best—poor. Such lengthy implementation periods have been a fact of life faced by most users to this point in time, independent of whether the programming language employed was machine language or a higher order language. This disturbing situation is exaggerated further by discovering that many of the applications are characteristically not complex ones. Finally, the cost of implementation, for both machine time and personnel, is high, this being compounded by inordinate costs in maintaining the programs.

General purpose packages, when cleanly designed and implemented, are a means of circumventing the programming bottleneck faced by most computer users. For one thing, they enable an installation to increase potential productivity by orders of magnitude. Another benefit is that a staff of qualified programmers can concentrate on the more complex applications that they should be working on in the first place, the more mundane applications being the domain of the generalized systems.

Unfortunately, the hardware manufacturers' historical role in, and approach to, general purpose software development has left something to be desired. There have been some exceptions, among them SDS MANAGE and NCR BEST. In general, user apathy toward manufacturer-developed packages has been brought about by the lack of flexibility and/or inefficient performance of these packages. It should be pointed out, however, that moderate inefficiency should not preclude using a general purpose package. Efficiency and economics have to be defined in their total perspective—namely, machine time costs (both checkout and production), personnel costs, and the intangible value of getting an application implemented in a relatively short period of time.

evolution of general purpose software

This article will discuss the evolution and types of general purpose software. Emphasis will be placed on those systems applicable to business data processing. Attention will be given to variations in language syntax and parameter notation and their implications for the user. Aspects of both batch and on-line systems will be covered. Finally, what the future holds in store will be discussed.

Mr. Sundeen is founder and president of Applications Software, Inc. He has been active in the development of six general purpose data management systems during the past eight years and has been a senior member of the technical staffs of Scientific Data Systems and Informatics' advanced information systems division.

Utility Packages. Generalized systems, in a limited sense, began with the availability of utility packages for card-tape, tape-printer and other peripheral operations. This was followed by the development of generalized input-output routines, since such functions were common to all applications accessing peripheral equipment. Complete input/output control systems (IOCS) next entered the picture followed by resident operating systems. Most recently, time-shared executive systems, comprehensive in scope (and often plagued with trouble), have appeared on the scene. The primary function of all the aforementioned tools is input and output, that is, the getting data from, and giving data to, peripheral devices. In the earlier systems the input/output functions were device dependent and applicable to data only. Second generation systems were directed at data and/or programs and were device independent. Regardless of the flexibility of such systems, they are tools used by *programmers* to facilitate input/output operations.

Application Dependent Packages. Application dependent packages are generalized programs for performing *specific applications,* such as billing, payroll, accounting, and inventory control. As one can see, such applications are universal ones. For years applications packages have been natural parts of the software support packages offered by computer manufacturers. Historically, these packages have not been well received by the industry. The main reason is that applications packages are invariably format and parameter constrained. This lack of flexibility has precluded the serious use of these tools by computer users. The manufacturers' traditional argument has been that the customer should be willing to bend a little. However, users have discovered this really means bend a lot.

Generalized payroll packages are a good illustration of the amount of "bending" required. In its simplest form, a payroll run consists of producing an updated payroll master file, a payroll ledger, and printing the payroll checks and stubs. The degree of parameterization normally allowed for by generalized payroll packages is usually limited to, at best, the following:

1. Method of calculating gross and net earnings.
2. Technique for handling tax withholding and mandatory deductions.
3. Allowance for optional deductions (e.g., insurance, credit union).
4. Moderate flexibility for rate differentials and overtime premiums.

Where the "bending" occurs is in the formats accommodated by the package. Consistently, they require control over the format of the payroll master file, time card file, payroll detail file and/or payroll ledger, and finally the format of the payroll checks themselves. This *format dependence* is a common characteristic of traditional application dependent packages. One known exception to this lack of flexibility is covered later in this article. Until this lack of flexibility is significantly overcome, *application dependent packages* will continually be ignored by computer users.

Application Independent Packages. As indicated earlier, utility packages are primarily intended for use by programmers and, to a lesser extent, operations personnel. One of the first examples of a software tool that eliminated the need for programming by the user was the sort/merge package. The sorting and merging of data files is a common function that applies to many applications. The primary differences encountered in sorting files of data consist of:

A. File Structure
   1. Blocked or unblocked records (in and out)
   2. Recording mode
      a. BCD
      b. Binary
   3. Tape labeling (header and/or trailer)
   4. Record format and length
      a. Fixed
      b. Variable

B. Sorting sequence
   1. Types of keys (alpha, numeric, binary)
   2. Relative position and length of key fields
   3. Direction of sort (ascending or descending)

Specification forms were designed for the description of the input parameters such as those above and along with the given sort/merge system became a natural element in the standard software support package of computer manufacturers.

The preparation of reports is likewise an extremely

common function in many data processing applications. Accordingly, the development of report generators occurred at an early date. Typically, parameters are input to a report generator describing the structure of the file to be processed, data fields to be printed, image of what the report is to look like, sequence in which the report is to appear, and, optionally, parameters describing control, summing/counting information and whether every record is to be printed or merely selected ones.

Program generators such as sorts and report generators, therefore, are examples of generalized software tools not requiring the technical familiarity of a programmer. Unfortunately, computer manufacturers stagnated at that point by not extending the development of program generators into all areas of file processing. Only recently (1964) have they attempted to remedy this with the introduction of general purpose systems. Development of the 9PAC System for IBM 709/90/94's was an exception, and it was developed by SHARE.

Extending the generalized concept of file processing beyond sorting and report preparation is not, of course, a recent innovation. As far back as 1957, a group at GE's Hanford, Washington, Atomic Products Plant[1] developed a set of generalized file handling routines for their IBM 702. These routines were developed to minimize the programmer time consumed implementing applications concerned with the installation's various data files. A joint effort by Advanced Information Systems and Douglas Aircraft Co. in 1961 resulted in the development of GIRLS (Generalized *I*nformation *R*etrieval and *L*isting *S*ystem) for an IBM 7090 at the latter firm's Missile and Space Systems Division. In 1962, the first, off the shelf generalized file management system, MARK I for the IBM 1400 Series, was introduced by Advanced Information Systems, (now a part of Informatics). It was followed by the MARK II and MARK III systems,[2] and more recently by MARK IV for the IBM 360. Standard Oil of California's SELECT System for the IBM 1401/1460 is another example of a generalized system for selective data retrieval and report generation, and it is in wide use throughout that company. SELECT has been made available to 1400 Series users through IBM.

Finally, the VIP (*V*ariable *I*nformation *P*rocessing) System of the Naval Ordnance Laboratory, Corona, Calif., has special significance. Whereas most other systems have been developed for rather large installations, where the potential benefits are obvious, VIP applicable to the IBM 7070 was developed in a rather small installation. However, the system has enabled a small group of programmers to maintain more than 40 data files and, additionally, to satisfy all demands for retrieval of data from these files. Among the more significant aspects of VIP is that it was designed primarily for processing files of variable record formats.

The generalized systems discussed so far have been primarily for data retrieval, as distinguished from document retrieval.

General Purpose Information Management Systems. Extension of the dictionary concept has made it possible to develop true, general purpose, information management systems for implementing file processing applications. Such systems are variously referred to as "file management systems," "data management systems," "information languages" and in other ways. However, for the sake of consistency, they will be referred to here as information management systems.[3] These systems are software tools whose primary functions are: file creation and maintenance; information retrieval; and report generation. Such functions can be performed without conventional programming in an assembly or procedural language. With flexibly designed systems, it is this author's opinion that at least 80% of the applications encountered in data processing can be implemented without any formal programming being required.

As we indicated above, one of the key features of a general purpose information management system is the existence of data file dictionaries. Such dictionaries are the primary means of attaining the flexibility and generality of these systems. Beyond describing the file structure, record format and data field attributes, they may also define processor dependent parameters such as the method of data field updating during file maintenance (e. g. replace, increase, decrease); punctuation characteristics and columnar headings used in report generation; and security codes specifying degree of sensitivity of the data.

As one can see, a dictionary contains a significant amount of parameter definitions. For this reason, it is the focal point of a general purpose information management system. From a functional standpoint, a data file dictionary is somewhat analogous to the Data Division section of a COBOL program. One major difference is that a COBOL Data Division section usually only describes the characteristics of the identified data fields which the given program will reference. A dictionary, on the other hand, identifies and describes the format and characteristics of all data contained in a given file. In an installation utilizing a general purpose information management system, many dictionaries usually exist—one for each data file to be processed. Dictionaries are generally isolated and captured in auxiliary storage (e.g. tape, disc, drum) along with the processors (compilers or generators) that comprise the system. They are usually identified by a file name or number. Since a dictionary describes the relatively fixed parameters applicable to a data file, only a minimal amount of parameters need be entered via control cards or terminal entries to perform selection, modification, retrieval, calculations, or display of data. Since most systems isolate dictionaries in auxiliary storage, a dictionary generator is normally a part of the system. Its primary function is to establish and maintain data file dictionaries. A secondary function of a dictionary generator is to produce a printed glossary applicable to each unique dictionary. A glossary, along with the specification forms for a system, constitutes the bible of descriptive documentation to which the users of a data file make reference. The existence of the printed glossaries minimizes the amount of user exposure to the reference manual associated with a system.

The processing environment in which information management systems operate may vary from a freestanding system with a self-contained loader, to a batch operating system, to complex time-shared executive systems. Independent of the type of operating system with which they interface, general purpose systems normally function in the following manner:

A. System control parameters are entered describing:
   1. Processing function (e.g. "UPDATE," "RETRIEVE," etc.)
   2. Dictionary name of file to be processed
   3. Global parameters and housekeeping information
B. The applicable processor is loaded and begins execution, which is usually comprised of three func-

[1] McGee, W. C., "Generalization—Key to Successful Electronic Data Processing," Journal of ACM, January, 1959.
[2] Canning, Richard G., "Generalized File Processing Software," EDP Analyzer, October, 1965, p. 5-6.
[3] Head, Robert V., "Management Information Systems: A Critical Appraisal," DATAMATION, May, 1967, p. 22.

tional phases:

Phase 1—Reads the processor dependent parameters (i.e., language statements) from the input device; satisfies the dictionary references applicable to the data referenced; validates the input; prints a list of the input including error messages for all invalid inputs.

Phase 2—Predicated on valid input, this phase compiles the object program for the function to be performed. The object program compiled is usually of the following types:

a. Compressed parameter tables
b. Pure machine language instructions
c. Subroutine linkage
d. Source language code to be input to another processor

Phase 3—Performs the actual processing of the given data file by :

a. Table driven interpreters generating the applicable execution
b. Executing the compiled machine language instructions

The foregoing description is purposely oversimplified in order to describe the functional process clearly. The three phases described above may be supplemented in various ways, such as the existence of a pre-processor performing a dialogue with terminal users or a post-processor which captures and saves the compiled object program. Furthermore, how these functional phases are designed and implemented varies considerably and can have profound effects on the performance of the system.

languages, notation and syntax

General purpose information management systems usually perform the same functions—namely, organizing, modifying, manipulating, retrieving, and presenting information. However, many differences exist in how users communicate with such systems. These systems are supposed to be software tools primarily intended for use by non-programmers. As it turns out, such is not the case. The breakdown occurs normally in the type of notation they employ. This notation broadly falls into two categories: tabular—structured specification forms; natural language—free form.

Tabular Forms. These employ fixed format or structured specification forms. Specific card columns are allocated for individual parameter entries. The choices of parameter entries are often pre-printed on the form, enabling the user to merely circle the desired option. Tabular systems sometimes provide the facility for specifying default conditions. In such a case, a user enters one global parameter entry to imply a series of frequently encountered conditions. This technique provides a shortcut for the user by specifying many functions with a single entry. Most tabular forms are designed to include a descriptive heading applicable to each function to which a given form is applicable. Some forms are accompanied by varying degrees of instructions to assist the user.

Natural Language Forms. These are much simpler in layout. The user has more freedom as to where a given parameter entry is to be made. This is usually achieved by employing a language syntax requiring a set of parameters to be entered in a prescribed order. Such entries are often separated from each other by a blank space and sometimes by delimiters (e. g., comma " , ").

Tabular and natural languages both utilize various techniques to identify data, control functions, and logical operations. The identification of data usually takes the form of field names or field numbers to reference a specific piece of data in a record. The specifying of logical operations is normally accomplished by use of mnemonics describing comparisons of data and logical connections.

Comparators, for example, may be indicated by, "G", "GR", "GT" or ">" to represent "greater than." Inclusive comparisons may be alternatively described by "GE" (greater than or equal to) or "NLS" (not less than). Logical connections may be represented by "OR," "AND" or various alternatives such as "++" (OR), "**" (AND). Some systems allow various alternative choices of identification. For example "GR" or "GREATER THAN" is used in the SELECT System of Standard Oil of California.

Which kind of form users prefer is largely governed by their specific background. By and large, clerical, administrative, and managerial personnel prefer forms utilizing tabular notation. The reason for this is that a tabular language normally requires less training, since there exist prefixed sections of the form for specific entries. Extremely significant also is that these non-technical users have fewer formal rules to learn and remember. Technically oriented users (especially programmers), on the other hand, often prefer free form notation. These individuals are not bothered by the more complex rules governing language usage, since this is consistent with their analytical makeup and disciplined training. It should be pointed out that some information languages of a free form type are beginning to encroach on the boundary between a non-procedural language and a higher level programmer language.

For on-line terminal input, there is no question as to which communication mode is required. When one is in a terminal environment, the only natural mode of communication is free form notation. This is true regardless of the background of the user and whether or not he is technically oriented. The bottleneck of the layman having to learn the applicable rules can largely be overcome, in a terminal environment, by having two forms of the same language: shorthand and longhand.

The shorthand form would be employed by those users who have learned the rules through exposure to the system. The shorthand form would be similar to its free form counterpart in a batch operating environment.

Use of longhand could be obtained by utilizing preprocessors that perform a finer level of dialogue with the terminal user. Such a technique would provide a "learn as you go" system, by specifying the various legitimate entries to the user via a question and answer scheme.

examples of general purpose systems

This section provides a representative list of general purpose systems currently available or in the process of being developed. The characteristics of each system will be described.

GIS (Generalized Information System)—introduced by IBM in 1965. It consists of a set of general purpose file processing programs applicable to System/360. GIS is designed for use only with OS/360 and its required configurations.

History: As of this date, only a pre-release version of the Document Processing System has been made available to System/360 users. In July 1967, IBM officially made the following statement regarding the status of GIS:

1. A field release of the Document Processing System is due in December 1967.
2. IBM has indicated that the Document Processing System is now a software product separated from GIS.
3. "The announcement" of the availability of BASIC GIS (no multi-tasking) will be made in April 1968.
4. "The announcement" of the availability of FULL GIS will be made in September 1968.

Type of User Language: free form
Data Identification: field names
Record Formats Accommodated: fixed/variable

Operating Environment: batch or on-line
Nature of Execution of Object Program: interpretive (table driven)
Source Language Implementation: assembly language
Processing Access Method: sequential or direct access
Minimum Machine Configuration: 128K bytes, Models G and above
Availability: currently being implemented
Comments: GIS is a comprehensive generalized system of significant utility. However, its implementation has been plagued by slippages for the past three years. When it is finally delivered, it will be characterized by two major drawbacks:

1. A minimum machine configuration of unreasonable size—128K.
2. Poor performance, considering the speed of the equipment, due to its interpretive mode of execution.

MANAGE—introduced by Scientific Data Systems in 1965.

History: MANAGE, a general purpose file management system, was initially released to SDS 9300 users in July 1966, and its 900 Series counterpart released in October 1966. It has been actively used by SDS users since late 1966. It has been used in applications ranging from student record processing, to inventory control, to monitoring the control of satellite ground commands.
Type of User Language: tabular
Data Identification: field names or field numbers
Record Formats Accommodated: fixed/limited variable
Operating Environment: Batch (SDS 9300); freestanding (SDS 900 Series)
Nature of Execution of Object Program: compiled machine language code and subroutine linkage.
Source Language Implementation: SDS BUSINESS LANGUAGE—(a character-oriented extension of SDS Meta-Symbol)
Processing Access Method: sequential tape
Minimum Machine Configuration:
Models—SDS 910, 920, 925, 930, and 9300
Core—900 Series, 8K (24-bit words)
9300, 16K
Peripherals—3 tape drives, card reader and line printer
Availability: currently available
Comments: MANAGE is an example of a flexible general purpose system successfully implemented for small computer configurations. Its performance is especially outstanding considering the limited machine characteristics: for example, successfully processing 20 queries simultaneously in one pass of a given data file on a 16K SDS 925. Additionally significant is that it was implemented for five different SDS computer models (SDS 910, 920, 925, 930, and 9300) simultaneously. The vehicle for attaining this was the SDS BUSINESS LANGUAGE, an SDS machine independent assembly language.

INFOL (*I*nformation *O*riented *L*anguage)—introduced by Control Data in 1965.

History: INFOL is a general purpose system for information storage and retrieval applications that was initially released to Control Data 3600 users in 1966. It was originally intended for use on both 3400 and 3600 computers but the 3400 applicability was removed.
Type of User Language: free form
Data Identification: field numbers
Record Formats Accommodated: fixed/variable
Operating Environment: batch (SCOPE operating system)
Nature of Execution of Object Program: generated code and interpretive
Source Language Implementation: COMPASS assembly language
Processing Access Method: sequential tape
Minimum Machine Configuration:
Models—CDC 3600 and 3800
Core—65K (48-bit words)
Peripherals—5 tape drives, card reader and line printer
Availability: currently available
Comments: From a design standpoint, INFOL has one interesting attribute, the facility for handling complex variable record formats. From a user viewpoint, its minimum configuration of 65K words of core is very unreasonable. Control Data has indicated that no future releases of the system will be made, and the existing version (Version 1.1) will not be supported.

IMRADS (*I*nformation *M*anagement *R*etrieval *A*nd *D*issemination System) was introduced by Univac in 1966.

History: Univac has been engaged in research into generalized information retrieval techniques over the past few years. IMRADS, as a conceived system, was the result of this research effort. Most recently, it changed from a research subject to a software product under development for the Univac 1108.
Type of Language: tabular
Data Identification: field names
Record Formats Accommodated: fixed or variable
Operating Environment: batch or on-line (Univac 1108 Executive 8)
Nature of Execution of Object Program: interpretive
Source Language Implementation: COBOL
Processing Access Mode: sequential or direct access
Minimum Machine Configuration: Univac 1108 with a minimum core size of 128K words (36-bit words). Minimum peripherals needed is unknown, although definitely a function of Executive 8 requirements.
Availability: Unknown
Comments: IMRADS applicability seems somewhat premature considering the current state of its development. Independent of its utility, this author considers its method of implementation (COBOL) an unfortunate choice and the ultimate machine configuration unnecessarily large.

BEST (*B*usiness *E*dp *S*ystems *T*echnique) was introduced by NCR to users of NCR 315 computers in June 1964.

History: BEST is an integrated system of data processing functions which was released (in abbreviated form) to NCR Data Processing Centers for use on the NCR 304, in November 1962. A more comprehensive system (now encompassing over 55 functions), for the NCR 315, was released to NCR Data Processing Centers in October 1963, prior to its eventual release to NCR 315 users in June 1964.
Type of Language: tabular
Data Identification: relative position
Record Formats Accommodated: fixed
Operating Environment: freestanding
Nature of Execution of Object Program: assembled machine language
Source Language Implementation: NEAT assembly language
Processing Access Method: sequential
Minimum Machine Configuration:
Model—NCR 315
Core—10,000 slab memory (20,000 character positions)
Peripherals—line printer, card reader (or paper tape), 5 tape drives
Availability: currently available

Comments: BEST has been a successful effort on the part of NCR to develop a software tool which eliminates the need for programming in the conventional sense. It was the goal of NCR to develop a system which circumvented the programming of at least 50% of the applications encountered by users of NCR 315's. Though a modest system, it definitely surpassed this goal. Among its limitations: slow compiling of a BEST program. This is brought about by BEST itself generating NEAT assembly language output, which in turn must be assembled by the NEAT assembler to finally derive an executable program. Another drawback is its sensitivity to data structures peculiar to NCR architecture (i.e., "slabs" of memory).

TDMS (*T*ime-Shared *D*ata *M*anagement System)—introduced by System Development Corporation in 1966.[4]

History: TDMS is the outgrowth of SDC research and experience with user-oriented languages, data base systems and time-sharing systems. It is strongly influenced by earlier SDC experience in developing and using LUCID and GPDS on the AN/FSQ-32 time-shared computer. TDMS is currently being implemented for the IBM 360 time-sharing system in SDC's Computer Center.

Type of User Language: conversational free form (shorthand and longhand)
Data Identification: field names
Record Formats Accommodated: fixed/variable/hierarchical
Operating Environment: batch or on-line
Nature of Execution of Object Program: not applicable
Source Language Implementation: JOVIAL
Processing Access Method: direct access (high capacity mass storage)
Minimum Machine Configuration: IBM 360/50 (specific configuration not established)

Comments: TDMS when implemented will constitute one of the most sophisticated generalized systems in existence. It is based on a very large computer configuration consisting of high capacity mass storage devices, high-speed communications equipment and a liberal number of remote terminals. It is a truly user-oriented system characterized by a conversational language whose man/machine dialog is very flexible. This flexibility allows a terminal user to obtain tutorial help while learning the system.

ASI-ST—a proprietary third generation information management system introduced by Applications Software in 1967.[5]

History: ASI-ST is an outgrowth of 50 man-years of comprehensive experience designing and implementing general purpose software. It is currently being implemented for three different computer series concurrently—IBM 360, SDS Sigma 5/7, RCA Spectra 70.

Type of User Language: tabular and free form
Data Identification: field names or field numbers
Record Formats Accommodated: fixed/variable/hierachical
Operating Environment: freestanding/batch/on-line
Nature of Execution Object Program: primarily compiled object code, though interpretive execution is conditionally introduced in an on-line environment.
Source Language Implementation: SPL (Systems Programming Language), a proprietary machine independent programming language of Applications Software Inc.
Processing Access Method: sequential or direct access
Minimum Machine Configuration:
Model—IBM 360 ("E" CPU or above)
Core—16K bytes (freestanding)
—32K bytes (DOS)
—65K bytes (OS)
Peripherals—card reader, line printer, 3 tape drives
Model—SDS Sigma 5/7
Core—16K words (SDS Sigma batch monitor)
Peripherals—card reader, line printer, 3 tape drives (or their disc counterpart)
Model—RCA Spectra 70 (CPU "35E" or above)
Core—TOS or TDOS required plus 16K additional bytes
Peripherals—card reader, line printer, 3 Tape drives (5 if TOS)
Availability: currently being implemented
Comments: ASI-ST is a highly modular, general purpose, information management system directed specifically at the user who is a non-programmer. Accordingly, it employs highly simplified notation which can be easily learned in a few hours. Attributes include default conditions that enable a user to specify a series of frequently encountered conditions with one parameter; optional input of COBOL Data Division entries in lieu of ASI-T dictionary definitions; and multi-processing of ASI-ST processors and object programs.

[4] Vorhus, Alfred H. and Wills, Robert D., "The Time-Shared Data Management System, A New Approach to Data Management," SDC Publication SP-2747, February, 1967.
[5] Sundeen, Donald H., "ASI-ST, A General Purpose Information Management System," Applications Software, Inc., 29000 South Western Avenue, San Pedro, California.

what the future holds

As we mentioned earlier, it has been a characteristic of traditional application dependent packages to be highly constrained with regard to the structures of the files they are capable of processing. One known exception to this is the SDS payroll generator. This package interfaces with the SDS MANAGE executive system and dictionary generator to allow a user of the system a significant amount of flexibility. Separate MANAGE dictionaries define the formats of: the payroll master file, the time card file, and the computed output payroll file. Furthermore, a variation of the MANAGE dictionary allows one to define the *format of the payroll checks and stubs to be printed.* This format independence—coupled with flexible parameter definitions for the method of calculating gross earnings, federal income tax withholding, mandatory deductions, and optional deductions (e.g. insurance, local taxes)—is truly representative of a "generalized" payroll package. The application of this technique of describing data structure/format/attribute to diverse application areas is an example of advancing the state of the art of general purpose software that is currently in the development stage.

Another area which is likely to find significantly increased applicability is development of comprehensive on-line general purpose systems. This will be stimulated by various conditions, including: more powerful CPU's, high speed communications equipment, high capacity mass storage, significantly reduced costs of all this equipment, and increased human motivation brought about by the non-technical user being able to use a terminal successfully.

Especially significant in the near future will be the wider availability of general purpose software packages characterized by excellent performance. One of the most frequent complaints computer users have had is the inherent overhead of general purpose packages. As it turns out, all systems have not been as inefficient as users have claimed. However, because of lack of exposure (from all industry directions) many users have not become familiar with some of the available efficient batch systems.

The key to successful development of general purpose software packages, that are by their design efficient, is worth more attention. Accordingly, an article devoted specifically to how one uses general purpose software effectively will appear in a future issue of DATAMATION. ■

THE MARK IV SYSTEM

general purpose file management

by JOHN A. POSTLEY

The MARK IV File Management System is an advanced general-purpose software system available now for use with IBM 360 equipment. It is designed for a wide range of file-oriented data processing. Reflecting eight years' experience by the same group in the development of similar systems, MARK IV itself has been under development since 1965. It operates on 360's under either the Disc Operating System (DOS) or Operating System/360 (OS/360). A system easy for management and operating personnel to learn and use, but which provides more sophisticated users with flexibility in using its full capabilities, was a major design goal. This article outlines the major facts about the system, its features, and its use.

background

Replacement of machine languages by assembly languages, early in the development of the software industry, represented a major advance in software technology. But much remained to be done. The next important step was the development and refinement of "higher level languages" such as FORTRAN, COBOL, and ALGOL. While these languages served further to improve programming time and cost, programming and its derivative tasks remained a highly specialized skill.

The general purpose software system is designed to make the computer available directly to the user by reducing to an absolute minimum the requirement for specialized software skills. More than 70 such systems, most of them designed to meet limited objectives within specialized environments, have already been developed. A few of them have sought to achieve broader objectives. These general purpose[1] systems are described in Mr. Sundeen's article in this issue.

The design of MARK IV, as well as its predecessors (GIRLS, MARK I, MARK II, and MARK III), is directed toward a system that is easy to use in the everyday environment of business and government operations. No special hardware requirements are imposed, and the system interfaces with the standard manufacturer-supplied software.

Nor does it require the user to design his application to fit the preconceived notions of other users. Quite the contrary. The system provides the means to combine its preprogrammed building blocks in any of a myriad of ways that may be dictated by each application and its organizational and operational environment.

the scope

Presently operational under DOS or OS/360, MARK IV is broadly based from a hardware standpoint. It runs on 360 models 30, 40, 50, 65, and 75. A minimum of 32K core and one 2311 disc are required.

From an applications standpoint, the system performs functions (applications components) rather than the applications themselves. Thus, file maintenance is not a payroll function or an inventory function; file maintenance is a component not only of those applications but of

The author wishes to acknowledge the helpful assistance of the MARK IV staff at Informatics Inc. in the preparation of this article.

[1] We use the term "general purpose" to suggest that a system was designed from the ground up to achieve these broad objectives, in contrast to "generalized" which suggests the later extension (or "generalization") of a system designed for more limited goals.

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countless others involving files of almost every kind.

The most important functions performed are:

- Read data from punched cards, magnetic tapes, and direct access devices.
- Create files on magnetic tape, cards, and direct access devices. These files may contain fixed or variable length records, and can be processed sequentially or indexed sequentially.
- Maintain files by performing changes, additions, and other update actions.
- Read a master file and as many as four related files simultaneously for updating, processing, and output.
- Select records from files that contain data which meet specific qualifications.
- Extract data from the selected records.
- Compute results for use in printed output, subfiles, updating of master files, and in additional computation.
- Arrange output by sorting, sequencing, and grouping.
- Summarize data to as many levels of totals and subtotals as required.
- Print reports containing such elements as Preface, Page Title, Page Number, Column Headings, Line Numbers, Detail Entries, Summaries, Averages, and other details that make a printed report or document informative and attractive; printed on standard computer paper or on special pre-printed forms.
- Produce new files, parts of files, combinations of files, and audit files; on magnetic tape, direct access devices, and cards.

The appropriate functions of MARK IV are brought to bear in each application by means of structured forms filled in by the user. This effort is reduced to a minimum by means of:

- Automatic file maintenance
- Simple structured forms
- Defacto/default operation
- Request cataloging

Once a file and its related transactions are defined, the system automatically updates that file whenever transaction data are encountered. The master file, and the transactions which update the data in the master file, are defined only once. They are defined on specialized forms; any fixed file or COBOL file can be defined, as can many other variable files, and there is no limitation on the transaction formats which can be defined. These definitions are stored in the dictionary and called in automatically when required. To perform the file management functions, the user merely gives the name of the file and puts "FM" in the proper place on the Run Control Form. The rest is completely automatic and absolutely no programming by the user is required. With this single item of input, MARK IV will:

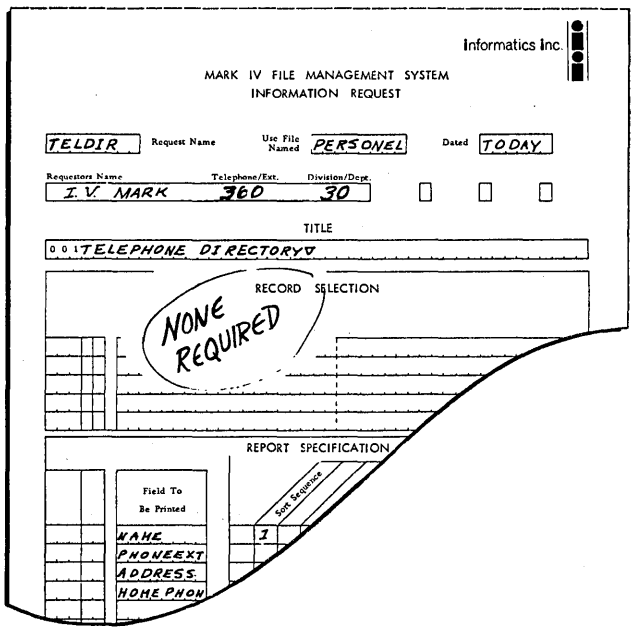
- read the master file
- read the transactions
- match the transactions with the proper master file records
- perform the appropriate updating process using data from the transactions
- produce audit files of
  —unacceptable transactions
  —deleted master file records
- write out the updated master file

Contributing further to its ease of use is the "de facto system." This de facto, or default, system is a preselected mode of operation that will solve many application requirements. The de facto system is carried out automatically whenever the user does not specify alternatives on the various forms. Thus, by not filling in a particular specification, the de facto system function for that specification will be performed. For example, to produce a report of *all* of the records in the master file the user simply *omits* filling in any selection criteria. This is shown in Fig. 1.

specialized forms

The simplicity of the structured forms facilitates user communication with the system. The specific forms used depend upon the complexity of the request and the data processing knowledge of the user. For simple tasks, only one form, the basic Information Request, is required. The information from this form, when entered as input to

Fig. 1



MARK IV, initiates the operation of the system. More complex requests require the use of additional forms which extend the functions provided through the Information Request and add the capability to process data from the master file and, simultaneously, from other files related to it.

Any request or combination of requests, simple or complex, may be cataloged (saved) by the system. Once cataloged, requests may be rerun (using new data) at any time without entering their detailed specifications again, simply by entering the appropriate request name or names into the system. Cataloged requests may be rerun in different combinations or sequences than originally specified; similarly, they may be combined with new (uncataloged) requests without redefining the old ones. These features provide the means readily to alter existing jobs as data and parameters change.

The general flow of system operations is shown in Fig. 2. Upon being called by the operating system, MARK IV reads the first record from the master file. Next, transactions against that record are read and processed and audit files produced if required. After reading matching records from related files, MARK IV then carries out the processing instructions of each user (request)[2] against these records. The results are then written out in the form of an updated master file, one or more subfiles, one or more printed reports for each request, or any combination of these products.

an example

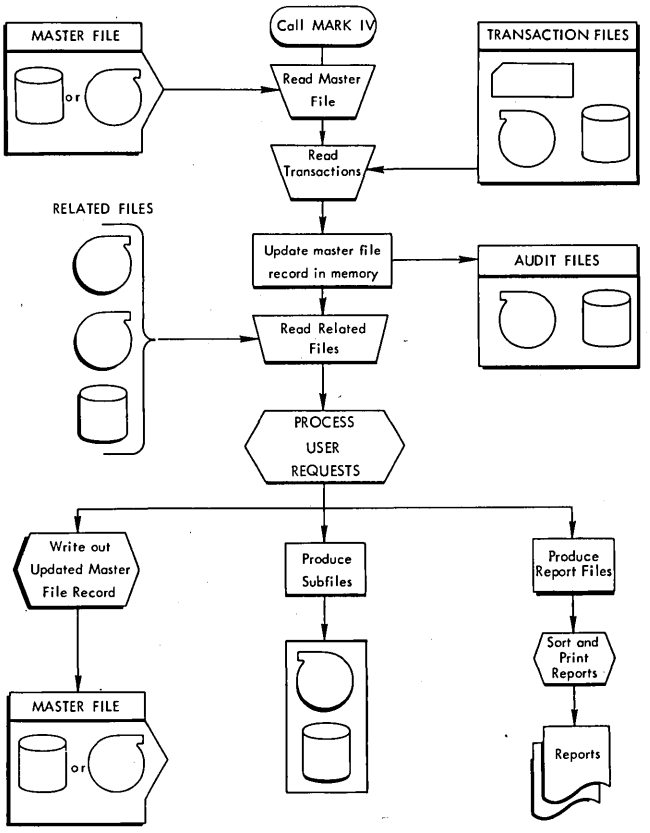
A simple example will illustrate the use of the Information Request. Assume the following problem: produce a telephone directory from the contents of the personnel file,

[2] Note that as many as 50 or more requests can be processed simultaneously in this fashion.

where the file is arranged in man-number sequence within department; include name, phone extension, home address, and home phone; print the directory in alphabetical order by name.

The Information Request, filled in as shown in Fig. 1, will produce the required result, as shown in Fig. 3. We have given the request the name "TELDIR" (short for telephone directory). It will use a small amount of data extracted from each PERSONNEL record in the file. The data on which the request is run (TODAY) will print on the report, titled "TELEPHONE DIRECTORY." Since this example assumes that every record (person) in the file is to be selected (i.e., none rejected), no selection information is required (defacto operation). Simple or complex logic might have been entered into the Record Selection section of the form to select such record subsets as specific departments, people with green eyes, locations, etc. Any appropriate combination of criteria, connected by "and" and "or" (and nested in up to 10 levels of parentheses) can be employed in this record selection process. And

Fig. 2



finally, the field names of the data items to be extracted from each record and included in the report are listed in the Report Specification section of the form, along with an indication that the report is to be sorted by name, without regard to the actual sequence of the PERSONNEL FILE.

In addition to the ability to supply simple or complex selection criteria, other requests using the Information Request form might call for such items as totals and averages of any of the data items in the report, sequencing by several fields (either ascending or descending) and cataloging the request for future use. More complex requirements, extending to almost any data processing application, can be met by employing the additional forms which provide extended capabilities to the more sophisticated user.

Recognizing that the effectiveness of any system depends upon an organization's ability to utilize it successfully, MARK IV is a warranted product. System engineers are on a regular once-a-month schedule of visits to each installation. These system engineers assist user personnel in the effective and efficient use of the system.

Supporting field operations, a permanent staff at Informatics' headquarters keeps pace with any official changes to either the DOS or OS software configurations and seeks continuously to improve the efficiency and extend the capability of the system.

The "IV League," the users organization formed in July 1967, provides a platform for the exchange of both

Fig. 3

FEB. 31, 1984 TELEPHONE DIRECTORY PAGE 1

NAME	PHONE EXTENSION	HOME ADDRESS	HOME PHONE
ADDAMS, S.	243	134 RODDA AVE	781-2345
BLAUNER, D.	272	1214 HILL ST	345-7829
BLIESNER, R.G.	260	891 WESTLAKE AVE	347-7865
BUETTELL, T.D.	269	812 N. ORANGE AVE	378-2121
BRADDOCK, F.	262	121 NATIONAL BLVD	347-8876
COOPER, W.R. JR	203	144 E. GROVE AVE	873-4211
CORYELL, N.T.	265	782 S. BRAND AVE	781-9782
COUCH, S.J.	247	817 ROSCOE ST	871-3131
CUTLER, W.C.	250	1218 STANDARD AVE	781-9650
DOWKONT, A.J.	240	1814 NATIONAL BLVD	781-9600
GATTO, O.T.	272	128 COMMERCE ST	781-2515
GLENN, R.C.	242	130 AVIATION BLVD	347-6430
HASKELL, E.L.	245	161 TRADE ST	341-9539
HUBER, C.L.	248	315 KIMBERLY AVE	345-7824
JACOBSOHN, H.	246	170 ALLEN BLVD	342-6830
JOHNSON, N.	253	23 LAMBETH WAY	781-5974
KEYS, P.M.	224	163 ARMENTA ST	348-1233
KINN, C.J.	242	1117 MAPLE AVE	341-[illegible]
KREINER, P.F.	268	1007 HILL	
LAMIA, A.	255	1025 TRAID ST	
LEVINE, D.A.	251	19 IRONDALE AVE	
MARK I.V.	360	444 IVY ST	
MASON, R.J.	279	411 LEAGUE	
MOORE, M.L.	260	33 FRANKI[illegible]	
POSTLEY, J.A.	278	412 CEN[illegible]	
PRINCE, L.C.	255	792 C[illegible]	
RAY, L.R.	251	745 [illegible]	
REDEKOPP, J.A.	276	45[illegible]	
SMITLEY, B.L.	274		
STONE, R.D.	243		
SUNDERLAND, R.S.	276		
TAYLOR, J.R.	276		
UTT, C.G.	[illegible]		
WHITE, R.R.			
ZANICCHI, J.			

application and other information about the system. A MARK IV Bulletin, sent bi-monthly to IV League members, contains news of developments and operating tips useful to all users.

The system is marketed on either a purchase or 3-, 6-, or 12-month lease basis. The price includes manuals and forms, initial training and installation, and system engineering support at user installations, as well as the system itself on tape or disc. All system maintenance, including updating to conform to the latest versions of OS or DOS, is also included without extra charge.

summary

The MARK IV File Management System places in the hands of a data processing manager a versatile tool that provides positive control over his time requirements, budget limits, and personnel scheduling.

The MARK IV File Management System enables the data processing organization to:

a) process more information for less cost
b) relieve pressing personnel problems
c) produce faster, more flexible reports
d) respond rapidly to changes
e) reduce response time for new requirements
f) reduce documentation costs
g) facilitate overall standardization of files and file structures ■

EVOLVING COMPUTER PERFORMANCE 1963-1967

by KENNETH E. KNIGHT

"Changes in Computer Performance" (DATAMATION, Sept. 1966) traced the developments in high speed digital computers from the Harvard Mark I in 1944 through the early months of 1963. In this second article we will examine 93 computer systems introduced between 1963 and 1967.

We again consider two aspects of computer performance: 1) computing power, indicated by the number of standard operations performed per second (P); 2) cost of the computing equipment, which equals the number of seconds of system operations per dollar of equipment cost (C).

Computing power (P) evaluates the rate at which the system performs information processing, the number of operations performed per second. Two machines solve a specific problem with different internal operations because of their individual equipment features. (P) will, therefore, describe operations of equivalent problem solving value to provide the desired measure of a computer's performance.

The equations to calculate computing power are identical to the ones described in the Sept. 1966, DATAMATION article, pp. 40-42. These were constructed by means of a careful analysis of the internal operations of each computer and allow us to calculate the relative performance of that computer for an average problem for scientific (and commercial) computation.[1] Using the same procedure we carried out the calculations for 93 computers introduced from 1963 through 1967 (Table 1).

a statistical averaging technique

The procedures used to calculate the computing power (P) and computing cost (C) represent a statistical averaging technique. The calculated numbers for a particular machine should not be taken as the "measure" for that particular machine. In making the calculations we used only one configuration for our average set of problems. The configuration selected was the one that was representative of the early systems. It should be emphasized that no attempt was made to optimize either throughput (number of calculations per second) or cost (number of calculations per dollar) for the machine.

The calculations of P (operations/second) and C (seconds/$ rental) are intended to provide over-all comparisons between machines of various sizes and between machines introduced in different years. From this data we determine the advances in computing power over time and investigate the differences between small and large computers (Grosch's Law). Because of the averaging technique used to calculate (P) and (C) our data do not provide direct comparisons between two machines for the specific set of user needs.

performance improvements 1963-1966

Data for commercial and scientific computation (Table 1) are plotted in Figs. 1 and 2 *(p. 33-34)*. As in the earlier article a regression technique has been used to describe the changes in computer performance from year to year and also to compare the computer performance per dollar of computer cost. The equation fitted is the same as the one used for the period 1950-1962:

$$\ln(C) = a_0 + a_1 \ln(P) + B_1 S_1 + B_2 S_2 + B_3 S_3 + B_4 S_4 \quad \text{(Equation 1)}$$

In this equation the a's and B's represent the regression coefficients to be determined by the least squares analysis. The S_1, S_2, S_3 and S_4 represent dummy variables (or shift parameters) for the different years considered (1963-1966). For the regression we will include 1962 as the base year. We will also consider all the systems from 1963-1966 in the regression analysis.

The result of the regression calculation using all 111 computers introduced between 1962 and 1966 are as follows:

For scientific computation: [2]

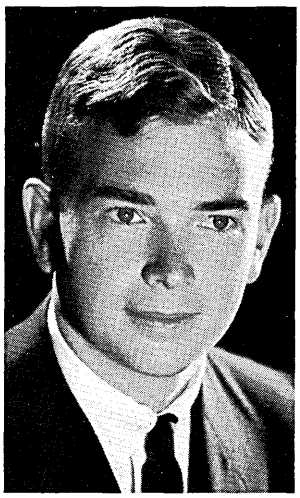
$$\text{Ln}(C) = +6.823 - .322 \ln (P) \quad \text{(Equation 2)}$$

+0.000 (1962)
+0.272 (1963)
+0.415 (1964)
+0.822 (1965)
+0.988 (1966)

For commercial computation: [2]

$$\text{Ln}(C) = +7.441 - .404 \ln (P) \quad \text{(Equation 3)}$$

+0.000 (1962)
+0.385 (1963)
+0.723 (1964)
+1.186 (1965)
+1.550 (1966)



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[1] The performance capability of each computer was determined for a typical mix of scientific/research problems and for an average mix of commercial/industrial problems.

[2] For both Equations 2 and 3 the adjusted (R^2) was over .80 and the a_1's, and B's were all statistically significant, different from zero at greater than the .01 level.

