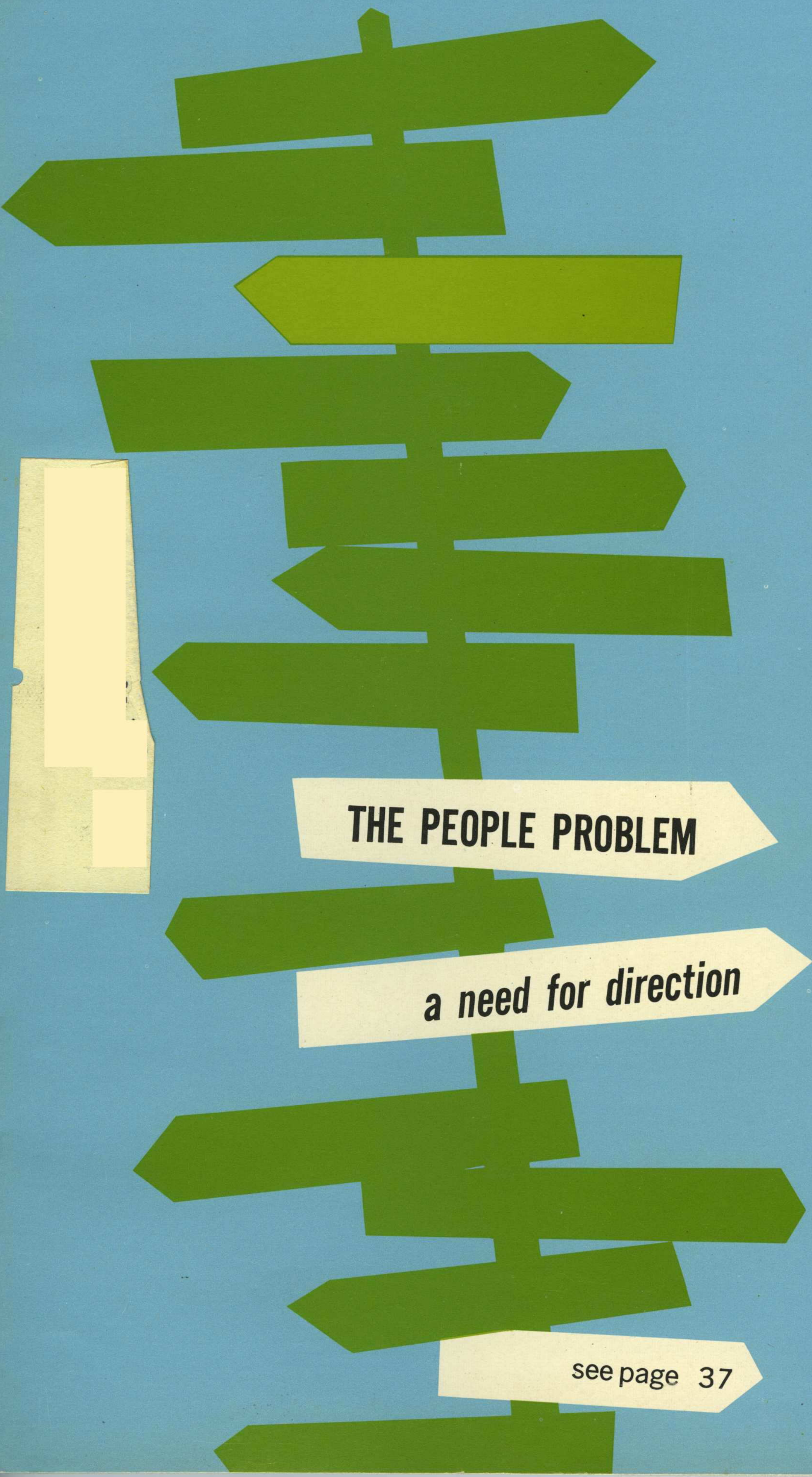
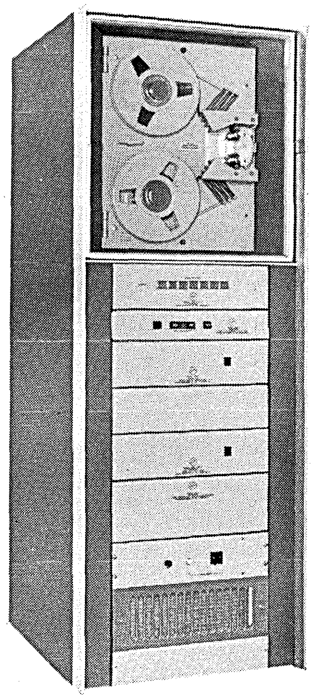
DATAMATION

63

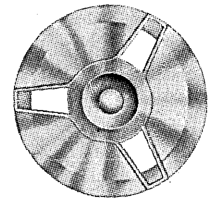
January

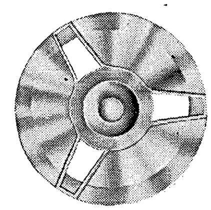


CIRCLE 5 ON READER CARD



AT REEVES SOUNDCRAFT





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T.M.

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These self-contained Potter tape test systems feature transistorized plug-in circuit boards and a precision dual read/write head assembly. When a tape defect is sensed, the Potter Tape Tester stops automatically, with the defective tape area suspended over a visual inspection table. The defective area is precisely located by a separate defect indicator light for each channel. The operator examines the exact questionable area and corrects or accurately determines the cause for the reject.

Potter Tape Testers can increase the reliability of digital computers and sharply reduce your tape costs. To learn how, simply write us.

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T.M.

CIRCLE 6 ON READER CARD

DATAMATION 63

the automatic handling of information

volume 9, number 1

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THIS ISSUE—44,729 COPIES

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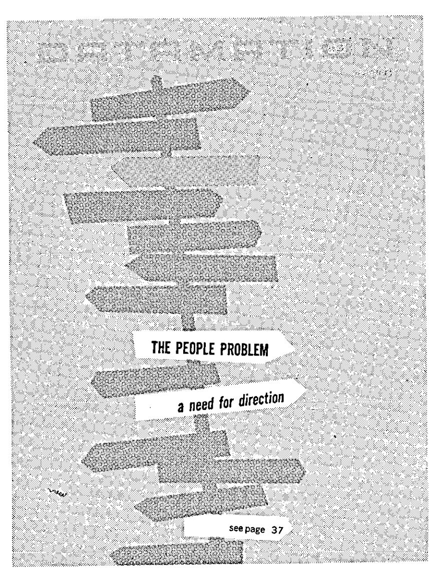

Cover

The need for closer examination of the how's and why's in selection, evaluation, and promotion of computerites is the subject under scrutiny in this month's issue. Guideposts for this requirement are not always clearly defined, suggests Art Director Cleve Boutell in her cover treatment.

Circulation audited by Business Publications Audit — BPA

Member, National Business Publications — NBP

DATAMATION is published monthly on or about the tenth day of every month by F. D. Thompson Publications, Inc., Frank D. Thompson, president. Executive Circulation and Advertising offices, 141 East 44th St., New York 17, N.Y. (MUrray Hill 7-5180). Editorial offices, 10373 West Pico Blvd., Los Angeles 64, Calif. (BRadshaw 2-0817). Published at Chicago, Ill. Accepted as controlled circulation at Columbus, O. Form 3579 to be sent to F. D. Thompson Publications, Inc., 201 N. Wells St., Chicago 6, Ill.

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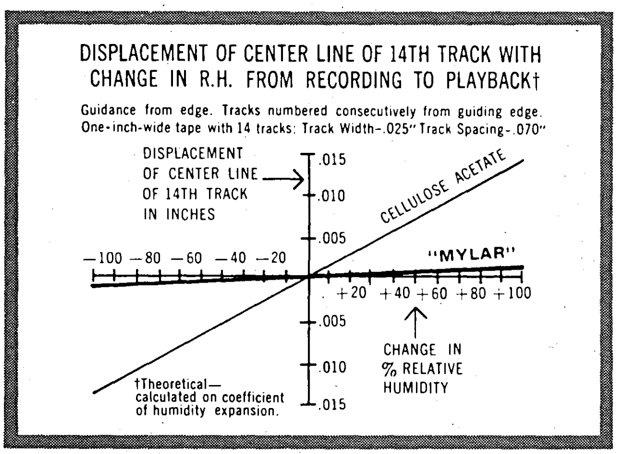
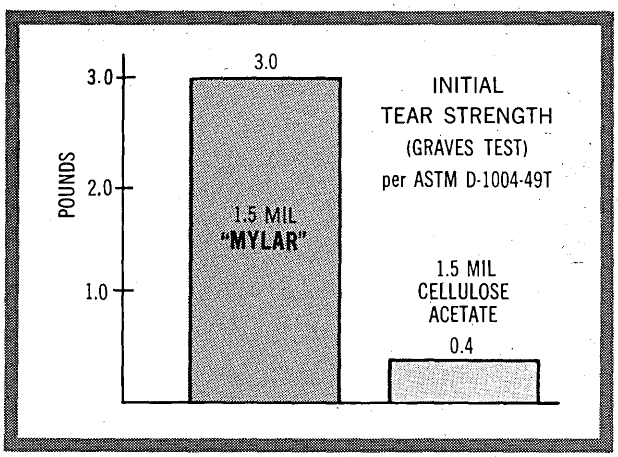
GUARD AGAINST GARBLED SIGNALS WITH RELIABLE TAPES OF MYLAR®





An unreliable tape can shrink or swell—cause garbled signals because the tape tracks shift laterally. away from the recording and playback heads. With tapes of dimensionally stable "Mylar"* polyester film you get accurate results . . . valuable programming time is saved.

"Mylar" is strong—has a tear strength seven times greater than ordinary plastic of equal gauge. Tapes of "Mylar" resist edge nicks, stretching or breaking from sudden stops and starts. "Mylar" is durable—is not affected by humidity or adverse temperatures. And because it contains no plasticizer to dry out, "Mylar" does not become brittle in storage over long periods of time.

Why not safeguard your valuable program time by choosing reliable tapes of "Mylar". To be sure you'll get top performance, insist on a base of "Mylar" on your next order for magnetic tape. Send for free booklet of comparative test data. Du Pont Company, Film Dept., Wilmington 98, Delaware.

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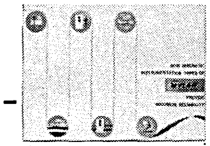

E. I. du Pont de Nemours & Co. (Inc.)
Film Department, Room #12, Wilmington 98, Delaware
Please send free, 12-page booklet of comparative test data to help me evaluate magnetic-tape reliability.

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Company________

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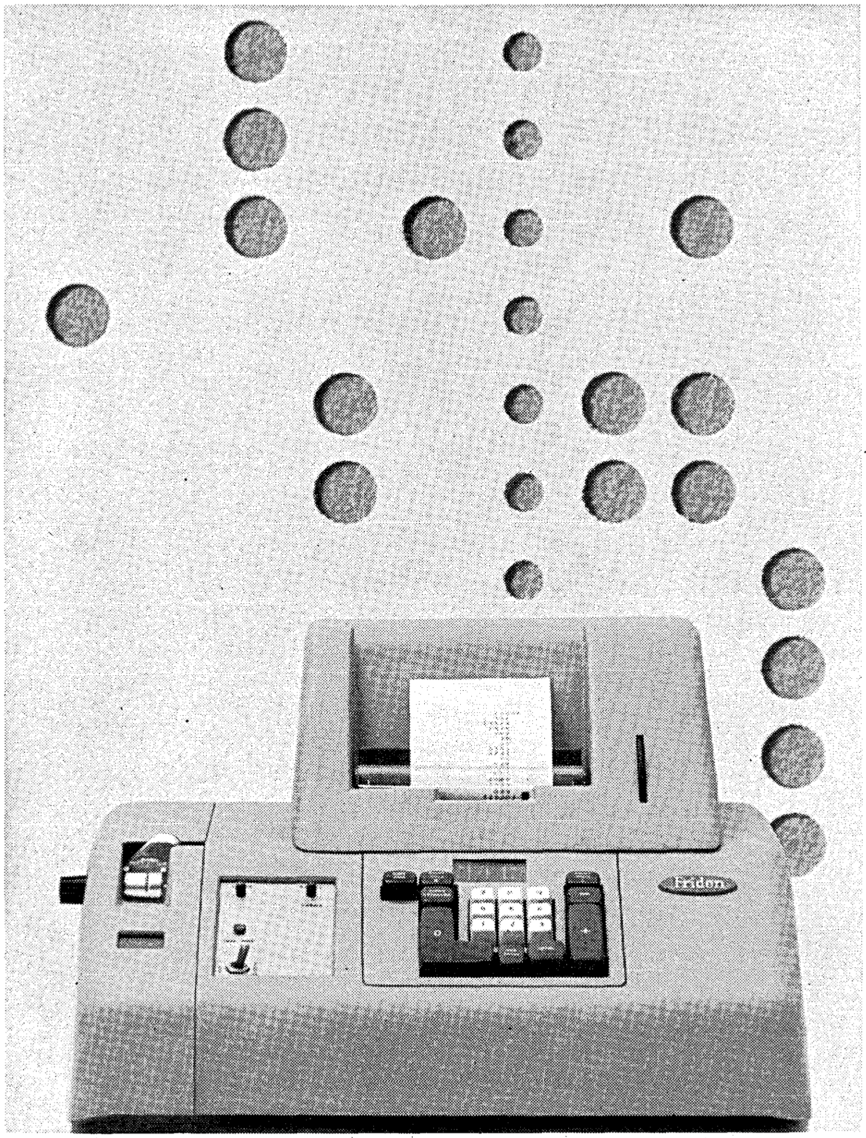

important DATES

• The IEEE Winter General Meeting, Jan. 27-Feb. 1, will feature special sessions on Artificial Intelligence. The meeting is scheduled for the Statler in New York City.

• The IEEE is sponsoring the Pacific Computer Conference, which will be held at the California Institute of Technology, Pasadena, on March 15-16.

• The IEEE International Conference on Nonlinear Magnetics will be held at the Shoreham Hotel, Washington, D.C., April 17-19.

• The 1963 Spring Joint Computer Conference will be held May 21, 22 and 23rd at the Cobo Hall, Detroit, Michigan.

• The Fourth Joint Automatic Control Conference will be held at the University of Minnesota, Minneapolis, on June 19-21. Sponsors are the American Institute of Chemical Engineers, IEEE, and American Society of Mechanical Engineers.

• The annual International Data Processing Conference and Business Exposition, sponsored by the Data Processing Management Association, will be held June 25-28, at Cobo Hall, Detroit, Michigan.

• The 1963 ACM National Conference will be held Aug. 28, 29, and 30th in Denver, Colorado.

• The 1963 Fall Joint Computer Conference will be held in the Las Vegas, Nev., Convention Center, Nov. 12-14.

• The Fifth International Automation Congress & Exposition has been scheduled for November 19-21 at the Sheraton Hotel, Philadelphia.

• The 1964 Spring Joint Computer Conference will be held at the Washington Hilton Hotel, Washington, D.C., May 26-28.

• The 1964 ACM National Conference will be held in Philadelphia, Penna., Aug. 25-28.

• The IFIP Congress 65 is scheduled for New York City in May, 1965. It is the first International Congress scheduled for the United States.


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Big computer Fortran for desk-size computer users

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The Fortran program written below might have been written for a large-scale computer system. Actually, it is a program written in Control Data's new 160-A Fortran . . . a Fortran which provides large-scale power and sophistication to users who need desk-type computer compactness.

The new 160-A Fortran features the following language characteristics: Complete I/O versatility . . . cards, paper tape, typewriter, line printer and magnetic tape ■ Fixed point, floating point and Boolean arithmetic, allowing mixed fixed and floating point expressions. ■ Common, Dimension and Equivalence statements allowing variables of up to three dimensions.

But these features are not the entire story. The real proof is in the computing . . . the ease of programming and the time required to execute. For instance, the DO-LOOP written below is executed in 4.5 seconds.

Get a complete description of this new 160-A Fortran system as well as other Fortran systems utilizing various computer configurations that start as low as $1500/month. Contact your nearest Control Data representative today.

EXAMPLE: 160-A FORTRAN PROGRAM

```
1  Format (8H CDC160A/5F10.8)
   DIMENSION A(5,5,5)
2  READ INPUT TAPE 1, 1,
  X(((A (I,J,K), I=1,3), J=1,3), K=1,5)
   SUM = A(2,1,5) + 4
   B = 11111.0
   DO 3 I = 1,1000
3  SUM = SUM + B**2
   WRITE TAPE 2, A SUM
   GO TO 2
   END
```

ABOVE 160-A FORTRAN TAPE SYSTEM

- 160-A Computer with 8192-word core memory
- New, optional multiply-divide unit, especially designed for Fortran (168-2 Arithmetic Unit)
- New Control Data 603 pneumatic tape drives, providing high reliability (75″/sec.; 200 and 556 bpi; 15 and 41.7 kc)

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8100 - 34th Avenue South, Minneapolis 20, Minnesota

letters

back to Syracuse

Sir:

I admire your candor in assessing the 17th Annual ACM Conference. As far as the papers are concerned, we screened out about two-thirds, and those accepted simply did not come up, as a group, to the standards one should expect at a national meeting. But they were the best available, which leads me to the conclusion that ACM is not regarded as a suitable presentation vehicle by the leaders in our profession. The pressures of our time demand that the writing energy of these people be directed, first, into proposals to DOD and NASA, second, into internal company technical proposals. ACM and other societies run a poor third. I do not deplore this, and will not explore it further, except to say that we in computing clearly are not concerned with establishing a formal body of professional literature. And without this concern we will not become a profession.