The plots of Equations 2 and 3 are shown in Figures 1 and 2.[3, 4] We see that the most striking observation once again is the rapid advance in computer performance. For scientific computation the average improvement in performance over the previous year, holding cost constant, is determined by the shift in the technology curve between 1963-1966. The measured shift is about 115% increase per year in computer capability for equal cost. The result shows that the rate of equipment improvement is even greater than that experienced in the years 1950 through 1962, an average of 81% per year. For commercial computation we find an average of about 160% per year, 1963 through 1966, against the earlier 87% for the years 1950 through 1962. As shown in Fig. 3 *(p. 34)*, we find that there has been a steady advance in computer performance capability each year 1963-1966, that is, each of the four years had a significant improvement in both scientific and commercial computation capability. *(Continued p. 35)*

Table 1

COMPUTING SYSTEMS

Computer No.	Name	Date Introduced	Scientific P (Ops/Sec)	Commercial P (Ops/Sec)	C (Sec/$)
219	IBM 7040	4/63	21,420	9,079	44.54
220	IBM 7044	7/63	67,660	23,420	23.98
221	RCA 601	1/63	68,690	58,880	13.86
222	Honeywell 1800	11/63	110,600	57,750	17.81
223	Philco 1000	6/63	6,811	10,440	65.63
224	Philco 2000-212	2/63	369,800	84,230	9.169
225	Librascope L 3055	12/63	114,000	30,620	10.39
226	H.W.Electronics 15K	2/63	119.6	50.98	1,247
227	GE 215	6/63	5,246	6,924	89.07
228	DDP-24	6/63	580.4	632.7	124.7
229	CDC 3600	6/63	459,065	156,375	12.47
230	UNIVAC 1050	9/63	12,028	19,675	113.4
231	UNIVAC 1004	9/63	97.12	1,473	415.7
232	PDP-5	10/63	6,338	12,519	311.8
233	IBM 1460	10/63	1,611	7,200	69.28
234	IBM 1440	11/63	1,412	5,559	183.40
235	Honeywell 1400	12/63	1,770	6,821	41.57
236	ASI 2100	12/63	24,628	10,241	178.2
237	SDS-9300	12/63	43,876	10,646	89.07
238	Burroughs 273	1/64	714.6	3,467	87.82
239	GE-235	1/64	28,557	22,244	51.96
240	IBM 7010	1/64	5,729	11,537	31.18
241	Burroughs B 160-180	4/64	295.5	1,599	145
242	CDC 160G	4/64	54,065	20,278	89.07
243	IBM 7094 II	4/64	217,108	95,146	8.20
244	CDC 3200	5/64	195,256	87,510	51.96
245	GE 415	5/64	7,472	15,668	77.94
246	UNIVAC 1004 II, III	6/64	79.16	1,878	283.4
247	SDS-930	6/64	73,181	21,035	103.9
248	GE 425	6/64	11,485	22,160	62.35
249	GE 205	7/64	1,775	6,188	311.8
250	Honeywell 200	7/64	1,148	7,027	103.9
251	RCA 3301	7/64	126,761	58,359	44.54
252	PDP-6	7/64	46,359	32,803	51.96
253	CDC 6600	9/64	7,021,619	4,091,293	8.31
254	UNIVAC 418	9/64	58,767	166,564	62.35
255	NCR 315-100	11/64	6,164	17,251	155.9
256	GE 635	11/64	338,958	253,898	11.34
257	CDC 3400	11/64	269,859	157,202	29.69
258	Burroughs B5500	11/64	376,275	544,201	20.78
259	SDS 925	2/65	92,692	150,102	155.9
260	SDS 92	2/65	19,140	79,065	239.8
261	CDC 3100	2/65	118,462	74,391	77.94
262	ASI 6020	3/65	28,160	13,161	178.1
263	DDP-224	3/65	52,330	81,492	103.9
264	DDP-116	4/65	2,176	4,023	677.7
265	GE 625	4/65	224,374	118,154	15.20
266	PDP-8	4/65	1,768	990.5	230.9
267	PDP-7	4/65	68,497	29,571	103.9
268	IBM 360/40	5/65	33,438	50,073	54.08
269	IBM 360/30	5/65	7,942	17,104	72.88
270	NCR 315 RMC	7/65	132,060	153,770	62.35
271	UNIVAC 1108 II	8/65	2,075,181	2,088,142	10.39
272	GE 435	8/65	24,803	56,623	41.57
273	IBM 360/50	9/65	187,488	148,967	27.47
274	IBM 1130	9/65	16.38	56.76	692.8
275	NCR 590	9/65	4.288	21.76	519.6
276	ASI 6240	10/65	33,177	13,232	155.9
277	UNIVAC 491 & 492	10/65	4,929	48,490	36.68
278	RCA Spectra 70/15	10/65	1,837	16,586	164.1
279	Raytheon 520	10/65	29,118	13,427	207.8
280	IBM 360/75	11/65	3,560,854	1,437,806	11.81
281	Honeywell 2200	12/65	12,222	14,332	77.94
282	CDC 3800	12/65	690,510	150,726	12.47
283	RCA Spectra 70/25	12/65	4,818	36,366	103.9
284	Friden 6010	1/66	1.66	48.66	1,039
285	CDC 6400	1/66	696,086	193,785	12.47
286	DDP-124	1/66	5,812	7,618	249.4
287	Honeywell 1200	1/66	2,130	10,907	115.5
288	IBM 360/20	1/66	1,932	4,497	239.8
289	UNIVAC 1005 II, III	2/66	88.25	1,677	259.8
290	UNIVAC 1005 I	2/66	71.73	1,186	366.8
291	Honeywell 120	2/66	2,108	9,526	190
292	IBM 360/65	3/66	1,385,573	809,738	13.86
293	UNIVAC 494	3/66	1,291,740	1,527,140	24.94
294	SDS 940	4/66	289,444	301,365	34.64
295	RCA Spectra 70/55	7/66	1,341,132	1,224,010	19.48
296	RCA Spectra 70/45	7/66	211,610	290,493	41.57
297	RCA Spectra 70/35	7/66	61,186	126,391	77.94
298	Philco 200-213	10/66	6,251,118	4,307,061	7.793
299	IBM 360/44	10/66	1,025,941	858,520	62.35
300	Honeywell 4200	5/67	45,569	32,270	31.18
301	SDS Sigma 7	12/66	894,566	554,280	41.57
302	PDP-8/S	9/66	1,595	8,546	1247.
303	PDP-9	12/66	107,672	352,534	1247.
304	SDS Sigma 2	1/67	118,152	101,079	155.8
305	Burroughs B 2500	2/67	22,153	28,791	124.7
306	Burroughs B 3500	5/67	154,842	130,251	69.31
307	UNIVAC 9300	6/67	4,350	18,424	138.6
308	UNIVAC 9200	6/67	1,592	7,458	415.7
309	Burroughs B 6500	2/67	3,127,266	2,755,760	15.59
310	CDC 3500	9/67	1,086,342	1,021,365	29.69

[3] The technology curves shown in Figures 1 and 2 are not comparable with those in the September, 1966 *Datamation* article. The curves shown in the current figures were calculated using all the general purpose computers introduced in the period 1962-1966. The earlier article used a procedure that eliminated some of the systems that were technologically inferior, those that fell far below and to the left of the technology line.

[4] Note that the slopes of the technology curves shown in the *Datamation*, September 1966 article, 1952-1962, were steeper than the current curves — 1962-1966. This results in the appearance that the base 1962 curves in Figs. 1 and 2 have been rotated and therefore they are not identical to the one shown in the earlier article; that is:

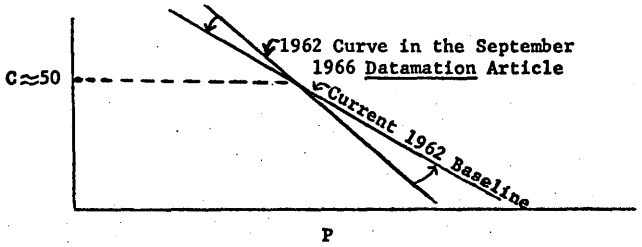


Fig. 1 Plot of Equation 2: regression calculation for scientific computation

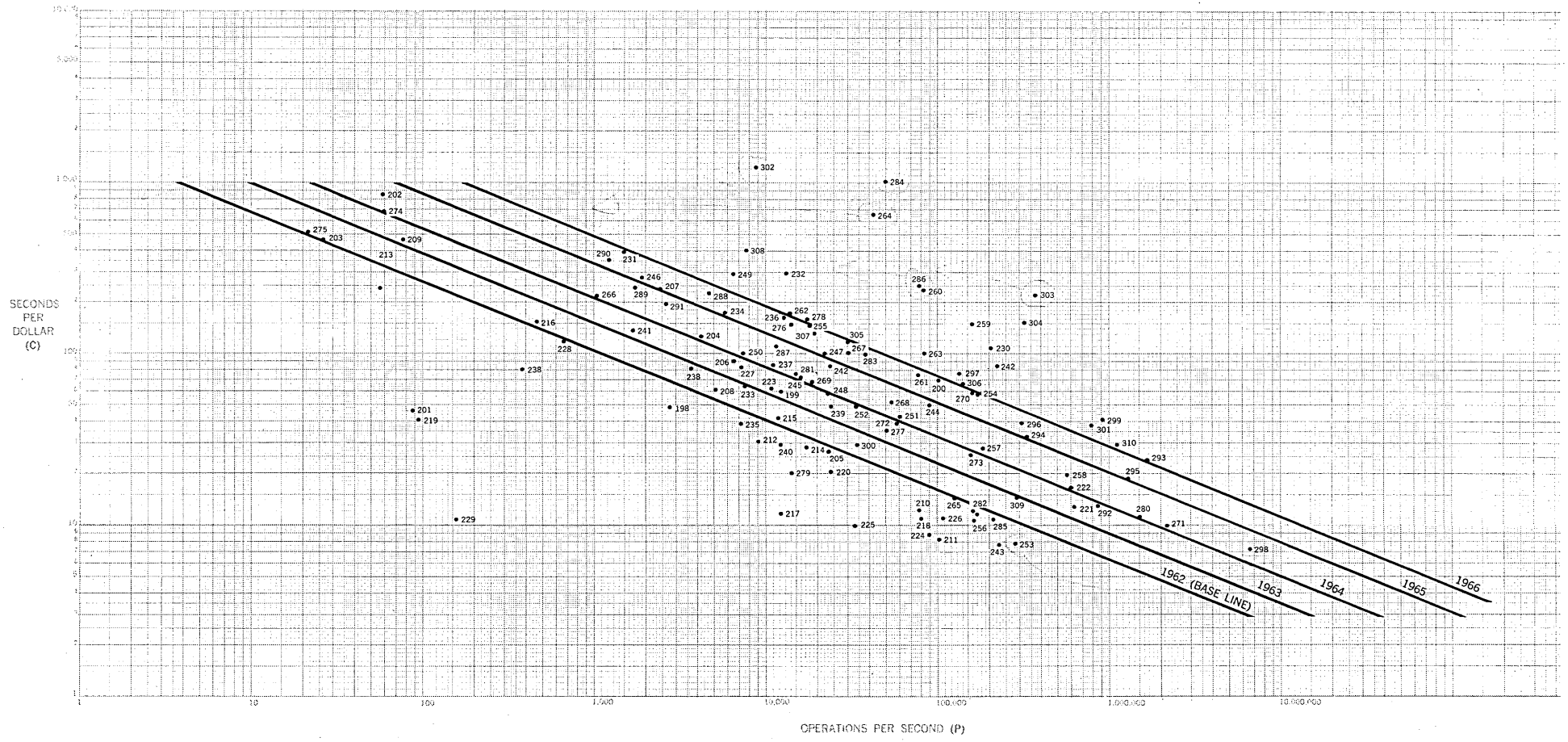
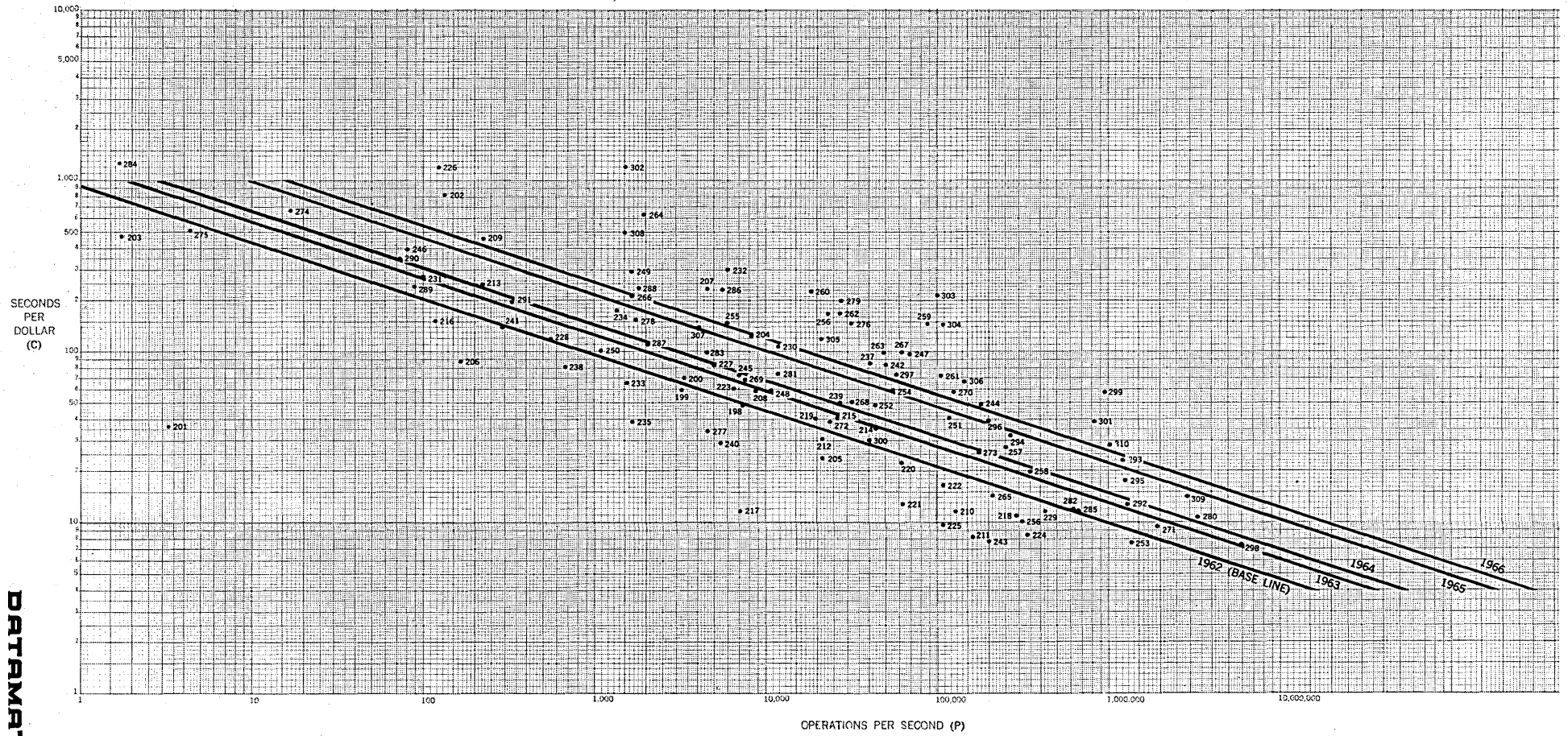


Fig. 2 Plot of Equation 3: regression calculation for commercial computation



grosch's law upheld

From our regression equation we obtain the new calculation of the economies of scale, Grosch's Law, for the years 1962 through 1966. Rewriting Equation 1 we get:

$$(C) = K \quad (P)^{a1}$$

$$(\text{Sec/Cost}) = K\,(\text{Power/}_{\text{Sec}})^{a1}$$

$$\left(\frac{1}{\text{cost}}\right) = K\,(\text{Power})^{a1}$$

$$(\text{cost})^{-1} = K\,(\text{Power})^{a1}$$

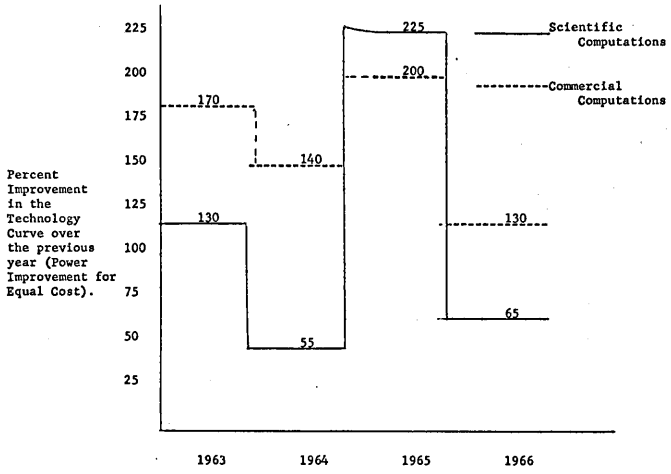
$$(\text{cost}) = K\,(\text{Power})^{-a1}$$

K is a constant which represents a combination of a_o and the yearly shift parameter. Grosch's Law predicts that computing power increases as a function of cost squared, or for twice the cost you get four times as much computing power. Grosch's Law using our analysis means that:

$$\text{Power} = K^1(\text{cost})\left(\frac{1}{-a_1}\right) \text{Where:} \left(\frac{1}{-a_1}\right) = 2; \text{ or } -a_1 = .5$$

Our regression equations yield $-a_1 = +.404$ for commercial computation, and $-a_1 = +.322$ for scientific computation. Both of these indicate that the return to scale are greater than that predicted by Grosch's Law. (For scientific computation 1962-66: Power $= K^1\,(\text{cost})^{2.5}$ and for commercial computation 1962-1966: Power $= K^1\,(\text{Cost})^{3.1}$. These returns to scale are also greater than those found during the period 1950-1962.[5]

Fig. 3. Average Yearly Shift of the Technology Curves (Power (P) Improvement for Constant Cost (C)).



conclusion

In conclusion, we find that the tremendous rate of improvement in computing power for fixed cost that we observed between 1950 and 1962 has continued and possibly slightly accelerated from 1963 through 1966 with the introduction of the third generation computers. We also find that the economies of scale predicted by Grosch's Law is supported and that today there appear to be even greater economies of scale, with larger machines providing equivalent computation at much less cost. ■

[5] For the 1950-62 period the results were that $-a_1 = +.519$ for scientific computation, and $-a_1 = +.459$ for commercial computation.

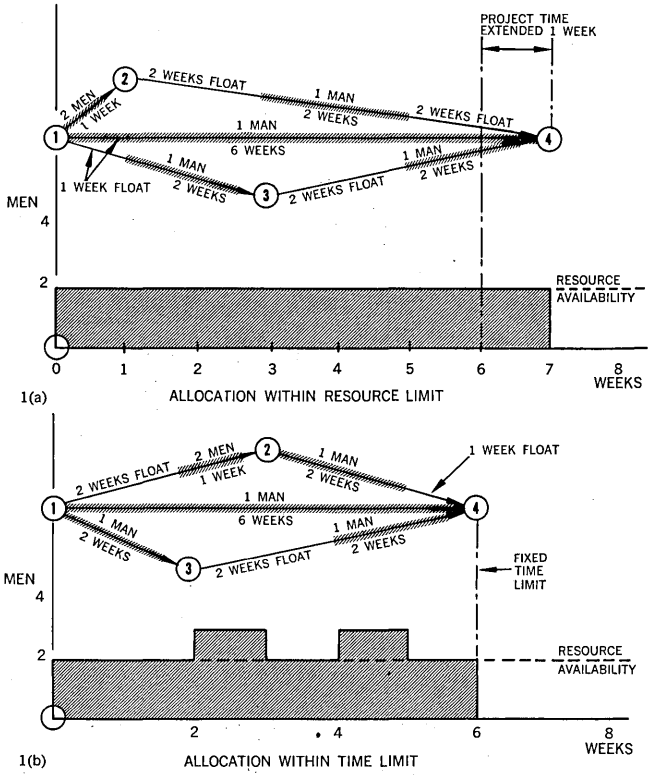
PLANNING NETWORKS & RESOURCE ALLOCATION

turning the decision tables

by H. S. WOODGATE

The arrowed diagram has become well established as a basis for time planning but is less widely used for the detailed allocation of resources. It is generally considered that the factors involved in specifying resource requirements and the conditions to be satisfied when allocating resources, vary so much from project to project that a generalised computer approach is impracticable. Early network-based resource allocation programs had severe restrictions in the manner by which activity resource requirements and project resource availabilities could be expressed and thus their usage was inhibited.

Fig. 1 Resource allocation



The basic problem appears simple enough at first sight and is usually to calculate either:

a. The minimum project duration if only fixed levels of resources are available.

or b. The minimum quantity of resources (and their most efficient deployment) if the end date of the project is considered to be fixed.

These solutions are obtained by scheduling the resource requirements for individual network activities against resource availabilities and deploying activity float to obtain the best result. A typical example of such an operation on a simple network is shown in Fig. 1 a and 1 b.

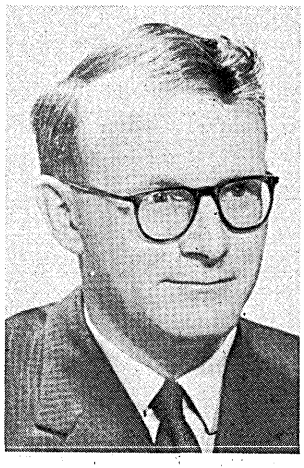
However, real projects are much more complex than this example. The network may comprise several thousand activities and involve more than a hundred different types of resources. Also, in practice many special scheduling conditions have to be considered when formulating work schedules. Some activities involve the use of several resources at different points of time; some must be worked continuously once started and others may be stopped if necessary, etc. It is the combination of size and complexity which has restricted the development of computer-based resource allocation models in the past.

A few years ago it was realised in the U.K. that there were substantial benefits to be gained from the effective deployment of computers to the allocation of resources on building sites and in factories, etc., and a determined onslaught was made on the practical problems which had so far restricted progress. It was clear from the outset that the need was for a system which took close account of the practical situation involved and operated on decision rules which could be changed easily as experience was gained. It was noted that many earlier systems of resource allocation had fallen into disuse because their pre-programmed scheduling method was found to be inappropriate and the effort required in reprogramming deterred further development. For these reasons it was decided that a flexible system should be prepared which took account of all conceivable conditions of resource requirements and availabilities and also incorporated changeable scheduling rules in the form of decision tables.

This system[1] has now been in operation for over a year and currently there are over 100 users of the program in the U.K. and Europe. Some of the salient features are now described.

The usual method of specifying activity resource requirements is to state for each activity the rate for one or several resources which are used by the activity, this rate then being considered as applying uniformly over the

[1]ICT 1900 Series PERT
International Computers & Tabulators Ltd. London 1966.



Mr. Woodgate is manager of the Management Systems Department of International Computers and Tabulators Ltd., and author of Planning By Network, *a project management text. Trained as an engineer, he now specializes in the application of computers to management problems.*

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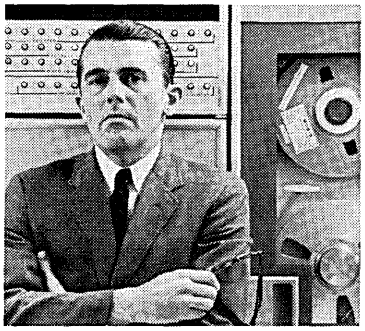

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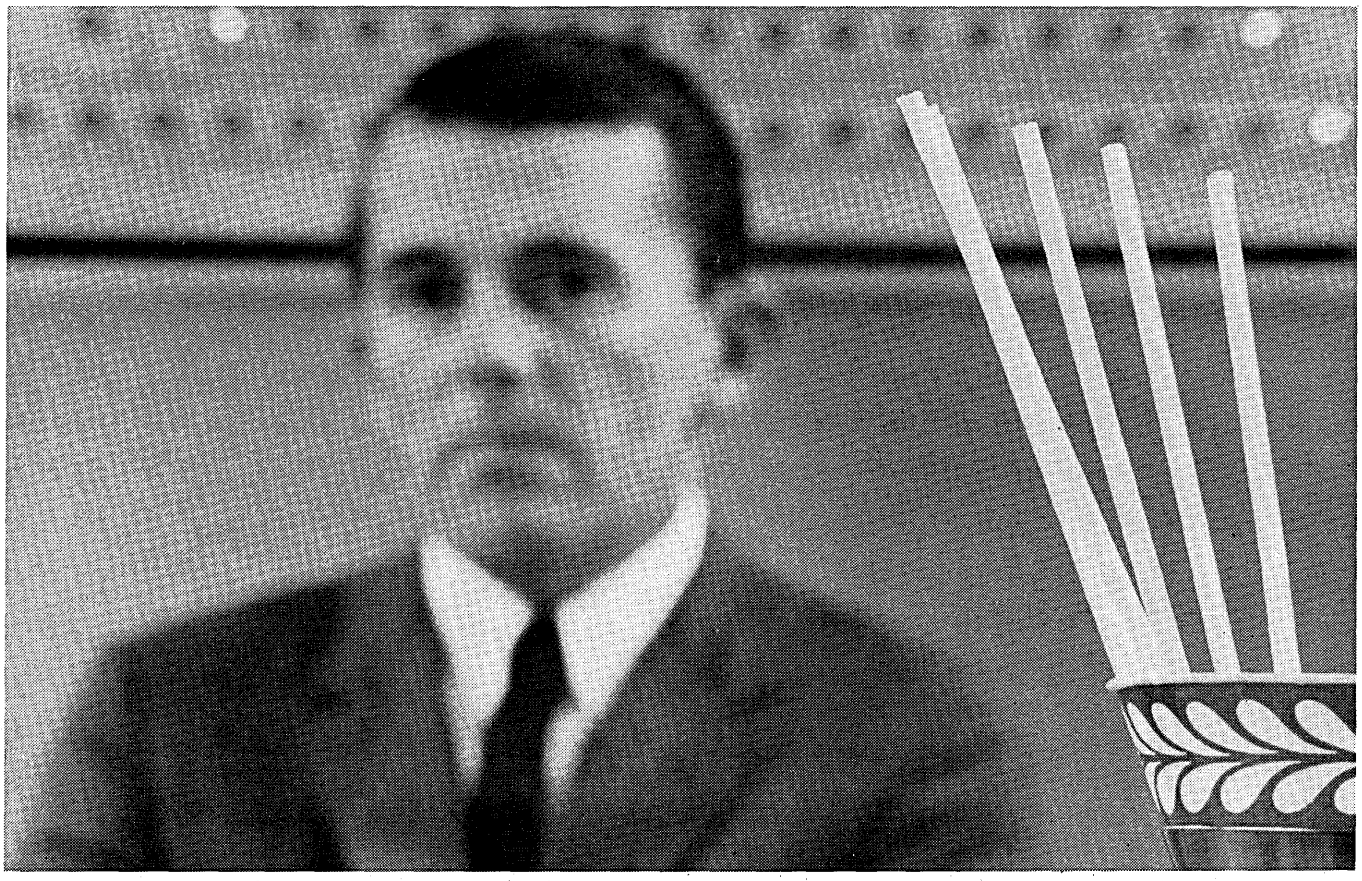

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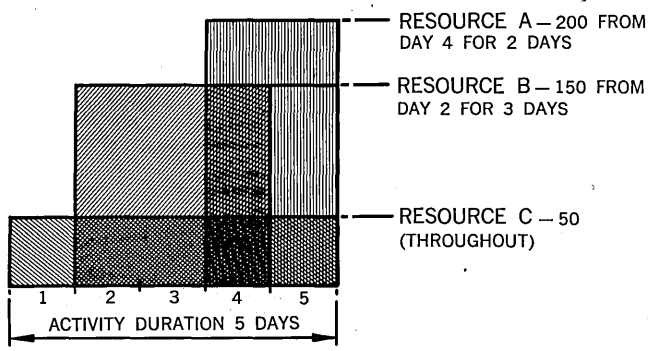
CIRCLE 20 ON READER CARD

duration of the activity. In the computer program described, however, a more flexible approach is used. Either the resource is specified as "rate constant" (as defined above) or as "total constant." The time from the start of the activity and the duration over which the resource is (or can be) applied is also given. An example of a five-day activity using three resources A, B & C is shown in Fig. 2.

If resource A is rate constant the program will consider the activity to require 200 of A on each of days 5 and 6. If A were total constant it would assume 100 units of A

Fig. 2 Activity with variable rate of resource usage



(i.e. 200 ÷ 2) on each of days 5 and 6. Similarly, if B is rate constant the assumed usage is 150 units for each of days 2, 3 and 4 but if total constant it would be 50 units on days 2, 3 and 4. If resource C is rate constant it specifies 50 units of resource for each day of the activity duration and if total constant it would be 10 units (i.e. 50 ÷ activity duration) for each day. This not only gives a comprehensive method of specifying variable rates of resource requirements but also provides a means of minimising alterations to input data when it is necessary to adjust activity durations. For example, when increasing the duration of an activity using multiple resources, some resources will increase proportionally to the activity duration (these can be specified as rate constant) but others will not increase in total (these can be specified as total constant). A special designation in the program enables activity-terminating resources to be specified from the end of activity duration, thus further simplifying modifications.

work continuity

In order to completely specify the characteristics of the work to be executed, a further set of data is necessary in order to indicate the required continuity of the work and any obligatory association with preceding and succeeding activities.

The calculation will permit an activity to be split into a number of parts (each part being separated by periods during which the activity is not worked on) if limitations of resource availability require it. The following exceptions can however be specified.

i. *Non Split.* Must be scheduled continuously.
ii. *Minimum Split* (+ time T). Can be split but segments must not be less than T.
iii. *Consecutive Start* (+ time T). The first T periods of this activity must be scheduled immediately following the previous activity.
iv. *Force Finish* (+ time T). The last T periods of this activity not to be split but to be worked continuously.
v. *Consecutive Finish* (+ time T). The last T periods of this activity not to be split and the succeeding activity to commence immediately this activity is finished.

Taken in combination with the methods of specifying activity resource requirements, these alternatives provide a realistic way of specifying the manner in which groups of activities are to be performed.

The amount of each resource available at each time period can be set at two different levels: *normal* level representing the preferred maximum rate of resource usage and *threshold* level representing a higher level which can be approached but not exceeded. The threshold level will usually represent overtime working, sub-contracting or other secondary forms of increasing capacity.

For convenience of input data preparation, various shorthand methods are used to specify the multiple combination of level and time for each resource. In addition to the normal method of stating level and duration, other notations include resource cycles, suspended cyles (e.g. interrupted by separately specified holiday periods) and combinations of cyclic and variable resources.

resource availability—pool resources

Normal and threshold resources are levels set at each particular period of scheduling time. *Pool* resources, on the other hand, represent resource levels which are not conditioned by time.

Another definition of pool resources is that they are those resources which can be carried forward from one scheduling period to the next. For example, manpower is only available for the time period specified. If 10 men are allocated to a project for two periods, the fact that only six are used in the first period does not mean that 14 will be available for the second period. If, on the other hand, the resource represented is bags of cement then 14 would be available in the second period because the unused quantity can be carried forward.

This method of defining resource availability can be used with advantage in connection with all resources which are transferable through time. It is, therefore, particularly suitable for scheduling space, materials and money.

For example, where specific sums of money are allocated to a project, rates of expenditure on individual activities may be scheduled against a finance pool which is progressively diminished and scheduling halted when funds are exhausted. If progress payments are envisaged, then the pool will be replenished at intervals corresponding with the date of payment.

Another important application of pool resources concerns work scheduling where space is restricted, i.e., in maintenance workshops or factory assembly areas, etc. In this case, site capacity (e.g., floor area) is set as the pool limit and activity requirements scheduled against this limit.

The use of pool resource limits for consumable materials, such as cement and bricks, has been mentioned but the technique is equally applicable to non-consumable resources, such as scaffold poles, shuttering, etc.

progressive feed (or ladder) activities

The use of progressive feed or ladder activities has become widely accepted as a simple and convenient way of depicting inter-dependent parallel activities on a planning network (description of the ladder convention can be found in reference [2]).

However, the method assumes a relationship between activities in the ladder chain which is not depicted by the network alone and it is necessary to introduce further data to ensure correct resource allocation. The situation is depicted in Fig. 3 *(p. 40)*.

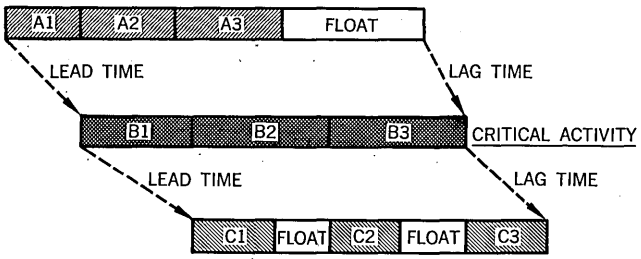
Here three activities A, B and C are inter-dependent and can take place in parallel subject to predetermined

[2] *Planning by Network*, Woodgate, H. S. Business Publications Ltd. London, 1964.

delays (lead and lag time). The middle activity B is critical and has no float whilst the other two activities A and C have positive float. The convention assumes that work is progressively fed from one activity in the chain to the next. Therefore, if the activities are considered as discrete segments 1, 2 and 3, it is apparent that the float cannot be deployed without consideration of schedule allocated to the identical segment in the other activities in the set.

The additional information required for each activity in the chain is the preceding event of the feeding activity and the lead and lag times. The calculation then ensures proper deployment of the float (as in Fig. 3) and also

Fig. 3 Resource scheduling with progressive feed activity.



ensures that if any activity in the chain is delayed then the appropriate delay is passed on to the inter-dependent parallel activities.

scheduling—project duration threshold

The use of alternative (threshold) resource levels has already been described and this technique illustrates a method of supplying the calculation with variable data to enable a greater flexibility to be embodied in the scheduling operation. Scheduling alternatives are possible, however, within a framework of project time as well; resource level and alternative project durations (threshold times) are included to further enhance this flexibility.

Two levels of increased project time are used, Project Time Change and Project Threshold Time.

The Project Time Change is the permissible increase in time (if any) beyond the project completion date calculated in the PERT time analysis. It is virtually additional float which has been allocated to the project and is therefore freely available during normal resource allocation.

The Project Threshold Time is the additional time, beyond the project time change, which may be used in dire necessity. The relationship between project time change, project threshold time, normal resources and threshold resources is shown in Fig. 4.

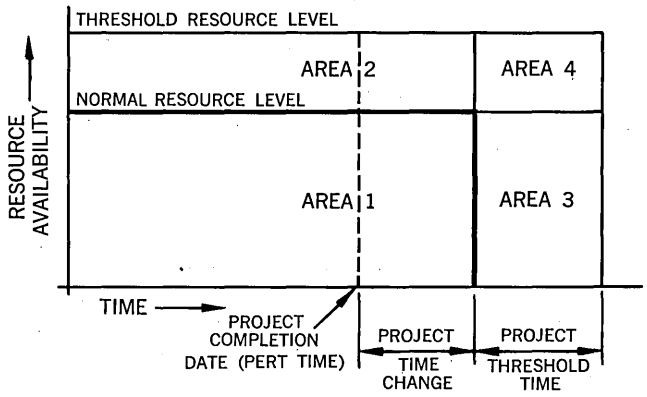
This figure shows the alternative areas in which activity scheduling can take place and also shows the boundaries which may be set. In the case of resource availability levels they may, of course, vary with time as described earlier.

Normal scheduling would take place in Area 1 providing the amount of resource required does not exceed the normal resource level or the inability to schedule (because of non-availability of resources) does not delay project completion beyond the boundary set by the project time change.

Where either resource requirement or time requirement exceed the boundaries then alternative schedules are possible according to whether the threshold resource is used or the threshold time is used. Thus a schedule may be calculated which uses either areas 1 and 2, or areas 1 and 3. Further non-availability of resources may cause areas 1, 2, 3 and 4 to be used. The sequence in which the boundaries of area 1 are exceeded in the case of scheduling difficulty are decided by the type of analysis which is requested. For example, a time-limited run would use threshold resources before threshold time and a normal allocation would use project threshold time before threshold resources.

In a time-limited analysis the allocation procedure is continued even if threshold resources are exceeded but the excess resource requirement is added to the alternative position which gives the least increase above the threshold

Fig. 4 Project time change, project threshold time, normal resources and threshold resources.



resource, thus ensuring that, although the maximum permitted level is exceeded, the minimum (and hence smoothest) increase is calculated.

Where the analysis is strictly resource limited (by setting priorities) then scheduling proceeds beyond the project time threshold. In this case a "long stop" is set (to avoid the possibility of scheduling to infinity) and the calculation abandoned if this is reached.

scheduling—methods

Broadly, the approach to scheduling used is the conventional network method whereby a set of activities available for scheduling (i.e. all preceding activities successfully scheduled) are maintained and then these are scheduled, time period by time period, starting at the earliest date. The activities available for scheduling are arranged in a priority sequenced queue, the order of which is preset, and they are subsequently scheduled in a manner determined by a decision table (described below).

According to the resources available and the information obtained from this decision table an activity is either scheduled or "delayed". In this context "delaying" means either:

a. Delaying (for one period) an activity not already partially scheduled.
b. Splitting the activity if it is already partially scheduled in the previous time period and it is *not* designated non-split (or the minimum split time is not exceeded).
c. Restarting the scheduling of the entire activity if it is already partially scheduled and if it *is* designated non-split (or the minimum split time is exceeded).

   In this case the portion of the activity already scheduled is cancelled, and the resources added back.

For example, if when scheduling an eight period activity a resource shortage was encountered in the seventh period, it would be either:

a. Split and scheduling ÷ 3, i.e., to leave three

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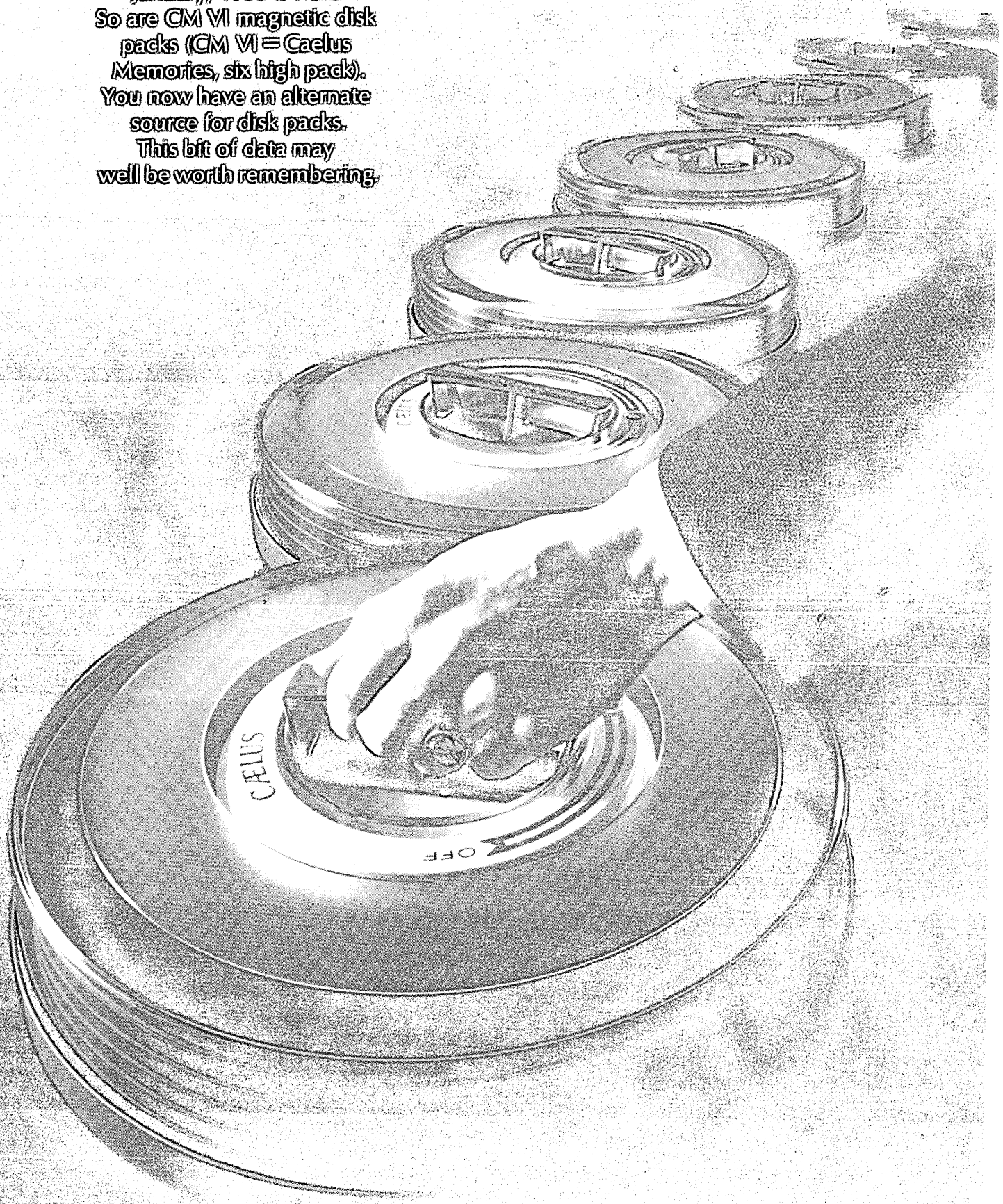

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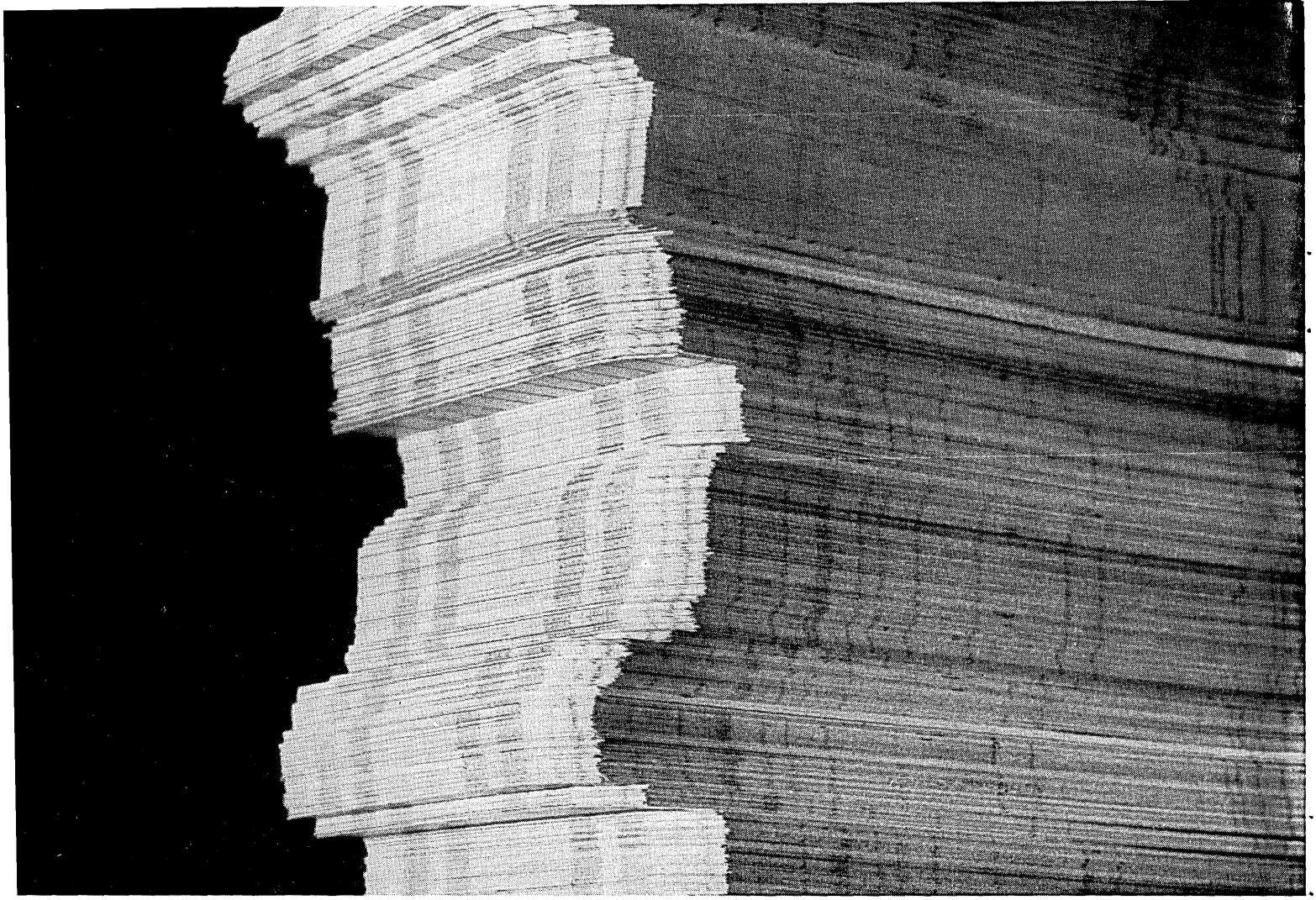

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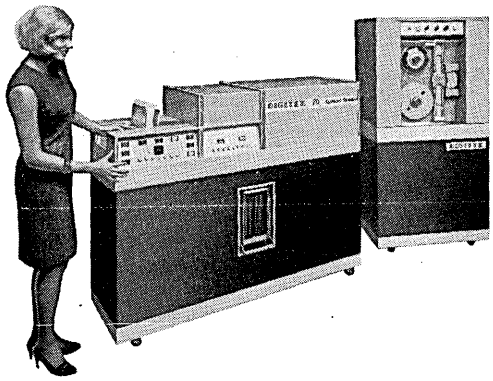

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complete periods available for scheduling uninterrupted.

scheduling—decision tables

The decision whether to schedule or to delay is made in respect of each activity by calculating four factors concerning the activity and using these four factors to reference a position in a four-dimensional matrix (the decision table). The four factors considered are:

1. Time situation in respect of project completion date (three cases)
   1.1 Positive total float
   1.2 Positive total float using project threshold time
   1.3 Negative total float (any condition)
2. Resource situation in respect of the requirement for the activity (three cases)
   2.1 Enough
   2.2 Enough with threshold resources
   2.3 Not enough
3. The amount by which an already partially scheduled activity would have to be unscheduled if not scheduled this period. This will be zero except for non-split activity where the amount is categorised into four ranges. The ranges can be varied but standard ranges used are:
   3.1 0 to 10 periods
   3.2 11 to 30 periods
   3.3 31 to 60 periods
   3.4 61 to infinity periods
4. Time situation in respect of project complete date if the portion of the activity already scheduled was to be cancelled and the activity rescheduled (three cases as in 1.1, 1.2, 1.3 above).

The decision table is set up in advance for the particular type of schedule required. Using the above four

Fig. 5 Segment of a typical decision table

DECISION TABLE FOR TIME LIMITED ANALYSIS — HARD SCHEDULE		3. AMOUNT UNSCHEDULED									
		0-10 PERIODS			11-30 PERIODS			31-60 PERIODS			6
FACTOR 1 TIME	FACTOR 2 RESOURCES	4.1. POSITIVE TOTAL FLOAT	4.2. POSITIVE TOTAL FLOAT AT TIME THRESHOLD	4.3. NEGATIVE TOTAL FLOAT	4.1. POSITIVE TOTAL FLOAT	4.2. POSITIVE TOTAL FLOAT AT TIME THRESHOLD	4.3. NEGATIVE TOTAL FLOAT	4.1. POSITIVE TOTAL FLOAT	4.2. POSITIVE TOTAL FLOAT AT TIME THRESHOLD	4.3. NEGATIVE TOTAL FLOAT	4.1. POSITIVE
1.1. POSITIVE TOTAL FLOAT	2.1. ENOUGH	S	S	S	S	S	S	S	S	S	
	2.2. ENOUGH WITH THRESHOLD	D	D	S	D	S	S	D	S	S	
	2.3. NOT ENOUGH	D	D	S	D	D	S	D	D	S	
1.2. POSITIVE TOTAL FLOAT AT THRESHOLD TIME	2.1. ENOUGH	S	S	S	S	S	S	S	S	S	
	2.2. ENOUGH WITH THRESHOLD	D	S	S	D	S	S	S	S	S	
	2.3. NOT ENOUGH	D	D	S	D	D	S	D	D	S	
1.3. NEGATIVE TOTAL FLOAT	2.1. ENOUGH	S	S	S	S	S	S	S	S	S	
	2.2. ENOUGH WITH THRESHOLD	S	S	S	S	S	S	S	S	S	
	2.3. NOT ENOUGH	S	S			S					

factors the appropriate decision is located and extracted from the table and the scheduling (or delay) then takes place.

A segment of a typical decision table is shown in Fig. 5.

segment of a typical decision table

In this figure it is seen that the various combinations of factors pinpoint the decision either S - Schedule or D - Delay. Shaded areas represent cases which should not occur.

In the computer program being described, nine decision tables are included. These have been devised to give the most satisfactory schedules in the following cases:

1. Aggregation at PERT time earliest date
2. Aggregation at PERT time latest date
3. Allocation, no threshold resources
4. Allocation, hard use of threshold resources
5. Allocation, easy use of threshold resources
6. An experiment table
7. Time Limited, easy use of project threshold time
8. Time Limited, hard use of project threshold time
9. Time Limited, no project threshold time

The significance of most of these will be self evident except, perhaps, for the distinction between "hard use" and "easy use" of both threshold resources and project threshold time.

In resource allocation, project completion may be delayed if resources are not available at either the normal or threshold level. The decision to use threshold resources is therefore a function of the degree of importance attached to project completion. The "easy use of threshold resources" table will produce an earlier completion but makes greater use of threshold resources (implying that these are less important than completion date). In this case, threshold resources may be used even when total float is present. The "hard use" of threshold resources will delay the use of threshold resources except under difficult scheduling conditions (as defined by the four-dimensional decision table).

Hard and easy use of project threshold time are used in conjunction with time-limited analyses. They are similar in effect to that described for resource allocation but, of course, apply to the use of project threshold time. Easy use implies that the threshold time is entered when the slightest difficulty with scheduling is encountered and hard use means that only severe difficulties cause the time threshold to be used.

The selection of the standard tables shown and the distribution of decisions within the tables represent a choice of the most commonly met conditions of scheduling. However, the method is extremely flexible and it is simple to add new tables or alter standard tables as experience or special requirements dictate.

conclusion

The developments described represent a few more steps along the path towards realistic work scheduling. The greater flexibility in specifying activity resource usage and project resource availability greatly extends the scope of network scheduling techniques. In particular, the technique of pool resources gives a new dimension to work scheduling and enables factors to be embraced which were previously excluded from this type of calculation.

The concept of project time thresholds, resource thresholds and work continuity rules when taken in conjunction with the other features described above give an extremely comprehensive scheduling model. The refinement of correctly handling resources in conjunction with network progressive feed (ladder) activities is a useful contribution towards meeting the needs of the practitioner who desires simple methods of network expression.

The use of variable decision tables as the means of steering the scheduling calculation gives the user of the computer a wide range of alternatives from which to choose. Taken in combination, these features provide almost infinite permutation of solution. The user is no longer in the position of having to accept the results of a fixed logic but can manipulate the model in the light of his own experience.

This complex and comprehensive computer program is also perhaps a step towards the perfect man-machine combination where man's skill and the machine's power can be harnessed together in such a way that the computer truly becomes an extension of man's intellectual powers. ■

To: Programmers and Managers

Subject: ADPAC

I. What is ADPAC?
ADPAC is a complete programming language designed specifically for commercial data processing applications (non-scientific). It's a 2-address, high level (machine independent) language that can cut your coding, compiling, and testing time in half.

II. What computers does it work on?
ADPAC is fully operational on IBM System/360 models 30 and up. As a language translator it interfaces perfectly with any of the standard operating systems TOS/DOS/OS. ADPAC is 'called' just like COBOL or ASSEMBLY. It uses all of the resident I/O modules for processing, including Random, Index-Sequential, variable length, single and double buffering, etc.

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IV. What are some of its special features?
A very powerful addressing system; relative, symbolic, subscript, indexed addressing. Data in any format may be processed, including Character, Packed Decimal, and Binary. A highly refined File Maintenance logic. A complete Report Generator, including single or multiple 'on-line' or 'off-line' printers. Information Retrieval logic. Complete subroutine and Do-Loop logic. Many special commercial operation codes such as TLU (Table Look Up), FLU (File Look Up).

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If you want to close your 'Programming Gap' in a hurry, write or call and we'll send all the sales and technical information you need to make a decision.

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A HEXADECIMAL PRONUNCIATION GUIDE

by ROBERT A. MAGNUSON

Computers manipulate their own internal physical states. These physical states, in turn, are represented by the graphics "0" and "1". Hence, it is said that computers process binary numbers. Perhaps it might be more accurate to say that they manipulate strings of characters taken from a two-letter alphabet. When it is necessary to describe the internal goings on, the strings are hardly ever written in binary because a large array of zeroes and ones lacks perspicuity. Instead the binary numbers are described in a coded form.

For computers such as the IBM 7090 having a character length of six bits and a word length of 36 bits, octal coded binary is used, in which three bits are represented by one octal digit. For computers such as the IBM System/360 having a character length of eight bits and a word length of 32 bits, hexadecimal coded binary is used, in which four bits are represented by one hexadecimal digit.

For example, suppose the instruction stored at location 000000000010110001011110 is 010001111111000011000-10100011010 (in a 360). Expressed hexadecimally, the instruction at 002C5E is 47F0C51A.

The widespread use of the IBM System/360 and its hexadecimal coding has introduced some new problems for the professional programmer. This article identifies and solves three of these problems.

hexadecimal and its problems

The new generation of computers is exemplified by the System/360. The character length is eight bits and the word length is 32 bits. Octal coded binary, the old system of representing binary numbers, is not used since octal coding requires a grouping of the bits into threes, and 3 does not divide 8 or 32. Instead the grouping is in fours, which means the binary numbers are represented by base sixteen numbers. This is the hexadecimal coded binary system.

Base sixteen numeration requires an alphabet of 16 digits. As usual with nondecimal bases the digits are borrowed from the decimal stock to the extent possible. There are six short in this case. The decision adopted by IBM was to use the letters A-F for the remaining hexadecimal digits. This decision is practically irrevocable because the particular choice of graphics is now an integral part of the System/360's software—assemblers, compilers, dumps, and utilities. Naturally enough, these letters are pronounced the way they were learned in childhood, viz, "ay," "bee," "see," "dee," "ee" and "ef." Three problems arise from the particular choice of graphics for hexadecimal:

(a) The conflicting mental associations of the six letters in their dual roles.

(b) The difficulties involved in pronouncing hexadecimal numbers.

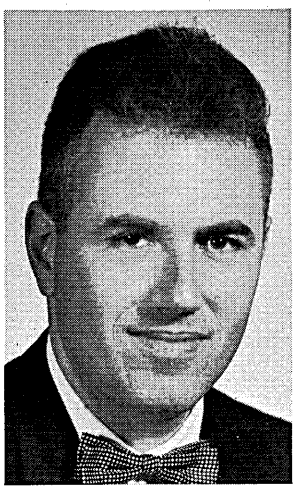
(c) The difficulties involved in keypunching hexadecimal numbers.

Conflicting mental associations. Every 360 programmer must memorize the hexadecimal-binary-decimal digit table shown in Table 1. The table was obtained by counting in parallel to the largest single-digit hexadecimal number.

Table 1. Hexadecimal-Binary-Decimal Digit Conversion

hex	*binary*	*decimal*
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
A	1010	10
B	1011	11
C	1100	12
D	1101	13
E	1110	14
F	1111	15

The problem of the mental association occurs because the digits A-F are off by one in their values. The first through sixth letters of the alphabet stand for ten through fifteen. Consider, for example, the graphic D—sometimes a letter, sometimes a digit. The programmer must know that D stands for 1101 which, of course, is 13. If he wants to load Base Register 13, he writes "BALR 13,0" in assembly language, and he writes "05D0" in machine language. Thirteen, an odd number, is associated with its unit digit 3, and, as previously seen, with the digit D. However, D is the fourth letter of the alphabet, and has a



Mr. Magnuson is a senior staff engineer with TRW's Washington, D.C. operations. He was formerly employed in the advanced research dept. of Research Analysis Corp.

card code of 12-4 (and 4 is an even number). The situation is similar for the other hexadecimal digit/letters.

Pronunciation difficulties. The 360 programmer spends a great deal of time writing, reading, comparing, and checking hexadecimal numbers. It is a regular part of his job to prepare programs, read dumps, make hexadecimal patches, and check all of these. There seems to be an irresistible tendency to pronounce strings of digits decimally even though some other base is involved. The hexadecimal number 12 is pronounced as "twelve" even though it really stands for 18 because it is easier to say "twelve" than "one two." For some obscure psychological reason, it is much more efficient to pronounce numbers than to spell them whether they are decimal or otherwise.

No problem arose with the use of octal since all octal digits are also decimal digits. However with hexadecimal usage there is the problem of the six nondecimal hexadecimal digits. Just as 29 is pronounced as "twenty-nine," we tend to pronounce its successor 2A as "twenty-ay." Unfortunately this sounds much like "twenty-eight." Whereas C4 may be pronounced "seety-four," to pronounce A4 as "ayty-four" is to invite disaster. How does one distinguish between 1A, "ayteen" and 18, "eighteen?" And what about 88, 8A, A8, and AA?

Keypunching difficulties. The third problem results from the physical layout of the keyboard on the model 29 keypunch. The existence of this problem is difficult to understand since the new model 29 keypunch was designed for use in conjunction with the 360. Nonetheless the following problem does exist. Keyboarding "0" through "9," 10 of the 16 hexadecimal digits, requires the simultaneous depression of the NUMERIC key; keyboarding "A" through "F," 6 of the 16 hexadecimal digits, requires that the NUMERIC key not be depressed. But hexadecimal numbers contain a random admixture of the 0's through 9's and the A's through F's. Hence, extreme difficulty is experienced in coordinating the use of the NUMERIC key when keyboarding hex. For example, if a "2" is desired and it is struck without the NUMERIC key all the way down, an "I" is obtained. Conversely, if a "D" is desired and it is struck with the NUMERIC key still down, a colon is obtained. IBM needs to put a HEXADECIMAL key on the model 29 keypunch. Holding down this new key would select only the hexadecimal digits and would lock the keyboard upon depressing a key other than any of the 16 hexadecimal digits.

solutions to the problems

The following system accomplishes the integration of the six maverick hexadecimal digits into the familiar decimal system of pronouncing numbers. Each of the six new digits is given a new pronounciation as shown in Table 2. These carefully chosen names are easy to remember, suggestive of the proper letter, and capable of euphonious modification for the -teen and -ty number words.

Table 2. New Names for Hexadecimal Digits

A	ann
B	bet
C	chris
D	dot
E	ernest
F	frost

The pronunciation of the -teen's and -ty's for the new digits is shown in Table 3. Note that the analog of the decimal pronunciation system has been used. The new name for each new digit has been chosen so that at least one of the -teen and -ty modifications is familiar sounding.

Table 3. -Teen and -Ty Pronunciation for the New Digits

1A	annteen
1B	betteen
1C	christeen
1D	dotteen
1E	ernesteen
1F	frosteen
A0	annty
B0	betty
C0	christy
D0	dotty
E0	ernesty
F0	frosty

Now 29's successor 2A can be pronounced "twenty-ann" without the slightest tendency to confuse it with 28. The pronunciation of C4 is "christy-four," and that of A4 is "annty-four." There is no problem in distinguishing between 1A, "annteen" and 18, "eighteen." And 88, 8A, A8, and AA are easily distinguished when pronounced "eighty-eight," "eighty-ann," "annty-eight," and "annty-ann."

Some two-digit hex numbers, each representing one byte, appear with their new pronunciations in Table 4.

Table 4. One-Byte Strings with Pronunciation

2F	twenty-frost
F2	frosty-two
5B	fifty-bet
3E	thirty-ernest
AF	annty-frost

Some four-digit hex numbers, each representing two bytes, appear with their new pronunciations in Table 5.

Table 5. Two-Byte Strings with Pronunciation

A01C	annty christeen
1ED0	ernesteen dotty
A007	annty oh-seven
DEAF	dotty-ernest annty-frost
3A7D	thirty-ann seventy-dot
47F0	forty-seven frosty

The problem of the values of the added digits being off by one is now easily solved. Merely remember the "ages" of these new-found friends. Learn that ann is 10, bet is 11, etc. without becoming confused with the fact that ay is associated with 1, bee with 2, etc.

The problems of some of the hex digits being NUMERIC and the others ALPHA on the model 29 keypunch is solved in the following fashion. Select a particular finger of the left hand, say, the little finger. No other finger of the left hand is to be used. The home position of that left little finger is on the NUMERIC key. The right hand is used for typing 0-9 and the (numeric) comma while the left little finger holds down the NUMERIC key. When A - F arise, they are typed with the left little finger—thus ensuring that the NUMERIC key is not depressed. Return the left finger to the home position on the NUMERIC key immediately upon finishing A-F.

the proposed system in use

The errors and confusion, previously mentioned, that result from the common current usage of hex with the System/360 are not hypothetical. Many 360 operators and programmers commit the errors referenced far too many times and suffer the consequences.

When put into practice, the suggestions contained in this paper—the new pronunciation, the "ages," and the keypunching method—eliminate the errors and confusion resulting from the unplanned assignment of graphics for the six additional hex digits. ■

MECHANIZATION IN DEFENSE LIBRARIES

by GEORGE KERSHAW and J. EUGENE DAVIS

Booz, Allen Applied Research, Inc., undertook a survey[1] in 1965-66 of 76 DoD libraries and information centers to determine their plans and experience with mechanized processes. The purpose of the survey was to:

1. determine the present status of mechanization in the facilities studied
2. assess the costs and effectiveness of the mechanized systems
3. identify successful techniques and isolate persistent problems
4. promulgate the resulting information to aid in the development and improvement of related systems

Libraries have to keep pace with increasing processing volume. Although much of the rising quantity of input material is of questionable value to potential users, quality control of input is beyond the scope of the libraries. Irresistibly, they are required to process any material they are chartered to accumulate. To improve the quality of input would take a cooperative effort on the part of government, industry, universities, and other information sources in order to:

1. establish realistic and enforceable abstracting standards
2. remove incentives for continuing replication of the same material
3. encourage regular state-of-art summaries

Sadly, such cooperation is not to be expected. Consequently, it appears that the major purpose of library mechanization is to permit an increase in processing speed without a corresponding increase in library staff.

The distinction between libraries and "information centers" is one of characteristics and of official definition. The information collection in a center tends to be narrow and deep in specific subjects, when compared to a library. A center also provides answers to specific questions rather than bibliographic references which are the usual products of a library.

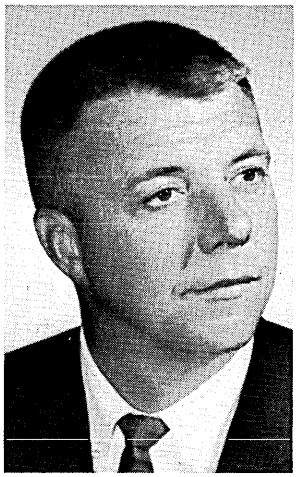
development problems

The typical library mechanization program is based on a computer. The problems that arose in developing computer applications were not unique to the libraries but are typical of computer applications in general. The usual source of these problems was poor understanding between the librarians and the system developers. In addition, system developers showed a lack of development discipline, standards, and control.

For example, in their relationships with programmers, the information centers had much less difficulty than did the libraries. This can be attributed to the following:

1. The centers' staffs were usually more technically ori-

[1] Contract DSA-7-15489 with the Defense Documentation Center, Cameron Station, Va.



Mr. Kershaw is a member of the technical staff of the MITRE Corp., engaged in the development of computer applications for the National Military Command System. He has a master's degree from the Univ. of New Hampshire.

ented and had an understanding of computer technology. They were able to communicate with the programmer on his terms. (We encountered no programmers who could communicate with the librarian on his terms.)
2. Some centers maintained a staff member who had the ability to program.

Many systems were acquired which proved useless and had to be abandoned, or which were only marginally successful and later required extensive modifications. Several of these systems seemed remarkably able to endure and to expand in the absence of need on the part of users.

All but one of the facilities studied are forced to rely on other groups for computer services. Computer service for libraries, however, typically has low priority and sometimes becomes unavailable for extended periods of time.

Table 1

ABBREVIATION	NAME OF FACILITY	MACHINE USED
AFCRL	AIR FORCE CAMBRIDGE RESEARCH LABORATORIES	IBM 7044, PDP-1
AMS	U. S. ARMY MAP SERVICE LIBRARY	UNIVAC 1004, HONEYWELL H-800
APL	APPLIED PHYSICS LABORATORY—JOHN HOPKINS UNIVERSITY	IBM 7094, 7040
ASDIRS	ARMY STUDY DOCUMENTATION & INFORMATION RETRIEVAL SYS.	IBM 1401, 7090
BATTELLE	BATTELLE INFORMATION CENTER	CDC 3400
BUSHIPS	BUREAU OF SHIPS TECHNICAL LIBRARY	IBM 7094, LARC
DELSIE	DEFENSE LOGISTICS STUDIES INFORMATION EXCHANGE	RCA 501
EA	ARMY EDGEWOOD RESEARCH & DEVELOPMENT LABORATORY	HONEYWELL 200
EPIC	ELECTRICAL & ELECTRONIC PROPERTIES INFORMATION CENTER	HONEYWELL 200, GE 635
FT. DETRICK	CHEMICAL BIOLOGICAL LABORATORY	UNIVAC 5S II-90
FTD	FOREIGN TECHNOLOGY DIVISION	IBM 7094, 1401
HDL	HARRY DIAMOND LABORATORIES	IBM 7094
MEL	NAVY MARINE ENGINEERING LABORATORY LIBRARY	IBM 1401
MICHIGAN	UNIVERSITY OF MICHIGAN INFORMATION CENTERS	IBM 1401
MPDC	AIR FORCE MATERIALS INFORMATION CENTER	IBM 1440
NAFI	NAVAL AVIONICS FACILITY	BURROUGHS 280, GE 225
NATICK	NATICK LABORATORIES—U.S. ARMY TECHNICAL LIBRARY	GE 225
NMC	NAVAL MISSILE CENTER	IBM 7094, 1401
NOL	NAVAL ORDNANCE LABORATORY LIBRARY	IBM 7090
NOTS	NAVAL ORDNANCE TEST STATION	IBM 7094
NPS	NAVAL POSTGRADUATE SCHOOL LIBRARY	CDC 1604
NWL	NAVAL WEAPONS LABORATORY	IBM 7090, 1401
PICATINNY	PICATINNY ARSENAL	IBM 7090, 1401
RSIC	REDSTONE SCIENTIFIC INFORMATION CENTER	IBM 7010, 1401, 1460
SEG	SYSTEMS ENGINEERING GROUP	IBM 7094, 7044
TPRC	THERMOPHYSICAL PROPERTIES RESEARCH CENTER	IBM 7094
USAMRA	ARMY MATERIALS RESEARCH AGENCY	TERMATREX

In several cases, a computer replacement required the library to return to manual methods for several months until programs were converted on a second-priority basis. In one case, funds for conversion never materialized and the library was forced to return completely to manual means. In any case there is a clear need for back-up material to permit a return to manual methods in the event the computer becomes unavailable.

In some cases, a library initiated a program of mechanization not so much because it was needed or desired by the library as because the computer facility had computer time and programmers available.

Bringing a storage and retrieval system into operational use is greatly complicated by the problem of file conversion:

1. Computer retrieval is effective only if a substantial part of the file to be searched is accessible to the computer.
2. File conversion may have to be stretched out over a long period.

Thus a library is faced with the operation of two systems: the old system, using card catalogs, etc., and the mechanized system, for which file capability is built gradually over a period of several years.

Cost information is not available for one or more of the following reasons:

1. Time is generally made available to a library on a computer that it does not own and, often, the library is not charged for the time used.
2. In some cases, programming has been done in-house at no cost to the library and with no records kept of man-hours expended.
3. In other cases, programming was done by contractors who performed many services in addition to programming for the library. The library programming costs were not separable from other costs.
4. The historical operating costs for the premechanized manual systems are not usually available for comparison.
5. Within the libraries mechanization development costs are mingled with other library activities, including use of the old system (card catalog, etc.), which the new system has not yet replaced.

Mr. Davis is a project scientist at Booz, Allen Applied Research, Inc. Previously with Bendix, where he aided in the design of digital communications systems, he has a BS in physics from the Univ. of Michigan.

status of mechanization

Table 1 lists 27 libraries and information centers that have significant mechanized systems, their abbreviations, and the machines used. Table 2 summarizes the mechanization status of these facilities. Of these, six have relatively sophisticated systems. These are BuShips FTD, Fort Detrick, APL, NOTS, and RSIC. None has a totally computer-dependent system. In almost every one of the facilities, a mechanization improvement project was underway or planned.

None of the facilities has developed novel programming techniques (e.g., automatic abstracting and indexing), and none has expressed the need or desire to do so. All depend upon proven and well-exploited software techniques.

None used time-sharing techniques, although TPRC plans to do so, and Recon Central experimented for a while with a Teletype communication link between operators—one at the Central and one at a remote computer.

Seven of the facilities stored their thesauri in computer

memory and used them for automatic error control and/or code conversion for natural language input and output. Most of the facilities used a thesaurus with the number of terms in the thesaurus ranging from 140 to over 22,000. The input forms of the terms were numeric and alphabetic codes, and natural language. Thesaurus ar-

Table 2

FACILITY	STORAGE & RETRIEVAL	SERIAL CONTROL	CIRCULATION CONTROL	SDI
AFCRL	O	O		
AMS	O			O
APL	O			
ASDIRS	MANUAL			
BATTELLE	MANUAL			O
BUSHIPS	O	O		
DELSIE	O			P
EA	O	P	P	
EPIC	O			O
FT. DETRICK	O	O		O
FTD	O		P	O
HDL	MANUAL			
MICHIGAN	O			
MEL	O			
MPDC	O			
NAFI	P			P
NATICK		O	O	
NMC	P			
NOL	O	P	P	
NOTS	O	P		
NPS	O			
NWL	O		O	P
PICATINNY	O	P	O	P
RSIC	O	O	O	O
SEG				
TPRC	O			
USAMRA	O			

MECHANIZATION SUMMARY FOR 27 OF THE FACILITIES STUDIED

rangement, for the most part, was hierarchic, but six facilities arranged their terms alphabetically. When improving the mechanized systems the tendency is to substitute natural language descriptors for coded descriptors and to place the thesaurus in the computer. Only three found links and roles to be worth the added complexity.

Eighteen facilities stored their search files in inverted form (a file ordered by descriptors), and four in sequential form (a file ordered by accession numbers). Two kinds of file structures were used in sequential files.

One is a two-tape scheme wherein an abbreviated file (accession number vs. coded descriptors) is actually searched while a second detail file is driven in parallel. When a selection is made on the abbreviated file, the detail provides the reference, bibliographic information, and abstract.

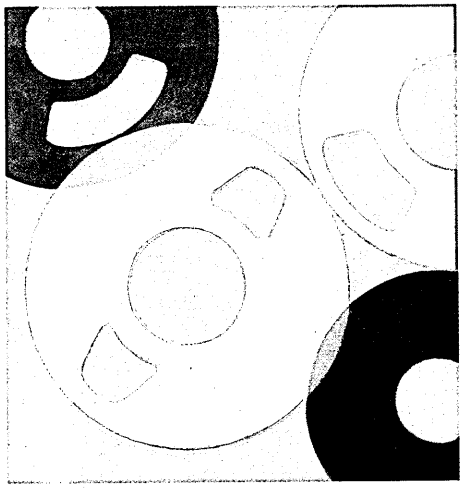
The second approach is based on a unit-record for each document in which each record carries the descriptors and detailed information.

The primary advantage of sequential over inverted files is that the retrieved information is printed out in detail (e.g., with bibliographic data abstracts) immediately without a secondary operation being required. Nevertheless, the greater search speed and strategy flexibility offered by inverted files has caused these to be much more popular.

Some facilities have developed Selective Dissemination of Information (SDI) systems. Two have performed extensive evaluation of SDIS: FTD and Ft. Detrick. These systems directly affect R&D staff, whereas other systems have a direct effect only on the library staff. The most difficult problem in developing an SDI system is the generation of the interest profile for the participating R&D staff member. Profile development requires patient, painstaking work on the part of both the profile developer and the participant. Otherwise the participant is poorly served and soon becomes discouraged.

Table 3 *(p. 53)* compares characteristics of storage and retrieval in 15 of the facilities studied. Serials control, circula-

From 3M: "Scotch" Brand No. 777, the world's finest computer tape, plus total tape capability and service.



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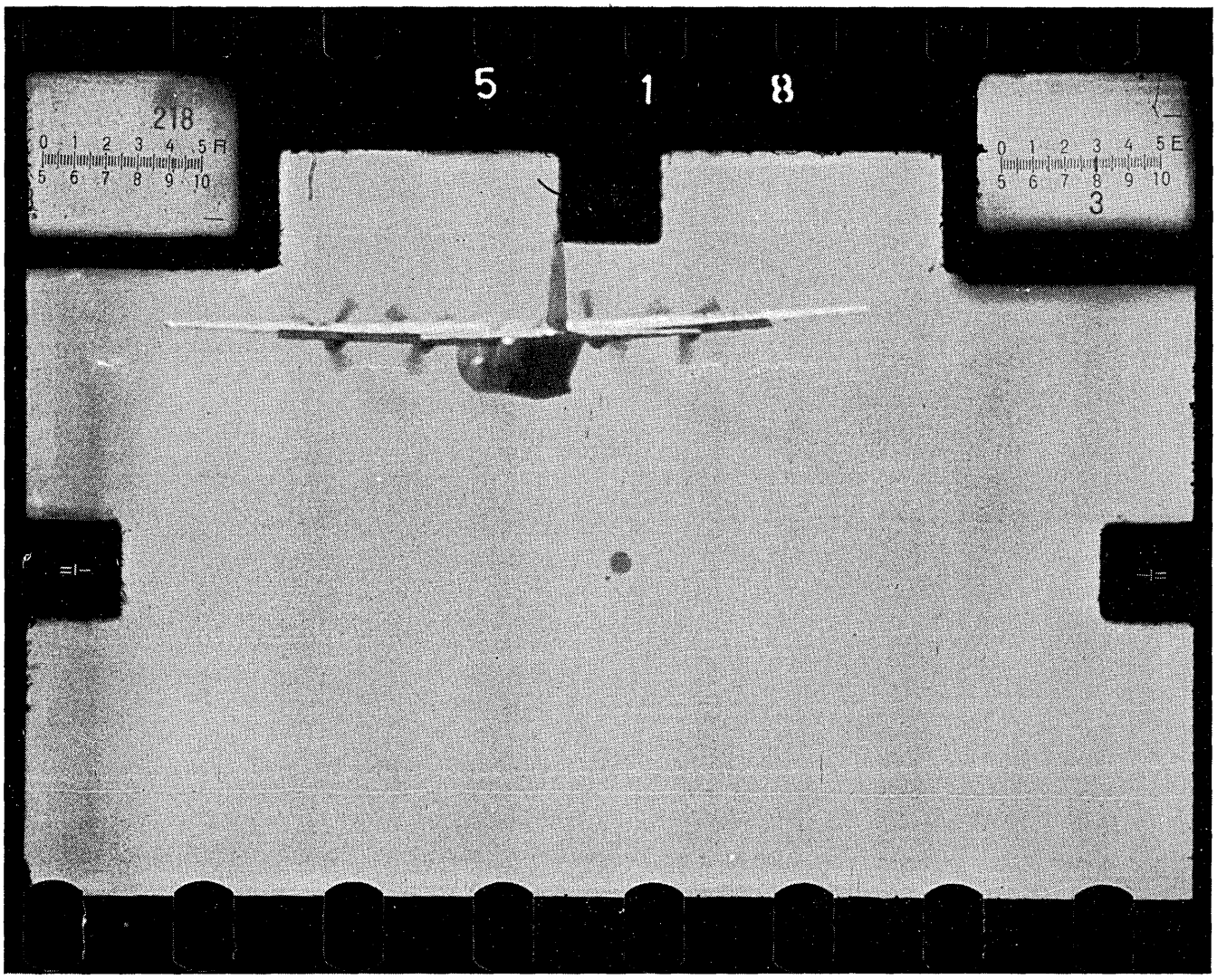

Hey, you dropped something!

And we know where it is to an accuracy of a thousandth of a degree in azimuth and elevation, on this frame, and the next, and the next — as long as the theodolite follows it.

The positional information is on the film, in those dials at the upper corners. But getting the information off of the film into useable form — automatically — is a task so formidable that only our Programmable Film Reader -3 does it. (Some other pretty big outfits are still trying.)

Think for a moment what is involved. First the computer-controlled scanning system has to locate the dials (they're not always in the same position on the film). Then it has to find and recognize two sets of arabic numbers. Then it has to determine where a tiny marker is on the linear scale and convert this into a number of three place accuracy. The last step is to find the parachute and correct for theodolite aiming error.

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CIRCLE 26 ON READER CARD

tion control, and file structure were studied, but nothing of particular interest was found.

conclusions

For the most part, mechanization has helped the libraries, but not to the extent it could. The major problem has been over-emphasis on computer efficiency rather than simplicity of use. Emphasis upon the following in system development would greatly enhance the utility of mechanization:

1. Use natural language rather than codes for input to and output from the computer; but for efficiency, use codes within the computer. Locate thesauri within the computer so that input errors can be automatically detected.
2. Provide for emergency fall-back positions in the event the machinery fails or becomes unavailable. A good example of this is the production of a portion of the system output, such as accession lists, catalog cards, serial check-in cards, etc., as a byproduct of preparing the input in machine-readable format for the retrieval data base.
3. Define the system objectives in terms that both the librarian and system developer can understand, and verify that such an understanding is actually reached.
4. Set up an independent group to test the product for conformance to specifications.

Table 3

COMPARISON OF CHARACTERISTICS OF STORAGE AND RETRIEVAL SYSTEMS FOR 15 OF THE FACILITIES

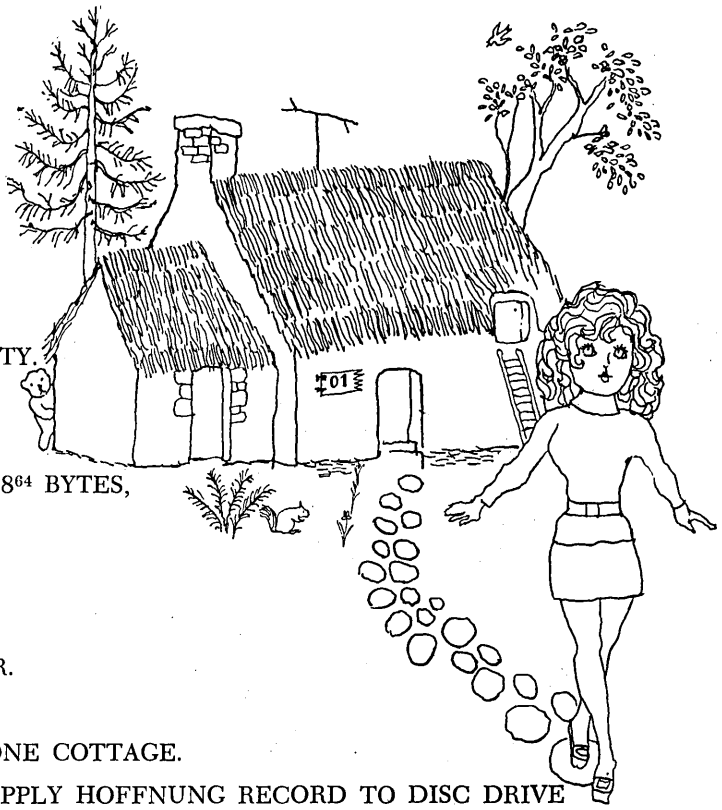
	THESAURUS		FILE		FILE CORRECTIONS					OUTPUTS					
	Language					Replacement by									
	Code	Natural	Inverted	Direct	Char.	Term	Sub-Group	Record	Cat.	Acc. List	Coord. Index	Acc. # & Code	Search Biblio.	Outputs Abst.	Descr.
APL		X		X					X	X		X	X	X	X
BATTELLE		X	X					X		X	X	X	X	X	
BUSHIPS		X		X			X	X	X	X		X	X		
DELSIE		X	X				X				X	X	X	X	
EA	X		X					X				X	X		
FT. DETRICK	X	X	X	X				X		X		X	X	X	X
FTD		X	X			X	X			X		X	X		X
MICHIGAN			X				X	X				X	X	X	
MPDC	X		X		X							X	X	X	X
NOL	X			X		X		X	X	X		X	X		X
NOTS	X		X						X	X	X	X	X		
NPS	X			X		X		X		X		X	X		
NWL		X		X			X		X	X		X	X	X	X
TPRC	X		X			X	X	X			X				
USAMRA		X	X									X	X	X	

Libraries should consider mechanization only if the following conditions prevail:

1. The need for detail in searches is greater than can be reasonably satisfied by card catalog and index reference techniques.
2. The quantity of input and the level of indexing detail seriously impair the system's capacity to maintain input currency.
3. The restrictions upon manpower are substantially greater than upon equivalent computer usage. ■

The Common Business Oriented Goldilocks

by PHILIP STANLEY
drawings by Barbara Vada Benson



IDENTIFICATION DIVISION.

PROGRAM-ID. ACOBOLFABLE.

DATE WRITTEN. ONCE UPON A TIME.

REMARKS. THIS IS EXAMPLE OF COBOLX VERSATILITY.

ENVIRONMENT DIVISION.

CONFIGURATION SECTION.

OBJECT COMPUTER. ANY MUSIC BOX, MEMORY SIZE 8^{64} BYTES,
19 TAPE DRIVES, 11 DISC DRIVES,
1 GOLDILOCKS, 3 BEARS.

INPUT-OUTPUT SECTION.

FILE-CONTROL.

SELECT TAPE DRIVES, ASSIGN THEM TO CREDITOR.

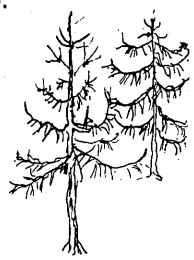
SELECT DISC DRIVES.

SELECT GOLDILOCKS, SELECT BEARS– ASSIGN TO ONE COTTAGE.

I-O-CONTROL. APPLY RED TAPE TO TAPE DRIVES, APPLY HOFFNUNG RECORD TO DISC DRIVE APPLY GOLDI, BEARS TO COTTAGE.

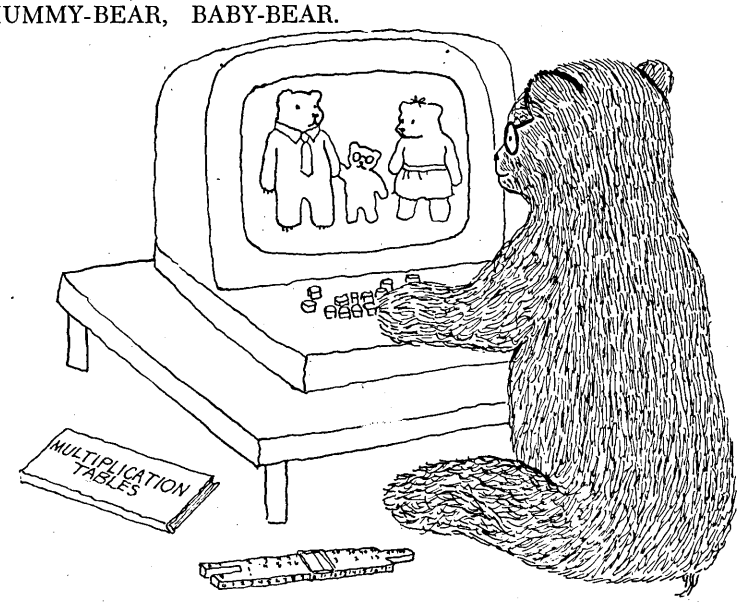
DATA DIVISION.

FD GOLDI. LABEL RECORDS ARE STANDARD, VALUE OF IDENTIFICATION IS "GOLDILOCKS" DATA RECORD IS GOLDILOCKS.



01 GOLDILOCKS.
- 02 HGT SIZE IS 62 INS.
- 02 WGT SIZE IS 110 LBS.
- 02 VITAL-STATS
  - 03 B 38.
  - 03 W 24.
  - 03 H 36.
- 02 RATING 100%

FD 3-BEARS. LABEL RECORDS ARE STANDARD, VALUE OF IDENTIFICATION IS "BEARS" DATA RECORDS ARE DADDY-BEAR, MUMMY-BEAR, BABY-BEAR.

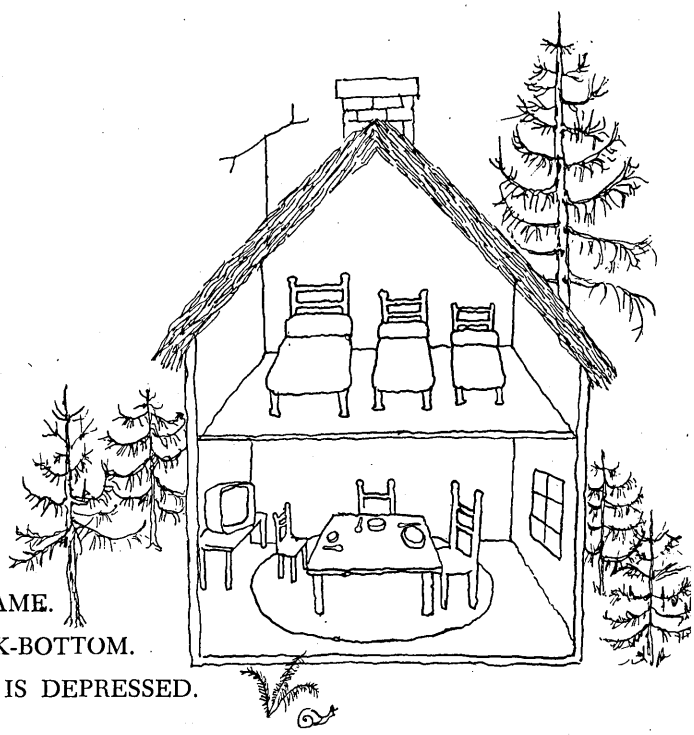


01 DADDY-BEAR.
- 02 HGT 70 INS.
- 02 WGT 750 LBS.
- 02 COLOR OF EYES BLOODSHOT.
- 02 DISPOSITION UNBEARABLE.

01 MUMMY-BEAR.
- 02 HGT 65 INS.
- 02 WGT 700 LBS.
- 02 COLOR OF EYES BLUE.
- 02 DISPOSITION BEARABLE.

01 BABY-BEAR.
- 02 HGT 40 INS.
- 02 WGT 200 LBS.
- 02 COLOR OF EYES BLUE.
- 02 DISPOSITION INFANTILE.

WORKING-STORAGE SECTION.



01 COTTAGE. PICTURE IS COZY.
  02 KITCHEN.
    03 TABLE SIZE IS LARGE, VALUE IS 1.
    03 CHAIRS SIZE IS MEDIUM, VALUE IS 3.
  02 PORRIDGE.
    03 KING-SIZE OCCURS 1 TIME.
    03 QUEEN-SIZE OCCURS 1 TIME.
    03 PRINCE-SIZE OCCURS 1 TIME.
  02 DOOR SIZE IS USUAL, VALUE IS OPEN.
  02 BEDROOM
    03 BED
      04 LARGE OCCURS 1 TIME.
      04 MEDIUM OCCURS 1 TIME.
      04 SMALL OCCURS 1 TIME.
    03 WINDOW SIZE IS SMALL VALUE IS OPEN.