It is significant that *Datamation*, presumably to add a professional aura to its newsy format, has disinterred the Burks/Goldstine/von Neumann writing of sixteen years ago. I may call down the wrath of some of my friends for this, but I didn't find it interesting. Who is doing the new work?

As a final word in defense of us hard-working Syracusans, the 17th Annual Conference was scheduled before either the Munich IFIPS Meeting or the Toronto SHARE meeting.

D. G. Lewis
Syracuse Chapter ACM
Syracuse, N.Y.

the open purse policy

Sir:

Dan McCracken's editorial on attitudes towards automation deserves a complement. He requires "an effective answer, in 17 words or less, to this statement: 'There will be 10,000 computers installed next year and each of them will lay off 44 clerks.' Make it catchy, give it as much emotional appeal to feelings of economic insecurity, and find a way to say it to 15 million people—the approximate number who saw the TV show on which the original statement was made."

Statement follows: "We of automation admit responsibility for technological unemployment; will spend $— annually sponsoring retraining studies and action." All the clever PR and TV on and above the earth will do the industry a fraction of the honest good that such a 17-word public statement would do. Something this strong is required to counteract McCracken's attitude, rather mild of its class, "I wouldn't be surprised to hear of a union contract that specifies that a computer must not be installed. Social ostracism of computer people within a plant will surely become commonplace. I predict, finally, that within this decade a computer will be bombed by a deranged, unemployed worker." The many employed workers whose paychecks have been "bombed" by a deranged, ill-employed computer that writes checks once a month and writes them wrong, are also to be feared.

It seems the industry has a simple choice: big profits and plush, or small profits and social responsibility. As McCracken suggests, time is running out for this conspicuously fat segment of our economy.

M. G. Saslow
Dept. of Psychology
Univ. of California
Berkeley, Calif.

a negativist replies

Sir:

Fred Gruenberger has thrown down the gauntlet. I shall bend over and attempt to pick it up. This position, of course, makes me vulnerable.

I, personally, believe that the benchmark or single test criterion system proposed in the article "Benchmarks in Artificial Intelligence" is not very intelligent. No one in his right mind would suggest that we judge the intelligence of our children, or stronger still, whether or not they were intelligent on the basis of one task or on tasks performed in vacuo. There is but one test and that is judging the OVERALL behavior of the thing under scrutiny.

To take one of Fred's examples—doodling—we can program a machine today to doodle in that fashion, and only when a certain phone line is activated if need be—but if that's all the machine did it would certainly not be thinking. Fred does two things while on the phone—communicates and doodles, and I don't believe that he automatically goes into his doodling syndrome every time the phone rings—that is called compulsive (the anthropomorphism for mechanistic).

The main point is that the machine—without intervention—must choose the appropriate set of responses to a large variety of stimuli in a human-like environment, the last because all of the judging is going to be subjective. This requires that the machine have some forms of humanoid communication capability, the ability to read the written word, to hear the spoken word, and to speak and write.

Since we are judging by human standards, I would impose one more requirement on this artificially intelligent machine. It must have some sense of humor—that is it must "laugh" as a response to certain stimuli—even little children do, you know. And further, it must in turn be able to turn about and attempt to make a joke now and then.

This is my benchmark. Turing's test, then, is the only valid test proposed to date, but unlike Turing's test, I want to know that it is a machine that I'm judging. Thus, creating a machine or writing a program for chess playing which always answers "your move" in response to "how are you?" will miss the mark by a long shot.

M. I. Bernstein
Santa Monica, Calif.

erring abroad

Sir:

In your August, 1962 issue in the article "The Market in Great Britain" by R. E. Williams, it is stated on page 53 that "IBM World Trade Laboratories has a staff of 500 top line British electronic engineers in their Laboratory in Winchester." The total strength of IBM British Laboratories is presently slightly over 500 including all functions; professional, technical and administrative. Of this total, over 175 are professional engineering and scientific specialists.

A. D. Monkhouse
IBM British Laboratories
Winchester, Hampshire

third cousins

Sir:

In your August issue, the article "The market in Western Europe" contains the statement that "Bull and Olivetti are second cousins, at any rate, both being financially tied into the Michelin Tire Empire."

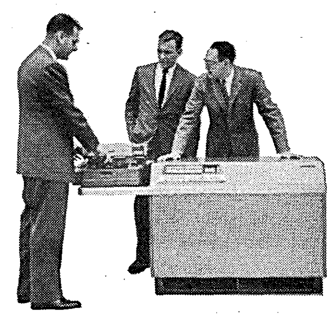
The Olivetti and Bull Companies have a working agreement, which covers *only* the Italian market. It is a mistake to speak of a financial tie-up between Olivetti and Michelin. No such relationship exists or is contemplated.

Riccardo Musatti
Olivetti & C., S.p.a.
Milan, Italy

(UPTIME & SOFTWARE)

TWO CONSIDERATIONS WHEN BUYING A COMPUTER. HERE, TOO, THE LGP-30 BEATS COMPETITION.

Uptime is the opposite of downtime. The time a computer will be giving service, not receiving it. With the LGP-30, uptime averages 97.5%. What other computer offers such high reliability? □ Software is the complement of hardware. The programming material fed into the computer rather than the equipment itself. Software — the program — can cost you a fortune or nothing. With the LGP-30, there's a good chance programming will cost nothing — thanks to our extensive Library of Programs. □ Unfair to the competition? Here are the other facts about the LGP-30. It's the most powerful computer in its class, with memory (4096 words) and capacity equal to computers that cost twice as much money and consume twice as much space. The LGP-30 is the easiest computer to program—even non-technical personnel can master it. You can operate the LGP-30 yourself—without dependence on a computer programming specialist. □ Solutions are printed in any desired alpha-numeric format—requiring no deciphering. It's mobile—can be used by any number of people in any number of places. No expensive installation—just plug into conventional outlet. Sales and service available coast to coast. For complete information about rental or purchase, write Commercial Computer Division.



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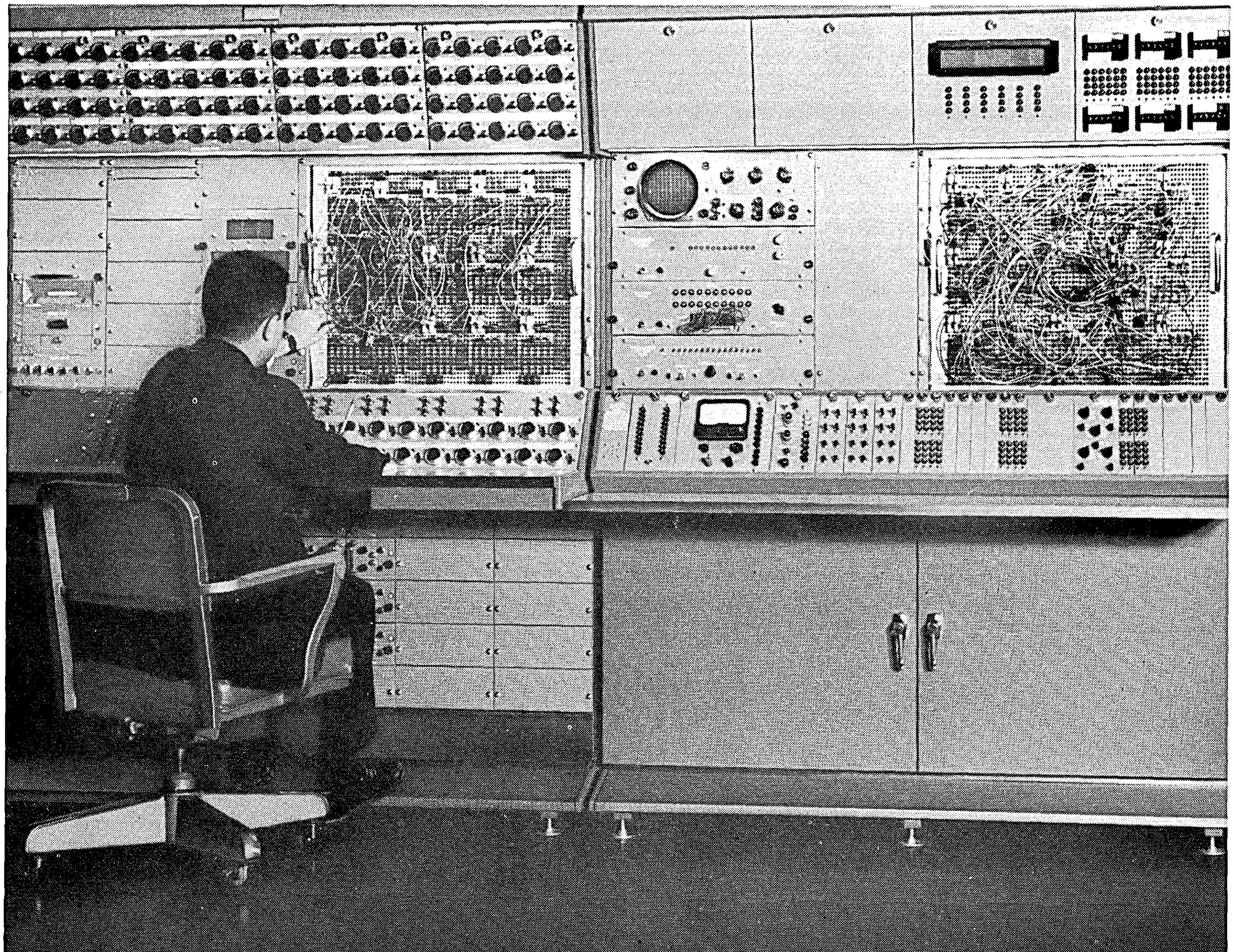

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EAI HYDAC Computer, Series 2000, introduces a new dimension to computer simulation by combining analog and digital operation into one integrated system. HYDAC achieves a computational efficiency well beyond the limits of either analog or digital computers alone. Moreover, it offers an economical alternative to tying a complete data processing computer to an analog computer for hybrid computation.

HYDAC combines two major sub-systems; the well-known PACE® Series 231R General Purpose Analog Computer and the new Series 350 Digital Console. The normal analog operations of summation, inversion, continuous integration, multiplication, division and function generation are performed by the analog computer while the digital system provides high-speed logic, switching and memory capability. All digital operations are accomplished by solid-state, general purpose, modular building blocks inter-connected by the proven prepatch panel system. HYDAC programming follows simple analog principles, making extensive retraining of analog programmers unnecessary.

HYDAC vastly increases the range of dynamic simulations that can be performed by computers. Such applications include iteration and optimization studies, partial differential equation solutions, simulation of logic functions, transport delay and other auxiliary mathematical functions as well as high-speed incremental computation. Full information on HYDAC, the new computer for dynamic simulation, can be obtained by writing for Bulletin HC 6238.

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EAI

ELECTRONIC ASSOCIATES, INC. *Long Branch, New Jersey*

CIRCLE 13 ON READER CARD

MUST

- *every computer be bound by the principles established for the first computers 16 years ago?*
- *the split-second reaction of a computer be forever limited by the time-consuming necessity for operator intervention?*
- *computer users be content with a conventional computer which was NOT designed or built to make effective use of higher level languages?*
- *the language of computers be irrevocably oriented more to machine than to man?*
- *computer users, hearing about the advantages of problem oriented hardware from computer experts, be satisfied with anything less?*

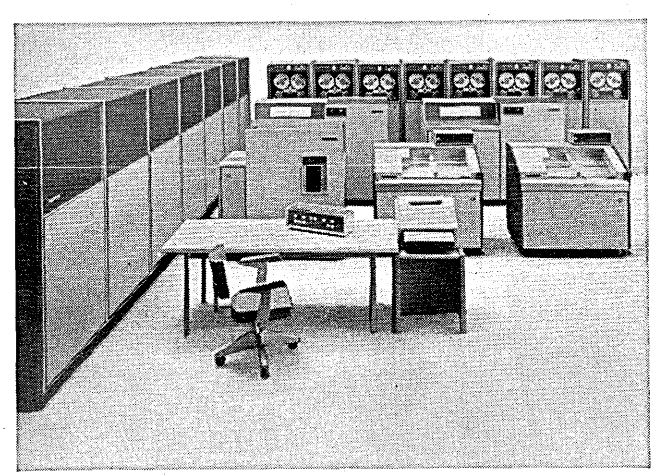
NO to all five questions. Because Burroughs B 5000 Information Processing System has blasted the 16-year-old mold that has shaped all computer concepts up to now.

The B 5000 schedules its own jobs, assigns its own peripheral units and handles its own interrupt conditions. It processes several programs at the same time, handles its own file identification, and generally saves user, programmer and operator the cost and bother of the thousand and one details for which other systems are so often criticized.

In addition, the B 5000 was specifically designed to utilize the higher level languages of ALGOL and COBOL. The B 5000 is the first—and so far the only—American computer to integrate ALGOL and COBOL compilers into basic system design.

Must you have more details for a serious consideration of the B 5000? By all means. Call our local branch and let our Systems Counselor give them to you. Or first read our booklet "The B 5000 Concept." Address your request to us at Detroit 32, Michigan.

Burroughs—TM



Burroughs Corporation

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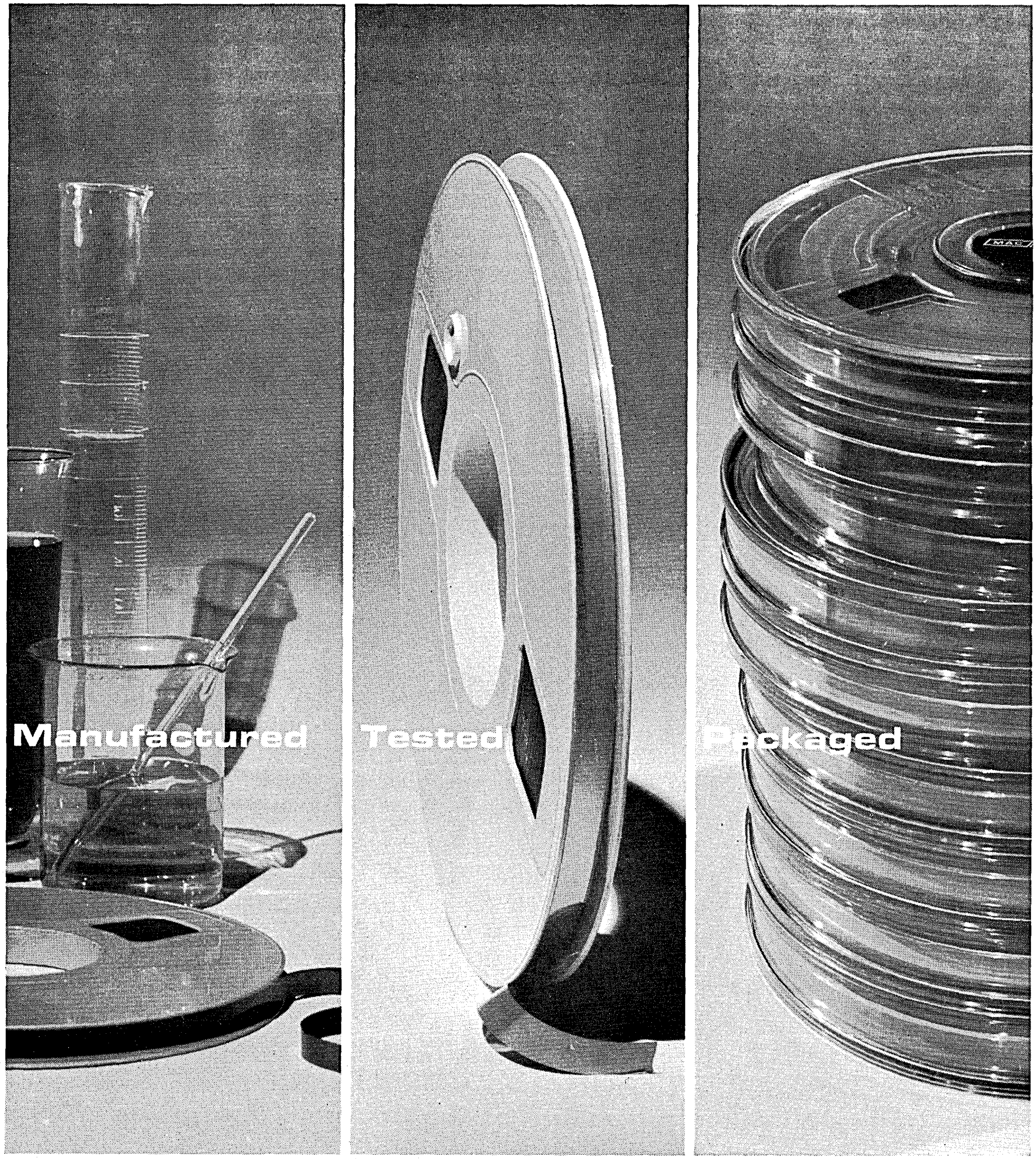
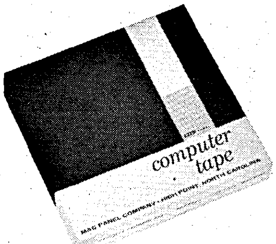


For Assured Performance!



Produced by a unique method under rigidly controlled, laboratory conditions, MAC Panel Computer Tape gives you greater assurance of perfect recording of input data and distortion-free output delivery. This assurance is guaranteed, because every inch of this heavy-duty tape is tested drop-out free at 556 bits per inch on General Kinetic test equipment. Packaging is important, too, to insure the safe shipment and storage of reels until you're ready to use them. In full-size or half-size reels, MAC Panel Computer Tape is **Manufactured for Performance . . . Tested for Performance . . . Packaged for Performance.** See how it can help you in your computer installation . . . ask your MAC Panel representative for a trial reel. Also, write for the informative booklet, "MAC Panel Computer Tape . . . Assured Performance."

MAC PANEL

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CIRCLE 15 ON READER CARD

DATAMATION

BUSINESS & SCIENCE

SHOW-BIZ AND SOFTWARE

Any Broadway producer worth his salt would have been proud of the production, "Computer Languages," presented for a one-night run at the recent FJCC. The audience-participation show had something for all theatrical tastes: comedy--drama--human conflict--and a firm measure of Thurberesque satire.

An all-star cast was headed by Al Perlis, supported by Harry Huskey, Bob Bemer, Bob Floyd and Bernie Galler. The following representative scene is reproduced here via tape recording for those unable to attend:

"Q. I'd like to know if the long-haired boys are ever going to flatten out the curve of (computer language) progress. Every few months someone comes out with an improvement of an improvement, and at least five percent of these improvements are real improvements. Now, when are we going to stop? Eventually us fellows are going to have to catch up. I want to know when and where. Am I going to have to wait one year? Two years? Twenty years? Thirty years?

"A. We've changed machines, we've changed translators, we've changed versions of translators, and we've never changed people's programs.

"Q. I'm not asking you how to run an installation. I'm asking you to predict when the development of languages is going to stop.

"A. Never.

"Q. Are you sure?

"A. We"d all be out of jobs if it stops.

"Q. Then you're doing it to keep your jobs?

"A. Right!"

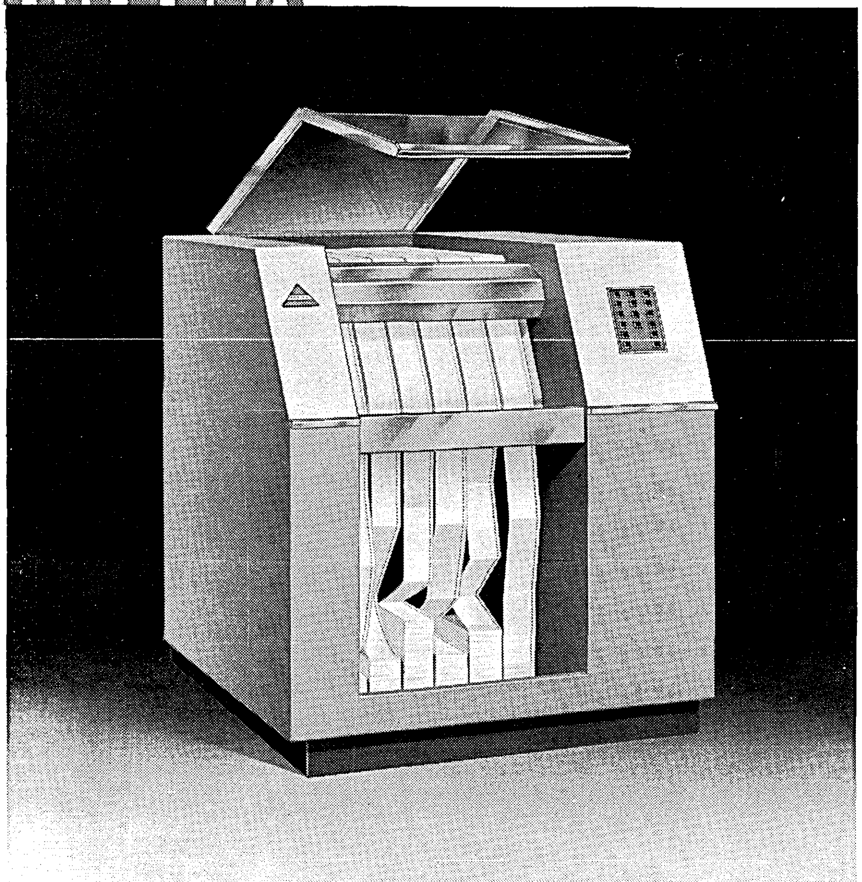
AT PHILCO: OPTIMISM & FORD $$$'s

Announcement at the FJCC of a "new concept" in rental rates, a sales price and leasing fee reduction for the 212, and the unveiling of a new, medium-scale computer, the 4000, contributed to the rosy glow of optimism which emanated from the Philco booth at the Sheraton.

Ford financial support for the computer division is evident in marketing plans for the 4000 which includes at least a doubling of the Philco sales force within the next few months.

Obviously a pump-primer to help boost the lethargic

NEW FROM ANELEX



MULTIPLE TAPE LISTER SYSTEM

For proving and clearing operations in demand deposit accounting in banks. Completely integrated system . . . six 24-column high speed listers, control electronics and buffers in a single, soundproofed housing. Compatible with almost any type of MICR Sorter-Reader. Prints a master list, four transit lists and one miscellaneous items list in a single pass through the Sorter-Reader. Prints at rates up to 2000 lines per minute.

Further information is contained in the new 4-page Bulletin, "Anelex Multiple Tape Lister Systems", available on request.

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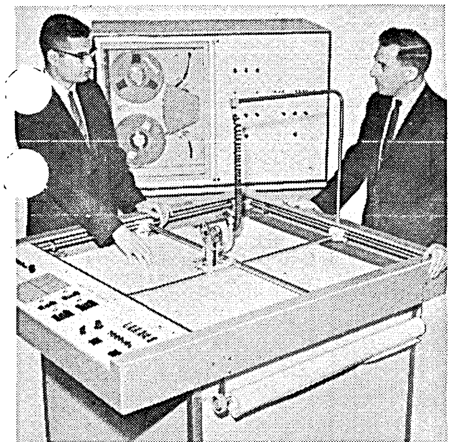

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Let Benson-Lehner data handling equipment help solve your problems more accurately in less time, with greater reliability and for less capital investment.

Benson-Lehner Record Readers will reduce your strip charts, electrocardiographs, photographic data, drawings or maps into digital form for input to any computer.

Benson-Lehner precision Plotting Systems will accurately display or reduce your data to graphic form comprising points, symbols, continuous lines and numerical identifications from paper tape, key-board, punch cards, magnetic tape or direct computer linkage.

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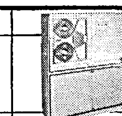
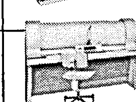
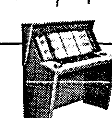
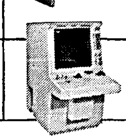
MAGNETIC TAPE CONVERTER for Digital Plotting Systems	
LARR—Large Area Record Readers and Digitizer	
OSCAR—Oscillographic Record Readers and Digitizer	
BOSCAR—Film Record Readers and Digitizer	

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CIRCLE 35 ON READER CARD

rate of Philco installations, the PACT (Pay Actual Computer Time) plan will be applied initially only to the 4000 series, but Philco expects it to be extended to the 2000 series in the near future. The plan enables the user to be charged a basic monthly rental plus an hourly use rate. For example, a particular 4100 system would be available for a monthly rental of $3,850, plus $22 for each hour the system is used.

Other moves to meet the competition include a monthly rental drop of $7,000 for a "typical" 212 installation, and a corresponding $650,000 reduction of the 212 sales price. Rental of a basic 1000 was reduced approximately $1,500.

While the 212 has been demonstrated as the fastest operating hardware commercially available, the problem of compatibility with 7090 programs still remains. Consideration is being given to contracting for translators in order to convert IBM customers.

ENGINEERS LEAD AFIPS IN EDP PLANS

Required reading for the new slate of AFIPS officers should include a six-point program recently announced by the Engineers Joint Council aimed at improving engineering information handling and computer utilization.

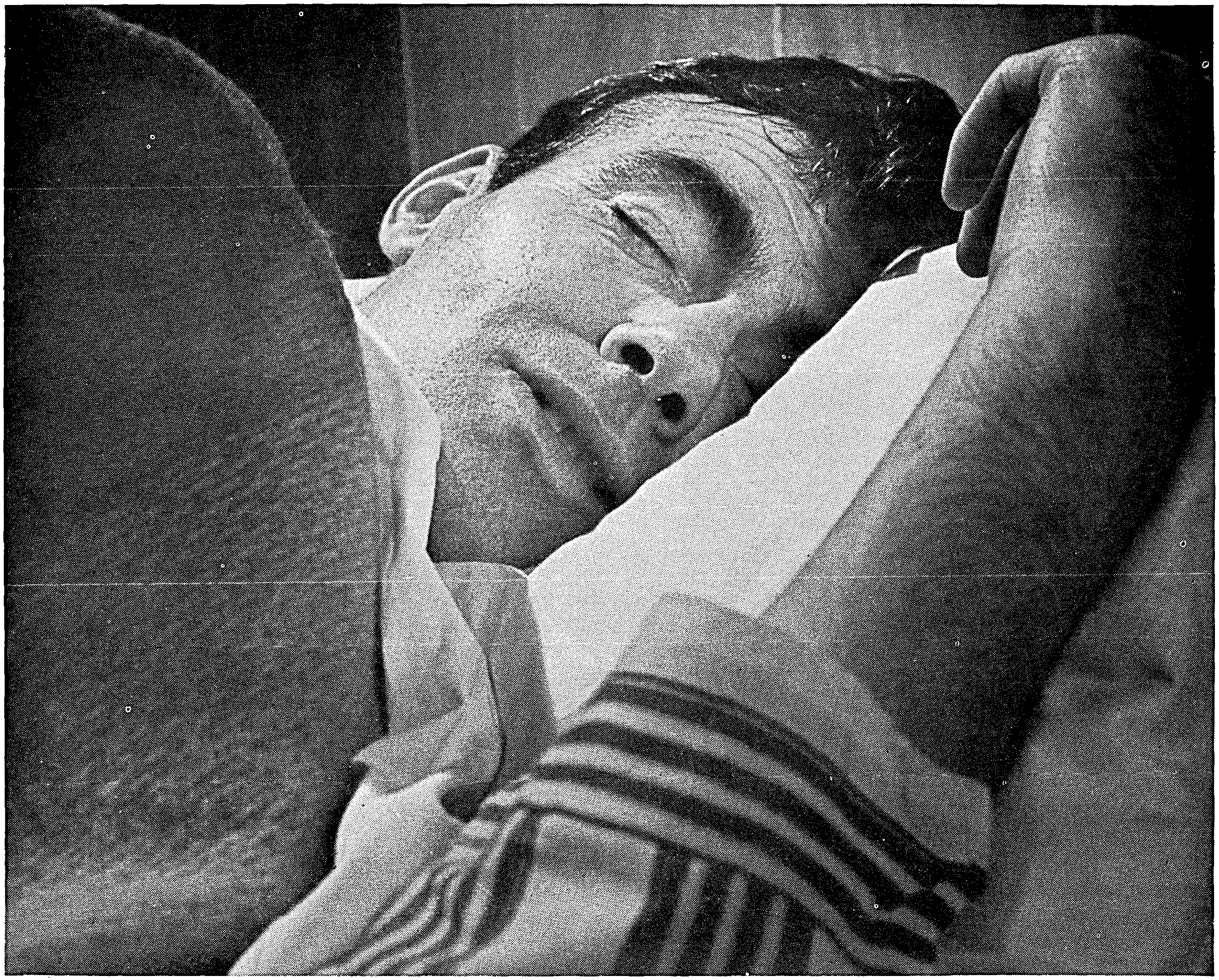
The most impressive aspects of this project are specific timetables prepared for implementing the Council's goals. In a position paper charting the proposed EJC course, Walter M. Carlson, chairman of the Information Systems Committee, outlines each of the six points (Engineering Information Center, Assistance to Government Agencies, Undergraduate Training, Design Automation, Training Practicing Engineers, and Equipment Compatibility) and delineates a timetable for each. The following schedule for equipment compatibility serves as an example of the Council's planning:

1st half	1963	Formulate study program details
2nd half	1963	Select cases for study
1st Q.	1964	Start field work
4th Q.	1964	Complete study and submit recommendations

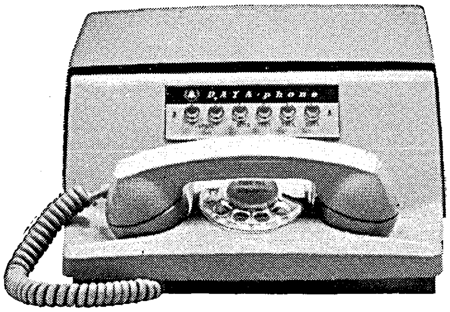
Operating plans for each point are clearly defined, including the specific objective, organization of committees, timetable, and how the project will be financed.

Even if accomplishments fall behind the timetable, a formal public commitment of this type is highly commendable since it prompts an organization to "perform" rather than "debate" the virtues of performance.

It's interesting to note that Carlson, in addition to his EJC chores, is also on the board of governors of AFIPS (chairman of the by-laws and constitution committee) and the IFIP Congress '65 committee. Perhaps his AFIPS efforts have been channeled in the wrong direction.



How to telephone a million words while getting eight hours sleep



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CIRCLE 20 ON READER CARD

EDITOR'S READOUT

1963: A YEAR FOR DISCARDING PATIENCE

During the coming 12 months, the computing industry's prospects for unexpected, dramatic growth or sudden, depressing failures are reasonably remote. It is probable, however, that basic patterns now in the process of establishment may be altered to conform to the economic needs of both manufacturer and user. The fundamental conflict between what is best for the long pull and what is presently most attractive to the coffers of corporate management will be stressed with far greater emphasis in '63 than in all of computing's short history.

Instrumental to accepting the interim between now and tomorrow is a posture which has shown initial signs of misuse. Its simplest designation is "patience."

Webster defines this word as the "state, quality, power, or fact, of being patient; forbearance." Its daily application however, has connoted a far wider range of virtues; namely, maturity, wisdom, erudition and considerable justification for virtually any position, particularly when a division of opinion is evident.

While popular connotations may be acceptable to the broad spectrum of industry and management, there is implicit danger for computerites in a religious adoration of this seemingly attractive posture. Most important is the fact that the computing industry stands apart from its peers in rate of growth, fundamental needs and current problems.

There is little need for reviewing the increases in machine population or the explosion of new applications. These are certain to continue in '63 and have been reiterated in all forms of industry and consumer communications. Less familiar are the internal headaches to which excesses of patience have recently been applied and have a potential for increasing in '63.

Society Leadership

As a comparatively new field, computing can boast of a greater variety of societies, associations, groups and other means of professional conviviality than any of its peers. A sampling of the major organizations might include ACM, DPMA, PGEC, SHARE, JUG, BEMA, ASA, AFIPS, and IFIPS. While the list is impressive, it also represents a diffusion of factions resulting in mild confusion for some and a complete lack of leadership for the entire industry.

One society on this list, AFIPS, has been billed as "the society of societies" and according to its charter represents a broad cross section of interests. Fulfillment of its charter, however, appears somewhat in conflict with the overly patient attitude of its leadership.

In almost any other industry, a society formed over 1½ years ago would not be expected to have accomplished more than AFIPS has done; namely internal organization and sponsorship of the joint computer conferences. In information processing, however, the need for less patience and greater activity in '63 is clearly apparent. Without a strong, cohesive force, computing's sundry interest groups will splinter further apart and the distortion of its public image will become irrepairable.

The Need For Warm Bodies
It has been said often enough: the problem is serious, getting far worse, and relief is not in sight. The shortage of programming personnel is, indeed, a concern of the greatest magnitude. Surprisingly, there has been little collective action directed at solving the problem. There is, however, an attitude of teeth grinding patience. A suitable analogy may be made to the application of chewing gum on a large hole in a leaking dam with the knowledge that heavy rains are imminent.

At present, computing education in secondary schools is viewed as too long range a solution; colleges have few instructors to adequately produce a large enough quantity of trained personnel, and manufacturers and users are far too busy plugging their individual dikes to be concerned about the larger dam.

There are, of course, some advantages in encouraging patience: salaries will continue to increase out of realistic proportion to merit and qualifications, transiency will be widespread, and a new industry of unknowledgeable body swappers will flourish. One disadvantage is prominent for the coming year: the incidence of sloth will be strikingly high.