01 RIGHT-COTTAGE REDEFINES COTTAGE VALUE IS SAME.

01 KING-SIZE-BED-SLEPT-IN SIZE IS BIG VALUE IS ROCK-BOTTOM.

01 QUEEN-SIZE-BED-SLEPT-IN SIZE IS MEDIUM VALUE IS DEPRESSED.

01 NO-PORRIDGE SIZE IS SMALL VALUE ZERO.

01 SIP SIZE IS LITTLE VALUE IS "SSSLUP".

01 SLUMBERLAND SIZE IS UNLIMITED VALUE IS ZZZZZZZZZZ.

CONSTANT SECTION.

01 COMMENT1. SIZE IS 36 A VALUE IS "SOMEBODY HAS BEEN EATING MY PORRIDGE."

01 COMMENT2. SIZE IS 36 A VALUE IS "SOMEBODY HAS BEEN SLEEPING IN MY BED."

PROCEDURE DIVISION.

FOREST SECTION.

START-OF-TALE. OPEN STORY. READ FOLLOWING.

FIRST-MOVE. MOVE GOLDILOCKS TO COTTAGE. IF DOOR IS CLOSED OR BEARS ARE GREATER THAN ZERO ALTER ENTER-GOLDILOCKS TO PROCEED TO HASTY-RETREAT.

ENTER-GOLDILOCKS. GO TO KITCHEN-SCENE.

KITCHEN-SCENE. IF PORRIDGE IS KING-SIZE PERFORM TASTE-ROUTINE VARYING PORRIDGE FROM KING-SIZE BY 1 UNTIL PORRIDGE EQUALS PRINCE-SIZE OTHERWISE COMPUTE IF COTTAGE = RIGHT-COTTAGE. GO TO BEDROOM-SCENE.

TASTE-ROUTINE. SUBTRACT SIP FROM PORRIDGE (KING-SIZE). SUBTRACT SIP FROM PORRIDGE (QUEEN-SIZE). SUBTRACT SIP FROM PORRIDGE (PRINCE-SIZE) GIVING NO PORRIDGE.

BEDROOM-SCENE. MOVE GOLDILOCKS TO BEDROOM. ADD GOLDILOCKS TO BED (LARGE). DISPLAY "IT IS TOO HARD". SUBTRACT GOLDILOCKS FROM BED (LARGE) GIVING KING-SIZE-BED-SLEPT-IN.
MOVE GOLDILOCKS TO BED (MEDIUM). DISPLAY "IT IS TOO SOFT". SUBTRACT GOLDILOCKS FROM BED (MEDIUM) GIVING QUEEN-SIZE-BED-SLEPT-IN.
MOVE GOLDILOCKS TO BED (SMALL). DISPLAY "IT IS JUST RIGHT".
ADD GOLDILOCKS TO SLUMBERLAND.

BEARS-RETURN. MOVE DADDY-BEAR, MUMMY-BEAR, BABY-BEAR TO KITCHEN.
MOVE CORRESPONDING BEARS TO PORRIDGE. DISPLAY "DADDY BEAR", COMMENT1.
DISPLAY "MUMMY BEAR", COMMENT1. DISPLAY "BABY BEAR", COMMENT1, "AND EATEN IT ALL UP". MOVE BEARS TO BEDROOM.

BEARS-IN-BEDROOM. EXAMINE BEDS REPLACING ALL GOLDILOCKS WITH BEARS.
DISPLAY "DADDY-BEAR", COMMENT2. DISPLAY "MUMMY BEAR", COMMENT2.
DISPLAY "BABY BEAR", COMMENT2, "AND HERE SHE IS".

HASTY-RETREAT. IF WINDOW IS OPEN EXIT GOLDILOCKS OTHERWISE MOVE GOLDILOCKS TO DOOR.
EXIT.

END. CLOSE STORY, DISPLAY "WOULD YOU BELIEVE CINDERELLA IN PL/I".
END TALE.

IBM's Systems Research Institute is now open to all data processing professionals.

Seven years ago Systems Research Institute was established to give a graduate-level data processing education to IBM [illegible]

[illegible]

seminar report

COMPUTERS IN CLINICAL ELECTROCARDIOGRAPHY

Computer capability to interpret the electrical activity of the heart was presented to a national group of 250 cardiologists in Washington, D.C., Nov. 17 and 18. The American College of Cardiology sponsored, as part of its continuing medical education program, a two-day session on "Computer Applications in Clinical Electrocardiography." [The electrocardiogram (EKG) is the electrical signal continuously emitted by the heart. Electrocardiography is helpful in the detection and diagnosis of most types of heart disease.]

The purpose of the sessions was to give cardiologists and allied professionals an overview of current practices in computerized electrocardiography, the indispensable background, and give only a hint of what may be attainable in the future.

The Surgeon General of the Public Health Service, Dr. William H. Stewart, keynoted the discussions with the prediction: "The plain truth is that the use of the computer in medicine is bound to increase in an exponential fashion during the next few decades. Our common task and responsibility in the days and years ahead is to answer, specifically and in detail, the question: What constitutes proper use of medical computer systems? The challenge to the physician," he continued "is to help develop computer systems to do the burdensome part of medical workup, so that he may give his full attention to the creative, human part."

Both by grants and in-house example, the Public Health Service has stimulated much of the pioneering work in medical computation, the Surgeon General said, spearheading the use of computers to improve the quality of medicine and help solve manpower problems.

At a press conference, Dr. Stewart noted that he had had an on-line (via Dataphone) computer-interpreted electrocardiogram during his last periodic physical.

The meeting was attended by physicians concerned with the shortage of specialists to read electrocardiograms and the growing demands for high-quality medical services. Medically interested engineers and related professionals who attended were primarily concerned with manpower utilization problems, cost reductions possible with computers, and how profit-oriented concerns can provide medical instrumentation and services.

compatibility

One of the problems of the past decade has been the difficulty of obtaining data (signals) from the patient in a format suitable for computer input. James Landoll of the Medical Systems Development Laboratory (Public Health Service) detailed how data-acquisition devices should be designed. Lack of equipment compatibility has hindered progress in the past.

The exhibit portion of this meeting showed that the problem of compatibility can be solved and that significant studies are being made in the design of input terminals for computers in medicine. Four industrial firms have commercial versions of data-acquisition devices suitable as medical signal input terminals. The Computer Instruments Corp., GCA, and Marquette Electronics models require analog-to-digital conversion interfaces at the data processing center. These three are directly compatible with telephone data sets, so that communication to a central data system is easily done. The Beckman data cart writes directly on to computer-compatible digital tapes. Two of the devices are multichannel systems. Three of the four systems have followed specifications from the Public Health Service so that compatibility is assured the user.

Several speakers emphasized that the computer and its programs are only a portion of the total system in even such a small area as the delivery of electrocardiographic interpretation. This is particularly applicable to computer manufacturers. Too often a computer concern may try to fit medical users' needs to its products, rather than the other way around.

Dr. Leonard Dreifus, director of the Electrocardiographic Section of Hahnemann Hospital in Philadelphia and one of the co-directors of the sessions, said that tools such as computers can solve major problems of heart stations. He differentiated between uses of data for immediate patient care and those for research. In an age where results are being emphasized this differentiation is a key to success.

The actual experience of developing an automated hospital heart station and the kinds of developmental problems were discussed by Dr. Alden Gooch and Dr. John Evans of George Washington Univ., who have been involved in experimental work in this area with the Public Health Service for six years. There are many educational needs to get physicians ready to utilize computer output in actual patient care.

Dr. Leon Pordy of Mt. Sinai Hospital in New York City referred to problems in programming computers to recognize and interpret rhythm changes in the heart beat. This work and that presented by Dr. Ralph Smith of the Mayo Clinic have been to a large extent supported by IBM, which deserves great credit for its efforts in the medical field. Unfortunately in the past it seems to have stressed the research market almost to the exclusion of the medical service area.

The work at Mt. Sinai, programmed by Roy Bonner at IBM and his staff, and the report by Dr. Gerald Whipple of Boston Univ. demon-

ELECTRO-CARDIOGRAPHY . . .

strated that the last area of difficulty in computer programming of the EKG arrhythmia interpretation poses no unsolvable questions. The Mayo programming, directed by Clyde Hyde of IBM, also represents a significant advance in the development of simultaneous lead interpretation. The Mayo Clinic has set up the first prototype of a fully automated heart station.

the first system

The program used at George Washington Univ., developed by the Public Health Service, is the oldest in clinical use. It has been validated by upwards of 100,000 clinical tracings. Mrs. Anna Lea Weihrer, who has directed that programming effort, outlined the steps used in the general pattern-recognition technique which she developed. She pointed out that the EKG is only a model developed for techniques to be used to program other medical signals.

Dr. John Whiteman described the interpretative logic portion of the Public Health Service program and alluded to the simplicity and low cost of a small computer such as he used (CDC 160A or 8090) with its assembly language. He challenged anyone to show concrete evidence that one of the larger, more costly machines could do a better and less costly service job, working on medical demand, by using more sophisticated languages or greater speed.

Two on-line EKG demonstrations were conducted at the Sheraton Park Hotel where the meeting was held: An EKG was continuously monitored from James McAllister of the Medical Systems Development Laboratory while he was delivering his paper. The teletype return, an English interpretation of the data, was sent back immediately to the hotel. The demonstration procedure was the same as trials now being carried on from patients in surgical operating suites. During his talk, McAllister described EKG transmission by RCA satellite from France to Washington, D.C., with interpretive return in 15 seconds, which he did several months ago in Tours.

Signals from two patients were continuously sent from a coronary care unit over AT&T three-channel Dataphone for on-line processing to the Medical Systems Development Laboratory. American Optical equipment was used at the transmitting end. The computer-interpreted answers were returned to both hospital and hotel. This was the first showing, by Dr. Howard Hochberg, of the Heart Disease Control Program's efforts to develop continuous monitoring of patients in coronary care suites.

Research results of computer use in electrocardiography were discussed by Dr. Alvin Freiman of Memorial Hospital for Cancer and Allied Disease in New York, who described his studies and those of Airborne Instruments Laboratory to correlate the EKG with other graphic displays. The degree of correlation between types of medical signals is of importance not only diagnostically but also to separate normals and abnormals in multiphasic screening. Dr. Lysle Peterson, director of the Bockus Research Institute of the Univ. of Pennsylvania, elaborated on the relative importance of modeling to obtain meaningful results. Examples of modeling's role in helping to detect unknown aspects of the physiology of heart disease were given by Dr. John Urbach of Women's Medical College in Philadelphia and Dr. J. Abildskov of State Univ. Hospital in New York.

Dr. Daniel Brody of the Univ. of Memphis showed how the investigator in electrocardiography can work with a computer via a light pen. He himself has been able to redefine many of his research criteria based on this interplay between man and machine.

During one of the panel sessions, five electrocardiographic experts at the meeting were matched against computer-interpreted electrocardiograms. It was obvious that no one lost; the computer found everything that the experts independently and collectively interpreted.

problem areas

There are still problems in the field of electrocardiography specifically highlighted by the entrance of computers into the field of medicine. Dr. Lowell Perry noted the lack of good criteria for human or computer use for children's electrocardiograms. Dr. Roger Simmons discussed the Heart Disease Control Program's plan, directed by Dr. Samuel Fox, to study exercise and stress results on the EKG to see if computer monitoring can identify coronary-prone individuals. Dr. Ernest Simonson of Minneapolis, as well as Dr. Cesar A. Caceres and Sidney Abraham of the Medical Systems Development Laboratory, presented population data to indicate that much more data of a quantifiable nature is needed in medicine. The inference is that we can get good tabulations only with computers. Dr. Donald Specht of Lockheed told of multidimensional statistical analyses

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CIRCLE 15 ON READER CARD

to improve on electrocardiographic diagnosis. Abnormals and normals can be well differentiated and classified.

On the clinical side Drs. Robert Dobrow and Arnold Fieldman of Hartford Hospital, Connecticut, noted the remarkable incidence of questionable electrocardiograms in outpatient populations (such as obstetrics) that usually are denied electrocardiographic health screening. By computer techniques, they have shown that the cost and manpower problems previously invoked as the reason for nonperformance of screening tracings are no longer applicable.

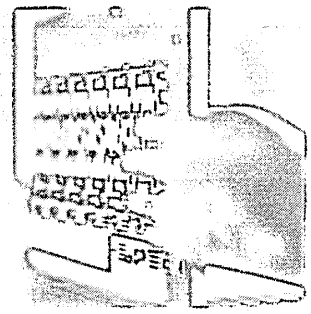
instrumentation needs

One of the sessions was devoted to a description of the instrumentation required for a total system. Alan Berson of the Veterans Administration Hospital in Washington, D.C., described analog-to-digital conversion and the vectorcardiographic system now operational under the direction of Dr. Hubert Pipberger. That research system was the earliest in the computer scene and has served as a model in several respects. It was pointed out that Dr. Otto Schmitt (of Schmitt trigger fame, among other things), from the Univ. of Minnesota, has been consultant and guiding light both to the VA project, which is primarily research-oriented, as well as to the Public Health Service-oriented operation. Great credit should go to being able to see both sides of the coin. Dr. Schmitt emphasized both approaches as separate.

Dr. Lee Cady, now at Planning Research Corp. in Los Angeles, discussed the real problems of medical programming—usually thought simple until one is in the field. Dr. David Geselowitz explained the realities of computers to the medical profession. Dr. Pentti Rautaharju of Halifax, Nova Scotia, put all of this together to discuss the ideal computer not only from the researcher's point of view but from the clinician's as well. The ideal computer for each system might be different, and each of course would also change in time, so that the ideal computer for 1967 might not be the ideal for 1987.

Dr. Lester Goodman, Chief of the National Institutes of Health's Biomedical Engineering Branch, stressed by example the problems of today's medical engineering world, the need for quality and perception in medical computer system design.

C. A. Caceres



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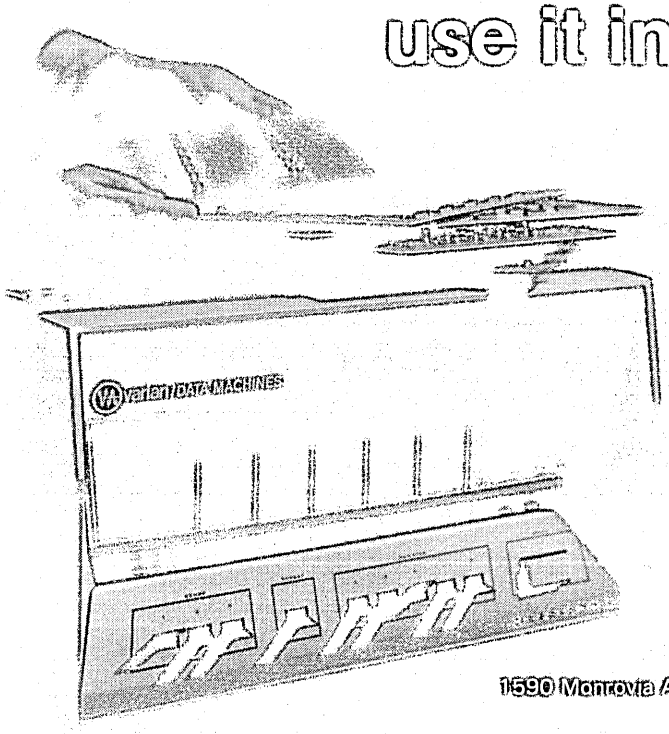

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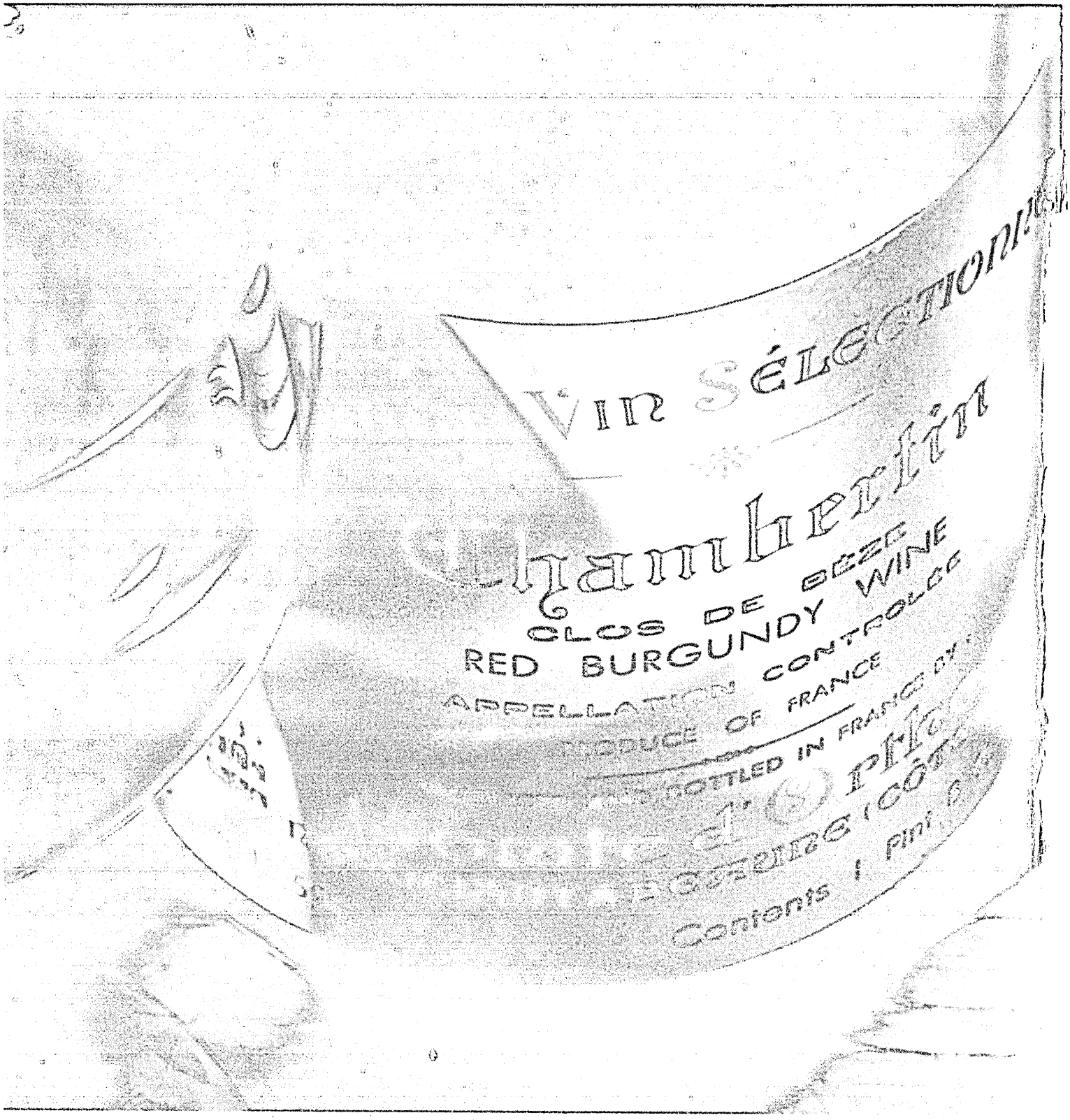

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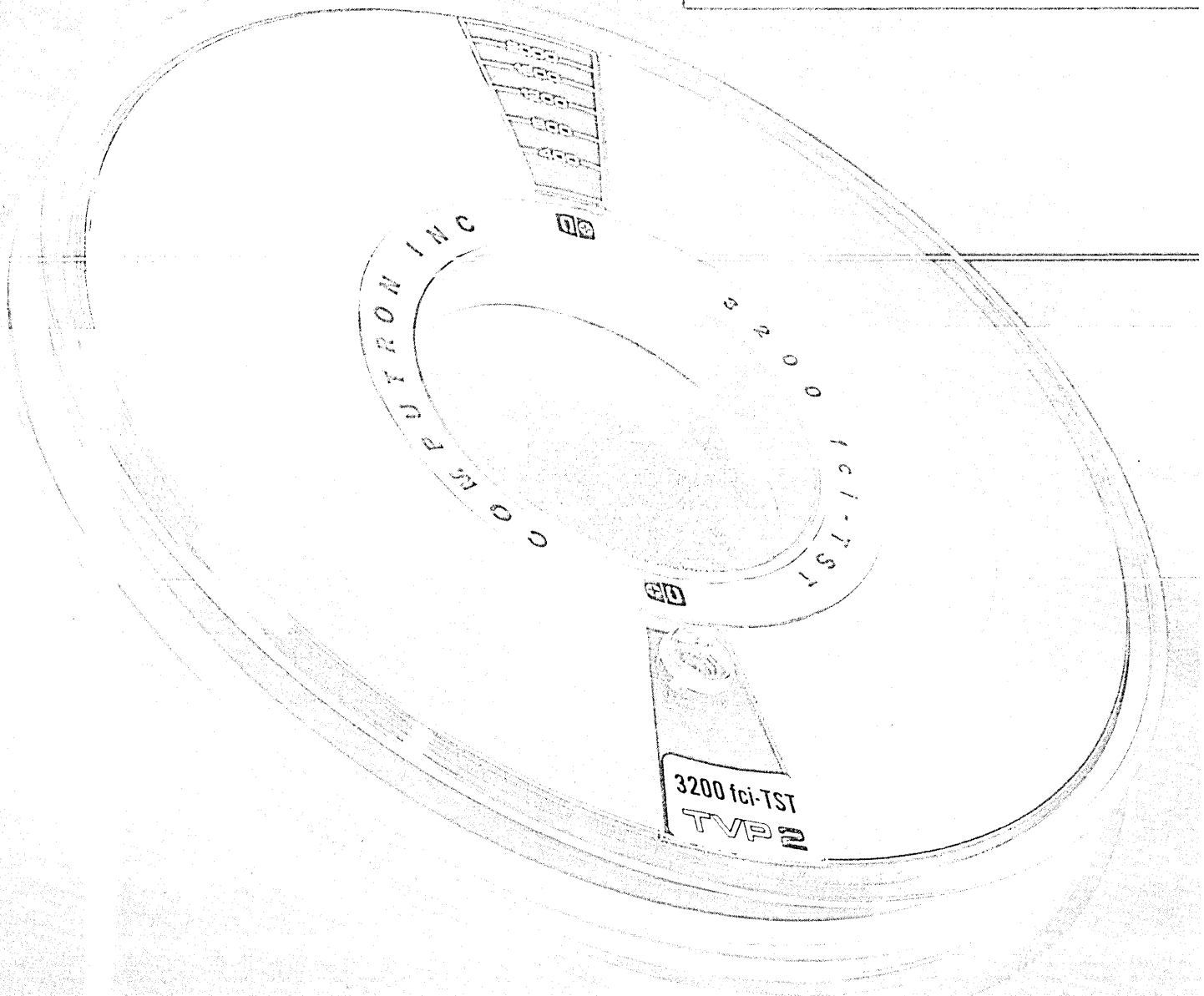

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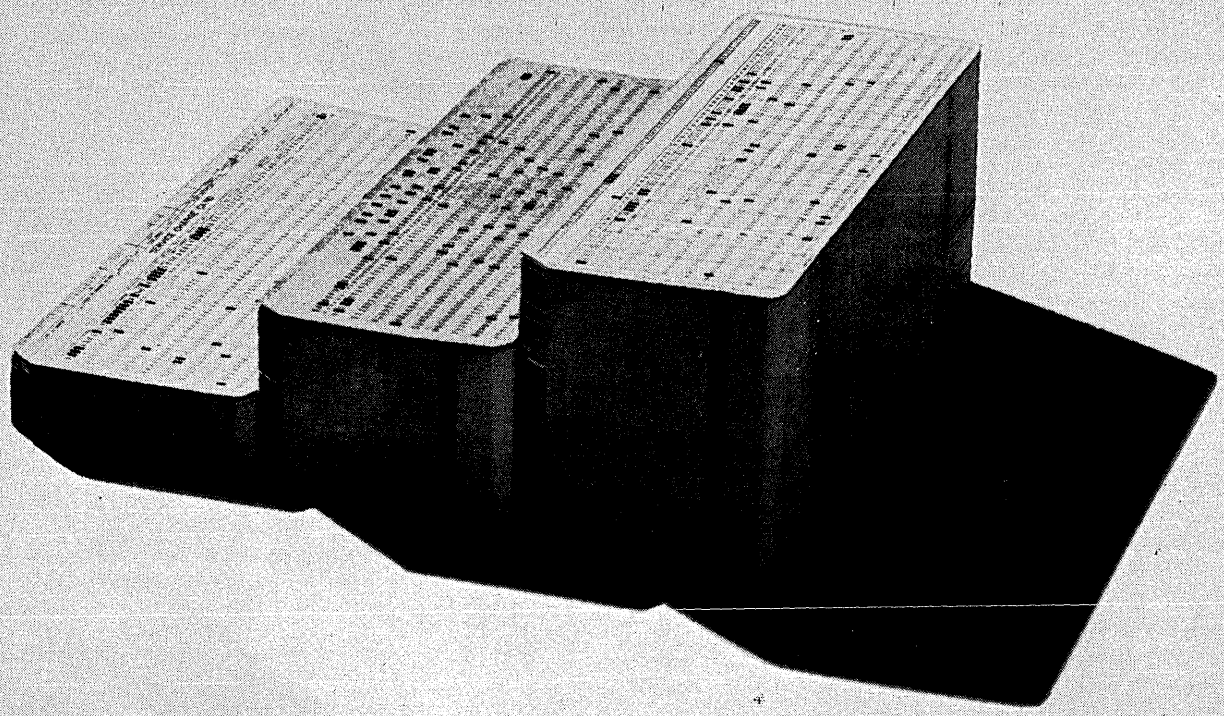

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news briefs

DOD SAYS IT HAS 9,500 MILITARY COMPUTERS

The federal government, in its latest census, reported there were 2,623 computers in the government in 1966, of which 1,967 were in the Defense Dept. But according to figures recently released to DATAMATION, the latter number fails to account for almost five times as many "military" computers. (All the figures exclude computers used in classified projects.)

The so-called military mainframes are differentiated from the commercial, general-purpose models in their special-purpose, hard-wired orientation or the fact that they are designed for weapons systems—as in the inertial navigation systems of military aircraft. Additionally, those gp computers placed in this category may be programmable but have a special I/O capability that would make them unsuitable for, say, computing a payroll.

An inventory of these computers is also made difficult because many of them are destroyed. A guidance computer in a missile being tested, for example, is destroyed with the missile. Many of them have been cannibalized, tested to destruction, destroyed with use, surveyed as obsolete, given away, or lost at sea, according to James A. Ward of the DOD's Office of DDR&E.

The count of military computers, gathered from an informal poll of the industry but believed to be reasonably accurate, is not official. Supplied by Ward, they show some 9,500 military mainframes within DOD. The number delivered to the DOD through 1966 exceeds 14,000, of which less than 11,800 had been delivered prior to '66 and another 2,200 during that year.

HIGHWAY SAFETY MODEL DESIGNED AT U.-MICH.

A mathematical model concerned with the value of vehicle inspections in relation to car and highway safety has been developed by two University of Michigan researchers of U-M Highway Safety Research Institute. Vehicle inspections are expensive; compulsory annual inspection of all cars in the country would cost an estimated $350 million, or about $3.50-$4 per vehicle. There is a strong feeling, but no firm data, that required inspections make cars and highways safer.

James O'Day and Jay S. Creswell, both of the HSRI, recently reported their development and first results to the American Society of Mechanical Engineers meeting in Pittsburgh.

The purpose of the model: to find out if inspections actually help, how much of an aid they are, and what is the most efficient level of inspection.

To first learn whether inspections actually made a difference in vehicle condition, the model was designed to show whether vehicle condition in required inspection areas differed from cars in areas of non-requirement. To test their model with a simple part they chose tail lights, which are easily observable. Drivers note tail light failures and repair them in a predictable manner. With that knowledge, the expected percentage of cars on the highway with tail light defects can be computed (as could other components).

The computer run of the model showed that some 5% of vehicles can be expected to have bad tail lights in non-inspection areas, reduced to 4% in inspection areas. Actual counts in Michigan, California, and Ohio (non-inspection required) proved 5% as predicted by the model, while Virginia, North Carolina, Pennsylvania and New Jersey, (mandatory inspection states) showed less than 5% defective.

The important aspect of this work, according to the researchers, is that now there is a model making possible the design of a system for insuring that a certain percentage of vehicles on the road will be up to a given standard. Periodic inspection is only one way to ensure certain conditions, the model is to help find the best way.

The model, combined with tech-

The Navajo tribe in Window Rock, Arizona, has installed an IBM 360/20 computing system to aid in controlling tribal expenditures and managing the tribal income, most of which comes from royalty payments on oil, gas and uranium leases. Other applications are preparation of utility bills, payrolls, and a livestock inventory program that will enable the tribe to distribute grain supplies efficiently during winter emergencies. Navajo Dineh (The People) are planning 40 new communities on the 15-million acre, three-state reservation. Future plans include using the computer system to determine population trends (the tribe is increasing at five times the national rate), and predict the needs of these new communities in the areas of water supply and streets.

The new computer center is operated in two shifts by a staff of 21 people, 18 of whom are Navajos.

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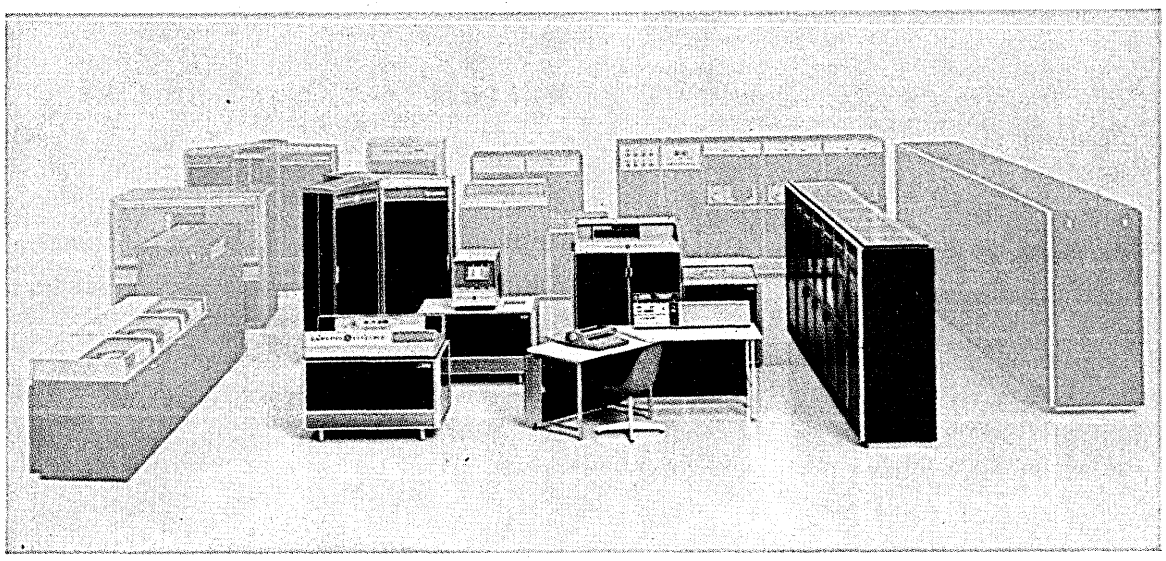

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GENERAL ELECTRIC

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niques yet to be devised, could reveal whether vehicles in good condition are truly safer than those that are not.

BIG U.S. COMPUTERMAKERS TAKE DEVALUATION CALMLY

The major computer manufacturers, deeply involved in international operations, seem to be taking devaluation of the British pound and other currencies quietly. Those contacted don't see any serious effects on profits and, in fact, hope for advantages in some areas.

This unruffled attitude stems from a combination of experience and financial foresight. NCR, for example, has been operating internationally for 80 years and is no longer surprised at currency fluctuations. They have a big operation at Dundee, Scotland, where Series 500 machines are made and the value of its assets have, of course, declined overnight in terms of U.S. dollars. So have those of other manufacturers. On the other hand, the products made there will now cost less and, presumably, can be offered as exports at lower prices or will generate higher profits. A complicating factor is price regulation in some countries where the products are sold.

Burroughs notes that the British action is "not expected to affect 1967 results negatively" and adds that they are "well-hedged." (This hedging may take such forms as financing operations with borrowed local funds, selling currency short in anticipation of devaluation, etc.)

Honeywell is another manufacturer with a substantial U.K. operation, turning out the 200 series systems. About half of this production is for export. A spokesman there points out that they use local materials and expect the relatively lower costs to be an advantage.

IBM comments that devaluation "occurs from time to time" and is considered a "normal risk" of doing business internationally. The principal effort they mention to minimize the risk is carefully maintaining working capital balances as low as possible.

Best bet for where the impact will be heaviest: on overtime rates for the accounting departments of these companies, trying to figure out what the new price structure will be.

FROM PRESIDENT TO PRESIDENT IN TWO YEARS

Sam Irwin is back in business. Sam is the founder and former president of Data Systems, which was sold to Union Carbide. UC proceeded to sell the assets (the Data Systems 2000) two years ago to Hewlett Packard, which now markets essentially the same machine as the HP 2116.

Now Sam is heading up Systronics, Inc., a 35-man Ann Arbor firm which plans to market a wide range of on-line and time-shared terminals. First product—a coded general-purpose keyboard—will be announced early next month. It will be followed by a Mohawk-like magnetic tape unit, offering lower performance and lower price, and competitive with paper-tape oriented gear, which it hopes to replace.

Irwin says he's "extremely well financed," having learned the hard way at Data Systems the importance of such matters. Directors include James Dingman, a Comsat director and former vice-chairman of AT&T; and Alan Newmark, chairman of the board of Harvey Radio.

1800 AT LAFAYETTE CLINIC AIDS MENTAL HEALTH PROGRAM

The Lafayette Clinic in Detroit, an agency of the Michigan Department of Mental Health, has a 120-bed facility, one of the largest outpatient mental health clinics in the country, seven research laboratories as well as a Computing Lab; it is also a training center. The prime interest of the Lafayette psychiatric group is research into schizophrenia, a huge problem when it is considered that 25% of *all* hospital beds in the country are occupied by schizophrenics. In training at the Clinic are 40 resident psychiatrists, plus student psychologists, social workers, and student nurses.

With the installation of the IBM 1800 this month it will make possible monitoring, control, and processing research data from the seven laboratories, these are: Biochemistry, Psychopharmacology, Neurophysiology, Psychophysiology, Psychology, Neurology, and Animal Behavior. Each laboratory has its own experiments, its own instrumentation, and attacks the research from its own disciplinary viewpoint.

Included with the 1800 are 32K core, three discs, two tapes, printer, eight typewriters, card read/punch, and an A/D converter; the Clinic people are building a D/A converter (32 multiplexed channels). Dr. James L. Grissell, head of the Computing Lab, considers that this will be a unique application of the 1800 as most are used for only one specialization.

The Clinic is pursuing a discovery of what they call "The Factor," a chemical substance present in everyone but found in higher amounts in schizophrenics. Researchers believe that it is a hitherto unknown hormone which is normally released under stress and declines with the passing of the stress period. In the schizophrenic the usual repression of The Factor does not occur. Russia has confirmed Lafayette's findings on The Factor. Part of upcoming research at the Clinic will be reactions to injections of The Factor after it is determined what priorities can be set for its use since there is such a tiny amount available (the source of TF being 35 long term schizo patients who have not responded to any treatment).

The 1800 will also take over the Selective Dissemination of Information (SDI) program, a profile plan to give each researcher articles for his individual reading interests on schizophrenia, which had been done for several years on a 1620. The Lafayette Clinic Library subscribes to MEDLARS and has the largest reprint file on schizophrenia literature in the world with the exception of the National Library of Medicine.

SUMMER CONFERENCE ON COMPUTERS & MATH SLATED

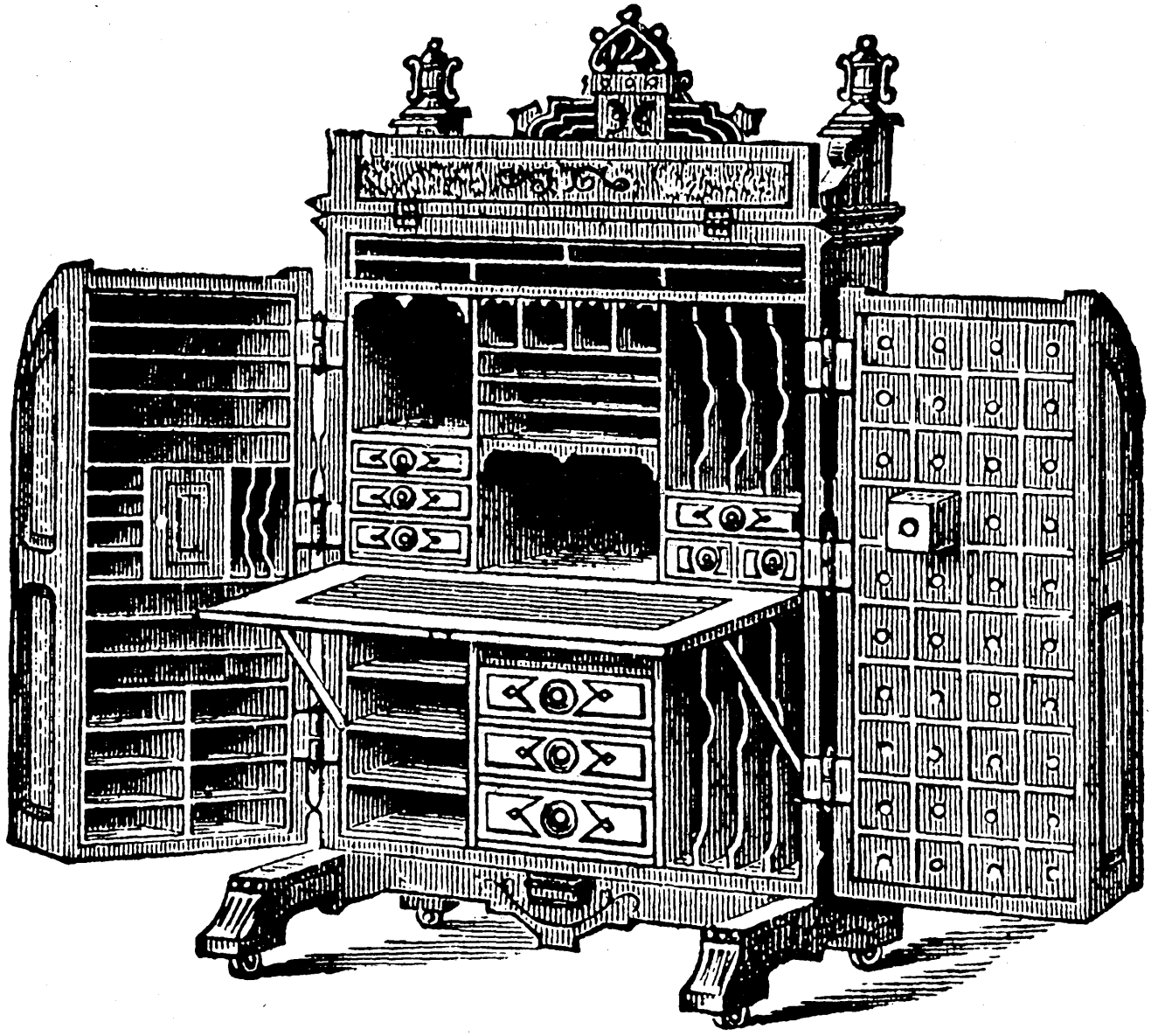
Last summer, a four-week conference on Computer-Related Mathematics was held at the Univ. of Oklahoma, sponsored by the National Science Foundation and IBM. Each participant received a travel allowance plus a $250 stipend to cover local expenses. Although it's not certain that NSF and IBM sponsorship is forthcoming, people interested in attending a repeat this year are asked to write to Dr. Richard V. Andree, Dept. of Mathematics, the Univ. of Oklahoma, Norman, Okla. 73069.

It reportedly was no picnic, lectures running from 9 a.m. to 4 or 5 p.m., and evening sessions lasting as late as midnight. But speakers representing the user, manufacturer and university sectors of the population covered topics from the esoteric to the mundane. Just the thing for college profs.

NEXT MAIN MEMORY: MAGNETICS OR IC?

Whether the mainframe memory in the next generation of computers will be nonlinear magnetics or semiconductors was discussed at one of the recent FJCC sessions. Contrary to the advanced billing, it was not a debate —despite the chiding of speakers by session chairman Tudor Finch of Bell Labs. Finch set the ground rules: the

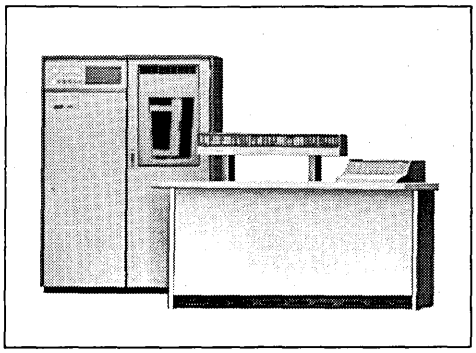
NCR announces the new 353-5 CRAM, most versatile random-access file system since this one:



Access was pretty random with this Victorian beauty. NCR's new 353-5 CRAM is less decorative and more efficient. Modular design permits the NCR 353-5 CRAM's capacity to grow as your needs grow. You don't pay for storage capacity until you use it. You can step-up ON LINE capacity to a total near 2 billion digits.

An NCR 353-5 unit can access, read or write and write/check at a rate of five magnetic CRAM cards a second. These functions are time shared with additional on-line units with the result that you get almost instant access to any record or a group of records.

Access speed is averaging less than 125 milliseconds, a rate made possible because random refiling of CRAM cards is shared with access time. 384 cards are stored in easily removable cartridges, and can be changed in less than a minute. Each 3.65″ by 14″ card contains 144 recording tracks with a storage capacity of 1500 six-bit alphanumeric characters to the track. Total capacity of each unit is 82,944,000 six-bit characters. One last spec: CRAM cards ride on a cushion of air to insure a long lifetime of effective performance.



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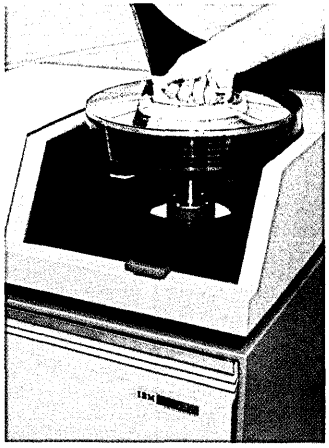

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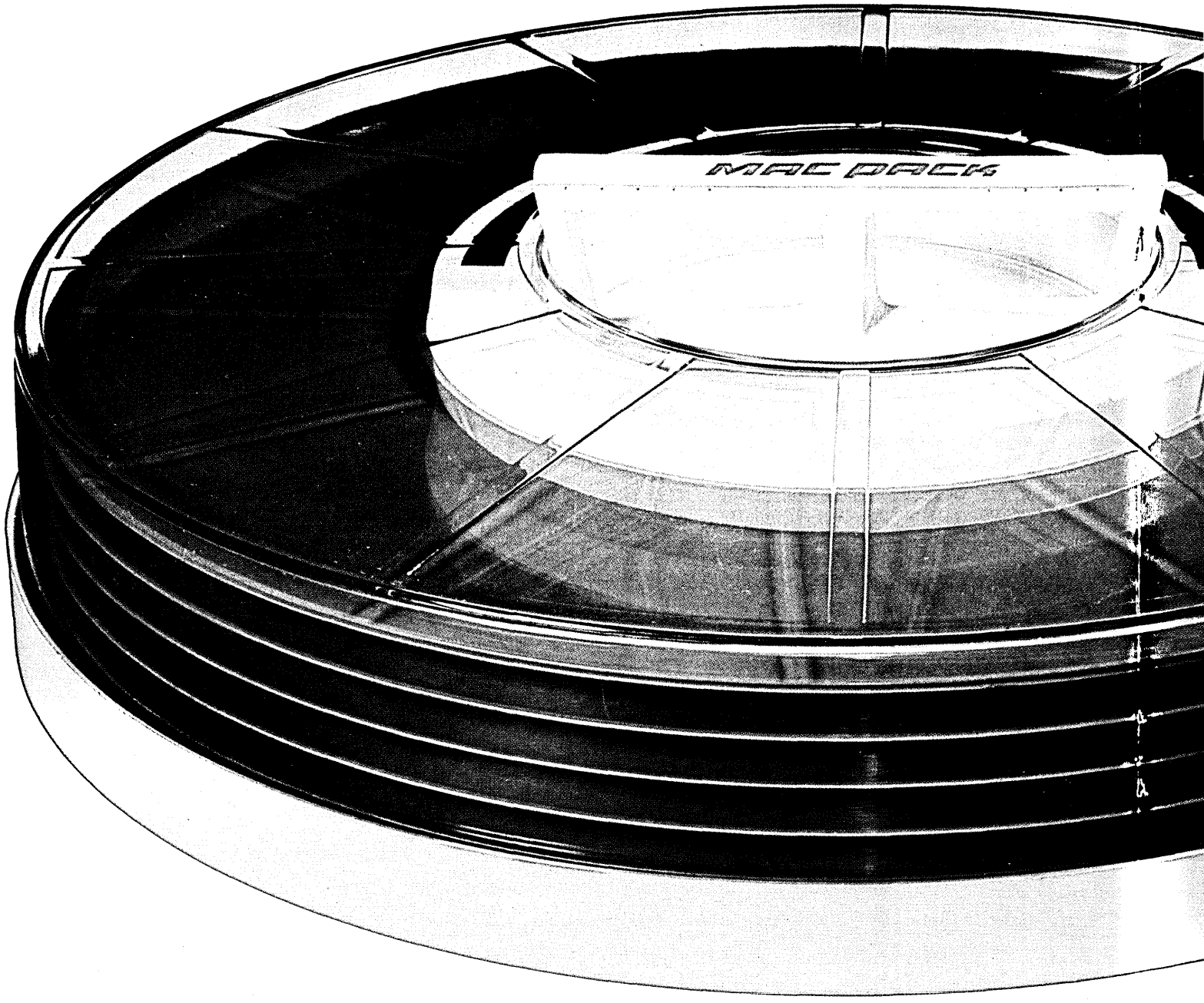

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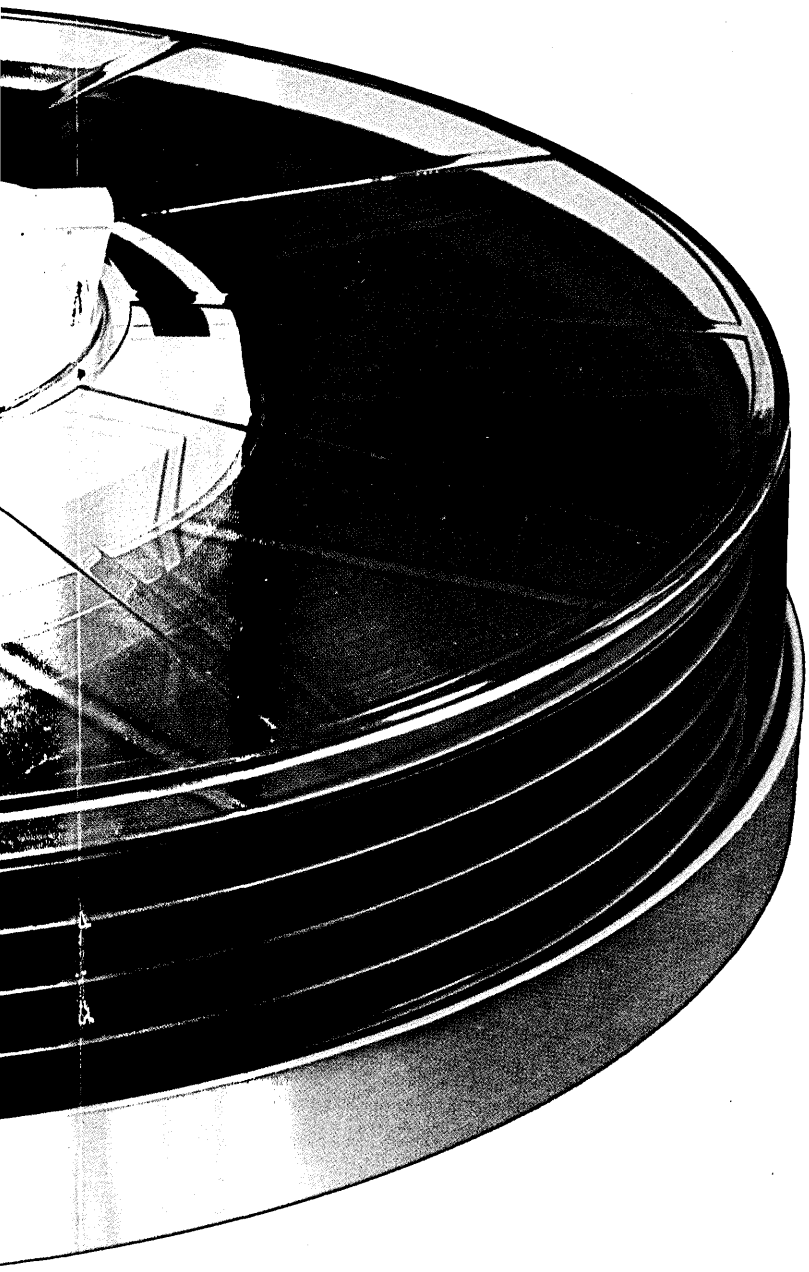

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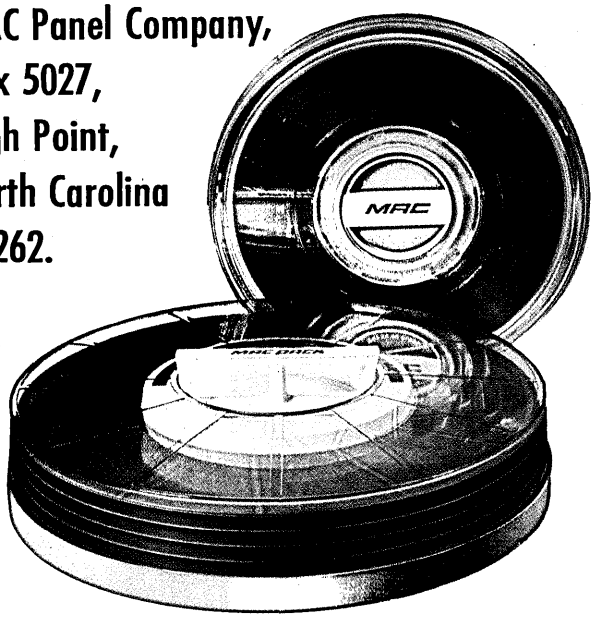

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Systems Engineering Laboratories

CIRCLE 39 ON READER CARD

discussion was to be restricted to memories of 200K to one-megabit modules having a 0.5-usec or less cycle time.

Dick Petschauer of Fabri-Tek, advancing the case for magnetics, said that memories of 10^4 bits was the crossover between magnetics and semiconductors; the cost would be lower, he said, using semiconductors for sizes below that, and the economics favored a magnetic memory for capacities above it. The chief advantage of the IC memory, he admitted, is its compatibility with the logic.

Petschauer compared the manufacturing costs—not the price—of current and "advanced" core and planar film/plated wire memories.

core	*film/wire*
3-wire, 2½D 19/11 mils	2-wire, 2D
16^6 bits	2×10^6 bits
500 nsec	250-500 nsec
2-3 cents per bit	2-4 cents per bit
advanced core	*advanced film/wire*
2-wire, 2½D 19/11 mils	2-wire, 2D
5×10^6 bits	4×10^6 bits
500-1000 nsec	200-400 nsec
1 cent per bit	1 cent per bit

The advantages in using magnetics, Petschauer added, were in cost, reliability, and capacity. Opposing Petschauer and speaking for semiconductors was Wendell Sander of Fairchild Semiconductor. Sander said that the reliability of semiconductor main memories hadn't been tested or proven but this was not a worry. The three factors leading to the use of semiconductors, he said, were its inherent compatibility, versatility and technological investment.

In the way of compatibility, Sander said the IC memory was more easily interfaced to the logic of the computer, and the designer could bypass hybrid circuitry and go directly to monolithic IC's. By versatility, he meant that the buyer could get a more powerful memory at little extra cost—such features as simultaneous read and write and associative cells.

Without additional work in the narrow area of semiconductor memories, advances will be made in the technology of semiconductor circuitry, and this will advance the memory technology. Not only will this bring down the cost, Sander said, but will mean savings in the overall system level.

The "debate" then centered on two narrower questions: if the memory is to be magnetic, will it be thin films or plated wire; and if it's semiconductor, will it be MOS or bipolar? Subsequent speakers foresaw such advantages for their technology as lower cost and higher performance. It thus became obvious that if the speakers had as much R&D money as they had conviction, the price of main memories would become low indeed.

Bunker-Ramo's Sam Nissim cited the most impressive array of features. The MOS memory would offer higher reliability, lower cost and power, smaller size, and the potential of new computer organizational techniques, he said. Among the latter was non-Von Neumann type organizational concepts and approaches—such as memory-oriented associative processors, time-sharing of mainframe memories, and increased use of mass storage with limited mainframe capability. With 170 flat-packs, he figured, there could be a 16K (18-bit) word, 2-usec memory for a medium-scale computer like the 360/40.

ARMY SCHOOLS TEST CAI SYSTEMS

The U.S. Army Signal School at Fort Monmouth, New Jersey, is initiating a study for the Army to determine if computer-assisted instruction (CAI) can be used to accelerate the training of electronics technicians. A contract for the study was awarded to IBM, which is using the 1500 instruction system with CRT terminals, a system

designed specifically for CAI. The current study is concentrating on practical applications of electronics training; the school's conventional lessons have been converted to CAI format. If the feasibility study is successful, the hundreds of Army training and education centers may prove an unlimited market for CAI systems.

AT USC, ONLINE SYSTEM MONITORS PATIENTS' EKGS

The Univ. of Southern California's School of Medicine, in conjunction with the Los Angeles County General Hospital, is using an on-line Control Data 1700 computer to continuously monitor electrocardiograms (EKGs) of patients in the four-bed coronary care unit. The 16K computer system is monitoring the EKG recordings for possible disturbances in heart rhythms which would require immediate medical attention.

The monitoring consists of comparing each consecutive sequence to previous cycle averages. If the signal changes, the computer is programmed to recognize the change, and to begin recording and studying the new signal. If the signal exceeds established maximum or minimum values, the computer will sound an alarm. The computer's accuracy can be checked by calling for simultaneous printouts of the numbers it has set for all components and for the EKG tracing, and then comparing the two.

Further uses of computers in EKG analysis are reported by Dr. C. A. Caceres, elsewhere in this issue.

HALF-TONE GRAPHICS DISCUSSED AT FJCC

A process designed "to allow people to see three-dimensional objects, as realistically as possible, using two-dimensional images (displays)," was introduced at the FJCC session on paper by Chris Wylie, Gordon Romney, Alan Erdahl, and David Evans, all from the Univ. of Utah. Working under a $5 million research grant from ARPA, Dr. Evans and his colleagues are developing this process on a system that includes a Univac 1108, PDP-8, and CRT control consoles.

As outlined in the conference session, the system is based on the use of geometric shapes: cubes, pyramids and spheres, which, when commanded to appear on the display, can be manipulated by the console controls into a variety of images. A camera mounted on an oscilloscope is then used to photograph the images created; the half-tone representations which result give the illusion of three-dimensionality through differences in illumination and light intensity.

The computer is programmed for this process by an algorithmic adaption of light and photographic principles; the program, PIXURE, written in FORTRAN IV, occupies 14K (36-bit) words on the 1108.

Each scan line (the original geometric shapes before photographed) generated by PIXURE is sent to the PDP-8 through an interface, stored in the memory, and transmitted through a D/A converter to a Tektronix oscilloscope. The PDP-8, acting as a buffer, accepts another scan line as soon as the previous one is completed. For a large image, this procedure takes approximately ten seconds to complete a picture.

A pilot study to use this system in

architecture is already underway at the Univ. of Utah. A building can be designed in perspective on a CRT; the design can be rotated on the display to any angle; and the architect can focus on the smallest detail, including the removal of walls to study the inside of a structure.

Also discussed in this FJCC session was VISTA (visual information for satellite telemetry analysis), a system that accepts spacecraft information orbit and attitude information and creates three-dimensional pictures of the objects so described on off-line CRT displays.

RABINOW ON FEDERAL R&D: PADDING, LOW SALARIES

R&D contractors who don't have enough work to keep all their engineers busy are nevertheless making a profit on the idle time—by padding their government contracts. Padding "is universally true in Washington (and) in the country . . ." added Electronics Engineer Jacob Rabinow.

Rabinow, who has made key contributions to optical character recognition technology, testified recently before a subcommittee of the House Post Office and Civil Service Committee. Chairman Joe Pool, of Texas, later took the rather unusual step of inviting the House Armed Services and Space committees to launch "a complete and thorough investigation into the Federal government's research and development contracts." (These two groups have the required authority; Pool's committee doesn't.)

At press time, the space committee was reportedly considering such a move. So was the Joint Economic Committee, which is looking into related matters.

Rabinow said contract padding can't be caught by government auditors "because the bookkeeping is honest." The only purgative is ". . . competent engineers who know the subject as well as the contractor, or better if possible."

He also charged that: far too much government R&D work is farmed out; too many layers of authority separate decision makers from those doing in-house R&D: system engineering is over-emphasized (to the detriment of hardware analysis), and so is the use of technical committees; value engineering should "get right into the design to start with," but it usually isn't considered until after new equipment has been built.

The subcommittee seemed particularly impressed with what Rabinow said because of his background—15 years with the National Bureau of Standards, as an R&D engineer and division chief; 10 years as head of his own R&D outfit, Rabinow Electronics, Inc., during which he did a lot of work for the Post Office; plus numerous posts with government technical committees. In 1964, Rabinow Electronics was merged into CDC. Rabinow indicated he's a happy captive, largely because working for CDC produces steadier employment and fewer ulcers than scrabbling for government contracts.

He stressed that his criticism of federal R&D, as it applied to the Post Office, was meant to be friendly. The department's present automation program, Rabinow explained, is organized far more efficiently than its predecessors, and appears to be free of political domination. He heaped praise on Dr. Leo Packer, Assistant Postmaster General for Research. Nevertheless, it was clear that Rabinow thought the Post Office program suffered from most of the sins mentioned above. For example:

The department farms out about 80% of its R&D work. Rabinow thought "at least 50%" should be done in-house. Also, Post Office R&D expenditures are grossly inadequate, he indicated.

AT&T spends 2% for this item, Rabinow explained. On the basis of information gleaned from a private source, he added that IBM spends 2½-5% ($100-200 million) of its $4 billion annual gross on R&D. The Post Office, by comparison, spent 0.3% in fiscal '67, and plans only a slight increase in '68.

The basic solution to these problems, said Rabinow, is to increase salaries for top federal R&D jobs. Some qualified people will take such positions even though Uncle Sam pays less than industry does; they're willing to accept more glory in lieu of more money. But the number willing to make this exchange is inadequate, he insisted.

The taxpayers lose in the long run, added Rabinow, because more R&D has to be farmed out, the oversight deteriorates, and the ultimate cost is far greater than the amount that would have been spent over the same period on higher salaries.

PERIPHERAL FIRMS ASK JEC FOR SEPARATE BIDS

Bryant Computer Products assistant vp Dick Caveney—who believes DOD discriminates against independent peripheral equipment makers when it advertises for adp systems—found a sympathetic audience in the Joint Economic Committee recently. There is some hope, but not much, that DOD system procurements will become more competitive as a result.

Caveney argued that independents don't get a chance to answer RFQs covering entire systems. The Pentagon, he says, solicits proposals only from main-frame manufacturers, who then bid on the whole package. Besides being discriminatory, this procedure allegedly hikes costs tremendously.

He cited one example in which DOD could have saved about $430K, better than 50% of the contract price, if it had purchased a single Bryant memory-controller complex instead of buying the mainframe manufacturer's peripherals.

The main frame makers can easily develop general-purpose, plug-in adapters that will enable their computers to talk with any of the inpendents' peripherals, Caveney added, so compatibility is not a big problem. Honeywell, he reported, already markets such an adapter.

Hy Abersfeller, who, as head of GSA's Federal Supply Service, is Uncle Sam's chief purchasing agent, confessed he wasn't aware that plug-in adapters were obtainable. If they are, purchasing adp system components from independents "is not the (difficult) technical problem I understood it to be." He promised to investigate.

Earlier, Abersfeller's boss, GSA Administrator Lawson Knott, told the committee that his power to bring about changes in procurement procedure like the one desired by Caveney, has just been strengthened. "The Controller General has very recently made it abundantly clear that he believes GSA's authority for the purchase of . . . (adpe) supersedes the authority of other agencies and that they must clear with us." (This was a reference to an opinion rendered Nov. 21st by GAO.)

Caveney's complaint is part of a much older, much bigger issue: whether DOD is doing all it can to stop contract profiteering. In 1962, Congress passed the "Truth in Negotiation Act," which says that a contractor or subcontractor, before being awarded a negotiated, fixed-price contract over more than $100K, must certify that his bid is based on accurate, complete, current cost-price data. Early last year (1967), GAO, after investigating, reported "serious and comprehensive" violations of the law. DOD was blamed for not establishing adequate audit procedures.

Prodded by the Joint Economic

Committee, DOD took another look at its compliance with the 1962 law, and at the recent JEC hearing, Assistant Secretary (I&L) Tom Morris released a new directive (Defense Procurement Circular No. 57, effective Nov. 30th), which requires an explicit statement in all negotiated firm fixed price contracts of $100K or more, giving the government a right to examine the contractor's cost records.

Whether this change will help Bryant and other independent peripheral makers directly is doubtful, since government auditors will, in most cases, enter the picture after contracts have been signed. But the data they, or GAO, might unearth would almost certainly help Congress persuade the Pentagon to do more multisource buying.

Morris was considerably more sanguine about the effects of the new circular than Comptroller General Staats, who had several criticisms: one of these was directed at DOD's criteria for differentiating competitive and non-competitive firm fixed price contract negotiations. The former are not covered by the new circular, while the latter are. Staats thought the criteria were vague.

"You don't have a chance in the world of getting the Defense Department to agree that (the government) has a right to have a breakdown on subcontractors' costs," said JEC member Martha Griffiths, who numbers Bryant Computer Products among her Michigan constituents.

"If it is a known cost, then it should be supplied by the prime contractor to the government at the time the negotiation takes place, under the Truth in Negotiation Act," answered Staats.

Assistant CG Frank Weitzel reported GAO had been discussing this problem with DOD. The Pentagon's reaction was "mixed," he said, adding that military officials are worried about taking away the prime's responsibility for delivering a satisfactory end product.

"I understand they could reduce the price of computers perhaps 50% if they would do it that way (i.e. if DOD would deal with adp component makers directly)," answered Mrs. Griffiths.

Subsequently she said "I'm not voting for any tax increase as long as this (lax DOD control over profiteering) is going on." That threat, if carried out, could cause the Administration a lot of trouble since the Michigan Congresswoman, besides being a member of the Joint Economic Committee is also on House Ways and Means. White House intervention in the procurement policy hassle is thus possible.

Other highlights of the hearing:

Comptroller General Staats revealed that GAO has reservations about BOB Circular A-76 in its newly-revised form. One alleged loophole is the failure "to set forth specific criteria for application of the policy in the support service contract area." A-76 is designed to help agencies decide when work should be farmed out and when it should be done in-house.

Staats added that a recent opinion of the Civil Service Commission's general counsel, which argues that contracting out certain kinds of support services is illegal, "will be of significant value to agencies in ascertaining the propriety of technical support or similar contracts."

JEC Member Donald Rumsfeld criticized GAO for not identifying contractors in its reports, and attracted some support from the rest of the committee. Likely result is that JEC will direct GAO to release the names of contractors involved in future reports, either when the documents are released or soon afterward. The present policy is the result of pressure mounted by Cong. Chet Hollifield's GovOps subcommittee two years ago. Rumsfeld, a member of that group, opposed Hollifield.

A PROGRESS REPORT: FORD'S COMPUTER CENTER

One of the largest technical computer complexes in the world is Ford Motor Company's Technical Computer Center (Engineering R&D) in Dearborn, Mich., and it includes a time-sharing service (the oldest and largest). The center now has 22 major computer systems, made by 10 different manufacturers, most of them on-line through special interfaces. Over 150 remote terminals or computer satellites are able to access the system.

The speed and power of the system, rated by a survey in *Automotive Industries* (November 1966) as "the most ambitious and advanced complex to be found at the present time" (aside from the military), derive from two military command and control computers—Philco 212's. The CPUs have access to core memory of 32K (48 bit) words plus use of another core of the same size which may be used by either 212 or shared simultaneously. Input/output to the 212's is by tape or disc: 16 (each system) 90,000 ch./sec. tape drives, and a 42 million character disc file with one million ch./sec. transfer rate is available from either CPU.

Interfaced on-line are two time-sharing GE 235's with their own disc and tape (in this configuration they become 265's); two Datanet 30's and one Philco 102 communications processors; and a network of satellite facilities. The satellites include Teletypes (150 in the United States and via transatlantic cable to overseas Ford divisions) CalComp plottters, a CDC 1600 to operate with the CDC 274 graphic display, IBM 1130's, 360-/20's, Honeywell DDP 116 for use with the Gerber 200 Drafting System, GE-115's, and Philco 102.

Off-line processors include two 16K Philco 1000's, and there is also an off-line CalComp plotter.

An Ambilog 200 hybrid is interfaced on-line to the 212's. Results of the data analysis from the Ambilog may be displayed on the CDC 274 screen and manipulated with the light pen.

All software is written internally and is designed to be machine independent. There are nine executive routines, 11 major compiler languages, and 10 problem-oriented languages.

TCC's own PL/2 (Philco Language for the 2000) was derived from TS-MAD, JOVIAL, and LIST 6. PL/2 is used as an implementing language to FORTRAN and COBOL. The PL/2 compiler generates re-entrant programs, manipulates partial word variables, and is suitable for a number of purposes including writing time-sharing systems. It was built to implement the operating system, the file system, and compilers within the time-sharing system.

The Technical Computer Center is the oldest (running for over two years) and largest (300 accounts) computer utility. Its clients are mostly internal company departments, some vendors, some subsidiaries, and some universities which work closely with the center. Charges to clients are about half the usual commercial rates and are for only the actual time used plus the on-line storage maintained.

Scientists and engineers can converse with the center complex in natural language from their own offices via remote terminals operating over regular telephone lines by direct dial. Which machines are accessed by the user depends on the sophistication of his program and the language designated. Each user has his own program stored in the disc file and also has access to a library of analytical programs and special languages.

The unique hardware/software interface through the 235's between the TS system and the 212 allows the user to run a 212 job from any on-line Teletype and gives him FORTRAN IV,

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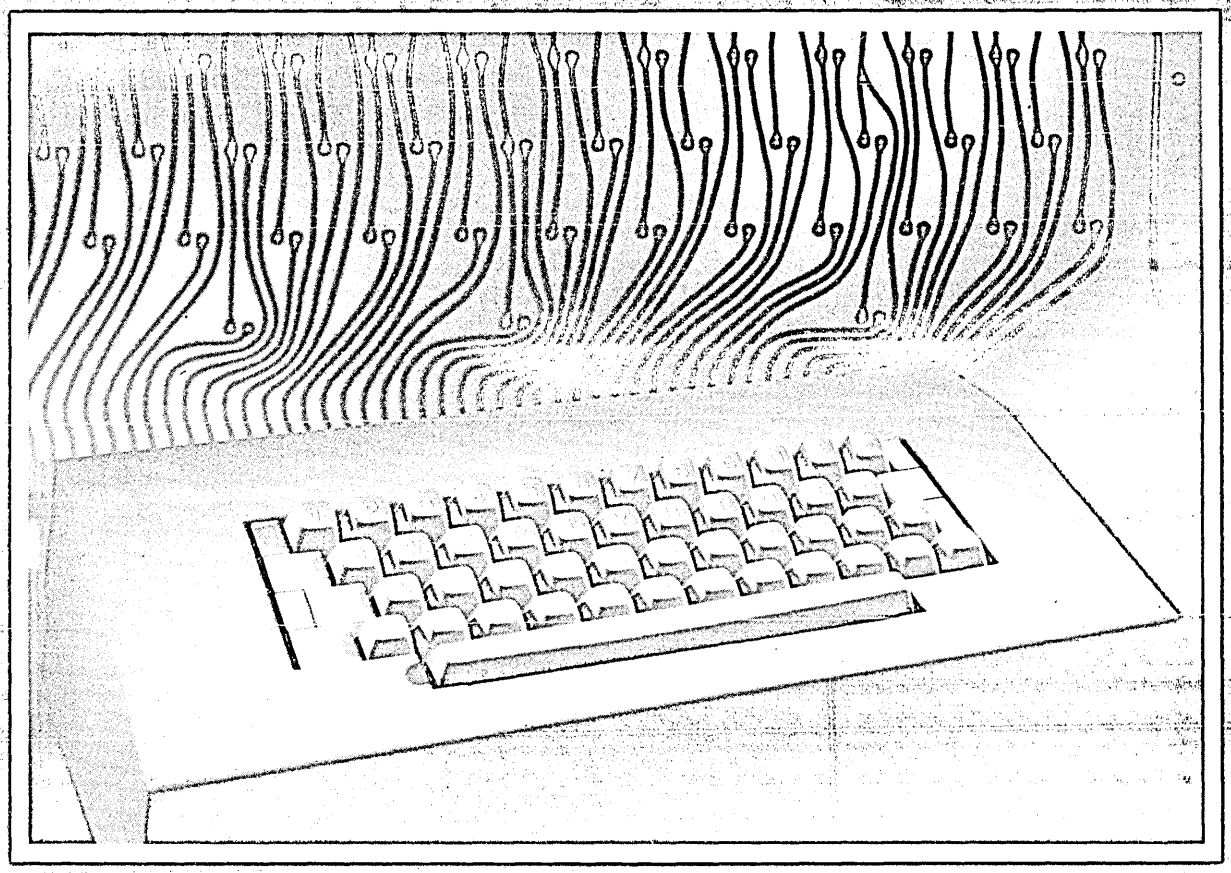

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APT (Version 8), SIMSCRIPT, SAMS, MAD, and other center resources.

For over a year the center has had computer-assisted instruction for new users. This is the TUTOR system, written in BASIC, which has an initial package of 30 programs (chapters) designed to teach the neophyte user how to use the Ford time-sharing system, the BASIC programming language and fundamental programming technique.

TUTOR (a Ford staff-written and copyrighted program that has been released to GE) has proven to be an excellent tool for instructing remote users and allows them to begin working on their programs after several hours of instruction. TUTOR supplements formal classroom instruction and live teachers; it allows each user to proceed from his own office, at his convenience, at his own speed, in his chapter of the program. The programs are available in French, German, Spanish, Hungarian, Portuguese, and Italian. About 100 people a month are being trained by TUTOR using the current sequence. Users include scientists, engineers, accountants, clerks, technicians, and salesmen (in the dealer program). This approach has added 7000 on-line programs to the library, many of which have been developed over the past year by computer newcomers and which otherwise might not have been available.

The Technical Computer Services Department has recently released on-line tutorial packages for time-sharing ALGOL and TS-FORTRAN. Under development are FORTRAN IV, APT and SIMSCRIPT.

At the present rate of growth of the center's work, the configuration will reach saturation by the end of 1968. They are exploring what additions could be made for expansion—with speculations about the Burroughs 8500 (yet to be proven in an installation) and the new CDC 7600. There are no more Philco 212 computers available, but a good deal of consideration is being given to a possible upgraded 212, the Philco 214, which will be an LSI machine having four to eight times 212 speeds.

PANEL CONSIDERS COMPUTER USE IN LAW ENFORCEMENT

A panel of representatives from industry, law enforcement agencies, and planning consultants convened at the FJCC to talk about the present and future use of computer/communications techniques as an aid to law enforcement. They found, in general, that these new methods show considerable promise but some substantial changes in organization, approach, and attitude are required—the nature of the changes depending on the point of view of each speaker and the group he represented.

There was one point of general agreement, mentioned by several panelists: law enforcement must be considered as only one link in the continuous chain of crime prevention, crime deterrence, criminal apprehension, complaints and charges, trial, sentencing, punishment and rehabilitation, parole, and later consequences for the criminal, his victim, and society.

Edward Davis, director of planning and control for the Los Angeles Police Dept., said that there are only about a half dozen areas in police operations where improvements could be made and the outlook for most of these is bleak. Reverence for the law should be increased, but instead it's declining. Police authority could be expanded, but it's actually shrinking. There should be more police, but Los Angeles can't afford them because the city is already spending $100 million a year on the department. There should be better police, but it's hard to fill the vacancies at the present level of standards. Modern technology should be adopted; this seems to be the best hope at present.

Some of the goals that Davis thinks are most likely to be reached with the full application of computer/communications techniques: accumulating enough information on "events"—crime and disorder—to allow analysis and prediction; improving identification techniques, both in quality and in shortening the time lapse between inquiry and response. The LAPD will make a start on these applications about next March, with a small data bank covering only part of their operating area. The department will also be soliciting proposals for a command/control system early next year. He is hoping for eventual establishment of some sort of regional centers, by state and groups of states, as the only effective way to identify a suspect found in one part of the country who may have committed a crime in another part.

Davis commented on the abundance of computer salesmen visiting him and the difficulty of choosing among their various schemes and equipment. He is setting up a technical group in the department to help separate the sales pitches from the constructive advice.

Edward Comber, head of the California Criminal Justice Information System Design Project, added his complaint about salesmen and mentioned the value of technical consultants. He summarized the big problem of law enforcement: no one really knows what's happening, because very few crimes are even reported—perhaps one in ten. Of those reported, only a portion lead to arrests, maybe 20% of car thefts, up to 80% for violence against people; only half of those arrested have charges filed against them; and only 6% of those charged in California last year were eventually sentenced.

The first spokesman for industry was Stan Rothman, from TRW Systems, and he had some counterarguments to offer—pertinent to the greedy-salesman concept. He said that the law enforcement authorities had failed to define their requirements well enough for industry to judge the nature and extent of the market. Therefore, the manufacturers can't tell whether or not it is worth their while to develop special equipment and techniques. One step that would improve this situation, he said, is for law agencies to invite industry participation in planning committees at an early stage.

Rothman also explained pointedly that most agency studies seem designed to try and find out how to improve enforcement without making any substantial changes in how it's now being done. For example, while the scarcest resource is policemen (people account for about 85% of a police department budget), a great many of them are used to control traffic rather than to catch robbers—yet traffic control is a prime application for machinery. (Two or three weeks after the FJCC, the L.A. Police Dept. announced that 25 or 30 civilians had been hired for traffic direction duties.)

Another obstacle Rothman noted is that state and local governments have complex and restrictive contract requirements and, even worse, item vetoes that can ruin a comprehensive system by strangling one essential portion.

In summary, he urged: better definition of requirements for industry guidance; setting up regional centers, preferably at universities, to analyze the whole problem in an area; surveying and initiating change of restrictive contract procedures; and nationwide standardization of law enforcement equipment needs.

R. P. Lynch, from the U.S. Dept. of Justice, regretted the small amount of money being spent on law enforcement—a fraction of the sum going for booze and tobacco. He also reported

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UNIVAC pioneering resulted in the world's first all-fluidic computer in 1964.

Now it's three years later, and research is still in its beginning stages, because there's so much left to explore.

Particularly in the areas of reliability and endurance of conventional computer input and output devices, because they have moving parts which can wear out and malfunction.

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We're exploring many other advanced ideas in UNIVAC research and development laboratories: new thin film memories, plasma displays, photochromic storage, to name a few. No one knows where it will all end. But, as with many other advanced projects, we do know where a lot of it began.

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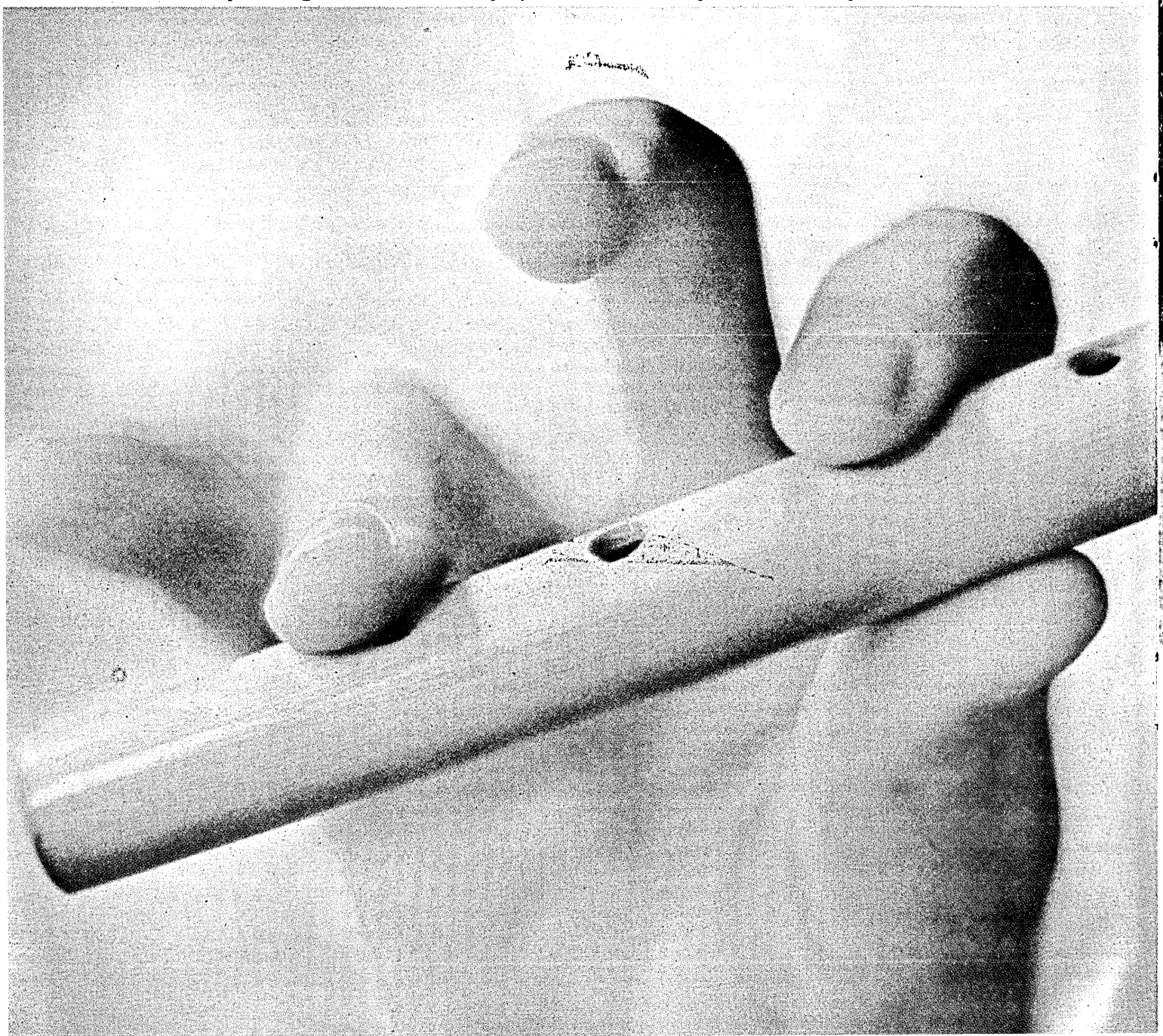
SPERRY RAND

CIRCLE 42 ON READER CARD

The idea behind the most advanced computer research goes something like this.

The simple thing that makes a flute play is what makes experimental computers work.



on the progress of the Safe Streets and Crime Control Bill, which has gone to Congress but has not yet passed and is undergoing various changes. Title 3 of this bill calls for setting up a national institute to deal with these problems.

Dr. Alfred Blumstein, from the Institute for Defense Analysis and also a member of the National Crime Commission, said that criminal justice is a century behind in technology. Police departments should have inquiry systems to track down people and things, comprehensive collections of criminal histories, and management information systems. Use of good edp systems, he said, would allow the police to relate their activities to the outside world—thus helping to resolve the major problem presented by the early speakers of considering criminal apprehension and justice as a whole.

GE OFFERS FULL DATA SET LINE

General Electric has announced a series of data sets handling transmission speeds ranging from 300 to 230,400 bps—a move intended to establish the firm as the second principal supplier of a full range of data transmission interfaces. The new DigiNet series, broken down into the 100, 200, 400, and 500 series, consists of 19 different data sets, digital subsets and modems—compatible with Western Electric counterparts where standards exist. Western Electric has about 40 data sets in the same general purpose categories.

The data set market is estimated to be between $20-50 million annually, and expected to grow 10-fold over the next five years, according to Glenn R. Petersen, marketing manager for the Communications Products Div. GE, no newcomer to the communications equipment field, has more than 700 franchised service offices which will also handle the DigiNet maintenance. The firm feels that its largest market, other than the government, is the 2,200 independent telephone companies. Dr. Louis Rader, vp and general manager of the Industrial Process Control Div., told the press that while the Bell System owns 85% of the phones and serves 70% of the population, its franchises cover only 15% of the geographic area. The rest of the area, split among 2,200 independents, is, of course, predominantly rural. But these companies are now in the initial phases of great growth in size and service because of the rural communication modernization made more possible by remote access development, and because of the trend toward suburbanization.

From 1962-67, said Rader, the independents increased their annual investments for plant additions by 100%, compared to Bell's 50%. And Rural Telephone Assn. members are expected to require $3 billion of new capital in the next 15 years, twice that of the last 15. Thus, observers note that while the independent has not been an extremely significant market for such data set markers as Western Electric in the past, the expected growth of these firms will bring GE, Western Electric and others into head-on competition for their business.

Other markets GE will attack include large dp users with leased lines or their own communications systems, and terminal equipment manufacturers (the modems can be rack-mounted).

Details on the equipment are as follows. The 100 series handles slow-speed terminals—teleprinters, paper tape and punched card units—with a 100-300 bps rate. It consists of the wire-line-connected TDM 110 (for dedicated lines) which is compatible with the Western Electric 103F, and the TDM 111 (for switched network), which is compatible with the 103A. Acoustically coupled data sets, TDM 114 and 115, are compatible with the entire WE 103 series; these units can't be put on dial-up lines now, however, because of common carrier restrictions on foreign attachments. FCC's Common Carrier Bureau has recommended this ban be lifted and a decision is pending.

The DigiNet 200 series operates in voice-grade channels at 1200-2400 bps and is suited for requirements of tape readers, video displays, and such. In this group are the: TDM-210, handling asynchronous serial data at up to 1800 bps over two- or four-wire private lines and compatible with the WE 202DI; the TDM 211, compatible with the 202C, handling 1200 bps over a switched network; the TDM 220, which handles synchronous or asynchronous serial data at up to 2400 bps. Data sets in the latter category are generally not compatible with other manufacturers' equipment because no standards have been set.

The DigiNet 400 and 500 series are designed for wideband, high speed applications, such as computer-controlled numerical control and computer-computer linkage. They use 12-60 voice channels. The 400 series, consisting of seven systems, can handle up to 50 kilobits/second (KB/S). The 401 is a synchronous baseband digital subset (no modem) handling 50 KB/S, and the 402 is the same unit handling the internationally standard 40.8 KB/S. The 403 is an asynchronous baseband repeater. The 420 modem (no digital subset) has a standard EIA 19-inch rack mount, and the 421 modem is in the new, more compact, shallow depth rack. The 422 is a full data set operating synchronously at 50 KB/S, while the 423 operates at the standard 40.8 KB/S.

The 500 series, consisting of five systems, handles 230.4 KB/S, the international standard, although it could be made to operate at 250 KB/S. No market exists for the 250 KB/S speed yet. The systems in this series, the 501, 503, 520, 521, 522, all correspond in type of unit to those in the 400 series (401, 403, etc.) but operate at the higher speed.

All the units are solid-state with discrete components, and have a projected MTBF of 58,000 hours, or 6½ years at 24 hours/day. Production of the 100 and 200 series is underway, while high-speed units will go into manufacture in '68. Prices range from $500-6,000. No leases initially.

CIRCLE 124 ON READER CARD

PUBLIC UTILITIES & DP WAS SEMINAR SUBJECT

Nearly 400 executives of public utilities attended the recent American Gas Assn. and Edison Electric Institute's 15th annual electronics seminar in Phoenix last month. While the somewhat vague theme, "EDP: Potential for Management," did not hint at the problems to be discussed, the attendees, troubled by common dilemmas such as a lack of data bases, and decentralization of computing efforts, struggled for solutions in workshop and panel sessions. (Typical of the shotgun development of many large installations is the Los Angeles Gas Co., which leases a 360/20 for cost accounting; uses a terminal to University Computing's 1107 for engineering applications, and has purchased an IBM 1800 for data logging and alarm.)

An implemented system, much admired at the conference, is the one at Houston Lighting & Power Co. With a data base on disc files, Houston L&P has a centralized system that includes an IBM 360/50, two mod 30's, two 40's, and on-line CRT's.

With these goals of centralization and a common data base, hardware discussions at the seminar naturally focussed on communication systems for interdepartmental use, and on

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ways to build massive files.

Four vendors occupied suites; while IBM showed films, GE, Honeywell and RCA demonstrated terminals on line to time sharing centers.

ACM HOLDS SEMINARS, LEADERSHIP WORKSHOPS

Under Jim Adams, director of education, the ACM (Assn. for Computing Machinery) has held numerous professional development seminars across the country. These range from half-day to two-day programs of tutorial and state-of-the art presentations designed to keep professionals up to date.

Meanwhile, ACM chapters of the greater New York region have been holding leadership workshops. At their latest one, 68 officials of 23 chapters (including student and prospective chapters) showed up on a Saturday, perhaps because the Vassar College student chapter hosted it. In addition to discussing the chapters' professional development programs, they formed three regional councils—for chapter chairmen, headed by Sam Matsa; for student chapters, under Mrs. Fran Zederbaum; and for faculty advisors, headed by Dr. Winifred Asprey.

IFIP FORMS ADMINISTRATIVE DATA PROCESSING GROUP

At the 12th general assembly in Mexico City of the International Federation for Information Processing, approval was given for organizing the society's first special-interest group—the IFIP Administrative Data Processing Group (IAG).

Other noteworthy business was the acceptance of applications from Cuba and Yugoslavia, thus increasing the membership of IFIP to 28 nations. An application from Chile was received too late to be given consideration.

A. A. Dorodnitzin (USSR) was elected president, and the Assembly also approved Ljublajna, Yugoslavia, as the site for IFIP Congress 71.

The General Assembly members were welcomed to the meeting by the Mexican government; Lic. Augustin Salvat, minister of tourism for Mexico, was the guest speaker at the closing day banquet. Host society was the Mexican Assn. for Computing and Information Processing (AMECOPI).

S. D. Duyverman, Netherlands Automatic Information Processing Centre, Amsterdam, Holland, is

Telespeed 750 High-Speed Tape-To-Tape equipment can send and receive entire inventory records in minutes.