Profit And The Machine Makers
"Amazing," declared the stockholder. "Our investment in computing has been enormous and everyone hears about the growth of this field. Why are we losing money?" "Patience," replied the computer sales manager.

Last year, the initial signs of patience were widely evident as the fall out rate of manufacturers was practically nil. For many firms, their losses continued but a change did occur: their chances of ever producing a profit, particularly in '63, decreased almost in proportion to their application of patience. For a small number, their profit probability factor is too low to calculate.

Accompanying the philosophy of "wait and see" was a fiscal policy of retrenchment. If continued during 1963, it will prove as dangerous to the livelihood of a computer manufacturer as a declaration of bankruptcy.

Standards and The Lost Majority
By far, the most extensive application of patience may be found in deliberations on standards for edp. Because of the need for voluntary acceptance of standards in this field and the dangerous possibilities of premature standardization, a reasonable amount of methodical plodding is both understandable and commendable. Unfortunately, this posture of acceptable patience can and has been misused as a rationalization for political entanglements, poor leadership and almost a total lack of accomplishment.

A blatant indictment of this nature is not tendered without considerable supporting evidence, the most obvious of which is the fact that while proposals have been in plentiful supply for several years, not a single specific accomplishment may be reported at this time

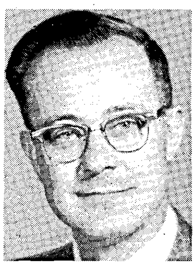
To be sure, committees have been organized and reorganized, and last year a majority ASA's X3.2 committee approved a new character set but a "consensus" was not obtained. It remains unclear as to what a "consensus" represents and whether this somewhat undefined obstacle may ever be overcome. 1963 would be a fruitful year for standards progress, but the outlook is for unabated patience.

There are numerous methods for discarding patience during the coming year. In some instances, it may prove more prudent simply to temper forebearance with a modicum of activity. However, the need for "doing" rather than "waiting" is widely evident and if subsequent results prove that a course of action was wrong, it is sometimes possible to learn from mistakes. The moral may be old particularly to computerites, but its application merits renewed interest. ■

THE MATURING FIELD

an editorial commentary

by ROBERT L. PATRICK, Computer Specialist, Northridge, Calif.



Only nine short years ago the digital computer field was punched card oriented. One did his work with 604's and CPC's, or it didn't get done. Then came the 701. It had many deficiencies, but offered a sound step forward in computer capacity. The few of us that experienced that transition look upon ourselves as old timers in the field, even though some of us are barely 30.

When the 704 planning started, the same group that are now old timers formed a club complete with rules and bylaws – it was called SHARE. Out of this series of meetings a camaraderie grew, the association gradually strengthened, and the outcome was a programming priesthood. We would don our flowing robes and sweep through the meeting halls. Conferences were held with the IBM inner circle, and the priesthood was further strengthened. Admission was earned by a contribution to administration, systems programming, or by being a hale fellow well met. Being head of an installation helped, although programmers of note were also eligible. Frequently I meet some of the priests and am amazed at their present assignments.

One would think that the 100 or so men who were part of the inner circle (or have recently achieved such status by association) would be powerful leaders in the digital computer field today. Most of them would have ten or more years experience in the field capped by a formal education. This provides them with at least the proper trappings for a major contribution to the art. Unfortunately this is not the case.

Many of the old cult have gone into management or, more precisely, administration. While they are usually associated indirectly (through one or more levels) with a computer, their job assignment is more or less one of wage and salary, personnel administration, planning, scheduling, and attendance at meetings. Unfortunately they've developed no unique skill of their own. They are in the same pot with a myriad of other managers within their same firm. In the early days some of these men were sharp, extremely hard workers. Unfortunately, they have allowed themselves to become complacent and comfortable in one or more comparatively un-taxing jobs. In many cases they have forgotten how to work (although I'm sure each one of them feels as though he earns his monthly paycheck). I wonder if they ever think of the future.

Except for those who are employed by a computer manufacturer, their skill has no direct bearing on the primary product of their corporation. Since they have no skill of their own and are not directly associated with the primary product of the firm, they can only rise to a moderate level in the staff of the organization. General managers and Presidents are usually picked out of the line. Many of these people are in jobs today that they've held for several years, and are likely to hold until retirement. Whenever I observe one of the old brotherhood in such a state, I feel doubly sorry. Once for him, because he has allowed himself to be sidetracked into a position that really offers no future challenge and cannot hold his interest; and once for the field, for here is a man of stature and competence, a producer if you will, whose services are lost at a time when we need them most.

Occasionally I'll meet other members of the clan that are still practicing technicians. Five or six years ago they were excellent technicians at the top of the trade. Today they are still excellent technicians, but their quality and output have not materially improved with age. Several years ago writing and checking out a utility program of note was a significant undertaking (which struck awe into the hearts of users). But these old friends specialized too soon.

A man with eight or ten years experience who has only done system programming is limited in his view of the world, limited in his utility to his employer, and limited in the remuneration he can receive for his services. Since many of these men have never learned how to handle a crew, they are even further hamstrung: the only assignments they can be given are those that can be done with their own two hands. They're never learned to delegate responsibility, how to manipulate others, and are too impatient to train an apprentice. Many of them have already started to level out financially: a man who has been *writing* the same kind of routine for eight years is not worth significantly more than the man who has been writing similar routines for only two years.

Some of these men have admitted that they feel a little like the aging fisticuff champion. Whenever they learn about a new computer or technique, they are hard put to stay ahead of some of the younger and less experienced people in their own organizations! These men will always earn a good living much as a skilled machinist earns a good living. For many of them it's too late to broaden their outlook and, if they get bored or dissatisfied with their present job, they may find it rather difficult to move to another firm at the same salary.

Still another faction of the old priesthood has gone into "research." They may have tried management, found they weren't too well suited for administration, longed for the clean precise technical life, and turned to "research." Some of our strongest, more competent old timers are caught in this web. At one time they may have sincerely attempted to do some research. But research is really harder than some people would like to admit. In addition to being smart enough to recognize researchable areas and competent enough to attack them, one must have the self-discipline and drive which keeps one's nose firmly against the grindstone. In the research environment one seldom gets direct supervision (if your research manager could schedule the work and measure your performance, it would be development, and not research). Many of these men lack the determination and self-discipline required. They have merely retired at 35. To be sure, they still attend meetings, are still well read, have many interests, but their managements retain them as a vestige of their once glorious past: no results from their research are actually produced. Few of them publish any papers; the papers when published are seldom of significance.

By far the smallest grouping of old timers are those who are still actively producing and at a rate proportional to their age and experience in the field. Some of these people have found that they are ill suited to permanent employment by major corporations, and have launched into the uncertain waters of private enterprise. While their future may be unsure, their present activity is anything but boring. They learn something every day and there is always the chance that they will finally end up in the really big money. Others of this same ilk have found homes with the larger corporations and are either in positions where their individual talents are amplified or they have positions which require extensive technical leadership. In many cases they have one or more administrative assistants to help with the paper work so that they can concern themselves primarily with the technical direction of a large programming effort or project. For these men I hold the deepest personal regard since they were in the front ranks of the field long ago, and have maintained their precarious status as leaders. Most of them have undergone an impressive intellectual growth in the past several years. They have retained their old skills and have developed several new ones: usually in the direction of finance, technical administration, sales, and applications. These are the men the field can and will depend on for leadership in the ensuing years.

The sorrow for my less fortunate brethren is amplified by some recent developments within the field. The computer field is beginning to mature. Just as a lake of lava slowly starts to congeal, the boiling, frothing mass which we know as programming is beginning to congeal. Although the standards activities have been magnificently unproductive to date (probably due to their leadership), the future indicates that we will eventually have a glossary of terms generally accepted by all. On this foundation we will build measures of computer performance and throughput. The colleges and universities (long suffering from the same conservative leadership) have finally ceased being sinks for talent and manpower. They may eventually pay their debt to society and become full fledged members with industry. This change has been primarily motivated by the dynamic leadership of two or three strong individuals who have impressed their personalities on their schools in such a way that the ivy was shaken from the encrusted joints, and the whole mechanism started to move.

Although many old timers would hesitate to publicly admit it, one good, three hour course given by a competent instructor is roughly equivalent to their first four years of experience which were so assiduously accumulated. Furthermore, the tempo shows every indication of quickening. This will make it even more difficult for a re-awakened old timer to catch up. A few far sighted individuals have taken the computer to some of the nation's high schools. One or two experimenters have even had the affrontery to introduce selected junior high school students to the marvels of the machine. True, young students have many advantages over those who learned about computing by the seat of their pants.

The children who are now in junior high school are the practitioners of the next decade. Most of the old timers have not yet stopped to figure out that they shall have 15 to 20 years of their work life remaining *after* these bright youngsters join the work force!

The market is changing too. The in-house productivity in many large firms is so low and the overhead so high that small independent contractors have been able to move in and take away juicy programming contracts. Thus, the in-house group is reduced to maintaining existing programs and the interesting work is being contracted out. In addition, the new look in contracts is penalty clauses.

While penalty clauses and incentive contracts cannot be rigorously defined in the absence of a standard glossary and measures of performance, the time is coming when more than a mere level of effort will be required of the contractor. He'll have to produce a program that is checked out, on time, and accurately documented to agreed upon standards.

In previous issues of this magazine we have seen the beginning of a debate on measurements of programmer performance. The die-hards maintain that it can't, shouldn't, or couldn't be done. The few experimenters are more than willing to admit that their efforts are halting and crude, but they have served notice on the field that they are trying to establish measures which require less intuition. Eventually we'll be able to measure a task, schedule it in terms of standard programming units, administrate the crew, and achieve a quality product on time at a reasonable cost.

On Saturday, December 8th, I had the good fortune to sit for the Certificate in Data Processing which is awarded by examination by the Data Processing Management Association. Although I entered the field via the scientific and engineering side, I have most recently been working about equally in both factions of the industry. I felt that such a certificate, if I were fortunate enough to pass, would eventually be highly valuable. Although I have been an ACM member for many years and, as such, have long been biased against the NMAA (now the DPMA), I have been favorably impressed with their society in the past several years. I was privileged to speak at their 1960 National Convention and found it well organized, well run, and well attended. While their average CQ (computer quotient) was somewhat lower than that enjoyed by members of the priesthood, I suspect that their diligence and drive more than compensated for their lack of formal education. When their certification program was announced, many of my ACM colleagues treated it lightly. Since they were old computer users they tended to treat *everything* the NMAA did with disdain. Well, they'd better fall back and regroup because this certification effort is excellent! The examination had been given earlier (June '62) in New York City. In December it was administered, for the first time, nationwide. One thousand fifty persons were reported to have taken the examination for the certificate. I was one of 103 Angelenos who took the quiz at L. A. State College.

The test was administered by an independent testing service under the most sterile of conditions. If you knew the material, you got a good mark. If you didn't know the material, you sweated, and there were five or six that did not complete the required schedule. Although the test material was hampered somewhat by the lack of an accepted glossary, the questions were generally excellent. They ranged from those which the old tab men could easily answer to those which many veteran computerites could not complete. In addition to the difficulty, the variety was impressive. The test covered automatic data processing equipment; computer programming; data systems analysis, design, and implementation; mathematics for data processing; accounting; and statistics. I admitted that I was taking an examination designed for practitioners in a field in which I do not specialize and cut my ACM ego with a moderate amount of cramming. I found questions on computers and programming easy (my primary competence). Questions on accounting and statistics tended to be rather difficult.

There are those among us who will staunchly maintain that a certification program is wasted effort, meaningless, and will never get off the ground. To these critics I say—when you show me your Certificate in Data Processing then I'll listen to your opinion. The DPMA has done an excellent job in preparing a test for managers which will measure their threshold competence in a wide variety of important fields. In preparing for the test most of the candidates will bone up. This additional study will raise the average level of competence of the entire field. As the manager becomes more technically competent and confident of himself, his technicians must follow suit or perish. While it's true the test did not measure all that an experienced professional might know on some of the topics, it did determine a minimum level of competence in all the fields that it covered. As such, the man who has never done an application cannot qualify without extensive study. Likewise, the man who is a shift supervisor or group leader and has never opened a technical book or magazine in the past several years is also handicapped.

Similar to an automobile driver's examination, the certificate will merely guarantee that the holder has a minimum set of qualifications. It will not differentiate between the ordinary clod and Sterling Moss. On the other hand, those who do not hold a certificate will be in an uncomfortable heterogeneous category. This category will contain those who are too young, unqualified, stupid, or lazy.

Eventually we will see a series of such examinations which are progressively harder and which progressively require more varied and greater experience. Perhaps such a series of examinations will be augmented by a series of specialty examinations at each level whereby the practitioner may obtain an endorsement for his particular technical skill. If such were the case, then trainee, coder, programmer, senior programmer, analyst, systems analyst, and manager would have unique unambiguous meanings. This would be a boon to the wage and salary boys who have long looked for measures other than "years since degree."

I wonder how many of the old group we will be able to find usefully producing ten years from now. In a free economy a man's worth is roughly proportional to his salary. I wonder how many of the crew keep a plot of the first derivative of their salary versus time?

In my travels I work with a lot of bright young men and women who have learned from experience, yet are not hampered by any vestige of what once was. I find that some of their irreverence for the priesthood has rubbed off on me. When I occasionally rejoin my old friends and we spend all of our time reminiscing, I inquire of myself (in my most obnoxious Brooklyn accent), "So wut've ya done lately?" ■

people IN DATAMATION

■ Werner Buchholz has been appointed chairman of the IFIP Congress '65, to be held in New York City in May 1965. Also announced were the appointments of B. Langefors and Alston Householder as chairman and vice chairman, respectively, of the Congress' program committee. Buchholz is with the IBM Development Laboratory; Langefors with Svenska Aeroplan Aktiebolaget, Sweden; and Householder, a former president of ACM, is associated with Oak Ridge National Laboratory.

■ Herbert S. Bright has been named Philco Computer Division's director of programming. All division personnel engaged in programming R&D activities now report to Bright, who formerly was technical advisor to the director of computer marketing. Bright, secretary of the ACM, was formerly with BEMA, Westinghouse-Bettis Atomic Power Laboratory, and the University of California.

Major organizational changes have also been announced for Philco's Lansdale Division. These are: C. G. Thornton, named manager of the newly-established Advanced Solid-State Development Department; Charles D. Simmons, manager of the Microelectronics Department, also a new function; Charles Gray to the post of manager, Commercial Engineering Department; James D. McCotter, manager, Semiconductor Product Development Department; and Robert C. Musa, named manager, Chemistry and Metallurgy Department.

■ The post of executive vice president of C-E-I-R, Inc., has been filled by George W. Dick. Prior to his present position, he had been a division vice president and general manager of RCA's EDP Division; VP/Marketing, American Mutual Liability Insurance Companies, and spent over 17 years with IBM. Dick will be responsible for all C-E-I-R operations in the U. S., Europe and Latin America.

■ Bernard Hathaway has been appointed director of manufacturing for Electronic Memories, Inc. Hathaway was formerly director of manufacturing engineering for Ampex Computer Products, and had also been associated with Telemeter Magnetics, Lear, and Canadian Marconi.

■ Lutter, Maremont and Co., Inc., Chicago consulting firm, announces three new staff additions: Herbert B. Lassiter, formerly with IBM, was named director of programming services; Joseph E. Butler was named director of sales, and Charles G. McGee engaged as a part-time consultant.

■ Electronic Associates, Inc., Long Branch, N. J., has appointed David P. Wilkinson director of corporate planning. Wilkinson joined EAI from GE's Technical Military Planning Operation, Santa Barbara, Calif., where he was manager of the Business Planning Operation. Wilkinson has also been with The RAND Corp. and Planning Research Corp.

■ General Precision's Librascope Division has named Dr. Edwin R. Lewis as a research scientist in the Advanced Research Department. Dr. Lewis, formerly associated with Texas Instruments, Inc., will conduct basic reseach on the simulation of nervous systems and other projects leading to advanced computer systems development.

FOREIGN EDP

a 5-10 fold increase projected

by RICHARD E. JENNISON, Director of Institutional Research,
Auerbach, Pollak & Richardson, New York City

Foreign electronic data processing represents the emergence of a major new growth industry that may in time approach or exceed the size of the domestic industry.

In the course of several trips abroad during the past year, attendance at the International Federation of Information Processing Conference in Munich, as well as the results of special studies conducted by our consultants, we have been considerably impressed by the level of interest and sophistication at this early stage in the development of the market.

the narrowing gap

Although the hardware and software technology still lags behind the state of the art in the United States, progress is rapid and the gap is likely to be narrowed sharply in the not-too-distant future.

Interest and reception to computers overseas has been tremendous, even in relation to the early build-up of the industry in the United States. This virtually unprecedented experience can be attributed to:

a. The aggressive attitude in most countries towards modernizing and improving industrial and business efficiency;
b. The availability of high-performance, solid-state computers, coinciding with the inception of the market;
c. Centralized forms of government, placing heavy requirements on record keeping and controls;
d. A long industrial history of technological and engineering effort.

Over the next five years, the greatest growth in foreign EDP will take place in the more highly industrialized nations.

However, even the less industrialized countries are evidencing a considerable interest, as computers are viewed as a principle means of overcoming the shortage in skilled workers, clerical personnel and engineering talent.

Furthermore, in some areas EDP is regarded as almost the only medium for overcoming the economic, educational and technical gap. This trend is likely to continue and, within the next five years, lesser-developed areas will also become major markets for EDP.

As in the United States, the build-up will not be unaccompanied by growing pains. A serious shortage of programmers already exists, and knowledgeable computer salesmen and service personnel are not too freely available. The shortage in programmers will be even more acute in the future, and may present a limiting factor to the rate of growth in business data processing applications.

While the bulk of the market to date is accounted for by business applications, we anticipate a rapid build-up in the market for scientific computers and more technical industrial applications in the very near future.

We have been quite favorably impressed with the level of technical knowledge on the part of scientific users. This provides a sound base for the development of very large technical markets for EDP equipment.

With a market in Western Germany of well over $100 million annually, rates of growth as high as 50% per year in Scandinavia and 75% in Italy, hundreds of installations already in existence in France, and great interest and activity rapidly developing in areas such as Australia and Japan, a sizable and broadly based future industry seems assured.

We have previously estimated that the foreign EDP market, which is now measured in hundreds of millions of dollars annually, could experience as much as a 5-10 fold increase over the next decade.

Almost inevitably, serious investor attention will begin to be drawn to this field. The interest will be influenced by the fact that the growth rate of foreign EDP will far outpace the growth of most major U.S. industries. Additionally, it will become outstanding among foreign industries. Indeed, the serious labor shortage in a number of foreign countries, which is causing a slowdown in business activity, provides a further stimulus to EDP demand.

With some 40 companies operative in foreign EDP, investment opportunities would seem to abound. Unfortunately, a number of these firms have very narrow product lines, limited marketing and programming capabilities, are somewhat behind in technology, or lack management with sufficient comprehension or aggressiveness to develop a solid long-term position in the industry. Also, several companies are privately owned.

Furthermore, competition will be intense.

Nonetheless, profits could be considerable for the more successful companies.

IBM World Trade Corporation has already become strongly entrenched throughout the world and probably accounts for 65-70% of the foreign EDP market, based on our estimates. Sales and rental revenues of IBM World Trade have grown very rapidly and presently account for roughly 24% of over-all company billings. Sales, service and rental income amounted to $497 million in 1961, and totaled almost $300 million for the first half of 1962, alone. We believe IBM World Trade will account for a substantially higher percentage of the overall revenues of IBM in the future.

The Univac Division of Sperry Rand, while considerably less successful in market penetration than IBM, has nonetheless developed substantial orders in a number of countries. Univac penetration of the German market may actually be larger than its percentage of the domestic market.

National Cash Register Company, in addition to its relationship with Elliott Automation, is beginning to develop a significant position in the foreign EDP field.

NCR has a strong marketing base for the company's future development in EDP. The NCR name and activities are well established in many of the lesser-developed countries which will become important computer markets over the longer range.

Following its highly successful developments in the United States, Control Data Corporation is presently initiating new activities in the European market. Sales offices have been established in Germany and Switzerland. Offices are planned in the immediate future for Scandinavia and other areas.

Control Data plans to concentrate initially on its very highly regarded large-scale computers, and the unusually favorable reception to the company's products displayed at the Munich conference indicates that Control Data may become an important factor in the foreign scientific computer market.

Among the foreign companies, Ferranti, in co-operation with the University of Manchester, has had one of the world's earliest computer development programs. The Ferranti-University of Manchester research groups are regarded as excellent. Ferranti should remain among the leaders in equipment design, although large scale production experience is yet to be realized. The company also appears to have good programming abilities.

ICT (International Computers & Tabulators Ltd.) is the result of the January, 1959 merger of British Tabulating Machine Company Ltd. (Hollerith) and Powers-Samas Accounting Machines Ltd., both old-line producers of punched card equipment. ICT also has a non-exclusive agreement with RCA which provides for an exchange of technical information and patents in EDP (similar to the RCA-Bull agreement). ICT is purchasing RCA 301's in groups of fifty machines, while RCA is buying ICT peripheral equipment to be used with its own computers.

ICT also produces a broad line of peripheral equipment, including printers, card readers and punches, although Ampex tape transports are currently being employed. Additionally, data collection recording and control equipment is being made.

ICT's computer research activity includes some advanced work in thin films. ICT and IBM Zurich appear to have some of the more promising thin film development programs in Europe.

Olivetti has made impressive progress since it entered the computer market a little over two years ago. Orders received for the ELEA 9003 computer total 35, and for the ELEA 6001 total 25. Both machines have relatively high internal speeds and characteristics generally appear attractive in relation to prices.

Siemens & Halske began studying digital computers in a serious manner as far back as 1954. Since that time, about thirty 2002's have been sold or rented, and about fifteen are still on order. The 2002 is rather slow by modern standards and we understand that Siemens plans to introduce a new commercial computer at the Hanover Fair this Spring.

Machine Bull has received a sizeable number of orders for the 301 computer manufactured by RCA. The company has ordered fifty 301's and exercised its option to purchase an additional fifty before expiration of the contract in 1964.

Important opportunities will also be presented in the peripheral area. Demand for magnetic tape transports is developing rapidly. Factory data collection is likely to become a significant market overseas. Also, significant work is now in progress in information retrieval and digital communications.

Serious investment interest will develop in the future on the part of substantial domestic investors as well as knowledgeable foreign investors. This interest may be further stimulated by a slowing in the rate of expansion of the domestic industry, which we anticipate in the not-too-distant future.

While rates of growth abroad will not be uninterrupted and certain problems are already developing, nonetheless we believe that the over-all growth abroad over the next ten years is likely to materially exceed the rate of growth in the United States.

Financing requirements will be substantial and competitive, and technological developments will need to be followed closely, creating the need for greater availability of information and contacts with overseas firms. ■

The authors contend that because of the entrenched position of FORTRAN, the failure of the ALGOL Committee to define a hardware implementation of ALGOL in 1960 and the Committee's desire that ALGOL be a good publication language, FORTRAN is well on its way to becoming a universal programming language.

ALGOL & FORTRAN REVISITED

an appraisal of philosophy & retrenchment

by NORMAN SANDERS & CHARLES FITZPATRICK,
The Boeing Co., Renton, Washington

A great deal has been written on the rival claims of ALGOL and FORTRAN to be able to do something. However, some of it has been quite superficial and there are a number of questions which have hitherto not been raised at all. We hereby exercise the temerity to raise them.

Our aim in this article is not to condemn ALGOL, on the contrary we welcome the good work that the universities and others are doing. Neither is it to exalt FORTRAN as a language — there are many glaring omissions and inadequacies in it.

We are concerned with: What is it that each is supposed to do? How well does each do it? Where is the conflict, if any? We approach the problem from the point of view of daily practicing programmers, not philosophers, consultants or salesmen.

For purposes of definition we regard FORTRAN to be a scientific programming language that has been evolving on the IBM 704, 9, 90 since the middle of the last decade, and ALGOL as ALGOL 60, defined in the report of May, 1960. Immediately it is obvious that we have a problem; we are comparing a functioning computer program with a written document.

What does FORTRAN do; what would ALGOL like to do; is there a conflict; and, if so, what is likely to be the outcome?

FORTRAN is a man-to-machine language defined in terms of a compiler, itself a program written in some language, and as such has become the dominant tool of the day-to-day computer programmer. By any criterion it has been successful in its intent and a great deal of money has been invested in it in terms of daily production programs throughout the industry. ALGOL's principal claim is as a man-to-man language but it possesses the corollary that its structure makes it a desirable man-to-machine language (i.e. a good publication language is a good programming language). Probably no one disputes the former claim but we propose to show that its structure makes it an undesirable man-to-machine language. The primary shortcoming of ALGOL as a computer language is its lack of a subroutine facility — a facility not required, of course, by a publication language.

At the risk of belaboring a point it should be stated that the subroutine concept since the early work of Wilkes, Wheeler and Gill has been one of the most powerful stocks-in-trade of the programmer, a discussion of the usefulness of which would be quite unnecessary in *Datamation*. However, to avoid misunderstanding, we define a subroutine to be a section of coding, remotely compiled and stored in some form enabling easy incorporation into a main program, and of which only one copy is in the working store at run time and to which control is transferred by the main program and returned automatically. As cheap mass storage devices came into being, the process of incorporating subroutines automatically became commonplace. However, problems arose in its incorporation in non-machine languages, i.e., FORTRAN, which required an extenison to the language in the shape of the CALL statement.

The incorporation of the CALL statement changed the nature of a FORTRAN listing. No longer was it possible to read a FORTRAN program per se and understand it fully. The concept of remote compilation and, more seriously, remote *description* made it necessary for the reader of a FORTRAN program to have knowledge not contained in the listing itself. Consequently FORTRAN could have no claim to being a communication language and made no such claim.

However the addition of the CALL statement made FORTRAN, quite powerful as a computer user's language and consequently has become the model scientific language used by the majority of programmers in the majority of computer centers.

Furthermore, the pattern of operations today is to have an automatic operating system using a stacked input tape of source and compiled object decks which have the ability of calling compiled subroutines in relocatable form from tape, card, drum or disc for inclusion into main programs.

The next step in this evolutionary process is to keep all programs in production status in the mass-store as well as the commonwealth of subroutines.

As ALGOL is presently defined the language tail will wag the computing dog. Because of ALGOL's desire to communicate man to man it does not have, rightly, any subroutine facility. Consequently the whole philosophy of computer operations would have to change. No longer the library tape! The disadvantages to this are severe; the programmer would have to incorporate possibly hundreds of lines into his program where one will now do in FORTRAN, and the computer would spend a proportionately longer time in compiling. Compiling, mark you, routines that it has compiled a thousand times before and, height of folly, possibly the same routine more than once in a particularly long program.

A parenthetical remark from one of the manufacturers is that the computer can compile faster than it can read in an object program. To which the rejoinder is that with so-called time sharing, speed is no longer the criterion.

The C.P.U. can be valuably employed doing new computing while the compiler waits for a compiled subroutine to be read in.

As we have said, the publication nature of ALGOL is the obvious reason for the omission of the subroutine facility but there is a subtler reason in the form of the block structure of ALGOL. The block structure is a device which provides for the dynamic allocation of storage enabling its economic use at run time. But because of the variable identification mechanism of the block structure it appears to be impossible to incorporate the concept of subroutine as we know it toady. (We address ourselves to this problem later in the article).

It should be pointed out however, that ALGOL does have a structure, the procedure, which upon first examination seems to function as a subroutine, but as we shall see it is an inextricable part of the "main" program and as such cannot be separately compiled. However, without changing ALGOL drastically a restricted procedure could be implemented as a subroutine.[1]

We repeat that if ALGOL is to remain a man-to-man communication language there is no question of having the subroutine facility added. However, if the manufacturers add a subroutine facility for programming purposes it might lose its effectiveness as a publication language and, of course, will no longer be ALGOL as defined. Furthermore it will probably be implemented in different ways by different manufacturers thus obscuring the aim of universality.

The remaining objections to the ALGOL structure are its lack of input-output, string-manipulation and diagnostic facilities, all facilities which would be required in a worthwhile implementation and it is a severe criticism of the ALGOL 60 Committee that it failed to define them. The May Report merely alludes to "several hardware representations" – the Committee did not foresee the ensuing Tower of Babalgol. To leave such matters for later ALGOL conferences was unfortunate, for by then compilers would have been written and as many different extensions made for the 1960 definition.

This all leads to a paradox, namely that despite claims for its universality ALGOL is no such thing and that FORTRAN, although it was designed for a specific machine, is fast becoming universal. And the compelling reason for this, of course, is that ALGOL lacks FORTRAN's trump card, namely economic motivation.

Despite the objections and difficulties described, however, suppose that ALGOL were to have subroutine and input-output facilities added, what then of its threat to FORTRAN as some sort of universal programming language? Admittedly the language is more powerful than that of FORTRAN. For example, subscripts are not limited in number or nature; recursion is possible; conditional and designational statements are more powerful; mixed expressions are allowed.[2]

It is very difficult to evaluate those improvements in terms of efficiency or ease of programming, and it is open to doubt whether some of them would find much use among the general run of day-to-day problems. But suppose it was demonstrable that the improvements were significant, the question then arises, should ALGOL supplant FORTRAN?

At this point the argument usually takes a semi-religious turn and we take our stand with the materialists against the idealists. The arguments are similar to those bandied about in the 1930's when Esperanto was tilting at the English windmill. The facts of life are that most programming and computer use today lies in industrial and governmental establishments where the cost of computing has become considerable; an incalculable investment has already been made in FORTRAN by managements who are not likely to write-off such an investment lightly; and the 100,000 or so programmers who use FORTRAN are probably human enough to oppose such a change. It looks fairly clear, then, that if a realistic definition of "universal" is to be used, FORTRAN is by definition the only contender for the title, inferior as it may presently be as a language.

Again, the facts of life are that IBM's share of the market is about four times as big as the rest combined. To displace IBM the rest must be compatible both in hardware and software in order to obviate the formidable cost of reprogramming. This need for compatibility is, of course, far stronger than the exhortations of international committees. Incidentally, it is interesting to observe that IBM, having invented FORTRAN for the purpose of improving its competitive position has done its competition the service of providing a bridge across machine incompatibilities and thus an inroad for its competitors, and in so doing has sown the seeds of its own possible (though unlikely) destruction.

Having presented some incontrovertible reasons for the retention of FORTRAN as a universal, scientific, man-to-machine language we would now examine the part that we feel ALGOL should play in the computing world. To do so let us then make a comparison of the structure of the two languages.

Superficially they appear to be very similar except that ALGOL has some sophisticated features not present in FORTRAN. However on deeper probing it is seen that the diametrically opposed storage allocation philosophies present some problems. ALGOL has a so-called block structure, that is to say all variables having the same name are assigned the same storage locations except when declared within a local area. On the other hand, in FORTRAN, subroutines of the same main program may each use its own set of variables without the requirement of coordination because each such set of variables is treated as distinct except when the contrary is specifically stated in terms of COMMON.

Now ALGOL and FORTRAN are attempts at "problem oriented languages" but because of the differences we have just described, we are forced to consider the idea of "language oriented problems." The question arises: how often are programmers confronted with ALGOL-oriented problems and how often FORTRAN-oriented problems?

The hallmark of an ALGOL-oriented problem is that it is one on which no work has been done, for example, no subroutines are available at the outset apart, perhaps, from the elementary functions. Furthermore, because of the difficulty of coordinating variable names within a team of programmers, an ALGOL-oriented program would be fairly short and coded by one person. The problem is as follows: In FORTRAN, variable identification in COMMON is transmitted to subroutines by *order* within the COMMON statement; in ALGOL, COMMON variables are identified by *name*. Therefore, in ALGOL there would be tedious coordination difficulties in writing a large program by a team of people. Another severe limitation is that it would be virtually impossible to use COMMON

[1] Theoretically, a "non-declared" procedure could be treated as global to an entire ALGOL program, much like the reserved library routines. Such a procedure could not have any global variables and this would be tantamount to not allowing COMMON variables in FORTRAN subroutines. If a "non-declared" procedure had a global variable then it must necessarily be treated as local to each "inner most" block in which it is called.

[2] However in some instances ALGOL's versatility has backfired in that some ambiguous constructs are allowed and must therefore be defined in the hardware language. For example see "ALGOL 60 Confidential" ACM, June, 1961.

as a means of communication to library procedures since any common variable name appearing in such a procedure would require the same *name* in all main programs using it.

On the other hand, the hallmark of a FORTRAN-oriented problem is one in which recourse is made to the commonwealth of work already done (in the shape of subroutines) with no problem of size and coordination. It can be written and checked out in small sections, in keeping with good programming practice, with little difficulty. It can also be written by a group of programmers with relatively little coordination.

To answer the question, then, in any realistic programming situation both aspects are involved: a substructure of algorithms for evaluating functions and a superstructure of logic tying those subroutines together. And it would appear that the languages might play complementary roles; however, if only one language were possible in any one complete program, then FORTRAN would be required much more frequently than ALGOL.

Another important aspect to consider concerns not the languages directly but their implementation. Of passionate interest is object program efficiency. It may well be that in this context, problem-oriented languages' greatest service has come from ALGOL, which, because of its versatility, has stimulated much study of compiler writing. The object time "stack" concept used by most ALGOL compilers is very powerful and represents a significant improvement over the more straightforward functioning of FORTRAN programs. If ALGOL object programs are efficient and the implemented versions of ALGOL have the ability to compile themselves then the theorem follows that such ALGOL compilers are efficient. The facts are that many solutions to ALGOL problems are also solutions to the problems of other problem-oriented languages. For example, the use of existing ALGOL techniques with FORTRAN would greatly increase the efficiency of FORTRAN compilers which is presently slow and produces rather inefficient object programs. It would be worthwhile to consider breeding a FORTRAN hybrid which would be capable of string manipulation and which would use a stack for at least parameter transmission to subroutines, thus making it ALGOL-like internally and allowing it to compile itself.