KEYED TO CONTROL INVENTORY COSTS

In today's marketplace, consumers demand variety. Most merchandise has to be available in many colors. Many styles. And with many features. And so it goes throughout all industries . . . with spiraling inventory costs causing serious problems.

Yet, many companies have cut inventory costs while keeping a larger selection of stock on hand! They did it through data systems that include Teletype data communications equipment.

This is how it works Teletype equipment is used to send and receive inventory data among warehouses, distribution outlets, and a computer center. The computer analyzes the inventory at each location and considers past stock requirements as well as seasonal demands and, where applicable, possible obsolescence. It determines the stock needs and material requirements of each ware-

house and distribution outlet. Then, Teletype equipment transmits stock replenishment orders quickly and accurately. As a result, management keeps inventories current and costs at a minimum.

Examples of how Teletype equipment can be used in your inventory operations are described below.

Aids decision-making capabilities A major producer of heating units replaced its traditional order handling and inventory replenishment method with a communications network that ties distribution outlets to its computer center via Teletype Model 35 ASR (automatic send-receive) sets. The data system has substantially reduced inventory levels, general administrative and paperwork costs, as well as cut four days off the entire order processing cycle.

Though inventory cost reductions have been significant, the firm's marketing vice president points out that the system also supplies management with more comprehensive and current reports than previously possible. This has improved their decision-making capabilities while permitting greater flexibility in dealing with customer demands.

Cuts inventory needs 45 percent The Wisconsin division of a leading food store chain once depended on an inventory system in which store managers entered stock needs in order books. These notations were translated to mark sense cards, and then converted to punched cards for input to a computer. The printout was used to fill and ship each store's order. The entire routine took three to four days.

To expedite the procedure, Teletype Model 33 ASR sets were installed in each store. Inventory tapes are now prepared on these sets and transmitted immediately to the company's computer center for further processing. Within 24 hours each store's inventory needs are filled. Also, backroom stock needs have been reduced by 45 percent. Consequently, the company plans to cut down this nonproducing storage space in future stores or utilize it for additional "front-line" display.

Eases costs of growing pains One of the midwest's largest distributors of ball and roller bearings faced a major problem resulting from a tremendous growth in business. The company's manual order processing and inventory procedure was taxed to the breaking point. Inventories skyrocketed in an attempt to keep enough stock on hand to assure prompt customer service.

To ease the problem, each of the company's branch offices was equipped with Teletype Model 35 ASR sets. Now orders are prepared on punched paper tape for immediate transmission to company headquarters. Here they are received in both paper tape and page copy form. The tape is converted to punched cards for order processing, and the page copy is used for inventory control. The new system has cut costs and assured management of control over the entire operation.

There are additional capabilities of Teletype equipment for improving all phases of management's business information needs. For instance, Telespeed 750 high-speed tape-to-tape equipment can send or receive an entire inventory of 7,000 items in minutes using only 1/3 of a tape reel. More facts on these capabilities are explained in our new brochure, "HOW TELETYPE EQUIPMENT MOVES DATA FOR YOUR BUSINESS OR INDUSTRY." For your copy, contact: Teletype Corporation, Dept. 81A, 5555 Touhy Avenue, Skokie, Illinois 60076.

This Teletype Model 35 ASR (Automatic Send-Receive) Set can edit order processing data, sending to each department only the data required to complete the order.

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machines that make data move

CIRCLE 46 ON READER CARD

chairman of the ad hoc board of directors. Robert C. Cheek, Westinghouse Tele-Computer Center, Pittsburgh, Pa., has been appointed chairman of the U.S. Committee for AIG by AFIPS,

The primary purpose of the group is to promote international exchange of information about data processing as applied to public and business administration. To this end, the IAG is putting out a bi-monthly bulletin with news of international activities, including reports on special projects of the group itself. It is also publishing a monthly journal of abstracts in English, French, and German of books and periodical articles in the group's area of interest. In addition, special technical reports are being produced and a quarterly technical journal is planned that will provide wide distribution of papers in English that were previously published in other languages.

Subscriptions to these publications are included in the IAG membership fee, which is $100 annually.

The two other main activities of the group are the study of systems, programs, standards, and procedures pertinent to adminstrative data processing and the training of teachers and students in this area, in conjunction with the IFIP Technical Committee for Education. These goals will be pursued by sponsoring surveys, symposia, and an international six-month seminar.

Participation in the IAG is open to individuals or organizations. Each of these in a given country will be known as a "partner," and they will comprise a national group or "member." Each member will select a delegate to attend a general conference meeting once a year, where a board of directors of not more than 11 will be elected.

So far, some 150 organizations have signed up—most of them in Western Europe. Early joiners in the U.S. are the Veterans Administration, the Westinghouse Tele-Computer Center (U.S. chairman Cheek's organization), the National Bureau of Standards computer center, Auerbach, and McKinsey & Co.

REINS ON COMPUTER-CATIONS DISCUSSED AT FJCC SESSION

The computer industry seems to have conceded that the FCC has the authority to decide if computer/communications services should be regulated—by the FCC, complained a UCLA law student at an FJCC panel session. Sharon Green took the floor several times at the "Information Service and Computer Utilities" session to pummel the industry for its lethargy in representing itself in government policy and legislation matters. She warned the group to remember the simple fact that the FCC is communication-oriented, has long worked with firms in this area, and does not know the computer field. Should there not be another agency formed to handle this problem? she asked. (Note: the FCC, in its inquiry announcement, said it would discuss whether it or another agency should handle regulation in the computer field if it should come about.)

In explaining why the FCC authority should be the first consideration in the inquiry, Miss Green pointed to the CATV issue, in which the FCC moved to regulate CATV systems. Now, after that long process, there are several cases before federal courts which challenge FCC's jurisdiction over CATV's. A researcher in copyright law and technology, Miss Green also complained that the computer industry did not see fit to represent itself in the copyright bill hearings and left it

to the presidential science advisor to recommend reopening of the hearings to discuss the question on computer input, storage, and output of copyrighted material. This kind of wait-and-see attitude could have serious detrimental effects on the industry, she implied. The audience met these comments with gusty applause, while the panel sat grinning, unable to rebut them.

Members of the panel, most of whom have appeared many times, many places on the same topic, outlined some of the policy questions and communications equipment problems. Manley Irwin, FCC consultant, noted the difficult tasks of defining: what is data processing and communications when the two operations are combined, what portions of these tasks should be considered under regulation (when is dp incidental to communications and vice versa), how to assign costs to such a facility and thus determine pricing, and how to cope with regulated and non-regulated firms producing the same product, such as I/O terminals.

Walter Simonson, CEIR, felt that the government should minimize regulation although some is necessary, rule out some restrictions now imposed by common carriers, and support competition in computer services. The common carrier should be required to provide service to all comers, including competitors (such as equipment manufacturers), and the burden of proof not to provide service should rest with the carrier. Today, the applicant who is refused service must go to the expense of proving why he should receive it. Simonson also noted that allowing foreign attachments on dial-up lines, recommended by the Common Carrier Bureau, is good for competition, and will not make a major dent in Bell's income. First, many customers aren't likely to abandon Bell equipment, and second, the income from this equipment to the firm is not significant overall. Another service that should not be regulated, he felt, is message switching (ITT has filed such a tariff, RCA has opposed it).

William Quirk of AT&T rose to "accentuate the positive." The main problem in serving computer users is to anticipate their needs. Forty modems are offered by the firm and 40 more are in the works. Shortly, a 203 data set for 3600 bps transmission will be out, as well as a 7200 bps private line voice grade set. But, he noted, equipment must be carefully phased in to keep costs down and avoid unnecessary duplication. (Panelist William Dobbs argued the industry can't wait for this phase-in.) AT&T is also gradually lowering long-distance rates, said Quirk. The notion of a digital network set up by a new common carrier, favored by many computerites, is ridiculous, he says. It would require a network the size of the present phone system.

Quirk also mentioned a significant departure in the company's policy—the phone companies will be buying computer equipment directly from the manufacturer, rather than through Western Electric. Dasa's Magicall system is being bought this way as well.

Jim Babcock, time-sharing entrepreneur and AT&T's favorite baiter, emphasized that the problem is not long-distance rates, but the high 40-50 mile transmission costs. Another snafu is interfacing; in his IBM installation, finding that the IBM multiplexer does not recognize dial-up lines, Babcock asked AT&T to develop a dataphone and was turned down. He ended up building his own interface. Babcock also complained that the standard teletype can't be attached to a computer, but was told during this session that it could be. It seems that the information had not filtered down from the parent company to the local phone company to the user—the traditional communications problem.

BRADBURY DISCUSSES "UNTHINKING MEN" AT FJCC

In a brief but memorable address before the FJCC luncheon, writer Ray Bradbury declared that the computer age is esthetically bankrupt and called upon members of the affluent computer industry to encourage greater involvement of artists and writers. Bradbury spoke for about 40 minutes on "Unthinking Man and His Thinking Machines," interlacing pointed criticism with ample wit and poetic insight to draw resounding applause from the capacity crowd at the Disneyland Hotel.

He said that the computer elite are today's Renaissance Princes, technocratic heirs apparent who should be commissioning great works of art as metaphors of identity. "Artists need your support," he told conference attendees. "And you need writers, sculptors, and painters to tell you who you are."

"Remembering our root system is not easy," said Bradbury. "It's difficult for all of us to remember that history really happened, that Caesar and Hitler did what they did and are not just creations of historians."

It's now possible for the first time, he said, to have a museum of history, using robots programmed to re-enact historical roles. It's now possible to

"We've completed the preliminary tests on your new tape drive."

walk around an idea, to see a thought in three dimensions, moving and interacting with us.

"You are the machine makers. You can make machines all that man is not."

Bradbury's critique was well leavened with self-effacing humor and anecdotes from his own life and work. Few of his many fans in the audience would have questioned his credentials as space-age writer in residence. But it was Bradbury himself who reminded them that he could neither drive a car nor fly a plane.

Bradbury says that he has always lived at the height of emotion, "seized the smallest fact that excited me."

Like Melville, Bradbury is fascinated by the symbolic forces in conflict throughout the novel *Moby Dick,* which he wrote for the screen in the late Fifties. The shape of the destructive white whale, he said, is the same shape as Capt. Nemo's idealized submarine and the rocket which will take us to the moon. Contrasting the anarchy in the universe represented by Moby Dick, he feels the latter two examples assert the triumph of human rationality over physical energies.

After observing the machine advances of third generation technology, Bradbury was asked: "Aren't they great? Aren't they wonderful?"

"No," replied the author. "It is you who are great. You are wonderful."

Underlying all that Bradbury said was the firm conviction that thinking machines cannot realize the goals of cybernation devoid of human values. Boiled down to essentials, what Bradbury seemed to be saying at the luncheon conference is simply this: the same esthetic ideals which give meaning to history are also necessary to circuit designers, programmers and systems analysts.

NEW FORTRAN BULLETIN STARTED BY SIGPLAN

A new publication, the *Fortran Information Bulletin,* will be published by ACM's Special Interest Group on Programming Languages (SIGPLAN), and, according to chairman Chris Shaw of SDC will be distributed as an occasional supplement to SIGPLAN *Notices,* the group's monthly newsletter. (An informal publication, *Notices* contains an index to current articles on programming languages, and provides a casual forum for the exchange of ideas.)

Editor of the *Fortran Information Bulletin* will be Professor Hellmut Golde of the Dept. of Electrical Engineering, Univ. of Washington, Seattle. Professor Golde, author of a textbook on FORTRAN, has requested contributions for the Bulletin on applications, details of all FORTRAN implementations, suggestions for language improvements, information on compilers and problems in programming. Similar bulletins on ALGOL, PL/I, SNOBOL, NELIAC, JOVIAL and Decision Tables are currently distributed to SIGPLAN members.

Membership is open to ACM members at $6 a year, and non-members for $7 a year. Applications may be obtained from ACM, 211 E. 43rd St., New York, N.Y. 10017.

● A Milgo DPS-6 digital plotting system has been installed by Waddell and Reed Inc., a Kansas City, Mo., mutual fund investment firm. Used with two 360 computers, they're producing graphs of comparative financial data on more than 600 companies, plus information on a number of basic industries. The graphs show stock trends and performance by company and by industry, along with relative earnings and price-earnings ratios.

● California has established a group to "control and coordinate the state's massive and extensive automatic data processing operations." And then, instead of getting it to report to the governor, they stuck it under the Business and Transportation Agency. The new Office of Management Services is headed by Charles P. Smith, formerly with System Development Corp., Santa Monica. A political appointee, Smith will be backed up by long-time civil servant Perry Stauffer, who had been director of automation for the Dept. of Motor Vehicles since '64. The state's annual expenditures for data processing—hardware, sites and personnel, the whole bit—is reportedly $45 million.

● Two scientists at Caltech's Jet Propulsion Lab have succeeded in recording bits with a diameter of less than one micron, which reportedly can lead to a storage density of 10 million bits per square inch. A micron is 40 millionths of an inch. The writing is done with a pulsed ruby laser whose beam is focussed on a magnetic film through a microscope. The film, only 700 angstroms thick—and 3/100,000ths of an inch—is produced under vacuum, with manganese and bismuth evaporated in that order onto a mica base. The thin films are called managanese bismuthide. The developers, Drs. Dimiter I. Tchernev and George V. Lewicki, are working under a NASA contract that provides $175K a year.

● University Computing Co. held dedication ceremonies in December for its new World Headquarters, Building in Dallas. The eight-story, $2 million center will serve as the administrative center for all the varied UCC activities and will house a Univac 1108 for the computer center plus a Honeywell 200 and 120 for the Data-Link center. The company expects to invest $100 million in the next three years for development of its international computer utility network.

● Bell Laboratories has announced development of a new alloy for permanent magnets that can be made into complex shapes, fine wire, or tape and used in computer memories. The alloy is made up of 82% cobalt, 12% iron, and 6% gold. It has a magnetic flux density of 18,000 gauss and a square hysteresis loop. The gold allows coercive force to be controlled by heat treatment during production to any value within the range of 10 to 20 oersteds. The alloy is being used in Bell's Electronic Switching System as a permanent magnet memory device and for this purpose is rolled to a thickness half one-thousandth inch. Details of the alloy were reported by E. A. Nesbitt, G. Y. Chin, and D. Jaffe at the International Congress on Magnetism.

● The Internal Revenue Service has reported that over 400 business firms used magnetic tape, rather than paper, in furnishing 1966 income reports. IRS prefers mag tape reporting because it is easier to match the reported payments with amounts appearing on individual returns; it also reduces handling costs. Tape reporting may be used with the W-2 form for wages and withholding, 1099 for interest and dividends, and 1087 for the payments of interest and dividends. Further information appears in Revenue Procedure 67-31, available at IRS service centers and district offices.

● Credit Bureau Services of Dallas, Texas, with 600,000 individual records is the first company to have an IBM CB/360 credit reporting system in operation. Using a 65K 360/30 with two disc packs, four tape sections and 48 terminals, the system was installed with the aid of the Associated Credit Bureaus of America, whose ultimate aim is to make possible a rapid and uniform national credit-reporting system. The system can permit Credit Bureau Services to log up to 10,000 inquiries a day; responses come between one and two seconds after a query. The Dallas company has over 40 branches in Texas, Arkansas, Louisiana, Florida and Missouri.

● A new tariff, which became effective the first of this month, has caused a cost reduction of $1,500 a month in voice grade communications channels between New York and points in England, France, Spain and Germany. The new rate, $6,500 a month for leased channels, was proposed by ITT Worldcom, a subsidiary of ITT Corp.

● Honeywell will build a plant in West Germany at Heppenheim to manufacture Series 200 machines. Construction of the initial 43,000-foot unit will begin early next year and should be completed by the end of 1968, when about 300 people will be employed. This will be the second computer plant for Honeywell in Europe: the other is at Newhouse,

news briefs

Scotland. Board chairman James H. Binger said the location choice was in recognition of the fact that Germany is now the largest market for computer products in Europe.

shortlines . . .

The Universidad Mayor de San Marcos, Lima, Peru, has purchased an IBM 1130 computer to initiate its computer center activities. This will be the fourth Peruvian university actively engaged in computing . . . Wyle Laboratories has been chosen by Computicket Corp., a subsidiary of Computer Sciences Corp., to produce the terminals for Computicket's entertainment reservation and ticket system. The $3.3 million contract calls for delivery of the units to meet Computicket's date of spring, 1968, for beginning operations in the Los Angeles area . . . A two-color (red and green) capability has been added to the GE Datanet 760 CRT terminal, formerly a black-and-white monitor . . . A conversational system that will allow 12-15 terminals to engage in FORTRAN editing, debugging and execution is being developed as a proprietary program by Honig Time Sharing Assoc., Hartsdale, N.Y. Called FORCE-3, the system will occupy a partition under OS on a 360/50 or larger computer . . . Psychologists at Indiana Univ. (Bloomington) are researching how humans learn, using an IBM 1800, six on-line CRT's and closed circuit television. Major investigation is into memory and concept formation. Also investigated is how humans organize and categorize information. The experiments in concept formation are expected to lead to better understanding of the decision-making process . . . At Oklahoma State Univ. (Stillwater) artificial intelligence research turns to teaching oral sounds to a computer in the quest of machines responding to voice commands. A possible application of such machines could be an astronaut's use of a small control unit attached to his suit which could understand some space terms such as "yaw," "pitch," "roll," and "stop." While floating in space the astronaut's voice commands would produce the required motion until he said, "stop." Another possible application might be a rescue machine which could be sent to inaccessible areas (forests, mountains) to bring out downed pilots or lost hunters . . . Syracuse Univ. is experimenting with on-line retrieval of library information as visual CRT output rather than printout. ■

A MILESTONE IN THE DEVELOPMENT OF COMPUTERS!

For: Programmers, Analysts and Users involved in the Interaction between Data Processing and Graphical Displays
with an introduction by **Walter F. Bauer**
President informatics inc.

The contents of this book represent a milestone in the development of computers; an important measure of success in releasing the computer from an aura of mysticism where a few specialists were knowledgable, to a realm of great usefulness of the computer by professionals of a wide variety of disciplines and, eventually, the lay public in our ever-increasing automated society.

The subject matter here includes not only apparent factors such as quality of output, reliability of machines and operation techniques, but also comprehensive and complex programming systems which relate to those factors and implement the entire process.

This publication covers a wide variety of applications. The subjects range from the simple presentation of information on a CRT to the development of programming and techniques for the production of contour maps. The activities involved, likewise are broad in scope – from the computer-aided editing of natural languages to the design and specification of automobiles and their component parts. The economics involved here are also wide in scope – from the direct recording of data by relatively unsophisticated printing devices to the techniques in typography for newspapers and for motion picture animation.

Graphic data processing or the synthesis of computers and the graphic arts can be called the "welcomed revolution". This book keeps the reader abreast of the changes.

292 pages, illus. $12.00

TWO OTHER, TIMELY WORKS FOR ALL CONCERNED WITH INFORMATION RETRIEVAL

INFORMATION RETRIEVAL AMONG EXAMINING PATENT OFFICES

ICIREPAT Fifth Annual Meeting
Edited by **Harold Pfeffer**, U.S. Patent Office
736 pages, illus. $30.00

Contains the proceedings of the Fifth Annual Meeting of the Committee for International Cooperation in Information Retrieval Among Examing Patent Offices (ICIREPAT), held in London, England. *It examines the changes that the patent systems of the world today face in order to keep pace with modern technology* – from the viewpoint that the patent system is a combination of the law, on one hand, and science and technology on the other. By means of progress reports the activities of the past year by eight Patent Offices in different countries are evaluated. Systems that were tested and either accepted or rejected are presented for the benefit of all.

The discussions that follow the reports open new doors to greater mutual understanding and closer international cooperation between Patent Offices in the fields of classification and information retrieval. Seven technical sessions relate pertinent information in areas ranging from the early development stages of a mechanical retrieval system to more sophisticated study relating to patent office operations.

Other topics of comprehensive coverage include: • Non-Conventional Retrieval Systems • Catagorized Term Systems • Coordinate Term Systems • Experimental File • Comprehensive Term Systems • Shared Development • Analog-Digital Converters • Electronic Computers.

These, and related information are contained in this significant work by the leading international information retrieval authorities.

INFORMATION RETRIEVAL — A Critical View

Edited by **George Schecter**, Frankford Arsenal, U.S. Army
272 pages, illus. $11.00

The symposium, co-sponsored by the Special Interest Group on Information Retrieval (Association for Computing Machinery, as well as groups representing Institute of Electronics and Electrical Engineers, American Documentation Institute, the Moore School of Electrical Engineering of the University of Pennsylvania and the U.S. Army) indicates the scope of this symposium. *The work represents "must" reading for all concerned with any ramification of information retrieval.*

Contents include: Information System Networks-Let's Profit from What We Know: The BOLD System; Associations and Thesaurus-Implicit Relationships; The Design and Testing of a Fully Automatic Indexing-Searching System for Documents Consisting of Expository Text; The TIP Retrieval System at MIT; A List-Structured Chemical Information Retrieval System; Performance of IR Systems; Psychology and Information Retrieval; User Appraisal of an Information System and Services through a Program of Joint Applied Research; A Generalized Language for Information Storage and Retrieval Applications; Getting it out of Our System; Relational Data File I: Designed Philosophy; Relational Data File II: Implementation; The SOLAR SYSTEM I: A General Method for Organizing and Searching Files.

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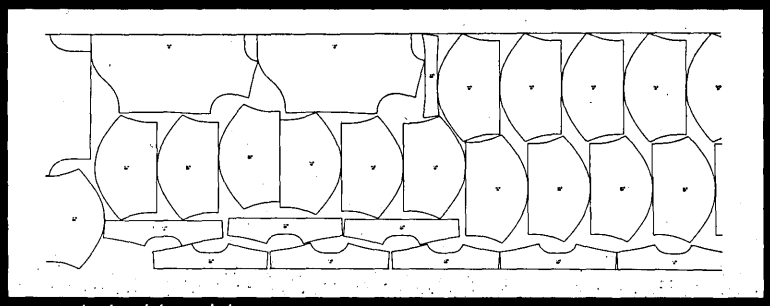

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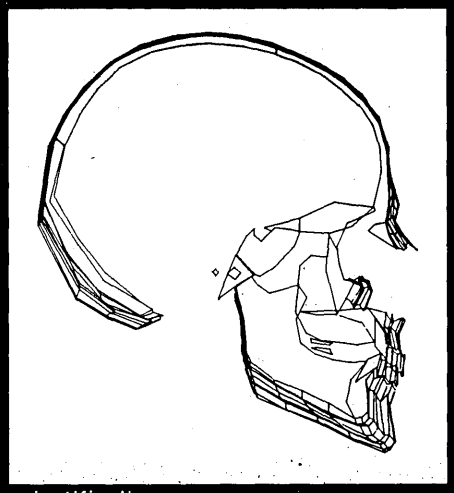

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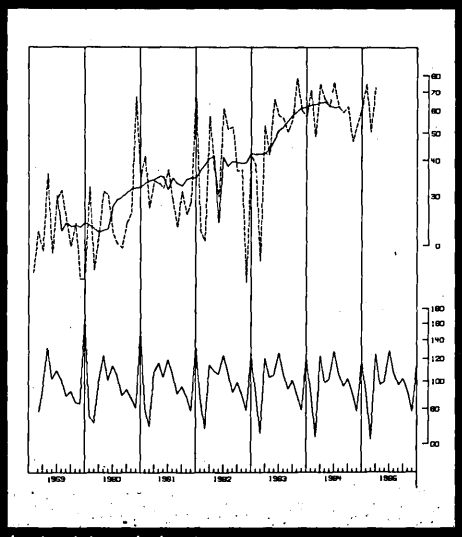

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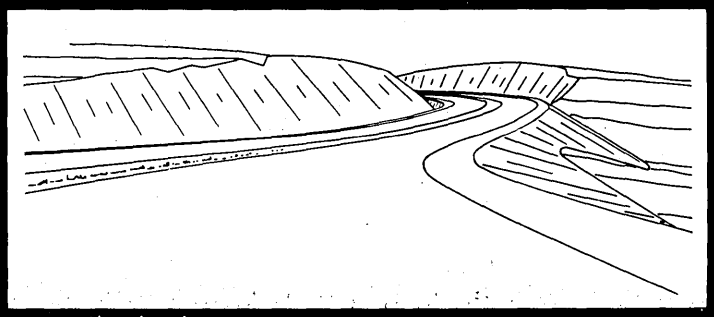

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CIRCLE 52 ON READER CARD

world report

PHILIPS NEARLY READY TO ENTER GP COMPUTER MARKET

The president of Philips Industries, the giant Dutch electronics and communications group, has said that the company opens its new computer department next June. Starting at the small to medium end of the business, Fritz J. Philips expects his firm to be making money out of computers within the first five-year plan. But in this highly competitive market he says that Philips will look for a partner. Talks are known to have taken place with UK manufacturers and an agreement with a reorganized British industry may be worked out later this year. With six months to go, the Dutch group is reluctant to reveal details of its new systems, but the first three machines labelled 1100, 1200 and 1400 are expected off the shelf as direct eight-bit-byte competition for IBM.

The first 50 Philips machines have been earmarked for its in-house dp centres. Software has been contracted out to the Computer Sciences offices in Brussels — in which Philips has a 25% stake. Computer Sciences has also opened a new office in London. Over the past three years the Dutch firm has been spending about $10 million annually in its build-up for the assault. A new factory at Apeldoorn will take on R&D and production for Philips Computer Industries. Sales outlets have been gradually bought up in the same period to establish a market base in the office equipment and dp field. Apart from the present developments, Philips has a stake in computers through a small company, Electrologica, which makes small scientific systems, and through communications groups which have a major slice of the wired-program machines used by communication authorities for message switching exchanges.

ICT CONFIRMS TALK OF UK GROUPING

Disclosing the company's performance for the financial year ending September, Colonel Maxwell, chairman of ICT, confirmed that discussions were in progress between the government, English Electric Computers and ICT for the concentration of the industry into a viable group under the umbrella of a British Computer Corp. Final terms of the plan may take a little while. Likely deal is a grouping with ICT as major stockholder, followed by a 25% equity taken by the government and a sizeable share for English Electric.

Earlier suggestions that English Electric should take over ICT seem to have faded in the light of economic studies made by English of its profit potential by the early '70's. Pooling the resources of the two companies brings a headache in that ICT is a committed six-bit design house at present with its 1900 series (with the 1000th order for the 1900 clinched by the year's end); English Electric makes a range under license from RCA. However, RCA is looked on with favour by the Ministry of Technology, which has fathered regrouping plans, and Sarnoff's men would be welcome participants in the new

(Continued on page 95)

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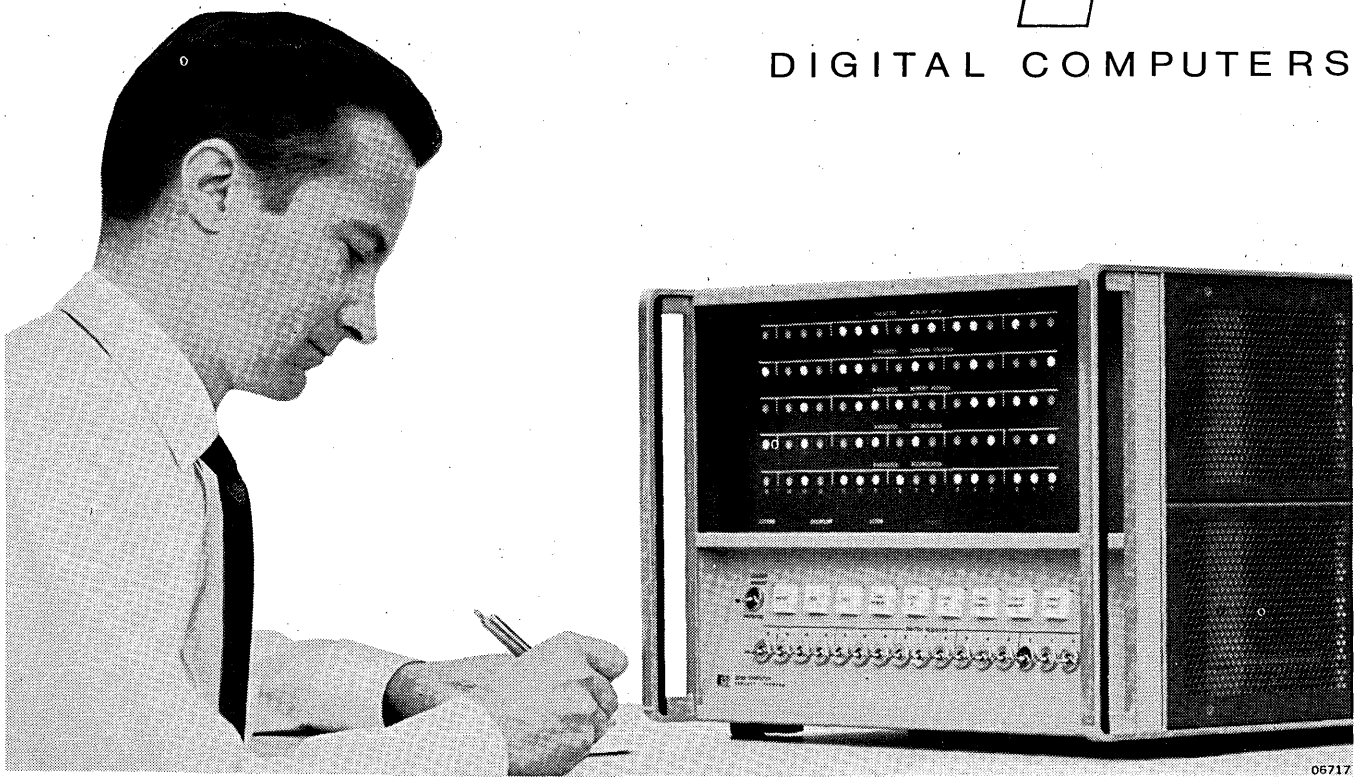
DIGITAL COMPUTERS



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CIRCLE 53 ON READER CARD

corporation. Joint English Electric and ICT teams are reported to have had discussions with RCA. Designs have factored out of RCA into the UK on two particular occasions when the British industry has been close to coming to its knees, and in spite of claims of independence, the UK manufacturers recognise the help.

Concentration of the UK manufacturing industry would come at a time when the balance of power in the market has shifted dramatically. On the on-order position, IBM is reported to have less than 30% of the business. ICT is number one with its 1900 and Burroughs could well have gained the second place by the end of '68. Burroughs is tipped to get yet another B8500 contract out of the British banks. Orders from Barclays and National Provincial for 8500's and Midland for peripherals have brought the firm near $50 million. Midland is expected to be a third candidate for the big processor.

NEW MESSAGE-SWITCHING SYSTEM FOUNDERS

The introduction of a new computer-based message-switching system for Britain's GPO in November has brought a train of woe for its operators. The $2.5 million installation is a hardware programmed device that takes telegrams into core and routes them automatically, holds them on mag tape if a transmission circuit is unavailable, or brings the message down to an operator position for manual checking if the telegraphic address is invalid in format.

The system is a sensitive installation in that it handles more than half of the telegrams leaving the UK and also acts as a forwarding centre for telegrams that are routed onto international circuits from other European countries. In its first month of operation, many complaints were received from business houses that were seeking information about messages that failed to reach destinations. Most infuriated calls came when businessmen in Australia failed to get notification from their London offices of details on devaluation of sterling. At least 1200 telegrams were reported to have been lost somewhere in transmission.

THE BUYING PROBLEM GETS MORE ATTENTION

In a hard-hitting piece to senior management, Tom Ward of Littlewoods Mail Order has proposed a new structure for buying computers. In the current issue of a special journal, Management Decision, he has proposed that management should go and look for a policy and not a machine. Consultants, he suggests, should be used for that purpose (if any) because most of them have not lived with computers long enough to be able to make a machine selection, any more than senior management. Coming from the head of management services for one of the UK's biggest and longest computer users, Ward's criticisms may stir consciences in more than one manufacturing house. Particularly as he cites instances of manufacturers' bids for machine systems which varied by factors of 2:1 in price, and even more in specifications — bearing little signs of serious consideration for the terms of the tender. Although he did not say as much, the examples have a hallmark of personal experience. He suggests that management excused themselves from learning about computers in the early days because machines were too technical. They now make the excuse that advances in development have made programming more comprehensible, and therefore easy to deal with.

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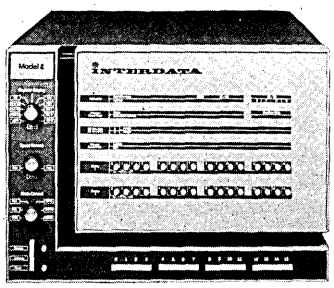

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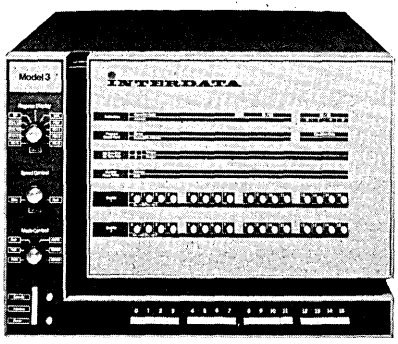

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- FORTRAN
- Hardware multiply, divide, and block input/output
- High speed memory access channels
- 4,096 to 65,536 byte memory
- 3.9 μs add time
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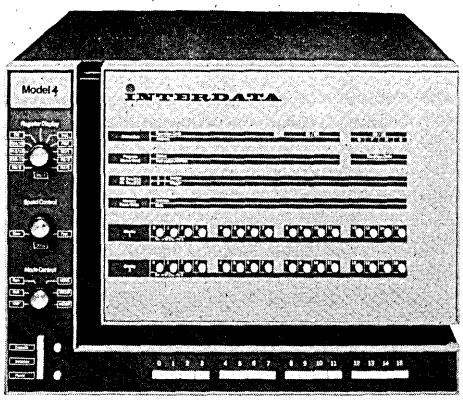

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washington report

BROOKS PUSHES FOR LANGUAGE CRITERIA

Cong. Jack Brooks wants dp standards developed faster. He also believes that if all government-owned software were inventoried, it would eliminate unnecessary programming and reduce future software costs. Brooks contends that widespread adoption of PL/I will increase present incompatibility problems by an order of magnitude. The answer, he says, is to "have the best minds in the data processing community" put their heads together and develop objective criteria describing the optimum language for the next generation.

These proposals were put into a letter Brooks addressed to BOB director Charles Schultze on Dec. 5. One likely result of the letter is that USASI will set up an industry-wide standards research effort, financed by companies and users directly involved. This approach, now being actively promoted by the government, is aimed at revealing intramural disagreements earlier and, hopefully, resolving them sooner, than is possible now.

When Brooks talks about convening the best minds to develop program language criteria, "he assumes a higher level of devotion than actually exists," says a knowledgeable source. Brooks probably will have to settle for an in-house government group, supplemented by an industry-user advisory committee.

The fruit of their labor is likely to be several sets of criteria, each related to a different family of applications. If these criteria generate one language, says our source, it is almost certain to be similarly fragmented into subsets.

WESTERN UNION GETS SET FOR COMPUTER UTILITY INQUIRY

Western Union's general solicitor W. E. Seward laid out his company's basic position in the upcoming computer utility inquiry recently when he argued that a computerized message switching system leased to the 3M company doesn't have to be covered by a tariff. Unregulated firms are offering similar systems, said Seward; it is unfair to regulate only one supplier.

Data processing people participating in the inquiry probably will argue that, with or without tariff, the service WU provides the 3M Co. is illegal because it involves dp as well as communications facilities. This is the basic argument used by Scantlin Electronics and Bunker-Ramo a few months ago when they opposed WU's proposed SICOM tariff — a computerized message store-and-forward service for stockbrokers.

Since then, WU has raised the stakes by filing two more tariffs. One involves the long-heralded INFOCOM service, the other expands TCCS (Telex Computer Communications Service). Their effect would be to make computerized store-and-forward service available to just about any user of public or private data transmission circuits. SICOM, INFOCOM and the TCCS expansion are currently awaiting FCC's final verdict. Protagonists in the computer utility inquiry have until Feb. 5 to file their position papers. Hearings probably will begin a month or two later.

CAPITOL BRIEFS

GSA service centers in New York City and Washington, D.C., with GE 225's being used part-time by GSA, are planned...Although Congress appropriated $10 million for the Brooks Bill revolving fund, BOB has ordered that only $2.5 million be spent in fiscal '68; another $2.5 million can be obligated.

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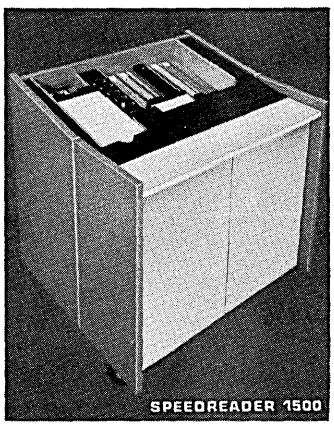

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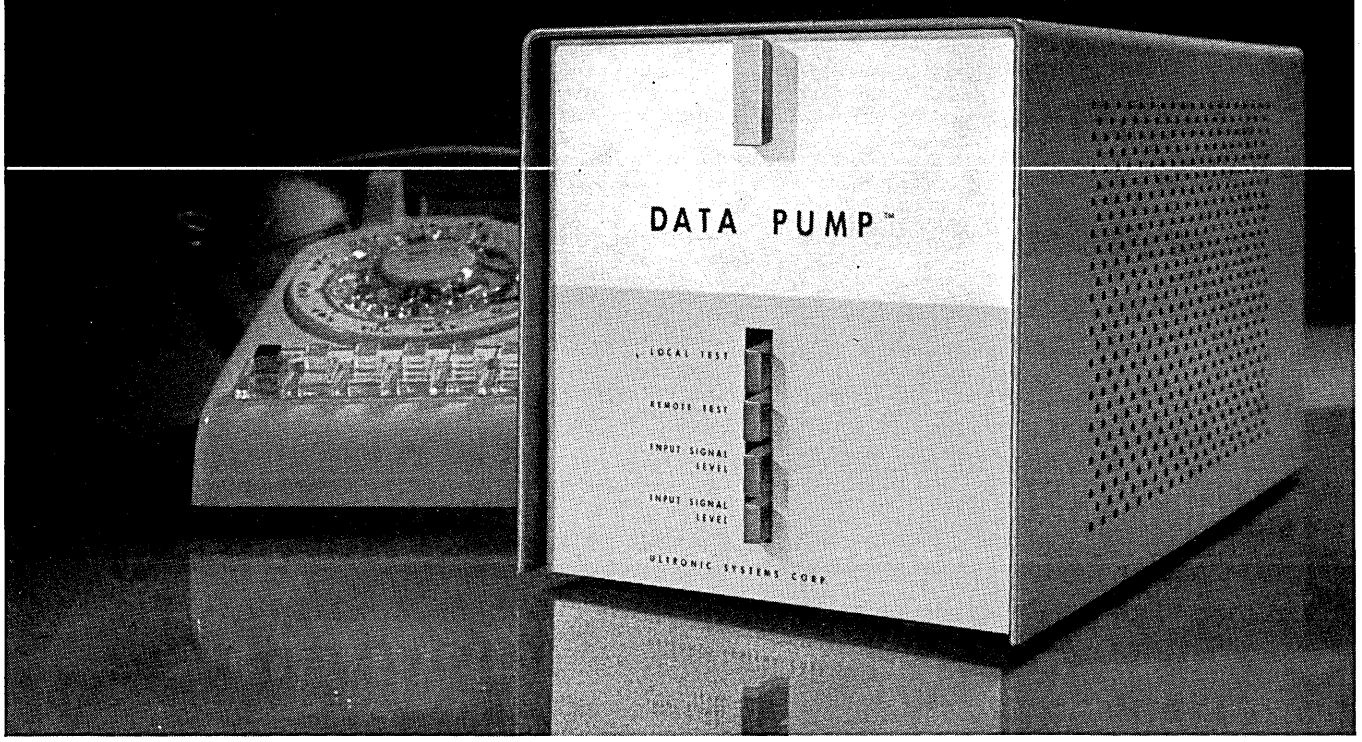

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We actually don't know *all* the advantages of COGENT yet. Every time we run it a new value is discovered. In brief, it's a simplified high-level shorthand that generates COBOL source programs which fit perfectly with System/360 operating systems (OS and DOS). And you don't have to scrap everything you've already done in another language. Not only that, it releases programmers from the dreary time-consuming job of maintaining files, cutting programming costs and lead time significantly.

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CIRCLE 57 ON READER CARD

new products

payroll system

GENPAY (Generalized Payroll) is a programming application package now being released to users of the series 200 computers. The minimum configuration required for the package of 13 programs is a 16K memory with four mag tape units, and standard peripherals. GENPAY provides for five types of payment (cash, one-check, bonus, regular payroll, and "restaurant"—meals and tips deducted), and affords spaces for up to 10 voluntary deductions including four tax options for the employer. The reports summarize the total payroll and give departmental breakdowns, journals, earnings statements and time sheets. The program is free to 200 users. HONEYWELL EDP, Weliesley Hills, Mass. For information:

CIRCLE 130 ON READER CARD

graphic terminal

The 960/10 graphic display system features a 22-stroke cursive character generator, constant velocity vector generator (500K inches/second), high-speed write-through-yoke techniques, and advanced display timing circuitry. The system provides up to 128 characters, including the standard USASCII 96-character set. The 14 x 14-inch display area has 1024 x 1024 addressable locations. Write time varies; for characters ⅛-inch high, writing speed is 135 nsec/stroke. Character size is up to a half-inch. Vectors such as solid lines, dashes, dots or dash-dot combination are available, all with eight programmable brightness levels. A major option is the interface between the CRT and any "modern high-speed computer." SANDERS ASSOC., Nashua, N.H. For information:

CIRCLE 131 ON READER CARD

file management software

GENCO is a program generator that accepts input statements written in shorthand-like form and transforms them into a modular COBOL file maintenance program. The program operates on a 128K System/360, although the COBOL file maintenance programs produced can be compiled on a 32K 360. Standard on GENCO is a data processing priority feature which allows the user to add, change or delete records or data fields at will. Options include sub-record codes permitting up to nine different input transactions against a single master file record, a master delete option and a control transaction option. SOFTWARE RESOURCES CORP., Los Angeles, Calif. For information:

CIRCLE 132 ON READER CARD

tape transport

The TM-16 tape transport, interchangeable with IBM 729 and 2400 transports, offers straight line tape loading, semi-automatic threading, and phase encoding, so that packing density can be doubled from 800 to 1600 bpi. Speeds are 75 ips for the model corresponding with the 729, and 112½ ips for the 2400 replacement. AMPEX CORP., Redwood City, Calif. For information:

CIRCLE 133 ON READER CARD

line printer

The 512 line printer is for use with CDC 3000 and 6000 computer systems. Type cartridges are available in a variety of fonts; speeds depend on the size of font used. A 48-character font has speeds of 1200 lines per minute; faster speeds are possible with a smaller font (up to 1500 lpm). The unit can reach a speed of 70 ips in less than two lines, and come to a complete stop from that speed in less than two lines. Standard features include a direct-reading forms alignment scale, line spacing of six or eight lines per inch, and a 12-channel photoelectric tape reader for vertical format control. CONTROL DATA CORP., Minneapolis, Minn. For information:

CIRCLE 134 ON READER CARD

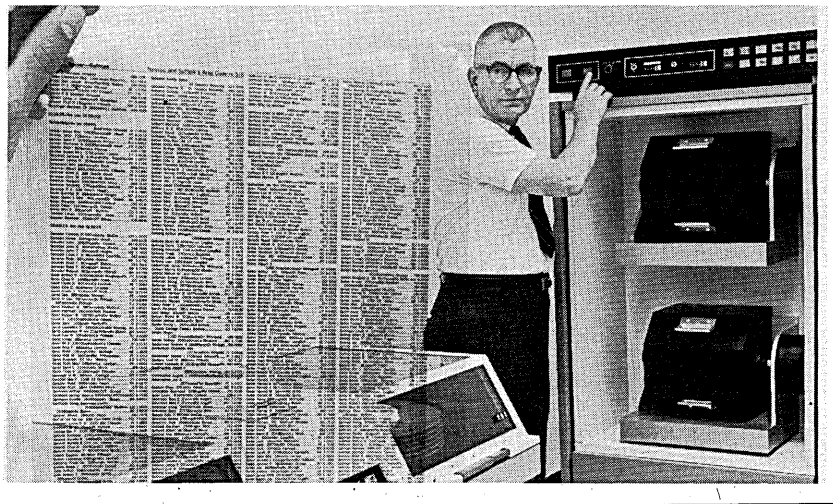
PRODUCT OF THE MONTH

The long-heralded typesetting system from Alphanumeric Inc., Lake Success, N.Y., has made its debut as the model 2680 CRT printer, for use with a 360/30, 40, or 50 computer. It produces graphic-quality type (800 strokes per inch) at up to 6,000 cps—depending on type style and size, font mix, and the control computer used—and proof-quality text (200 strokes/inch) at up to 10,000 cps.