No language in use is static, and in computing there are two dependent modes of evolution, that of the source language and that of the compiler. FORTRAN, given an ALGOL-like compiler, could evolve relatively painlessly into a language like ALGOL.

Our conclusion as to ALGOL's probable position in the future is that it will continue to be used as a man-to-man algorithmic language and will also serve as a goal for the language of FORTRAN to approach. There is the chance that someone may define a "hardware representation" of ALGOL 60 which would include a subroutine facility similar to FORTRAN's using galactic (larger than global) close procedures. On the other hand, IBM has offered FORTRAN to the ASA who have accepted it as a proposed American standard man-to-machine language, giving it something of the recognition for scientific purposes that COBOL receives for so-called commercial purposes. This decision has been welcomed by FORTRAN's heavy users. FORTRAN works, our programmers use it effectively, we can trade programs between installations and between the machines of different manufacturers, and it goes a long way to preventing a reprogramming problem. ■

NEW FIRMS & mergers in DP

Research Analysis Corp., Bethesda, Maryland, has established a Computer Sciences Division, to be headed by Joseph O. Harrison, Jr. The Division will be responsible for two new spheres of activity: a broadening of RAC's present program of computer applications to specific military problems; and longer-range research into "frontier" areas of computer science, including hyper-languages, machine translation, man-machine systems, and artificial intelligence.

CIRCLE 107 ON READER CARD

Budd Electronics, a division of The Budd Co., has established a new facility in Mountainside, N. J., for the marketing of edp and specialized management engineering services. The facility, to be known as Systemetrics, will be engaged in computer applications and problem solving.

CIRCLE 108 ON READER CARD

Basic Systems, Inc., has opened a Los Angeles Division office, located at 56 N. Hill St., Pasadena, Calif. James L. Rogers, formerly with Burroughs, was named manager of the LA division. Basic Systems specializes in the preparation of programmed instruction courses.

CIRCLE 109 ON READER CARD

Mesa Scientific Corp., Inglewood, Calif., has formed System Programming Corporation, a subsidiary which will engage in computer systems programming and provide a complete design and development service for computer software packages. Named as vice president and general manager was Jack N. Graham, Jr., formerly manager of the Systems Programming Department at Aeronutronic Div. of Ford Motor Co.

CIRCLE 110 ON READER CARD

Pacific States Engineering has changed its name to Pacific Data Systems, Inc., and is now located in new facilities at 1058 E. First St., Santa Ana, Calif. The company is engaged in the development of special purpose data handling equipment.

CIRCLE 111 ON READER CARD

Varifab, Inc., High Falls, N. Y. manufacturer of portable keypunch equipment, has formed a Systems Engineering Division, which will develop input equipment on a custom basis. The development area will include card and tape punching, reading, handling and printing machines.

CIRCLE 112 ON READER CARD

Announcement has been made of the formation of Comress Inc., a Washington, D.C., firm which will provide computer consulting services and software packages. The company was formed by Shieldtron, Inc., an electronics firm. One software package available from Comress is called SCERT (Systems and Computers Evaluation and Review Technique) which is designed to incorporate decision theory techniques into the solution of the problem of computer hardware and systems evaluation. President of Comress is Donald J. Herman.

CIRCLE 113 ON READER CARD

The Auerbach Corporation announces formation of a Management Sciences Division, which will provide computer application services for operations and management control and decision problems. The division will consist of four separate technical groups: Business Information Systems, Product and Market Planning, Programmed Teaching, and Computer System Analysis. Named to head the division was John Sayer, who was formerly executive vice president and general manager of Documentation, Inc.

CIRCLE 114 ON READER CARD

a *Datamation* review

THE FALL JOINT: POTABLES & PAPERS

by IRWIN SCHORR, Assistant Editor

This much may be said about the 1962 Fall Joint Computer Conference: the exhibits overpowered the technical sessions, and it didn't snow – at least not until the waning hours of the conference, and by then, it didn't really matter.

The official registration figure was well over the 2,000 mark, while those entrusted with the task of head-counting estimated that about 6,000 thronged the exhibit area located in the lower levels of Philadelphia's Sheraton Hotel.

Probably the most talked about feature of the conference was the care and feeding of delegates by the Sheraton, which provided a minimum of service and employed a maximum of surly desk clerks. Many attendees, with confirmed reservations in hand, were told at check-in that the hotel had no record of their reservations, while some who arrived a half-hour or so after their scheduled arrival time were informed that their rooms had been assigned elsewhere. Delivery of potables to hospitality suites, however, was on the plus side.

As a result of many unfavorable comments, the ACM hierarchy was reported to be taking a second look at a hotel site for the 1964 ACM conference, also being considered for Philadelphia's Sheraton.

Aside from the hotel's machinations, the conference planners merit considerable praise for conducting an efficient program. Registration counters were removed from the maelstrom of the hotel lobby and placed in a large room, across from the exhibition area. Also located in this room was the recruiting bulletin board which, for the second consecutive conference, was radiant in its neatness. Recruiters, however, were very much in evidence, with the usual notices jammed indiscriminately under doors by high school boys, rather than hotel clerks.

While the conference nabobs predicted a high registration, their forecasts did not encompass the turnout for the three concurrent evening discussion sessions which was Standing Room Only, providing many late-comers with the dubious alternatives of either lining the walls of the meeting rooms, wedging themselves into doorways, or standing cheek-to-jowl in the immediate corridors. The sessions were titled "New Devices – Their Effect on Computer Technology," "Organization of Computers," and "Computer Languages," of which the latter drew the largest of the SRO audiences.

Although the exhibit attendence figures received a good share of plaudits, by comparison there was only a sparse number of delegates at the presentation of technical papers. Many of the more venerable computerites appraised the papers as ranging from "poor" to a begrudging "fair-to-middling."

An innovation at this year's FJCC was the presentation of the AFIPS Technical Paper Award to the author or authors of the paper judged to be "clear and well-written, and contributing to the state-of-the-art." The initial award went to D. L. Slotnick, W. C. Borck, and R. C. McReynolds, Westinghouse Electric Corp., Baltimore, Md., for their paper, "The SOLOMON Computer."

The guest speakers – including the panelists who were to discuss "EDP as a National Resource," and the principal speaker at the banquet, Sir Edward Playfair, chairman, International Computers & Tabulators, Ltd., London, England – were well received.

Sir Edward, speaking on "The Computer and Man," listed two inherent dangers in this relationship: the first, that of expecting too much from the machines, or expecting the wrong things. " . . . the lines of development may become a bit twisted if we import into the study of (computers) a kind of rosicrucian glow, an implication that they are the key to all knowledge of man and the world, a determinant of all action, and a substitute for human wisdom.

"We must not encourage the self-hypnosis of those to whom a conclusion printed out by a computer carries more conviction than the same conclusion arrived at by mother-wit."

The second danger, he said, is the opposite of the first, of not exploiting computers to the full. "Where man and machine interact, too much of our research is computer-directed, and not enough man-directed . . . academic effort on the relations between man and machine seems to me to be rather too much devoted to the relations between future machines and a simplified concept of the human brain; industrial effort too much to sticking computers onto existing forms of organization."

Panelists for the discussion were Gaylord P. Harnwell, president of the University of Pennsylvania; James B. Carey, president of the International Union of Electrical, Radio and Machine Workers, and a vice president of the AFL-CIO; John P. Nash, VP/Research, Lockheed Missiles and Space Co.; Arthur L. Samuel, T. J. Watson Research Center, and F. Joachim Weyl, ONR.

The obvious crowd-pleaser of the group was Carey, whose pungent commentary on the activities of several major corporations evoked snickers and a few muffled cries of protest from the assemblage. Said Carey: "We are, frankly, increasingly appalled at management's indifference to human values, its obsession with profit-grubbing to the exclusion of almost all else. We are appalled at the fact that some of the top manufacturers in your field have been indicted over and over again for criminal conspiracy to swindle the U. S. government and the nation's taxpayers through price-fixing and bid-rigging.

". . . there is every reason to believe that these great companies have gone back to their criminal conspiracies after the jail sentences and fines imposed on them here in Philadelphia in February, 1961. What can we expect, therefore, from such companies in terms of employment security, in terms of keeping faith with the workers who produce their wealth? Very little, we fear."

On the positive side, Carey said the labor movement will encourage the development of "cybernation," but it will insist on parallel planning.

"We have to face the fact that there is no serious planning in the United States to prevent cybernation from becoming mankind's victimizer rather than its benefactor. In Washington today we now have 320 so-called 'brain factories' compared with 300 a year ago; and these organizations now employ 72,000 compared with 60,500 a year ago.

"We don't begrudge these 'think factories.' Without them maybe our nation would be increasingly vulnerable to attack. But we would like to see just half as many 'think factories' devoted to social and economic problems and their solutions."

The computer scientists are creating problems, he pointed out, but he criticized the "multi-million dollar and billion-dollar corporations that employ so many of them and show no concern about those problems."

Incidental FJCC intelligence: chairman-elect of AFIPS for the coming term is Don Madden, System Development Corp. . . . named to IFIP's TC-1 committee was Bob Bemer (UNIVAC) . . . delegate to the TC-2 committee will be Dick Clippinger (Honeywell EDP) . . . the official FJCC program was to have been mailed from the Philadelphia post office, which had inaugurated a new "automated" system. Sadly, a good number of programs were still reposing at the post office at the time of the conference, due to system breakdown. Undaunted, AFIPS will mail these programs (presumably by old-fashioned methods) although the 1962 FJCC is now history. Two reasons are given: first, to remind members of the date and location of the '63 Spring JCC, and second, to provide the source for obtaining copies of the FJCC Proceedings . . . discussion among computerites of future conferences centered around the '63 FJCC, with particular stress placed on the varied and interesting convention facilities available at Las Vegas. ■

JFK REPLIES TO AFIPS NOTE . . .

In a letter to President John F. Kennedy, on the eve of the 1962 FJCC, Willis Ware, chairman of the governing board, AFIPS, said ". . . we feel the computer community has served the country well. In the past ten years the cost of mathematical computation has been reduced from $300 for 1,000,000 operations to $1 for 1,000,000 operations; speed has increased from 2,000 operations per second to 200,000 operations per second; costs have been lowered to bring them within reach of the average business and the size has been expanded to enable the accomplishment of vital Atomic Energy Commission calculations.

"And yet, unfortunately, the main official attention the computer industry receives is a threat to employment. Computing is not automation but the two names have become synonymous.

"At this conference and through our society publications we are appealing to an already dedicated profession to double its efforts in meeting the needs of our country . . . we are challenging the individual and we are putting into effect programs to help carry out these goals . . . we are proud of our record. But under the urgency of today's demands we can do more. We are re-dedicating ourselves to this task."

Replying to Dr. Ware, President Kennedy observed that "during the past ten years, the government and country as a whole have learned to rely on computers for many essential tasks, ranging from processing large quantities of data to making rapid calculations that can immediately affect the safety and welfare of the nation.

"It would be difficult to imagine how the government and industry could work effectively today without the help of electronic computers. Computers have expanded our horizons and have demonstrated to the world important advances in American technology. The meeting of the American Federation of Information Processing Societies, will help to improve the development and applications of computers and their contributions to the quality of American life." ■

FJCC EXHIBITS

Eighty manufacturers — a record turnout for a joint computer conference — occupied a total of 170 booths and 20,000 sq. ft. of floor space to display their wares for approximately 6,000 persons at the 1962 FJCC.

The prodigious array of equipment, which carried a total price tag estimated at ten megabucks, included 14 operating computers and three analog devices. (The only static exhibit which rivaled the operating computers for attracting viewers was the Bendix booth, which successfully defended its title for retaining the most attractive female help.)

Philco had the largest exhibit, featuring its 1000 and the military-oriented Basicpac, in addition to an operating 212 console. Centerpiece of the display was an operating fountain, complete with vari-hued lights and real water.

Other computers on the air were an RCA 301; Honeywell 400; GE 225; General Precision's RPC 4000 and new LGP 21; Scientific Data's 920; Packard Bell 250; TRW 130; Digital Equipment's PDP 4; Control Data 160A; and Autonetic's Recomp II and III. Limiting themselves to a display of peripheral equipment were Burroughs, NCR, and UNIVAC, while Bendix showed a mock-up of the G-20 and Ferranti a scade-model of its Atlas system. With a local Datacenter across the street, IBM confined its exhibit to an operating 7750 Programmed Transmission Control System.

The Sheraton's exhibit area could not be considered as a model for spaciousness; narrow aisles contributed to traffic jams, while a labyrinth-like layout often had visitors going around in circles.

Three industry tours were arranged during the conference. Burroughs demonstrated its D825 computer at its Great Valley Laboratory, and also ran ALGOL programs on the 220 at its Paoli, Pa., Research Center. A demonstration of the 2000-212 was presented by Philco at its plant at Willow Grove, Pa., and UNIVAC put the U-III and 1004 through their paces at the UNIVAC Engineering Center, Blue Bell, Pa. ■

THE 4000 SERIES

medium-scale hardware from Philco

The 4000 series, a medium-scale system designed for both business and scientific/engineering applications, was announced last month by the Philco Computer Division.

A basic 4100 system consisting of a central processing unit with 8K characters of core storage, printer, card reader and mag tape units will lease for $3,850 monthly, plus $22 for each hour the system is in use. The read/write cycle time for the 8K memory is less than 3 usec. A 4K memory is available with a cycle time of 5 usec. Core storage may be expanded up to 32K characters (six bits plus a parity bit).

Configuration variations offered include a fixed word length of 12, 24, 36 or 48 bits for one program, and a variable word length for the next program, through the use of an N register; decimal arithmetic, binary arithmetic, or both; and one 4000 system or two used in tandem.

A wide range of peripheral equipment will be made available: 150, 300 or 900 lpm printers (the first is described by Philco as the "slowest high-speed printer available"); I/O switches for four or eight channels (up to 64 devices may operate on one channel); 6K, 16.5K, 90K or 240K cps mag tape units; 100, 200 or 250 cpm card punches; 600 or 2,000 cpm card readers; 1K cps paper tape reader; and 60 cps paper tape punch.

Software being prepared includes a 4100 assembler-compiler; operating and executive system; utility programs; service routines; sort-merge package; report generator, and "compact" COBOL.

Delivery of the first 4100 is scheduled for August. ■

CIRCLE 115 ON READER CARD

THE LGP 21

small-scale hardware from General Precision

General Precision's Commercial Computer Division unveiled its successor to the LGP 30 at last month's FJCC. Called the LGP 21, the solid-state, small-scale computer features a magnetic disc memory with a capacity of 4K, 30-bit words.

The computer, said to be suitable for engineering and business uses, consists of arithmetic and control units, disc memory, typewriter, paper tape punch and reader. Up to 32 I/O devices may be used.

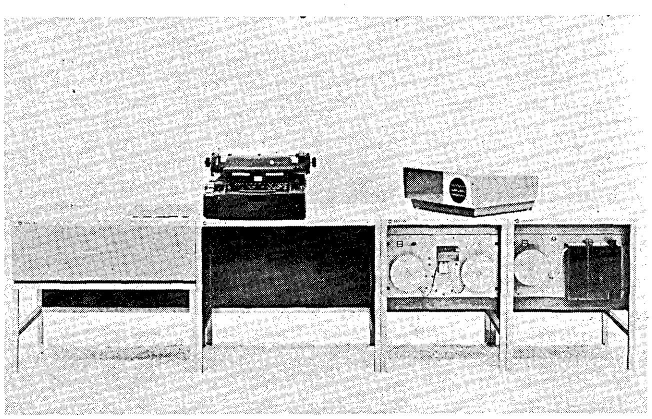
Programs for the LGP 30 will be compatible with the LGP 21. The command list for the new machine totals 23, an increase of seven used with the LGP 30. A single address, serial computer, the LGP 21 has an average access time of 25 milliseconds and a clock frequency of 80 KC. Four breakpoints are available, with a priority interrupt available on request.

Input/output capabilities are: paper tape punch, 60 cps; paper tape reader, 60 cps; typewriter, 12 cps; Flexowriter (optional), 10 cps. Format for I/O is decimal, alphanumeric and hexadecimal.

Physical characteristics of the LPG 21 are: height, 12"; width, 31"; depth, 19"; weight, approximately 90 pounds. The computer will operate from 110 volts AC, 60 cps, single phase power supply, with an output of about 300 watts.

Carrying a price tag of $19,500, the computer will lease for $690 monthly. Initial shipment is expected in April, with a delivery schedule estimated at 30-60 days.

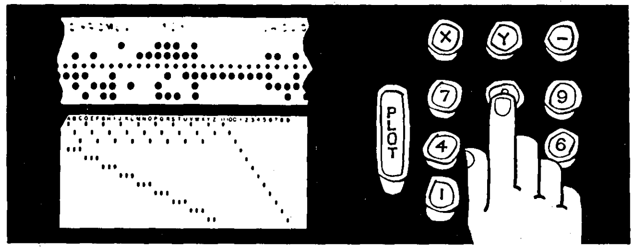
CIRCLE 116 ON READER CARD



PLOT FOR ECONOMY

SAVE TIME... SAVE MONEY...

CONVERT THIS



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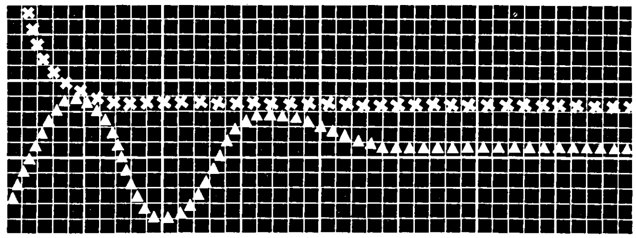

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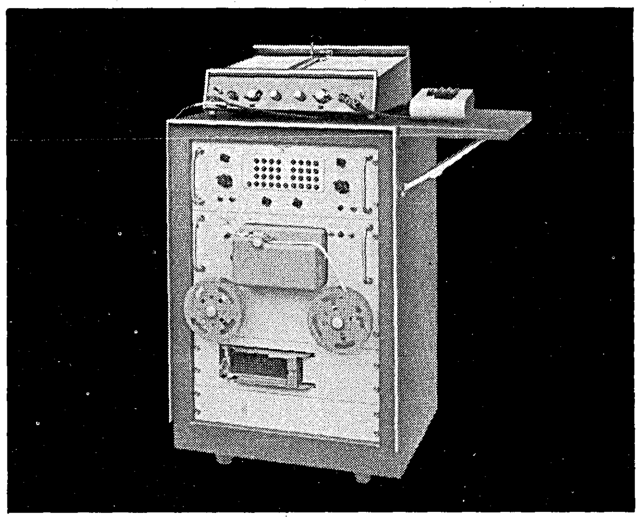

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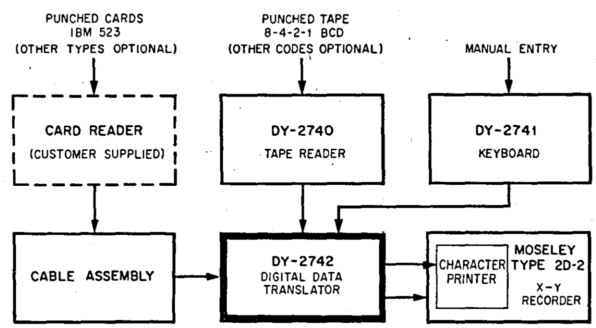

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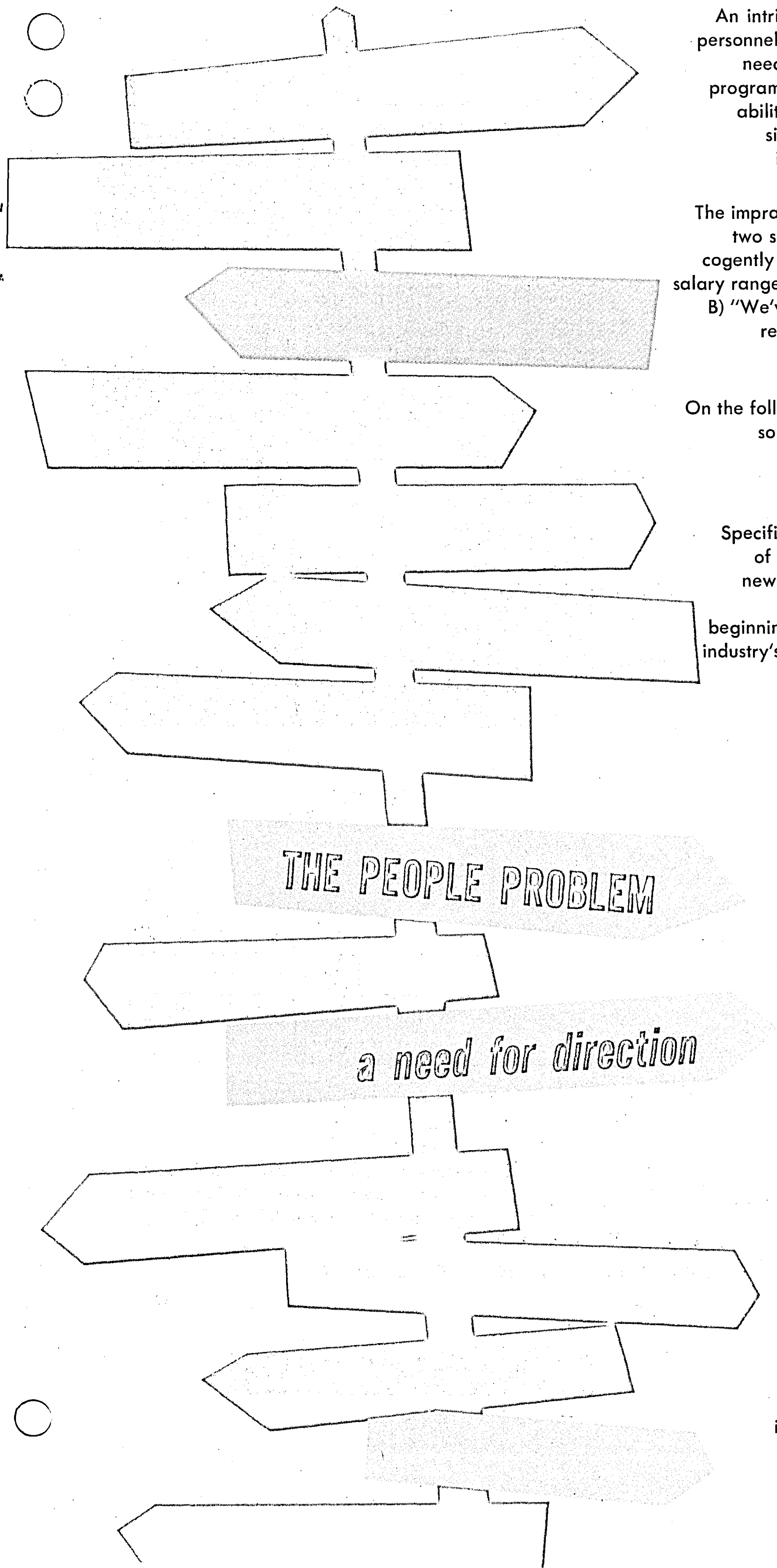


An intrinsic danger common in most approaches to the personnel problem is oversimplification; namely, that the need is merely for larger quantities of twinkle-eyed programmers with a modicum of experience or intuitive ability. An obvious result of this thinking is to seek a single, simplified solution which holds promise of immediate rewards for the individual company.

The impracticality of this approach is widely evident and two such solutions not uncommon to the industry are cogently expressed as follows: A) "We offer the highest salary range in the business, keep our eyes shut and pray." B) "We've turned over the whole mess to a professional recruiter. He finds 'em, tests 'em and sends us the results. It hasn't worked worth a . . . . !"

On the following pages *Datamation* offers no comparable solutions but rather a profile of some of the more promising routes toward ultimate relief from present confusion.

Specifically, immediate action is needed in evaluation of present and potential programming talent. The newly formed Computer Personnel Research Group has set its sights on this goal and is described beginning on page 38. This organization represents the industry's first attempt at collective activity in personnel.

Since a collective effort requires reflections on individual projects, the specifics of a programmer evaluation technique at Sandia Corp. is detailed on page 40. While this effort may hardly be considered the ultimate approach, it represents an unusual direction which has elicited considerable interest. On page 42 a satirical note on "How To Fire a Programmer" is directed with well-deserved sharpness at the condition of contemporary personnel management in edp.

A brief evaluation of the role of women in computing, page 41, suggests that although computing is open to the distaff side, recruiters have hardly extended themselves in this direction.

For the long range view applicable today, two editorial features are concerned with the field of computing education. The first, a diary of one instructor's experiences with a class of seventh graders begins on page 48. In addition to its obvious usefulness as a guide to other teachers, it may also serve as a source of much needed embarrassment to accomplished computerites. The second article, page 57, provides a number of specific reference sources and directions for initiating a computing program in communities and schools throughout the country.

THE COMPUTER PERSONNEL RESEARCH GROUP

a new, voluntary effort with impressive goals

Not so long ago, one of the nation's leading computer installations was preparing for the acquisition of a new computer. Two programmers were assigned, independently, the task of devising an interpreter routine which could be used on the new machine until existing routines could be reprogrammed. Well before the deadline, each had a working interpreter of almost equal value, and the selection of one of them for use was based on quite minor considerations. Obviously, the two men were equally well-suited to such a task.

Both men were newcomers to the shop. However, one had been hired as an experienced programmer at nearly twice the salary of the other, who was considered to be a neophyte. That these two men turned out work of equal value on a complex problem, working against a tight deadline, came as quite a surprise to the center's director, who has since declared, "Six months later this result wouldn't have surprised us very much. After we had gotten more familiar with both of them, other evidence tended to go in the same direction."

How does this installation go about screening and evaluating prospective programmers? "Essentially what we do," the director states, "is look for the twinkle in their eye, the principal reason being that we don't know of a test which has been as well validated!"

Such a method is not as atypical as might be expected. Another employer of programmers bases his selection on an "indefinable enthusiasm." "We call it the programming bug. If a fellow has the 'bug,' we're going to take a chance on him despite his background."

The problem of the selection, development, and evaluation of computer programmers and analysts is one of the principal areas of study of the Computer Personnel Research Group, which was formed last year at a meeting held at The RAND Corporation, Santa Monica, California. A second meeting was held more recently in St. Louis.

Members include: Raymond Berger, Joseph Rigney, and Arthur Gershon, Electronics Personnel Research Group, University of Southern California; James Degan and James Burrows, the MITRE Corporation, Bedford, Massachusetts; John Helmick and Alex Law, Educational Testing Service, Los Angeles; Dallis Perry and William Cannon, System Development Corporation, Santa Monica, California; Harry Colman, Armour Research Foundation, Chicago, Illinois; Robert Reinstedt and James Tupac, the RAND Corporation, Santa Monica, California; Robert Rich, Johns Hopkins University, Silver Spring, Maryland; Donald Robbins and S. H. Peres, Sandia Corporation, Albuquerque, New Mexico; and Sidney Fine and Robert Dickman, Applied Physics Laboratory, Silver Spring, Maryland.

In addition to conducting studies in various computer personnel problem areas, the group has assigned itself the tasks of collecting, integrating, and disseminating research information and of coordinating the participation of computer programmers and analysts in such research.

At the Santa Monica meeting, it was discovered that a great variety of methods exists in the selection of programmers. Tests of one sort or another are widely administered. However, a survey conducted by SDC's Dallis Perry revealed that of the 233 organizations contacted, 60 per cent were using one or more of some 60 different tests, with very few organizations reporting that they had made studies to determine the effectiveness of their testing procedures. Many installations indicated satisfaction with their personnel selections, based on subjective appraisal of the results, but data supporting these opinions were rare.

The types of tests used include tests of general intelligence, aptitude, interest, personality, and programming achievement. The Programming Aptitude Test, distributed by IBM, was used either alone or with other tests by 40 per cent of the reporting installations. But again, very few users, other than IBM, had verified its validity for their own requirements.

Robert Rich of Johns Hopkins indicated they find little correlation between the marks a man receives in their training program and his supervisor's on-the-job ratings two and three years later.

On-the-job evaluation is of prime interest to the group. There are no standard criteria for judging performance, and there is concern that today's programmer may not be getting a "fair shake" as a consequence of the current evaluation systems. Evaluating a man's work quite often is done by application of the so-called "lifeboat order" technique; i.e., all men in the shop are evaluated and ranked in descending order of their value to the installation. But there are some inherent weaknesses in this method inasmuch as it is almost impossible to rank programmers in an installation which works on a wide variety of problems. One programmer may have spent an entire evaluation period working on a particular problem which has not been completed at the time of evaluaton, while another has completed many small assignments. The evaluating supervisor may have almost no idea how the programmer on the long-term project is doing. On the other hand, a man who has just successfully completed a very thorny problem has a significant advantage. And, finally, the supervisor may not really appreciate the programmer's handling of a problem unless he has himself tried to program it.

It cannot be stated that within the field there is any universally "good" programmer; an "ideal" against whom the average programmer can be judged. Some men are better suited to complex, long-term problems, while others adapt more easily to the short, quick problem. Both can be valuable.

A representative of a commercial installation pointed out that ability to get along with people, specifically the customer, was an important factor in his organization. But in a research group, such an attribute may be of much less significance. Similarly, some organizations look for programmers who will work on programming teams, while the work of other organizations is primarily based on individual efforts.

The USC Research Group feels that this problem of evaluation is the most pressing for computer personnel research. Better criterion measures are needed, not only to provide management a more equitable basis for evaluating personnel, but also as a crucial step in the validation of a test or selection program. The USC group recognizes that no fair assessment of the predictive efficiency of any test can be made until appropriate criterion measures are established for the job in question. It is the relationship between the test scores and the established criterion measures that tells us whether a test or any combination of tests has any validity in the selection of applicants for the job or for job training.

The USC group has already embarked on the development of objective criterion measures against which selection tests will be validated. The first phase of work has been to analyze the task structure of programmer and system analyst jobs. This analysis is designed to provide two kinds of information important to the development of criterion measures. One will define job types in terms of their task structures, as a basis for establishing criterion groups in research studies. The second kind of information concerns the importance of each task for each job type and the relative skill required to perform the task. The most critical tasks (in terms of importance and skill) then will be translated into proficiency test items.

The second phase of work will involve the construction of proficiency tests appropriate for each criterion group. These proficiency tests will be tried (along with aptitude tests of known factorial content) on samples from each criterion group. The correlation between the proficiency and the aptitude tests will provide leads to the psychological skills and aptitudes important for on-the-job success. The proficiency tests will also be checked against proficiency ratings of the type in present use. The final phase of the study will be concerned with applying selection tests that correlate with the criterion measures.

Another approach to the problem of identifying and evaluating the characteristics which are desirable in a programmer has been made at Sandia by S. H. Peres. His approach, which is custombuilt to the specific employee classification, is based upon essays, or behaviorgrams, submitted by the employees. The employees are asked to write a brief essay describing the performance of the best employee in their specific field that they have ever known. The idea is that there are attributes which are characteristic of good performance in a particular field and this is an attempt to build a rating scale that is tailored to the needs of a particular homogeneous group of employees rather than using general categories to rate everyone across the board. (A detailed description of this program appears on page 40.)

A problem related to both the selection and the evaluation of programmers is that of advancement, especially into supervisory slots. There is a tendency, the newly-formed group fears, for programming to be a "dead-end" profession for many individuals, who, no matter how good they are as programmers, will never make the transition into a supervisory slot. And, in too many instances this is the only road to advancement. Almost no consideration has been given to the special qualifications, if any can be defined, which a supervisor may need. It has been suggested that this probably goes back to the problem of selecting neophyte programmers. Are there "supervisory characteristics" which could be spotted at the outset of a man's employment? Would it be possible to establish something akin to management training programs for such people, with an eye toward the day when they will be running the computer labs?

The problem of training crops up in all phases of computer personnel research. Programming is a field in which formal training or extensive prior experience are not necessary prerequisites for employment. One employer indicated that of the ten or twelve people he may hire in a year, he would feel lucky to get two with a total of three years experience! The burden of training generally falls on the computer lab which, paradoxically, cannot often state with any statistical evidence that it has a validated method for selection of those in whom it is making its investment. And the training problem may present itself anew even for the most experienced if a new machine or a new language is introduced. Some programmers adapt quickly to a new language, while for others the transition is long and laborious, and may result in a marked reduction in efficiency and output.

Although the Computer Personnel Research Group is not concerned with the formulation of a training program, it does consider some aspects of training within its purview. Areas such as the selection of trainees, evaluation of training programs and the levels at which such programs are needed, are among the problems being considered.

Members of the group will address themselves to such issues as exactly what it is a programmer or analyst does, what type of person is needed for the job, methods of selecting such a person, ways of insuring that his training is adequate, and procedures for evaluating his efficiency on the job.

A primary problem in proceeding to such studies is that of securing sampling groups. Programmers are spread out across the country, but the geographic distribution is uneven. Some are in pure research centers and some in industry. Such studies cut across disciplines; it is a personnel problem, but it deals specifically with computer people. Testing and evaluation is the field of psychologists, but, again, it is the computing field which is affected. The composition of the Computer Personnel Research Group is aimed at maintaining a balance between psychologists and those actually involved in the management of computer facilities.

Some studies may require cooperative effort in order to achieve representative sampling for purposes of analysis, evaluation, and experimentation. Data must be collected, verified, analyzed, and integrated; results must be effectively disseminated. These problems were considered at the St. Louis meeting, and the requirements for gathering information for various kinds of studies are currently being formulated.