Copy can be fed to the printer through any 360 input device. The computer formats and justifies the copy, automatically hyphenating words at ends of lines. It then transmits the text to the CRT, where it photographically exposes a moving roll of film or paper. The film, 9.4 inches wide and up to 800 feet long, is housed in a cartridge; it must then be removed, developed and used to prepare printing plates. There are 250 fonts of 50 type faces in sizes up to 18 points, which can be set in column widths up to 50 picas. The printer is being built to IBM specs by Alphanumeric.

The 2680 will rent for $8,600/month, and sells for $387K. Initial shipments are scheduled for the first quarter of 1969. IBM DP DIV., White Plains, N.Y. For information:

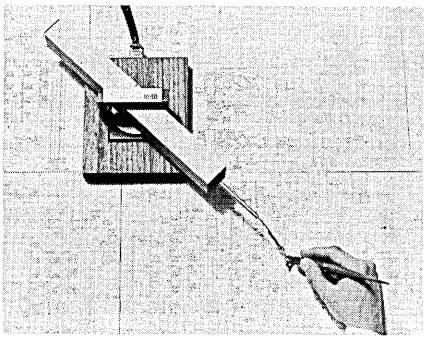
CIRCLE 135 ON READER CARD



new products

graphic input translator

The Model 20 GRAFATRAN is an input device for translating graphic information contained on large formats into analog voltages, and consists of a writing stylus and radial and azimuth film potentiometers mounted on a gimbal assembly. The radial potentiometer has a travel of 10"; the



rotary azimuth potentiometer can measure up to 100°. The stylus is attached to the shaft of the radial potentiometer with an anti-parallax coupling. An optional version of the model 20 is available with sine/cosine potentiometers in the azimuth axis. BOLT BERANEK & NEWMAN, DATA EQUIPMENT DIV., Santa Ana, Calif. For information:

CIRCLE 136 ON READER CARD

portable terminal

The model 2 Dataport terminal is a stand-alone coupler available with either an acoustic or magnetic capability. The coupler can interface to any Teletype, IBM 1050, 2740 or 2741 through a standard telephone to a computer. Like the previously announced model 1, the model 2 has a mod 33 Teletype which operates at a speed of 10 cps and has the standard character set. Delivery is on a 30-day schedule. HONIG TIME SHARING ASSOC. INC., Hartsdale, N.Y. For information:

CIRCLE 137 ON READER CARD

tape transport

The 4800 series tape transport is plug-interchangeable to the IBM 2401 tape transports for the System/360 computers. Interface circuitry, programs and tape loading are identical: no main frame modification is required. The series is available in a complete line of replacements for the 2401 models 2 through 6. Conversion kits are available to transform the 4800's from 7- to 9-track, and from 800 to 1600 bpi capability. According to the manufacturers, the advantage

is economic: with a purchase or lease plan including service cost, they claim a user could save nearly $500K over a 5-year period. MIDWESTERN INSTRUMENTS, Tulsa, Okla. For information:

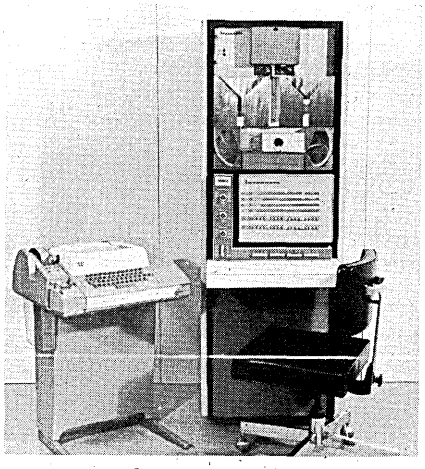
CIRCLE 138 ON READER CARD

logic controller

The model 2 is a 1K-2K-byte system designed as a special purpose programmable logic controller. The integrated-circuit unit has a 3 usec cycle time, 45 usec add time, and an I/O transfer rate of 5K bytes/second. Each of 16 general registers has a 16-bit halfword used as accumulators or index registers and a 32-bit program status word with condition code. Over 70 instructions are standard, as is an integrated priority interrupt system for up to 256 devices. The instruction set can be replaced by a plug-in, user-specified program. CPU and 1K-memory cost is $4,700.

The model 4 is faster than the model 3 and is the first of the Interdata systems to offer a hardware floating point option. The 4 has a 1.5 usec cycle time (1.8 for mod 3) and 4-64K bytes of memory (as does the 3). Add time is 3.9 usec with a 8-bit byte transfer rate of 20K bytes/second. Like the model 3, it offers options for hardware multiply/divide, hardware block transfer, and high speed memory access. Standard is a 77-instruction set. The priority interrupt system handles 256 devices.

Standard peripherals and system modules can be interfaced with all



systems without special adapters. All include a software package of debug and editor programs, math library, I/O routines. Mod 3 and 4 have FORTRAN and assembler. The basic 4K model 4 with floating point is under $25K. INTERDATA, Oceanport, N.J. For information:

CIRCLE 139 ON READER CARD

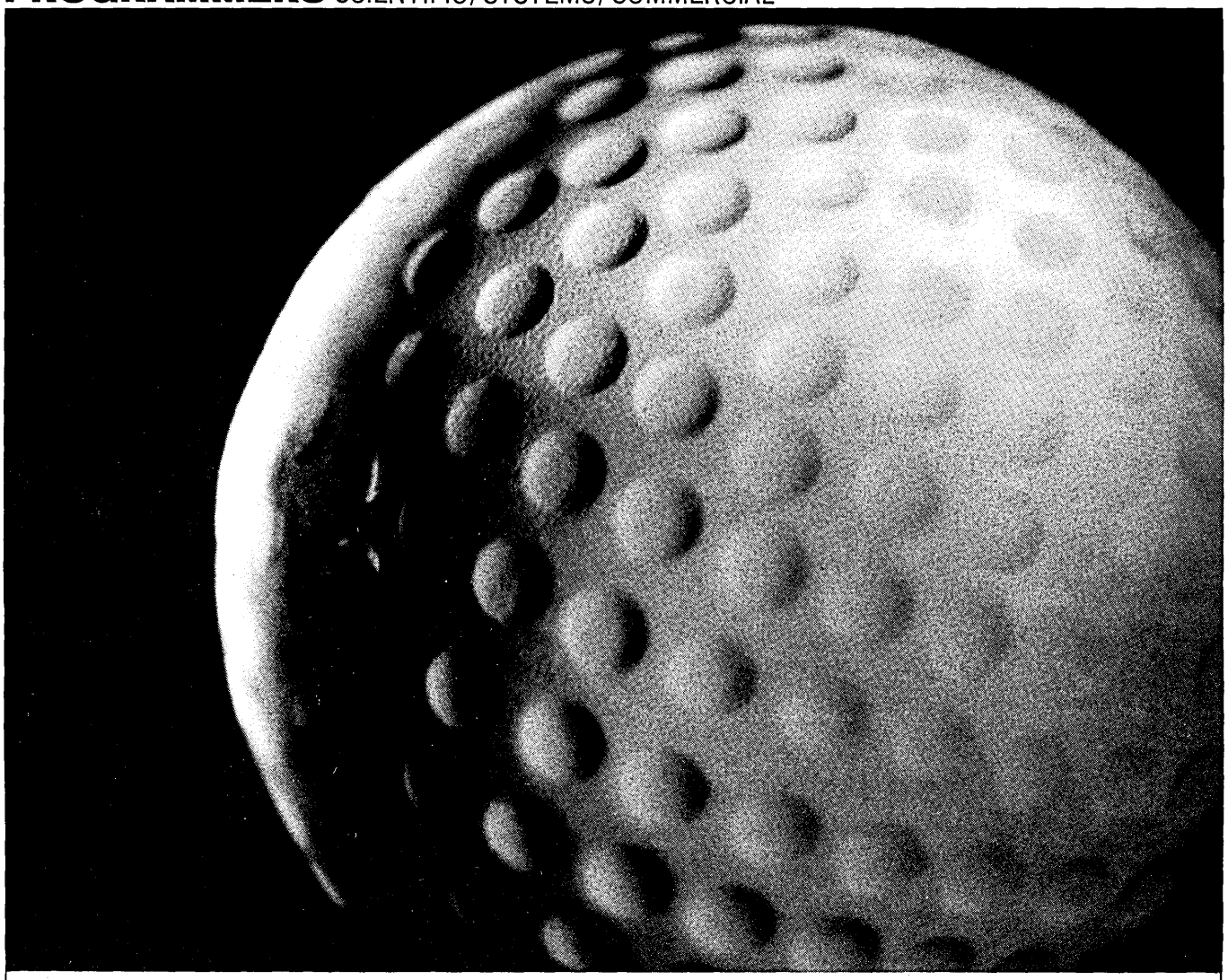
plotting software

GEORGE and DRASTC are FORTRAN subroutines that enable the production of a tape for a tape unit that controls a CalComp 566 digital incremental plotter. GEORGE checks, supplies or calculates graph dimensions, and then calls DRASTC to draw, scale, tic-mark, and number the axes. GEORGE also labels the axes, titles the graph and plots the data array. Subroutines are programmed for an IBM 7094; they can be modified to operate with any system. COSMIC COMPUTER CENTER, Univ. of Georgia, Athens, Ga. For information:

CIRCLE 140 ON READER CARD

information retrieval

File-Master is a proprietary information retrieval system currently operational on the CDC 3600/6600, GE 235 and 625/35, IBM 360, Univac 1107/08, and the SDS 930/9300. The gp file processor is available with business subprocessors, auditing and statistical subprocessors, project management routines, and a public administration subsystem. Whenever mag tape files are processed or generated, multi-file reels and multi-reel files reportedly are handled irrespective of the operating system; appro-



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ITT service

priate labeling is provided and length of I/O records is adjusted by parameter cards. It is said to provide flexibility in data formats and free assignment of descriptive names, headers and/or codes for documentation. The system is available on a lease or purchase basis. DRES INC., Los Angeles, Calif. For information:

CIRCLE 141 ON READER CARD

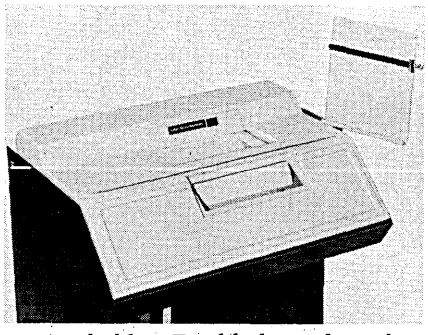
terminal multiplexer

The TM 113 transmission control unit multiplexes remote Teletype or IBM 2741/1050 terminals in any combination of models or speeds to an IBM 1130 computer, which can be in a stand-alone configuration, acting as a message switcher or as a line concentrator. With the TM 113, up to 15 start-stop, half-duplex lines can be operated simultaneously, and all transmission is overlapped with 1130 I/O and program execution. A keying option eliminates datasets for operation up to a mile; for greater distances or for operation over common carrier lines, interface is with any serial by bit RS 232B dataset. The software reportedly causes less than 10% throughput degradation and, depending on the number of terminal types and buffer sizes, occupies between 1,500 and 2,000 words of core. WESTERN TELEMATIC INC., Arcadia, Calif. For information:

CIRCLE 142 ON READER CARD

teletype silencer

The 800 series acoustical cabinet provides noise absorption, permitting location of mod 32 or 33 Teletypes without regard to noise and its effect on nearby personnel. Features include acoustical interior, copyholder and di-



rectory holder. Double-hinged top has view areas, slot for forms exit, and allows unrestricted keyboard and platen access. GATES ACOUSTINET, INC., Santa Rosa, Calif. For information:

CIRCLE 143 ON READER CARD

programming system

Cogent II is a semi-automatic programming system that includes a file management system, report generator, data description generator and a shorthand programming language that generates source programs in COBOL. The system operates on System/360 configurations from model 30 on up, and requires 32K bytes of core in a Disc Operating System, and 128K bytes in an Operating System configuration. The system consists of a program specification language and a processor which interprets this language and generates COBOL programs. The specification language enables the user to define the data to be processed and to indicate how he wants the data to be maintained. COMPUTER SCIENCES CORP., El Segundo, Calif. For information:

CIRCLE 144 ON READER CARD

core memory

The Micromemory 1000 core memory offers a range of storage capacities from 512 to 4,096 (8-bit) words. It has a 2.5 usec cycle time and an access time of .9 usec. Operating temperature range is 0° to +50° C. The 1000 is priced under 10¢/bit. ELECTRONIC MEMORIES, INC., Hawthorne, Calif. For information:

CIRCLE 145 ON READER CARD

Move With Advanced Computer Technology At NCR Electronics Division

SYSTEMS FORMULATION
Analysis and development of advanced systems specifications; consultation on systems design, hardware configuration, software trade-offs; analysis of competitive systems. Applicant should have familiarity with very high speed memories, large-scale integration, disc files, drum files, communications and time sharing plus related BS degree and 3 to 5 years' experience in one or more areas mentioned.

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Programmers to develop executive and operating systems for third-generation computer systems. Desire experience with medium- and large-scale general-purpose systems employing high speed peripheral units, tapes, random-access files, disc files, drum files, on-line, time sharing and multiprogramming. Requires related BS degree and 3 to 5 years' directly related experience. Positions also open for hardware-oriented programmers to do systems diagnostic work.

EDP ANALYST/PROGRAMMERS
Analyst position entails systems analysis in financial and administrative areas. One year of EDP experience required, degree desirable. Programming positions involve accounting and manufacturing systems. Degree and recent experience on medium- to large-scale systems desired.

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To do computer-aided design of specific elements in complex optical systems, such as field and condenser, as well as image-forming elements. Activity includes optical-electronic lab work, systems layout and design, technical liaison. Involves geometrical and physical optics. Requires BS in physics or optics plus 2-5 years' directly related experience.

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Creative mechanical engineer capable of designing sophisticated manufacturing hardware and of developing machines to do jobs which heretofore have not been encountered. Requires BSME and minimum of two years' experience.

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Q.C. assignments include process capability studies, failure analysis, design reviews, establishment of inspection standards. Position requires 2-3 years' experience with EDP equipment, knowledge of magnetic materials, BSME degree. Reliability positions involve planning, conducting and reporting reliability tests of electronic components, assemblies and units. BSEE required plus experience with reliability mathematics, computer circuitry. Positions also available in systems test.

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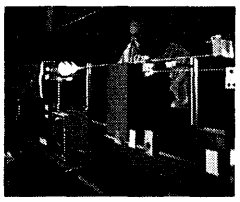

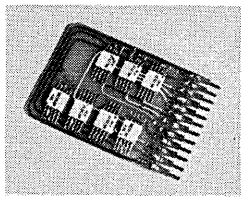

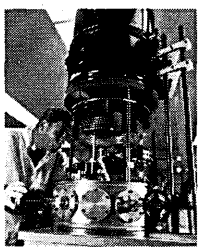

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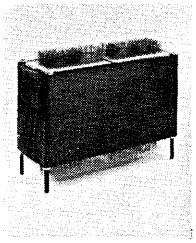

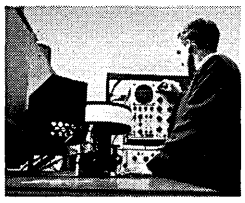

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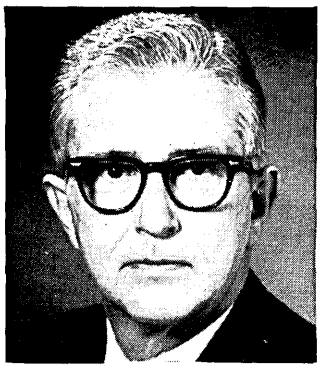

meet Fred Anderson

Fred Anderson is a computer professional.
As with all our staff, Fred's computer background is extensive. He brings to our firm 12 years of proven and varied computer experience. As Brunswick Corporation's Director of Management Information Services, Fred was responsible for the planning, development and implementation of a total MIS in a multi-divisional, multi-plant environment. He was directly responsible for 150 professional computer people and managed a multi-million dollar annual budget. In his career, Fred has successfully installed four IBM 650's, one IBM 305, three IBM 1401's, one IBM 1410, one GE 415, one GE 425, three H-200's, three IBM 360/30's, one GE Time Sharing System, and two nationwide communication networks. Fred has been associated professionally with the S.P.A., N.A.A., TIMS and AMA, for which he served as a frequent lecturer. Fred's formal education includes a Bachelor of Science Degree in Business Administration from Drake University.

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Client companies assume our charges.

CIRCLE 312 ON READER CARD

COMPUTER SCIENCE OPPORTUNITIES

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- Management Information Systems

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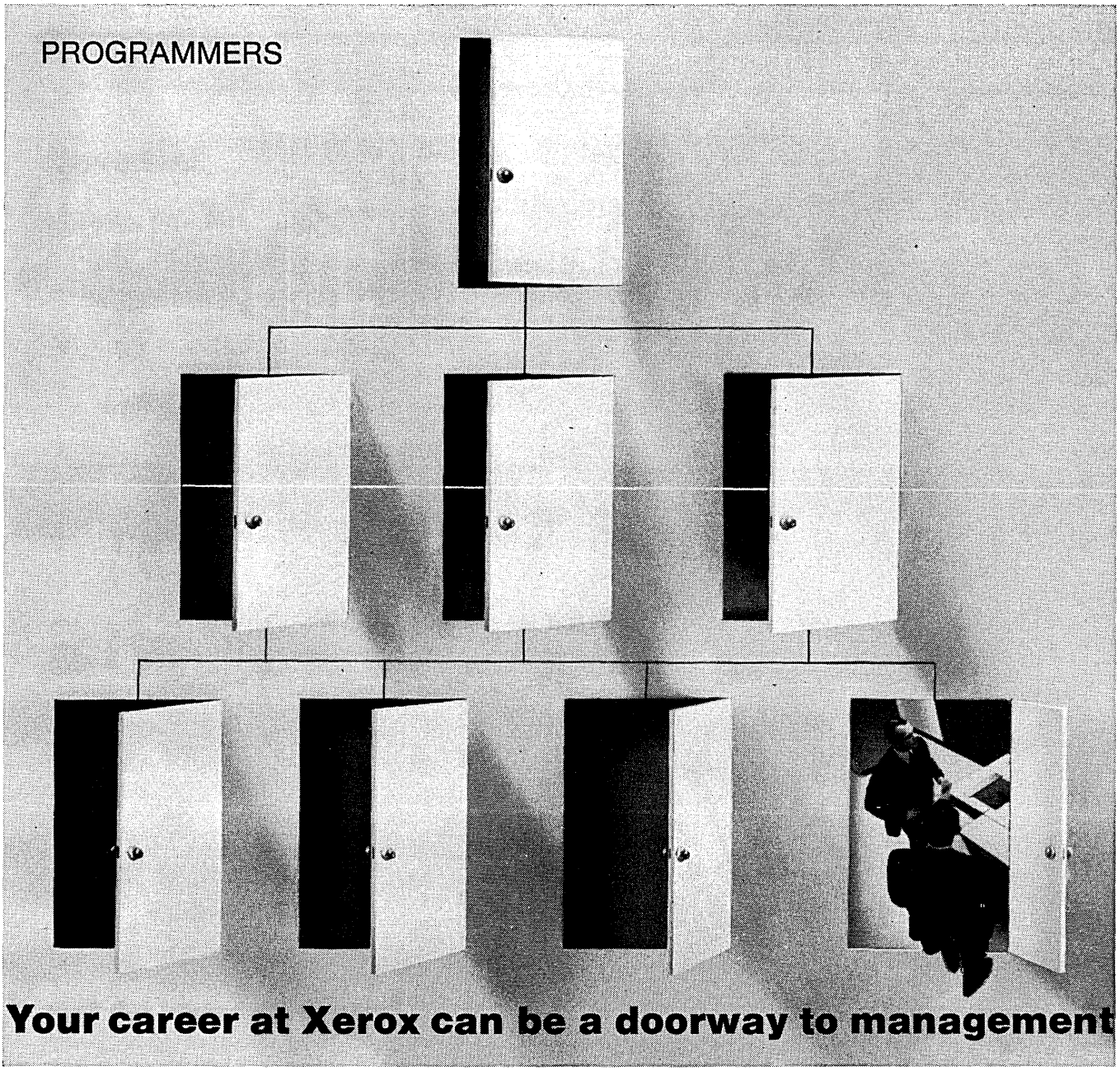

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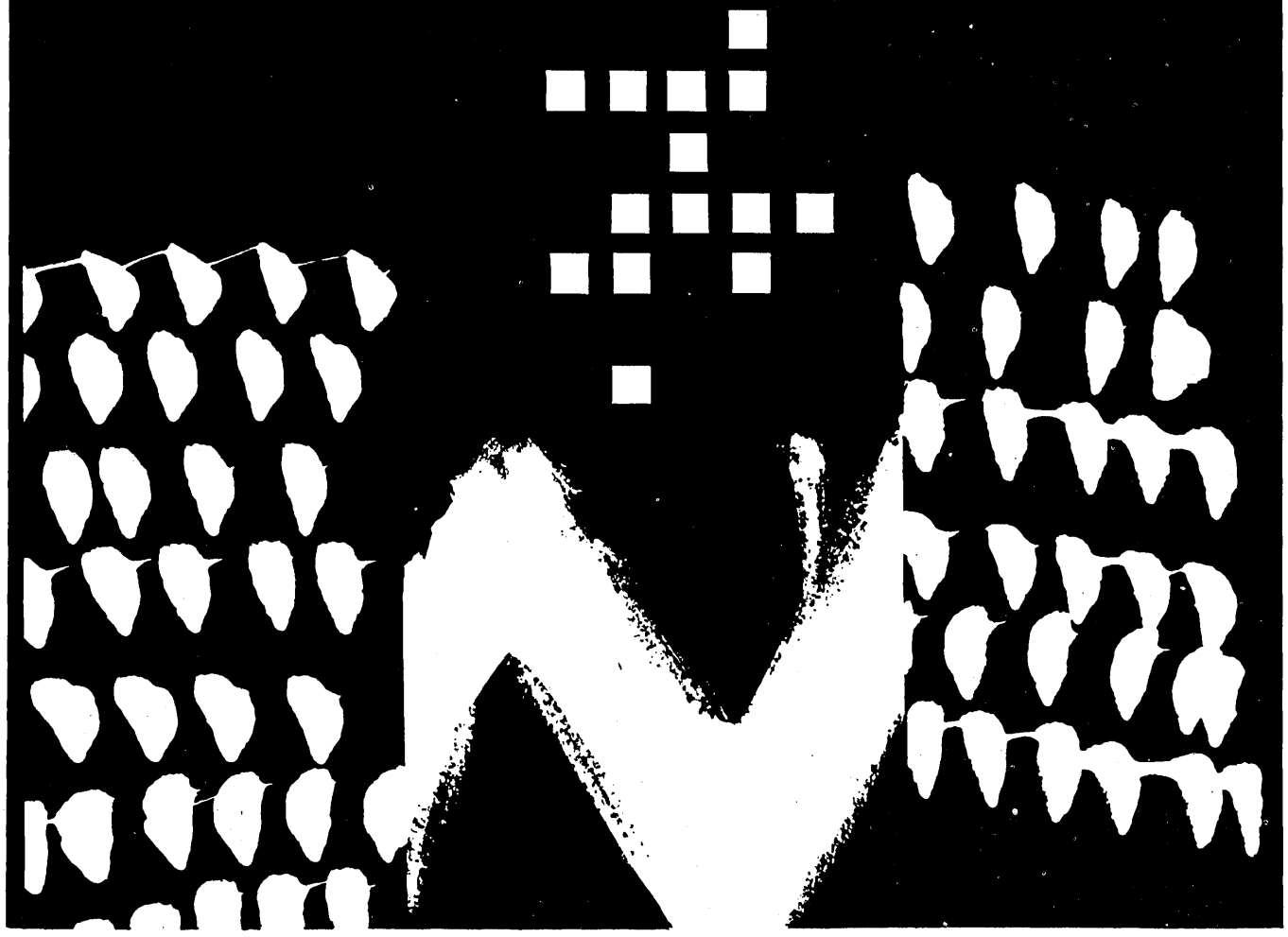

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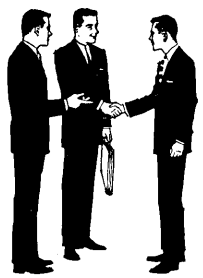

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new literature

PLOTTING SYSTEM: Twelve-page brochure illustrates applications for the DPS-6 digital plotting system in such fields as civil engineering, finance, marketing, and construction. The system includes an X-Y plotter, an input source and supporting software and is offered in either vertical or horizontal models. MILGO ELECTRONIC CORP., Miami, Fla. For copy:

CIRCLE 183 ON READER CARD

TIME-SHARING: Feature article in quarterly magazine reviews various ways in which multiple users are applying the capabilities of the 940 time-sharing system. Applications include character-recognition research, petroleum exploration, financial analysis, and environmental studies. SCIENTIFIC DATA SYSTEMS, Santa Monica, Calif. For copy:

CIRCLE 184 ON READER CARD

DIGITAL MEASURING SYSTEM: Folio of literature describes the series 6200 digital measuring system, a modular system featuring plug-in versatility. Other literature is to be added as additional function modules are developed. ELECTRONIC ASSOCIATES, INC., West Long Branch, N.J. For copy:

CIRCLE 185 ON READER CARD

MAG TAPE: Data sheet provides technical information on physical and magnetic properties, wear resistance, photo sensing markers, placement of markers and storage and operating environment factors of new tape for digital computers. In a 200-pass test, the tape is said to average less than one permanent write error per pass with a maximum of two permanent write errors in any given pass. AUDIO DEVICES INC., New York, N.Y. For copy:

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TRANSPORTATION SIMULATOR: 140-page report describes the TRANSIM transportation simulator developed at UCLA to fill the need for a general-purpose computer simulation method which is simple and economical to use for a wide variety of problems in transportation. Purpose of the report is to provide examples of TRANSIM applications to assist users of the method in their simulation analyses of similar problem areas. PB-176 158. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

DESK-SIZE COMPUTER: Eight-page brochure describes the company's line of digital computing equipment. Model DE-600 can be used as a calculator or digital computer, uses familiar algebraic symbols both on the keyboard and to set up the programming panel. Sample procedures and solution times are also included. CLARY DATACOMP SYSTEMS, San Gabriel, Calif. For copy:

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OPTICAL SCANNING SYSTEM: 12-page brochure describes model 70 optical scanning system's capabilities, applications, basic principles, flexibility of operation, and the forms and formats it handles. The device reads pencil marks from 8½ x 11 in. documents and records the data on magnetic tape. OPTICAL SCANNING CORP., Newtown, Pa. For copy:

CIRCLE 188 ON READER CARD

DATA COMMUNICATION: 34-page introductory manual outlines the various techniques used to accomplish the different types of communication, what these services are, and from whom they may be purchased. Glossary of terms is included. DIGITAL EQUIPMENT CORP., Maynard, Mass. For copy:

CIRCLE 189 ON READER CARD

ACM SEMINARS: Brochure gives pertinent information on professional development seminars to be held early in 1968. Topics include the selection and evaluation of computer personnel; digital simulation of physical systems; file structures for on-line systems; managing the computer center;

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Sanders offers exceptional opportunities for professional development. Facilities include the newest commercially available equipment plus state-of-the-art hardware developed here. Systems are everyone's business at Sanders, and you will be encouraged to contribute solutions beyond your own specialized area. And because we emphasize creativity, you will be constantly encouraged to innovate rather than follow conventional practice.

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new literature

decision tables; computer graphics; information storage, retrieval and management; time-sharing systems. All will be held in several different locations. ASSOCIATION FOR COMPUTING MACHINERY, New York, N.Y. For copy:

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DISPLAY AND CONTROL DEVICES: Eight-page catalog describes complete company line of display, control and input/output devices and systems. Sections include digital readouts, display systems, subminiature indicators, transistor controlled indicators, switch/indicators, switches, electronic keyboard systems, CRT display systems, and special products. TRANSISTOR ELECTRONICS CORP. For copy:

CIRCLE 191 ON READER CARD

TAPE SYSTEMS: Twelve-page brochure lists the necessary peripheral products and supplies for tape controlled machines. All company products are described and services outlined. NUMERIDEX TAPE SYSTEMS, INC., DIV. DIVERSIFIED METAL PRODUCTS, Chicago, Ill. For copy:

CIRCLE 192 ON READER CARD

CAREERS: 40-page directory of employment opportunities for computer engineers, systems and applications programmers, and systems analysts. 30 employers represented with full-page profiles. RESOURCE PUBLICATIONS INC., Princeton, N.J. For copy:

CIRCLE 193 ON READER CARD

MULTIPLEXER: Technical bulletin on model 3929 digital instrument multiplexer which provides time-sharing capability for five or more input sources gives specifications and special features, as well as information on the company's digital printers, which may be used in conjunction with the multiplexer. BECKMAN INSTRUMENTS, INC., Richmond, Calif. For copy:

CIRCLE 194 ON READER CARD

MAG TAPE CLEANER: Two-page brochure describes model magnetic tape cleaner capable of cleaning ½", ¼", and 1" tapes on all standard computer and instrumentation reels up to 14" in diameter. Automatic forward and reverse pass cleaning cycle cleans a 2400' reel of ½" tape in 4.8 minutes. GENERAL KINETICS INC., Reston, Va. For copy:

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To find out more about these major areas of programming at RCA, write to: Mr. T. Beckett, RCA, Dept. SW-1, Bldg. 2-2, Camden, New Jersey 08102. An Equal Opportunity Employer.

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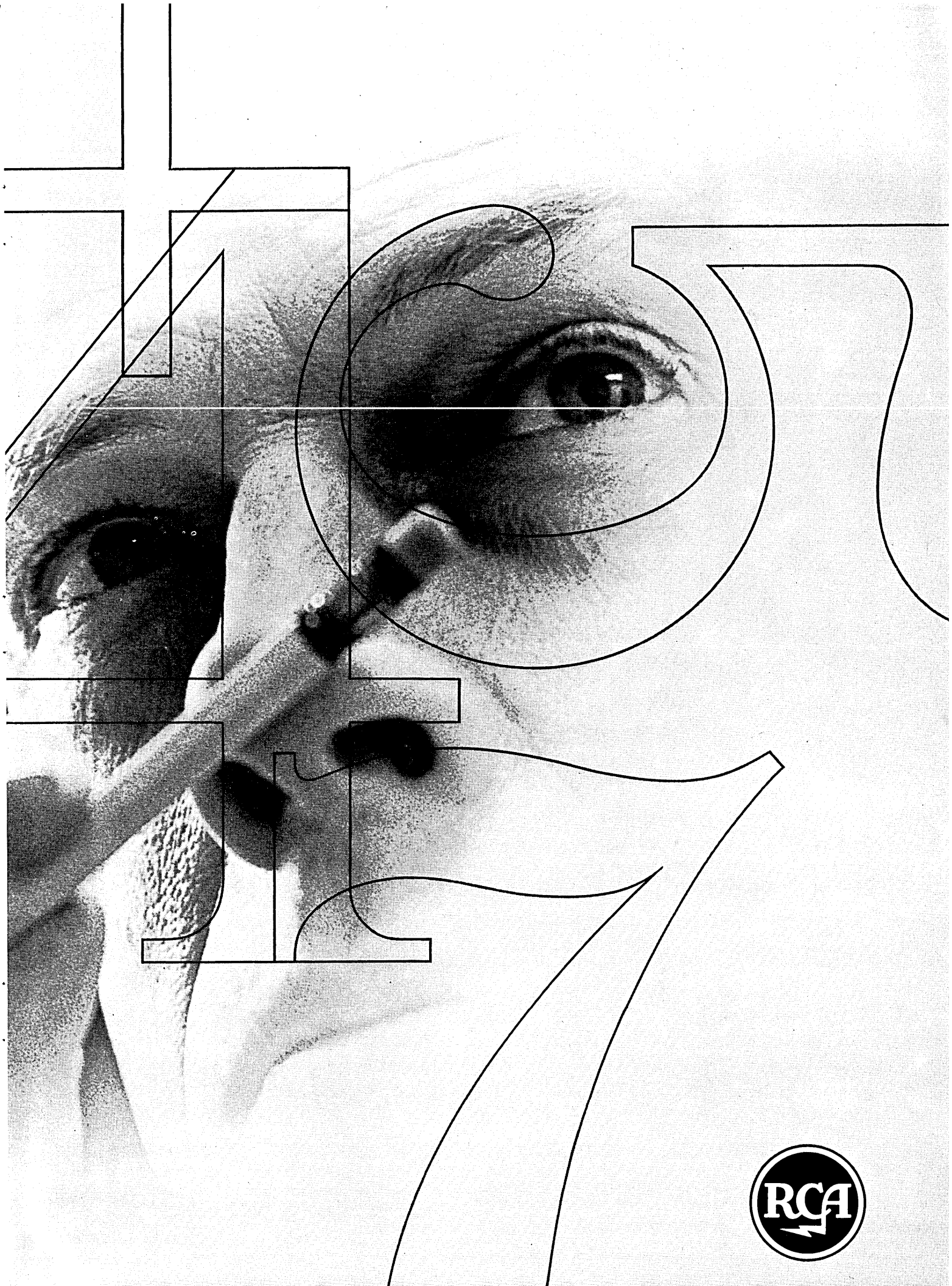
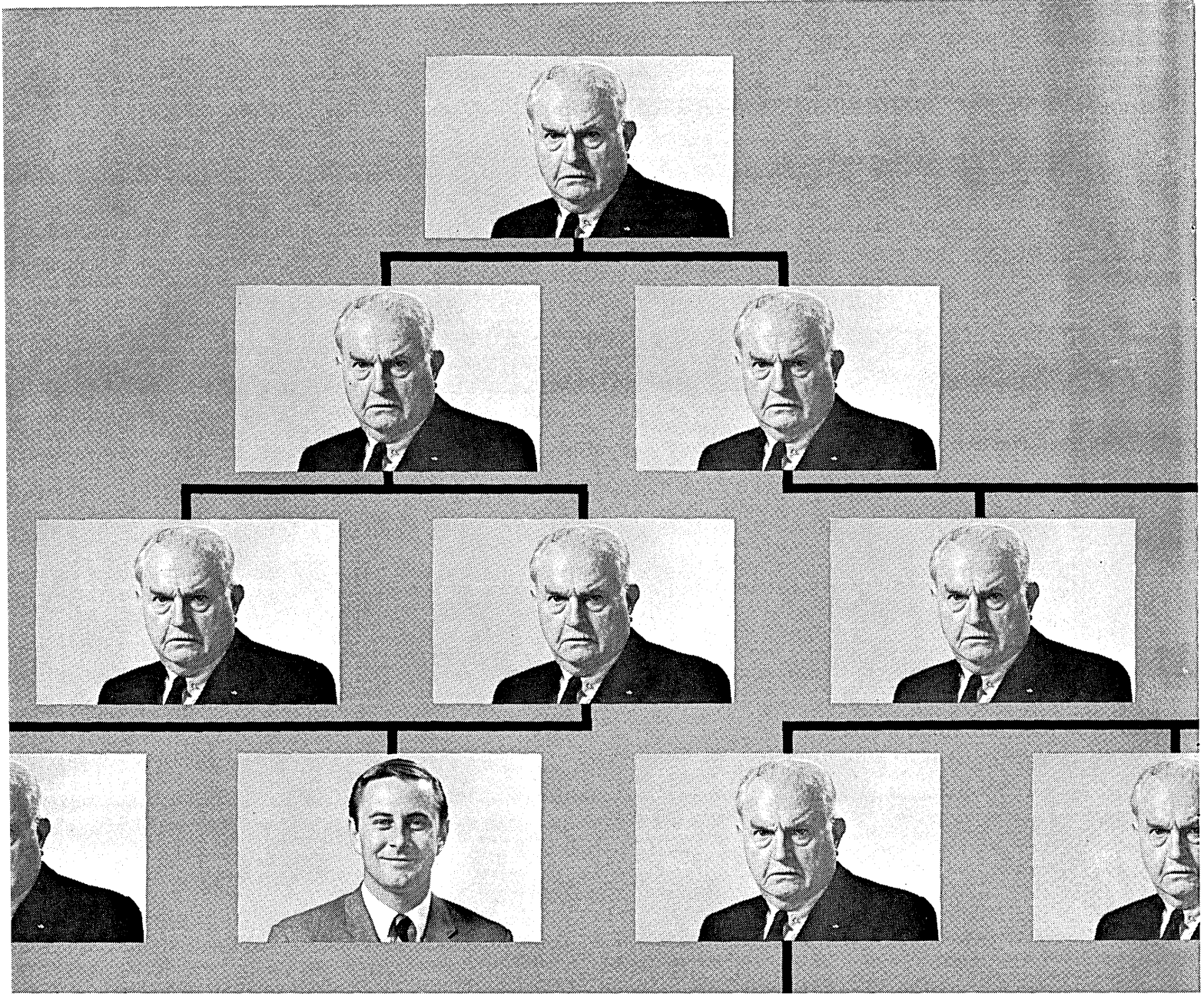

RCA



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SDS
Scientific Data Systems,
Santa Monica, California

CIRCLE 322 ON READER CARD

books

Privacy and Freedom, by Alan F. Westin, Atheneum, 1967. $10.

Most defenders of privacy against "electronic snooping" are arm wavers: they declaim against the threat to a "cherished right of free men" and assume instant sympathy. Even those inclined to be sympathetic may sometimes wonder uneasily about this cherished right, watching their fellows eagerly rushing to bare their private lives on television shows; noting masses of federal employees (Professor Westin asserts 200,000) voluntarily submitting to polygraph tests without protest; and observing their fellows willingly inhabiting cacophonous anthills, riding in sardine subways, and taking their pleasure at teeming public beaches and stadiums. One of the great virtues of this important book is that Professor Westin is not an arm waver. He devotes a sizable portion of his book to a rational demonstration that privacy is important to man's psyche and freedom, and has the fairness to present evidence that the value of privacy is far from universally appreciated.

Mayor Lindsay of New York, reviewing this book for *Life* (a tough act to follow), was upset by this; he complains that Professor Westin displays insufficient outraged indignation at the invasions of privacy he chronicles. This is unfair, because although the author's personal bias is as strong as anyone's (he says so in the book), he is attempting to present a rational foundation for others to use in strengthening the defenses of personal privacy. In fact, Professor Westin chides some of the intemperate arm wavers who, he believes, have done his cause little good by simply creating high intensity sound waves. Mayor Lindsay also notes correctly that the book is a little dry. In developing his carefully reasoned historical foundation, Professor Westin presents exhaustive chronicles of the legislative history of privacy protection, and of judicial actions and publications related to each issue he discusses. These chronicles are slow going for the casual reader, but certainly necessary background for anyone wishing to be well informed in this area.

Starting with anthropological studies and animal analogies, Professor Westin attempts to demonstrate that privacy is an innate need of mankind. He then proceeds to an historical survey of efforts to guarantee privacy, reminding us that the framers of the Federal Constitution placed a primary emphasis on individual dignity and protection from government pressure. He shows that the words "private" and "privacy" were used from the start in connection with these individual rights. He presents a history of court decisions from the early 19th century through the present, showing both a general judicial sympathy for privacy and a continued difficulty in separating public necessity from private right. In particular, the courts have been confused and vacillating in regard to surreptitious observation of individuals through technological means—wire tapping, recording and photography—ever since the 1880's. Seven Supreme Court decisions during the last 30 years are used to point up this confusion with especial clarity. The Court has reversed itself frequently, and has never provided a clear foundation for enforceable legislation.

In the area of most concern to us, potential invasions of privacy because of computer-based collections of data, Professor Westin shows less interest or concern than in areas involving more physical types of privacy invasions. He believes that the history of concern with data availability dates back only to the mid-1960's, and confuses this concern with the concern over growing reporting burdens and volumes of government-required paperwork. He also shows a tendency to confuse the present with the future, speaking almost in the present tense of national data banks and inter-organizational dossiers containing individual personal histories. He cites some of the more outrageous claims for universal computer utilities and cashless societies made by optimistic members of our profession, but inspires respect by indicating some skepticism about their practicability (apparently only computer experts believe these forecasts). He does believe that in time our entire governmental structure and financial system will change in basic structure because of the "behavioral-predictive theory of information" made possible by computers. He asserts that in such an environment it will be more difficult than at present for the individual to inspect, verify, or correct records about himself. One hopes that, in fact, the opposite will be true: that any greater availability of data for investigators will be accompanied by a greater availability of data to the subject for inspection and review.

A failing Professor Westin shares with other commentators on national data banks is a failure to appreciate the magnitude of the problem of collecting the data. Those of us who have been associated with file conversion and standardization efforts can conceive of the work involved in bringing all the nation's files of information about organizations and individuals into commonality of nomenclature, coding, format, and machine readable medium. Such an effort may very well require more manual labor than any single task ever undertaken by mankind. (One is tempted by the foolish thought that this job might be a good answer to the problem of providing jobs for the unemployable. If they were used for the job of data re-coding and keypunching, there would be several advantages: the social good involved, the relatively low cost, and an automatic degree of protection for the individual resulting from the colossal mass of transcription and coding errors in the file that would frustrate most inquiries.)

Professor Westin devotes more attention to surveillance devices (wire tapping methods, microphones and optical devices) than to any other area, perhaps because of their longer history of use, public protest, and legislative action. He chronicles examples of their use and of protests against them in detail, and observes that such devices are available to all—and even advertised sometimes

in ways that would appeal to voyeurs and the abnormal. He notes somewhat ruefully that the public seems to approve of their use where the objective is popular. As examples, he speaks of "automated" TV heroes and public applause of successful surveillance of reprehensible criminals. Fortunately, the examples of the use of surveillance devices indicate that a great deal of effort is involved in successful spying. Presumably this will always impose a practical restriction on the scope of their use.

The author mounts an effective attack against use of the polygraph,

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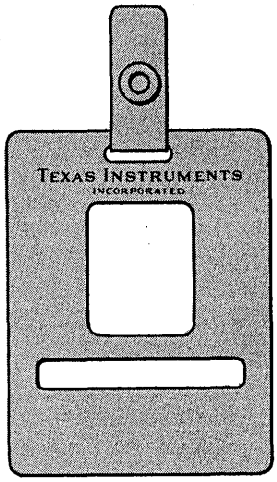

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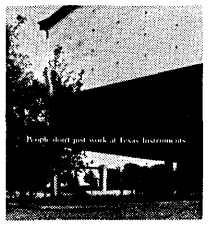

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CIRCLE 323 ON READER CARD

books

describing it (with convincing evidence) as almost completely unreliable as well as outrageous to personal privacy. He fears that technology will make possible polygraph tests performed without awareness of the subject being tested, an unwelcome possibility. Subliminal advertising is also discussed briefly, because of the privacy-invading aspect of its use with an unaware audience. In this case there was great public objection to the technique, and there has been fairly conclusive proof of its ineffectiveness. Professor Westin concedes that it is not in use now, but remains concerned because he theorizes that some similar, more effective technique might be developed in the future.

Some of Professor Westin's major blasts are aimed at personality testing. He asserts that it is of doubtful value at best, and is used far more widely than it should be in personnel interviewing and security matters. He cites in support of his thesis a number of authorities who have refused to use personality testing; it is noteworthy that these non-users generally refer to ineffectiveness of personality testing rather than any fear of public objection. Indeed, Professor Westin ruefully concedes that the public does not seem to mind submitting. He again lapses into speculation, hypothesizing that in the future personality testing might be combined with some form of drug or electric treatment that approximates actual mind control. Profoundly important as this would be if it happened, there seems little use in considering such a purely speculative possibility in a book intended to be primarily factual.

Professor Westin speaks quite explicitly of measures he thinks should be taken to protect personal privacy. He believes that the climate of public opinion has changed to a degree that makes effective legislation possible, but no convincing proof of this appears in his book and it must remain a personal judgment. He does make the telling observation that both right wing and left wing critics are united in support of privacy protecting legislation, the conservatives because they fear increased use of surveillance by "big brother" regulating the entrepreneur, and the liberal because of his concern for individual freedom. He may be right, but it would be comforting to see more solid evidence of universal public concern.

In connection with restrictions on data availability, Professor Westin advocates the usual passwords, machine rejection of invalid questions, and maintenance of records of activity including identification of questioner and question. He also advocates the establishment of certain over-all legal and regulatory principles which apply to all areas of privacy protection. They center around the principle that each invasion of privacy must be individually justified by the courts, and that every such invasion must be monitored after the fact for compliance with the original intent. Specifically, he suggests:

1. Individual justification of each invasion of privacy;
2. Proof that no alternative legal means could be used;
3. Proof that the technique to be used is effective in principle;
4. Demonstration that it is impracticable to gain the consent of the party to be observed;
5. Specific restriction on the scope, duration, and operation of each surveillance, followed by monitoring of compliance;
6. Government-sponsored development of protective devices and measures of redress that can be used by individuals and organizations;
7. Establishment of explicit sets of standards and codes of conduct for employers, professionals, and others having individuals' privacy at their disposal.

He believes that if statutes are enacted at the federal and state level incorporating these principles, and that if suitable judicial and review bodies are set up including procedures for individual redress, that satisfactory privacy protection can be obtained.

Perhaps Professor Westin is right; perhaps this legal mechanism will solve the problem. However, one wonders if this is not another of the many cases where legislation is only peripheral to the issue. Perhaps the people will have the degree of privacy they want regardless of what laws are on the books. If they collectively and individually cherish their privacy, they will not need laws to help them offer massive resistance to the official invader, and to discourage the private invader by showing him general contempt and lack of employment. If they do not care for their privacy no laws will cause them to; no one will object to violations of the codes of ethics; no one will use the means of obtaining redress of grievances. We are with you, Professor Westin, but if most people are not, perhaps the issue is already decided against you.

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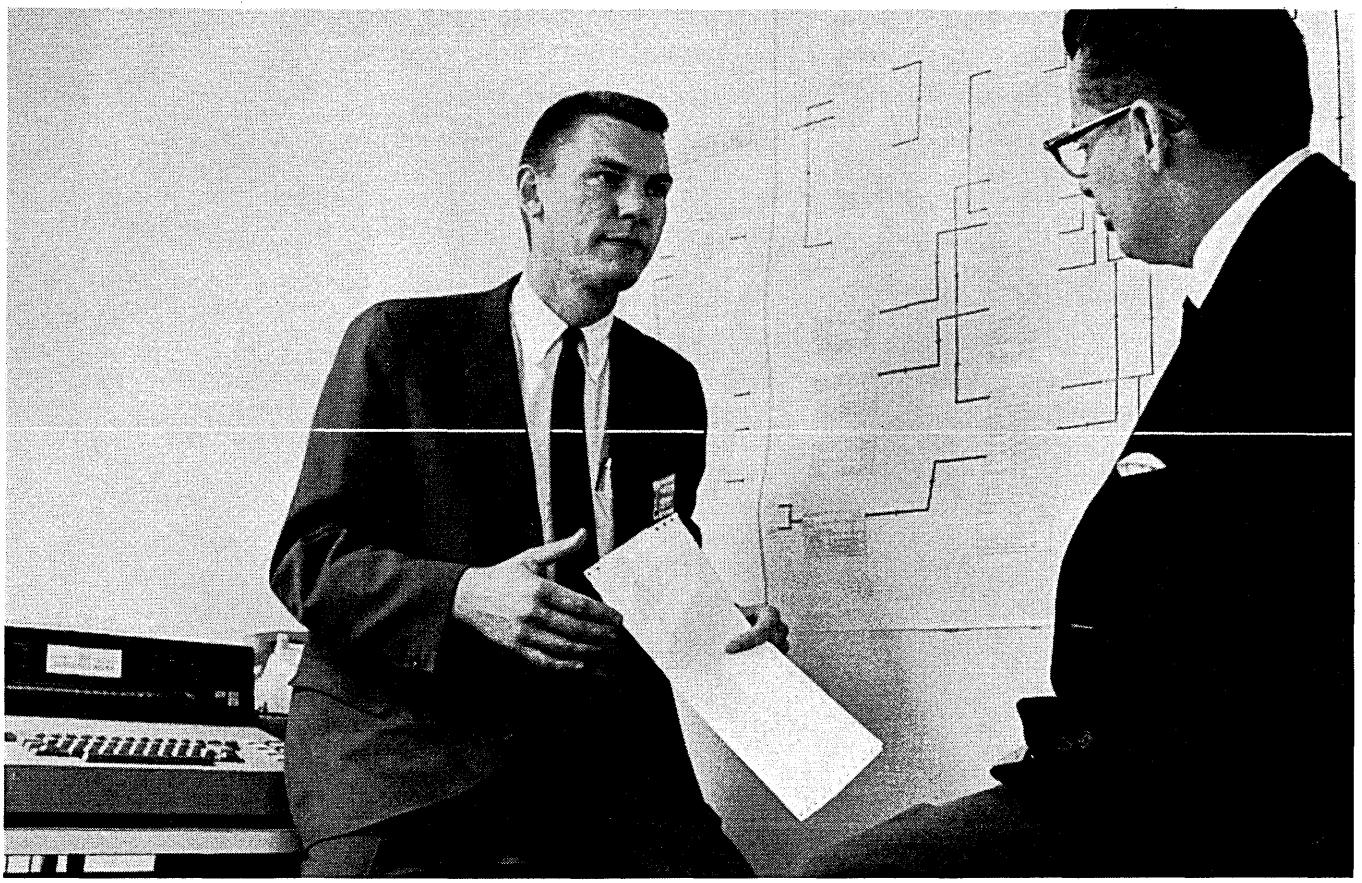

Tom, Senior Management Systems Analyst in the Management Systems Department, is responsible for designing and programming computer-oriented information systems. He's not just a programmer, nor a systems analyst. He is a hybrid!

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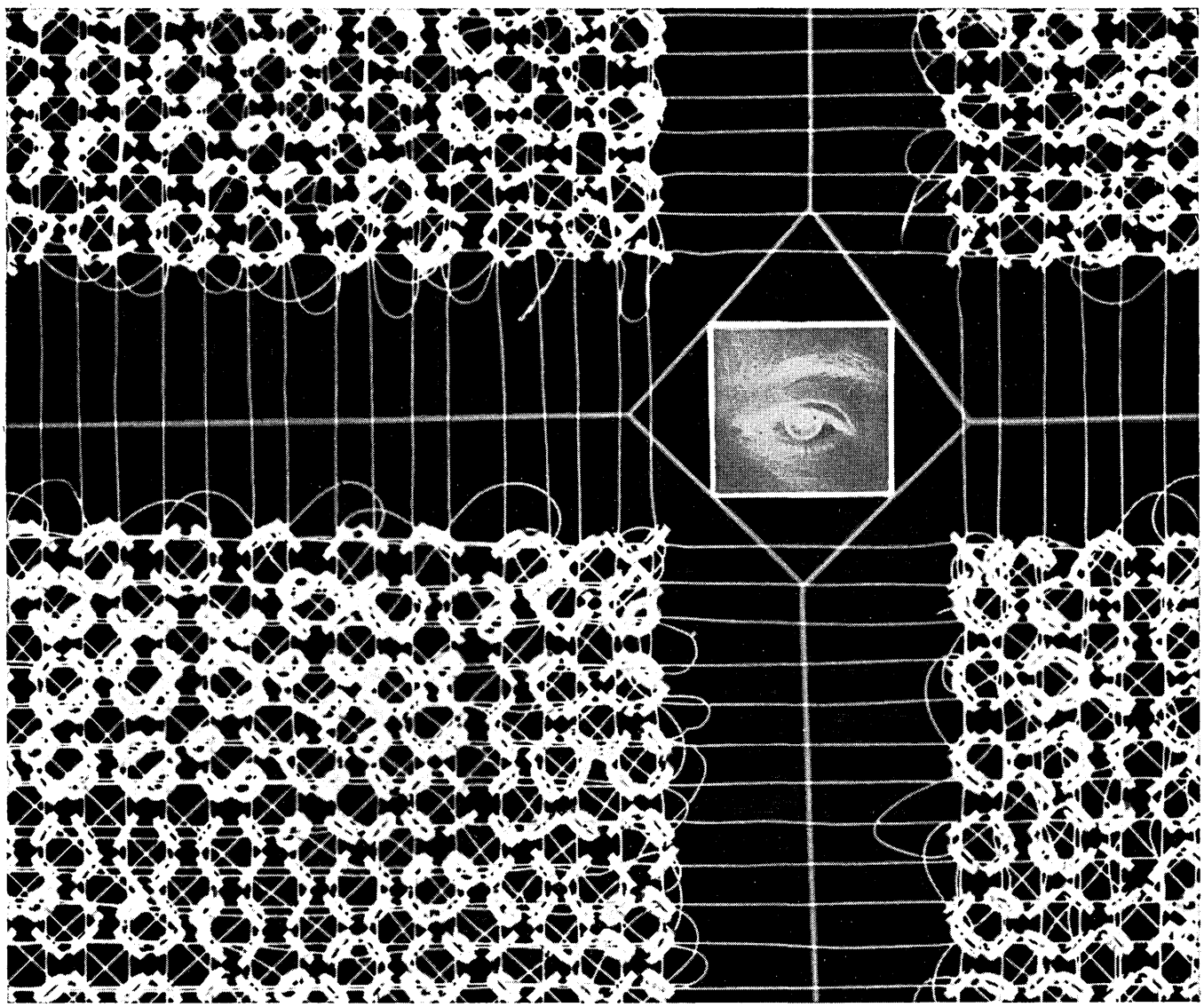

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look ahead

UPS & DOWNS OF INFORMATION RETRIEVAL

The Yale-Harvard-Columbia medical libraries' plan for the first cooperative on-line information retrieval system among universities, announced in early '65, just didn't happen. Harvard officially withdrew because of other priorities at its library; Columbia did some cataloging; but it is Yale that has most strongly continued on its own. More than 12,000 medical titles, with both Library of Congress and in-depth subject headings, are now stored, and Yale has hopes of doing the same for the 59 other libraries. Off- or on-line IR, however, is a distant plan, the data bases initially being used for catalogue card production and accession lists. Storage cost and technology hold back the total project for now.

Yale's Frederick Kilgour, a project leader, has gone to the Ohio College Library Center, where plans are just beginning for an IR project which may tie together many of the states' 63 junior and community colleges.

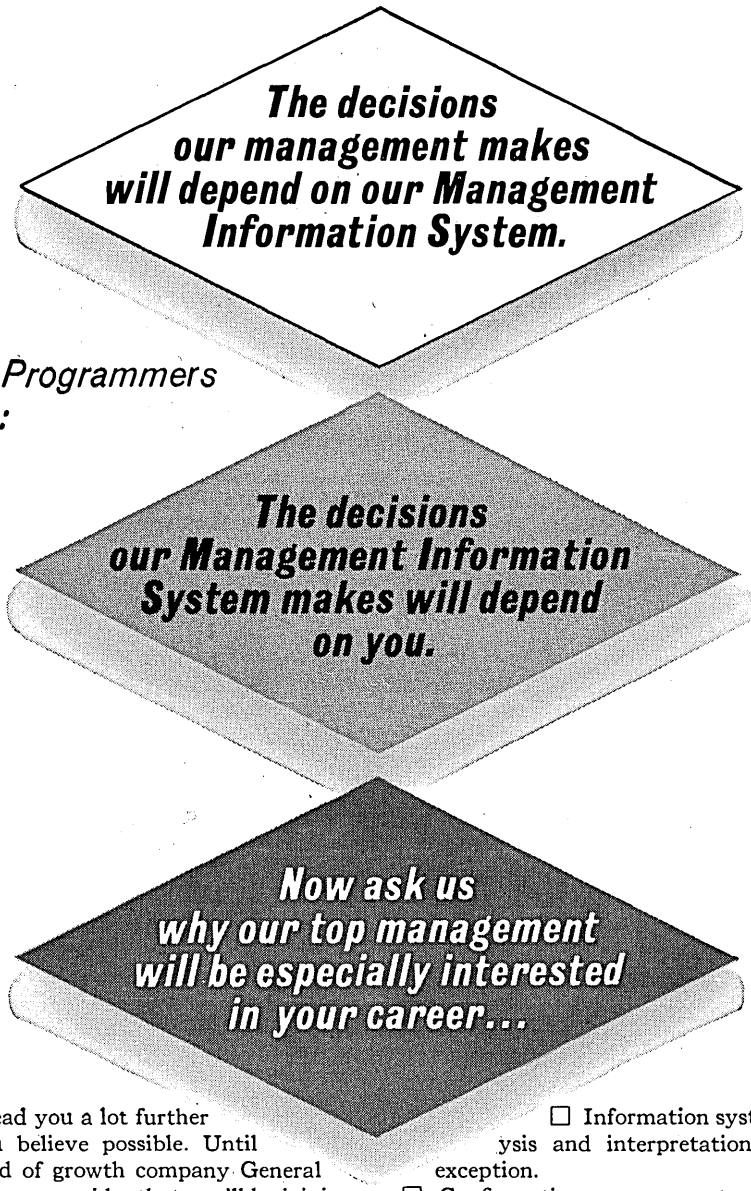
Yale was one participant in the Library of Congress MARC project to disseminate to selected libraries titles of current English monographs (600-900 additions/week) in machine-readable form. The result of this effort is that in mid-'68 the Library of Congress will go commercial, offering these tapes generally, under MARC II, which will provide 2,000 titles weekly. Particularly significant is that several national libraries have agreed on the L of C format as the communications standard for bibliographic data, and acceptance is indicated from such agencies as COSATI and AEC. The United Kingdom is also initiating a MARC-type project.

SURVEYORS USE ON-LINE DATA 620

Thirty users in 14 states are on-line to a $140K Varian Data 620 system being provided by Technical Advisors Inc., Wayne, Mich. They're mainly surveyors using TAI's Tech-Mac language for coordinate geometry problems. Due to be available soon is an automatic drafting capability on a Gerber VP 622 (50 x 60 inches) plotter. Till then, the civil engineers are using mod 33 Teletypes. Charges for the service are $10 an hour for the first 25 hours and $7.50 thereafter, plus memory space. In addition to the 8K 620, there's 250K words of disc, printer and paper tape gear.

RUMORS AND RAW RANDOM DATA

Samuel N. Alexander, a pioneer in the computer field and recipient of the Harry Goode Memorial Award, died last month at the age of 57. Next month, we'll have more on his life, his contributions...With the announcement of the IBM 2680 phototypesetter (see p. 101), RCA can be expected soon to release its mod 830 Videocomp. We hear it's faster and cheaper than IBM's, will set 8½-inch lines, and has up to 96-point type. Like the 2680, the 830 has a proofing mode...Word of warning dept.: Datamation's circulation goes on a computer soon. Need we say more?...Ed Yasaki, key Datamation editor for the past five years, joins Composition Information Services this month... Lee Johnson, dynamic and controversial former Univac government marketeer, dropped one shoe this month by stepping in as top man at Comress, D.C.-area software house. President Don Herman steps up to board chairman, with emphasis on mergers and acquisitions. We'd bet big things are in store for Comress under the ambitious Johnson.



. . . which is apt to lead you a lot further and faster than you believe possible. Until you consider the kind of growth company General Dynamics is . . . until you consider that you'll be joining the professionals in our expanding Data Systems Department, an organization destined to grow as fast as our Management Information System itself . . . until you consider working in an atmosphere of individual project responsibility . . . until you consider that the system you help us develop will oversee and correlate all aspects of all the work of the two major divisions constituting our Marine Systems Group.

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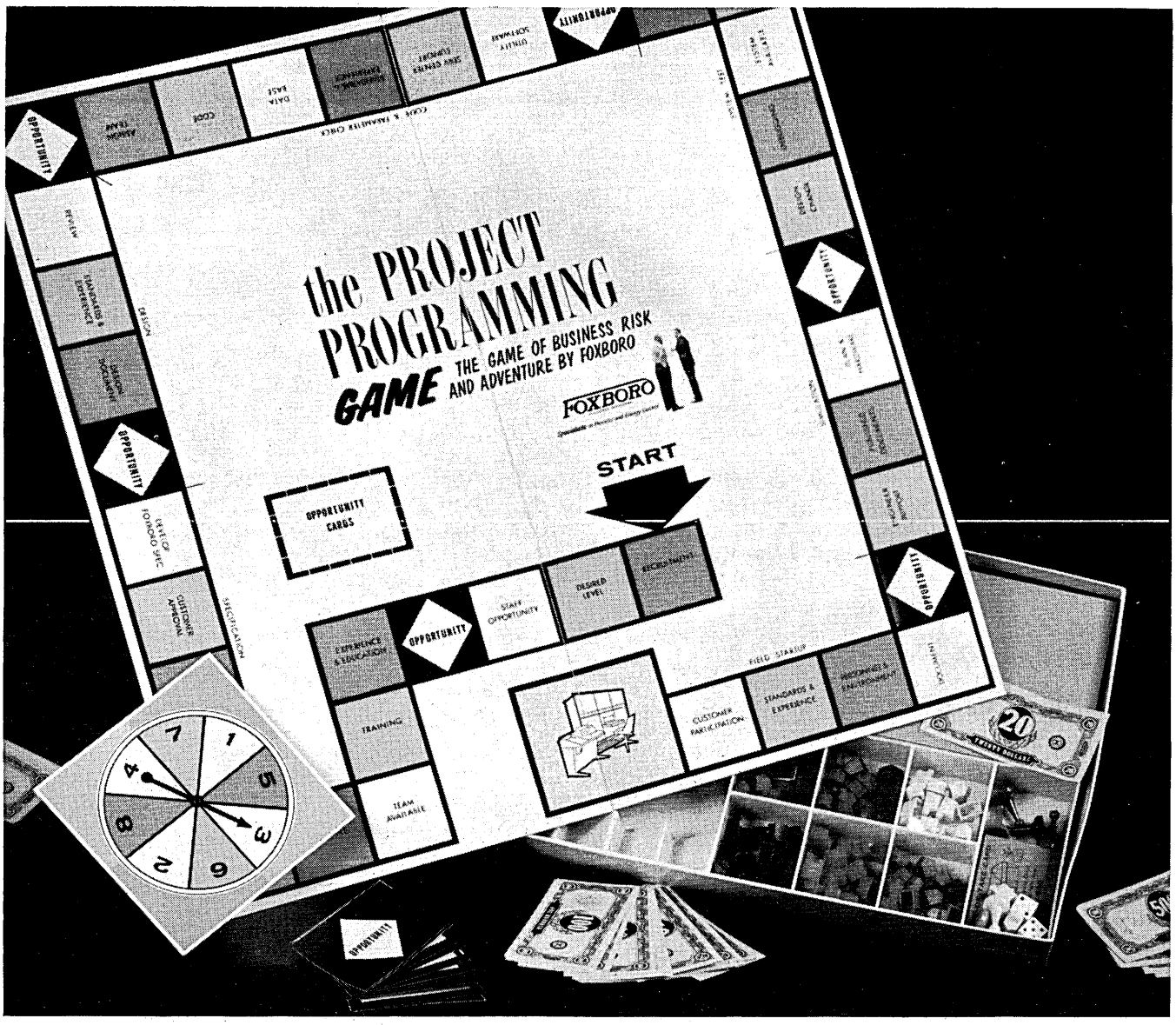

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people

■ Eugene E. Prince has been elected a vice president of Ampex Corp. He will continue his duties as general manager of the company's computer products division.

■ Dr. Glenn E. Lewis has joined the Univ. of Southern California as director of its Computer Sciences Laboratory. He had been director of the computing facility at the National Center for Atmospheric Research in Boulder, Colo.

■ James R. Bradburn has become executive vice president of information systems for RCA and will be responsible for electronic data processing, edp service, and the graphic systems division. He had been vice president and general manager of edp.

■ Dr. John M. Richardson has been appointed director of the new Commerce Dept. Office of Standards Review. He had been with the National Bureau of Standards for 15 years.

■ Wesley E. Niemond is president of the newly formed Marshall Information Sciences, division of Marshall Industries. Maurice P. Chrysler is vice president of the company.

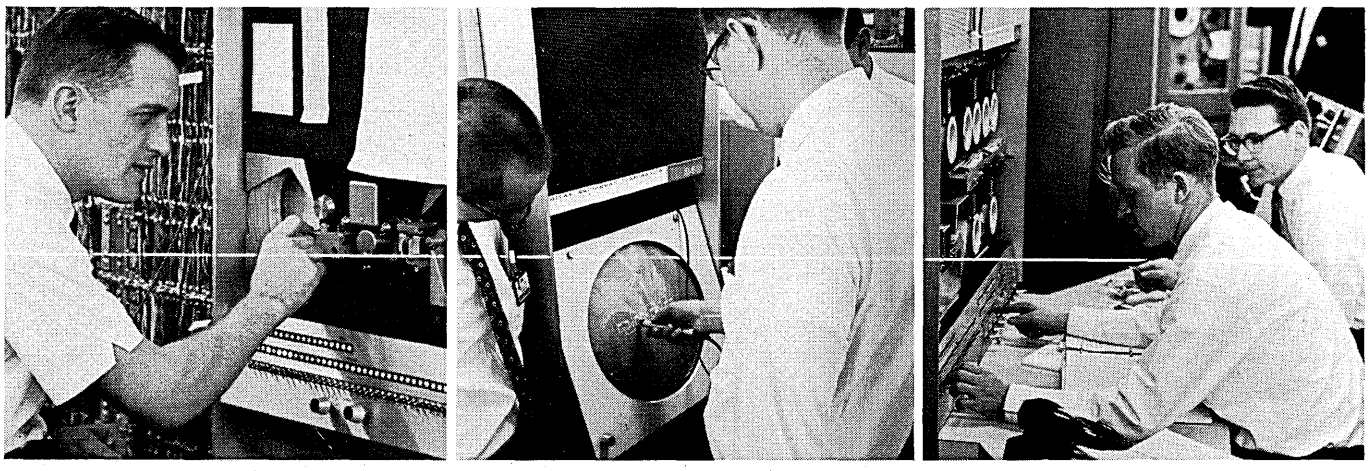
■ H. Paul Rogoway has joined IBM's Systems Research Institute as a staff member to develop a new advanced programming option. He had been PL/I advanced planning manager for the company.

■ Philip J. Pesapane has been elected executive vice president and director of Computer Procedures Corp., Mineola, N.Y., a recently organized subsidiary of Colonial Commercial Corp. Most recently he was vice president in charge of data processing operations for Coburn Corp. of America.

■ Roy E. Platt has been named general manager of the Information Records Div. of IBM in Princeton, N.J. He had been assistant general manager of operations for the division. Platt replaces Frank H. McCracken, who was recently elected an IBM vice president and group executive.

■ J. Stanford Smith, formerly vice president and general manager of General Electric's information systems division, has become group executive of the new information systems group as a result of recent organizational changes within the company.

sales/applications engineering positions at digital



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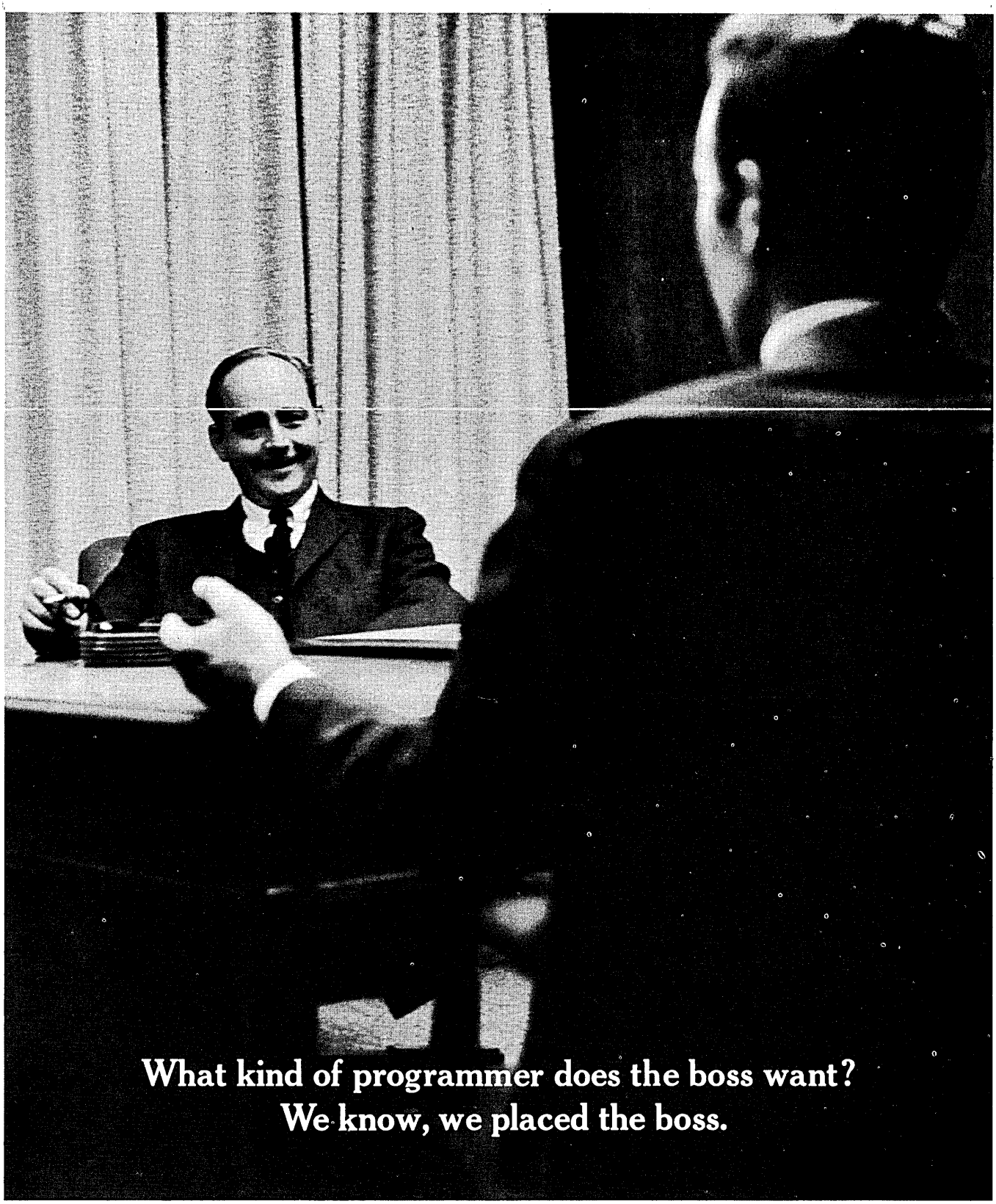

In our business we have to be experts in your business. Send us a resumé today and we'll prove it. Today, we have more than 350 openings in the Greater New York Area for people in Management Information Systems, Systems Programming, Applications Programming, Software Systems and Systems Design. The fastest route between you and one of these opportunities is Drew. Today.

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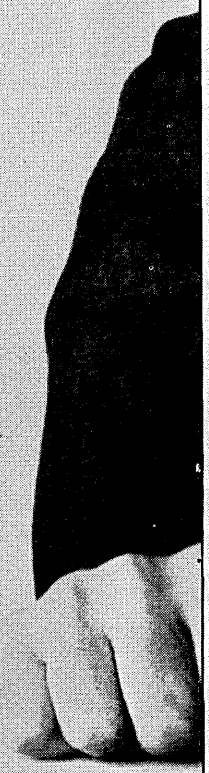
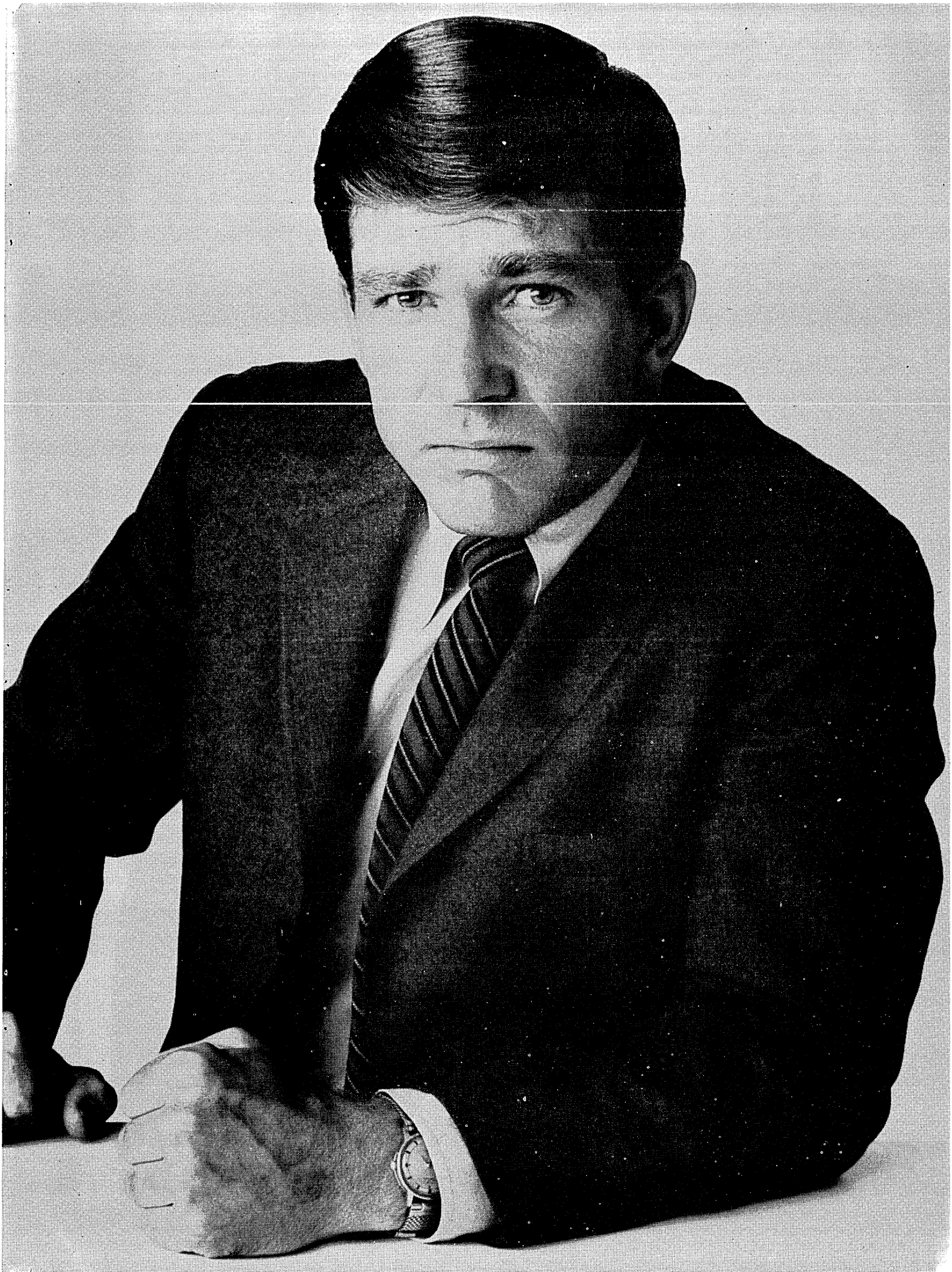
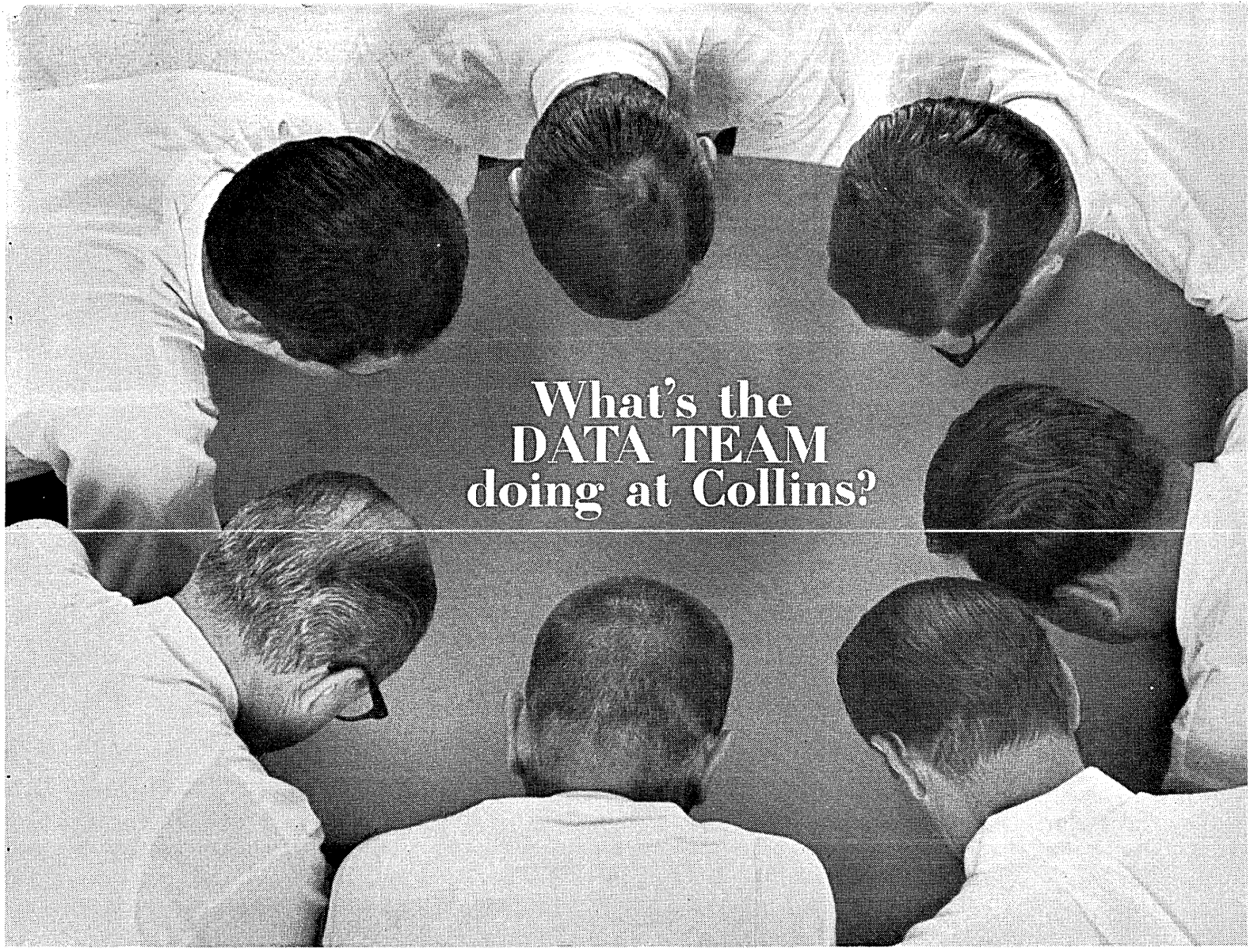




advertisers' index



Collins' data team is designing, developing, manufacturing and marketing some of the most advanced data systems in the industry.

Members of this team are engineers, physicists, mathematicians, salesmen, marketing analysts, systems analysts, operations analysts, programmers, and computer instructors.

Collins data systems are used by airlines and railroads to process and transmit hundreds of thousands of messages a day. (Aeronautical Radio, Inc., alone used a Collins system to handle more than 226 million messages in 1966.) Collins systems provide computer control of earth stations designed by Collins for satellite communications. They permit digital control of communication/navigation systems in airliners and military aircraft. They combine communication, computation and control functions in single systems for large business and military operations.

If you are interested in joining the Collins data team—and benefiting from the creative environment and career opportunities offered by Collins—send your resume in confidence to Manager of Professional Employment, Collins Radio Company, Dallas, Texas; Cedar Rapids, Iowa, or Newport Beach, California.

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the forum

The Forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

DIVERSITY AND BANK INTRUSION

Respected theologians tell us that God is dead. Marshall McLuhan tells us in words that the word is dead. And now some people tell us cash is dead.

To say that the quality of future living will be profoundly affected by the various uses computers are put to is to say what everyone knows. Unfortunately, there has been too little discussion about how these profound technological changes, unless carefully directed, may threaten the continued existence of values and institutions basic to our way of life in this country.

It is fortunate—and a sign of the continued health of our pluralist society—that there is widespread concern with the safeguarding of individual privacy in the proposed national data bank. Another matter—perhaps equally important though not as accessible—which must be thoroughly considered is the banking intrusion issue. It has been reliably estimated that within ten years banks, unless restricted, will be offering as many as 37 nonbanking services, such as business brokerage, site location, tax collection, agricultural management, travel services, credit advisory services, and market research.

It is generally accepted that this rapidly escalating proliferation of nonbanking services offered by banking institutions received a good deal of encouragement during the tenure of James J. Saxon as Comptroller of the Currency. It is also true that many states liberalized their interpretations of their own regulations to keep pace with the latest federal fashion.

It is not surprising that those adversely affected by widespread banking intrusion should seek their own remedies. The reaction has been that insurance agents in Georgia and travel agents in Massachusetts go to court, and it is only reasonable to assume that there will be more of this. Readers of DATAMATION are probably already familiar with the ADAPSO (Association of Data Processing Service Organizations) case against the American National Bank and Trust Company of St. Paul. Legal authorities see this case as one with far-reaching significance, and the American Bankers Association has entered the case as "a friend of the court." In general, ADAPSO, the industry trade association, which quite naturally includes United Data Centers, claims that American National—and by implication other banks—are damaging member firms by marketing data processing services. American National claims that it has every right to service its customers. And the American Bankers Association has stated its concern that an adverse ruling in this case will prevent member banks from making excess computer capacity available to customers. Informed people in the service bureau industry are not overly impressed with the ABA argument since many banks have installed multiple versions of the same computers in addition to setting up separate data processing installations, often with separate identities and management. In fact, they could have ordered equipment tailored to their specific needs in the first instance.

Apart from the specific charges involved in the ADAPSO case against the St. Paul bank and the question of whether bank management is not jeopardizing the interests of stockholders by engaging in a high-risk business not incidental to banking, there has been a good deal of serious discussion as to whether banks are, in effect, paying interest on demand deposits since their charges for data processing are often directly related to the average sustaining balance of their customer. It is expected that this matter will receive attention in depth during the hearings on banking intrusion of the House Banking and Currency Committee scheduled early in 1968 under the chairmanship of Representative Wright Patman (Dem.-Texas). High hopes are held for these hearings, but it should be remembered that Congressman Patman will be opposed by the strong, well-financed forces responsible for the languishing of the Multer bill.

While it is obvious that banks are chartered monopolies or quasimonopolies within the context of their respective geographic locations, much more is involved than the letter of the law. The fundamental thing involved here is the concentration of vast powers in the hands of already powerful institutions. Approximately 46% of the American people are presently borrowing money from banks for a new home; 34% are using banks to finance new car purchases, and 18% are borrowing for home improvements. Little wonder that thoughtful citizens are alarmed at the possibility that banking institutions, already swollen with power, are rapidly expanding into many other fields simultaneously.

Specifically, what must be decided is whether or not it is in the public interest to allow banks to endanger the health, growth possibilities, even the continued existence of the young data processing service industry, which includes more than 1100 qualified data centers. The decision which must also be made is whether or not it is in the public interest for economic power to remain reasonably diffused in order to preserve the opportunities, economic and others, which find encouragement in the diversity so essential to a free society.

—BERNARD GOLDSTEIN, President
United Data Centers, Inc.

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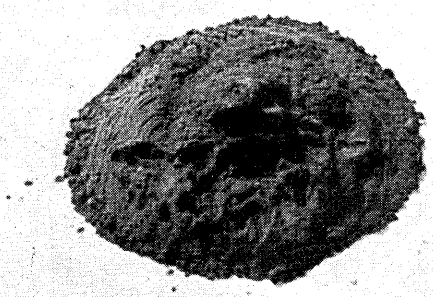

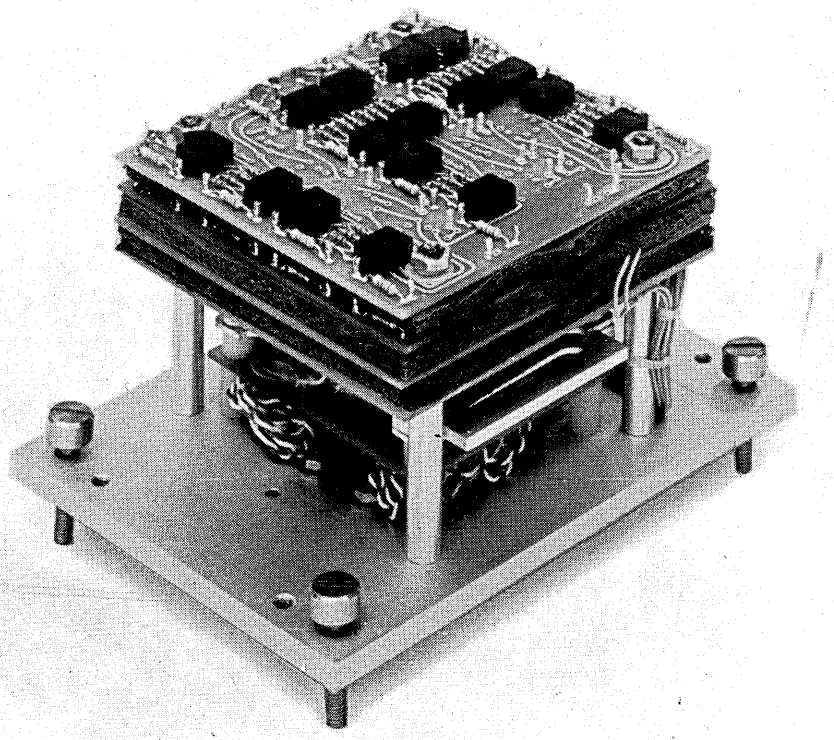

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