Care is being taken to assure organizations which allow their programmers to participate in associated research projects that maximum possible utilization will be made of the time involved. The amount of time a particular group of programmers is off the job, involved in research testing, interviewing, etc., will be held at a minimum. Furthermore, the contributing organizations will themselves benefit from the results of the studies. To this end, the group hopes to act as a "clearing-house" for computer personnel information, with new ideas, procedures, and developments being reported to it for further analysis and study. It would also disseminate such information to the industry, and provide assistance in the form of results of its findings to computer installations. ■

The third meeting of the Computer Personnel Research Group will be held at The Sandia Corporation, Albuquerque, New Mexico, in February. This meeting will be devoted to establishing which areas are to be investigated and to outlining specific approaches to be employed.

The group welcomes additional participation in its program. Information may be obtained by writing Robert Reinstedt, The RAND Corporation, 1700 Main Street, Santa Monica, California.

IDENTIFYING PROGRAMMER BEHAVIOR

by SHERWOOD H. PERES and PHIL H. ARNOLD, Sandia Corp., Albuquerque, N.M.

An exploratory study directed at the identification of the performance characteristics of programmers at a large nuclear research and development laboratory is reported here.

procedure

Twenty-three programmers and their six supervisors were requested to write an essay describing the best programmer they knew or had known. They were asked to describe in detail the behavior of this programmer that made him outstanding in their eyes.

The 29 essays were read, and 218 statements describing programmer behavior were extracted from them. Although minor editing took place, care was taken to retain phraseology and vocabulary. Through a process of combination and elimination of closely similar statements, the number was cut to 140 statements.

In order to plan for later statistical analysis, the statements were sorted into 12 homogenous groups, or categories, representing predicted performance factors.

The 140 statements were presented in the form of a description check list to the programmers and their supervisors. Each member of the sample received two programmer description check lists. The instructions were to rate, on the check lists, the best and worst programmer they knew or had known.

Once the respondent had called to mind the particular "best" and "worst" men, he was requested to complete the check list scale on each of his choices. He was told to consider the 140 statements, one at a time, as they applied to the man he was rating. If a statement applied very well to the ratee's behavior, it was to be given an applicability value of 5. If it applied very poorly, it was to be assigned a value of 1. Numbers 2, 3, and 4 were to be used to designate intermediate degrees of applicability.

The statement responses of the 58 check lists were reproduced on IBM cards and transferred to tape to facilitate the analysis of the data on the 7090.

Since all the statements on the description check lists had previously been sorted into 12 categories of programmer performance, it was possible to obtain category scores by summing the responses for statements in the category.

Pearson product-moment correlation coefficients were computed between all 12 categories and also between the applicability values given to every statement and each set of category scores. The statements were then subjected to a modified centroid factor analysis by the Wherry-Winer method for factoring large numbers of items. The factors were rotated to orthogonal simple structure and interpreted.

results and discussion

Six specific factors emerged from the analysis. An interpretation of the factors follows. The factor loadings of representative statements are indicated in parentheses following the statement.

Factor I: Personal Maturity and Stability. This factor has significant loadings on such statements as "has patience" (.57), "is not easily discouraged" (.51), "is willing to take suggestions to improve his work" (.46), "doesn't blame the machine for errors" (.27), etc. This factor characterizes the programmer who can work under pressure and who does not rush in performing any phase of the job. He doesn't take himself too seriously and takes criticism in proper perspective.

Factor II: Cooperation – Inter-personal Relations. This factor characterizes the programmer who cooperates and gets along well with others. Such statements as "easy to talk with" (.30), "works well with other programmers" (.33), "is willing to help others in solving programming problems" (.22), "has a cooperative attitude" (.30), etc. are typical of the statements which fall in this factor. A programmer described by this factor is willing to share information with other programmers and is able to gain the cooperation of personnel in other organizations. He's a good listener and can make suggestions in such a way that he doesn't antagonize others.

Factor III: Communication Skills. This factor identifies the programmer who "is able to sell his ideas to line organizations" (.36), "is proficient in disseminating information" (.48), "has a knack for simplifying technical terms for nontechnical people" (.41), etc. The programmer characterized by this factor has a good command of language and is able to write clearly. His instructions to key punch and operations are simple and he can explain programming methods to others in a clear manner.

Factor IV: Thoroughness – Dependability. This factor represents the programmer who is detail-minded and thorough in performing his job. Typical statements on this factor are "will program only when sure he fully understands the job and the client's need" (.25), "remains noncommittal on promising results until the capability is proven" (.49), "is thorough" (.29), "documents his job" (.47), etc. This type of programmer asks questions until he understands every detail of the problem, and becomes thoroughly familiar with the application before he begins to program.

Factor V: Professional Competence. This factor describes the programmer who has the technical wherewithal to do the job. Representative statements are "is experienced with several different machine languages" (.34), "can analyze a problem from the beginning to the end" (.24), "can choose the best combination of methods for an integrated processing system" (.26), "keeps current with new programming methods" (.45), etc. There are other significant loadings which suggest that this programmer has an analytical mind and can reduce a problem to logical steps. He has imagination and likes to experiment with new systems and subroutines.

Factor VI: Job Interest and Zeal. This factor reflects the programmer who "is enthusiastic" (.41), "puts in extra time and effort to improve the system" (.40), "feels a responsibility for the quality of his work" (.24), etc. This individual gives all he can to the job. He will accept any assignment and will work odd hours as required. He is always searching for ways to improve a program.

conclusions

This exploratory study has given some insight into those performance factors considered important in the programming position. Research is being conducted at the present time to cast the factors into an evaluative and diagnostic forced-choice format in order to ascertain not only performance ranking within the organization but also individual relative strengths and weaknesses. ■

THE WOMAN PROGRAMMER

a subjective reflection

by VALERIE ROCKMAEL, News Editor

As the demand for qualified programmers draws wider public attention, an increasing number of women are directing their résumés at the data processing community. Their motivation for a programming career stems from the belief that this is one industry in which women may enjoy complete equality and an above average salary.

The fact that prejudice exists against women in business is generally evident but whether it has been overcome in the programming profession or simply underplayed because of current needs is a matter for conjecture.

As a rule, employment practice in edp places greater emphasis on education and experience rather than on the applicant's sex, and while some companies are still hesitant at hiring women programmers, a few have expressed a preference for the distaff side. They have found that women are less aggressive and more content to remain in one position. Many women choose not to advance in position and feel that even if they were offered a promotion to a supervisory capacity, they would refuse the job because it is not as important for them to have higher salaries and the prestige of an impressive title. Many women prefer "less strain" and would rather not "stand off" from their fellow workers.

Others feel that promotion is a threat to their femininity and that as supervisors they will manifest certain traits which are characterized as masculine. Men, of course, readily concur with this position.

Women also consider fringe benefits of more importance than their male peers and are more prone to remain on a job if they are reasonably content, regardless of a lack of advancement. They also tend to maintain their original geographic roots and are less willing to travel or change job locations, particularly if they are married or engaged. For these reasons there is a considerably lower turnover rate in women programmers and as a result, the initial investment in training pays a greater dividend for their employees.

Intuitive generalizations made by some personnel managers are that women have greater patience than men and are better at details, two prerequisites for the allegedly successful programmer. On the subject of whether women possess logical, analytical minds the controversy becomes more intense.

It is also felt that women have a humanizing influence, make working conditions more pleasant, and even add to the decor of an office. The notion that female programmers are dull, drab, lipstickless creatures is grossly erroneous.

As to recruitment of female programmers, present tactics and dissemination of literature about the field leaves much to be desired. Of the many companies distributing career brochures about this field only a few have prepared special literature directed at women.

Newspaper and magazine ads are generally oriented toward men, although women applicants are frequently accepted. In the majority of cases however, there is no statement in the advertisement indicating this fact.

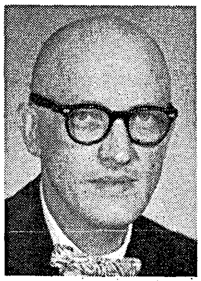
If prejudice against women programmers may be pinpointed in the development of a career it is most likely to occur in the consideration of a promotion. It is felt that a great many men as well as women resent supervision by a woman. In some cases, a woman might be chosen over a man of equal ability to advance to an assistant supervisor's job since it is often felt that the woman will be less of a threat to the male supervisor's position.

The paradox of prejudice against the woman programmer is apparent in her general acceptance as an instructor of programming since the female has now been widely accepted in the posture of a teacher. In other cases, a woman who is exceptional as a programmer will appear more prominently in the evaluations of her supervisors simply by virtue of her position as one of a small minority.

It is generally felt that the most undesirable category of programmers is in the female about 21 years old and unmarried. One supervisor claimed that he had a girl in this category who wrote bug-free programs early in the week but during the latter part of the week her error rate increased substantially. In the course of an interview, she stated that when she would start thinking about her social commitments for the weekend, her work suffered proportionately. ■

HOW TO FIRE A PROGRAMMER

by JACKSON W. GRANHOLM, President, Mellonics, Inc.
Tucson, Arizona



As it must to every director of a large computing group, the day of decision had come to Dr. Rupert B. Pooble. The suave, overweight, hirsute Pooble was in his exalted position of Director of Mathematical Action of the Inscrutable Atomic Corporation, a man of note in computerdom. Pooble's extensive biography read like a Who's Who of digital electronics. Beginning as Assistant Developer in the plate room of Mount Wilson Observatory, shortly after receiving his PhD from Cal. Tech, Pooble rapidly saw the unlimited opportunity in computing. He moved swiftly to Associate Manager of Scientific Appliedmanship with the massive IBMRAND Corporation. Following his Dismissal from IBMRAND, Pooble coasted for a while as Assistant Professor at Abercrombie Institute. He came blazing back as Group Engineer, Digital Computing with Stretch Unlimited, the well-known manufacturer of athletic equipment. From there Pooble swiftly jumped to Director of Planning, Suffix-Specific Division of Quantum-Occluded-Domineer. Then, after a short stint as Director of the Institute of Human Foibles, Harvard, Pooble took his proper place behind his present massive mahogany desk at Inscrutable Atomic.

Pooble's list of memberships and offices was no less impressive: Co-founder and first President of the Meta-Computer Society, Board member of the ACCM (Association for Confounding Computer Meanings), Chairman of the Editorial Board of SCDCA (Southern California Digital Conversation Association), and Ex-Officio Director of AFAPS (Amalgamated Federation of Asinine Procedures and Systems.)

But now the chips were down for Dr. Rupert B. Pooble. The situation was beyond all avoiding. It was plain as the nose on Pooble's face. Horton Nemo, Pooble's Associate Chief of Opcode Production was manifestly incompetent. What is more, he was grossly insubordinate. He also bathed too infrequently. Pooble faced the worst of all possible decisions. He had to fire a programmer!

Pooble had been mulling the Nemo situation for weeks. He had considered all the alternatives: transfer to the blueprint department, promotion to the planning department, secret submission of Nemo's biography, suitably embellished, to a local flesh-peddling agency. All of these had been discarded for one reason or another.

The incompetence Pooble could forgive. After all, he was incompetent himself. Pooble had never been able to program his way out of a wet paper bag. However, he did have a large measure of that illusive quality known as "management rapport" which enabled him to function outstandingly well as a department mouthpiece. He had a minimum of leadership and a maximum of political acumen, ideal mixing for his job.

But the insubordination Pooble could never put up with. Rupert B. Pooble was accustomed to standing firmly on the necks of his assembled employees in order to gain a better vantage and viewpoint from which to look around in order to be better able to decide just when to stab his boss, The Vice President, Corporate Futures, firmly between the shoulder blades. An intransigent loudmouth like Nemo had no place in this picture. There was room for only one loudmouth in Pooble's operation.

So Nemo had to go. There was no doubt about it.

The corporate groundrules of Inscrutable Atomic provided little help. The fifteen-volume, bookshelf-long set of Corporate Administrative Procedures contained no provision for firing an employee. Pooble would have to plough his own ground.

After work on Friday, Pooble dropped in at the Velvet Glove. After his third belt of Scotch and Soda, Pooble began to form a strategy.

Early Monday morning Dr. Rupert B. Pooble pressed the button on his intercom. His cultured voice spoke into the box:

"Miss Campylos, come in please."

Lucy Campylos, Secretary to Dr. Rupert B. Pooble, had her head fastened on right. She had several other parts attached pretty attractively too. She was a noted traffic stopper in the Women's Activities booths of a number of computing conferences.

"Yes sir," Miss Campylos said, standing posturewise before Pooble's massive desk.

"Miss Campylos, will you please ask Mr. Nemo to step into my office?"

"Yes Sir."

The opening bout with Horton Nemo was a little tough. Pooble hit first in a soft spot:

"Now, Nemo, what about the FRAMTRAN statements for the blowdown tunnel research problem?"

"What about them?" Nemo countered.

"Well, they were due last March, as I recall."

"What you want I should do?"

"Well, you might take some action to speed things up."

"What kind of action you want I should take?"

"What about the people in your section out there? Couldn't you urge them on or inspire them a little?"

"Them clods?"

"I beg your pardon?"

"I say, how you gonna inspire them dunderheads? How come I never get to hire my own guys? How come I always gotta take the guys you hire?"

"Well, you know, we have to maintain hiring standards and procedures here. We must have standardization of rank and advancement curves or things will get out of hand rapidly."

"They will?"

"Yes of course."

"Ain't they kind of out of hand now?"

"That's exactly my point. We've got to get some action out there in your department, or we'll have to take steps."

"You going to dancing school, or somethin'?"

"This is no time for your bright comments, Nemo. We've got to maintain work flow in this department."

"What we tryin' to do, scare the customers?"

"No, of course not. We're trying to render a service here. We're a corporate support function, you know."

"Thank God we got a big foundation under this building."

"How's that?"

"You want I should get out there and inspire people, huh?"

"Yes, that's the general idea."

"All right."

Nemo slouched out of Pooble's office. Dr. Pooble mopped his brow slowly. He looked forward to an early evening at the Velvet Glove.

A week later Pooble scheduled a conference with Cicero Beam, Director of Personnel at Inscrutable. Pooble outlined his problem, leaning heavily on the many shortcomings of Horton Nemo.

"You have a problem, Doc," Beam said, sucking at his pipe.

"Precisely," said Pooble.

"Have you considered transfer to the Planning Department? That's where we send everyone who doesn't fit."

"It won't work," Pooble said. "Nemo's pay grade falls into a planning slot rank. It's impossible to process papers and have them approved. I'd have to give Nemo a raise, and I'd die first."

"I can't think of a thing," Beam said. "We don't even have forms for firing people."

When the IBMRAND account salesman came to call, Pooble tried touting Nemo's advantages, hoping that an attractive offer might draw him out of the Inscrutable fold.

"Impossible," the account salesman said. "Nemo worked for us five years ago, you know, for six weeks. Went to sleep in the District Manager's sales meeting. It's unthinkable we could take him back."

Horton Nemo could not be fired for sloppy attendance. Though he was absent an average of three days a week, he did not punch the time clock, and there were no procedures for people who did not.

Since there was no ground rules for predicting opcode production, on which Nemo worked, and since one cannot tell if a programmer is working by looking at him, the proving of Nemo's obvious incompetence would be a rough row to hoe.

Pooble went to Enoch Mote, Inscrutable Atomic's inhouse psychiatrist. Seating himself on the edge of Mote's large leather couch Pooble said:

"I have a man who desn't take a bath often enough."

"Indeed?" Dr. Mote replied.

"Yes, the key punch girls won't associate with him."

"Why on earth not?"

"Because he doesn't bathe, dammit!"

"Your thesis is not acceptable, Pooble. Freebish proved twenty-five years ago that a manly aroma is a great psychological factor in attracting or sexually stimulating the opposite sex."

"We are not talking about a manly aroma here, Mote. We are talking about a programmer with dirty finger nails who smells from failure to use sufficient soap and water, by George!"

"Precisely what is your definition of 'bathing sufficiently?'" Dr. Mote asked.

"What the devil does that have to do with it? If someone smells he by George smells!"

"How long have you shown these symptoms of alarm and confused thinking, Pooble?"

"Confused thinking, dammit, is something I certainly have never suffered from. My thinking is very precise on this matter. I'm going to get Nemo out of here before everyone else leaves on account of him!"

"Do you ever have apprehensive moments?"

"Not till I came in here. What kind of a crackpot are you, anyway?"

"I ask the questions in this office, Pooble. Now, have you considered that a long vacation might do you good?"

"No, I have not considered that a long vacation might do me good, and I have work to do. I've wasted enough time here listening to your drivel, and I am now leaving, thank you!"

"Sad case," Dr. Mote muttered.

Rupert B. Pooble slammed the door mightily.

Through the next three weeks the Nemo affair preyed continually on Pooble's mind. He lost sleep. His face took on a haggard look. He went up to six belts of Scotch each evening at the Velvet Glove.

The FRAMTRAN coding for the blowdown tunnel was not forthcoming. Yet, somehow Pooble avoided leaning on Nemo for it. He even began to avoid Nemo in the hall and found himself walking through the machine room so as not to pass Nemo's desk.

On the following Monday Pooble went up to seven belts of Scotch at the Velvet Glove. At precisely 8:04 p.m. by Pooble's wrist watch, he staggered from the men's room of the Velvet Glove, driving the edge of the door resoundingly into the frail, dapper figure of Bruno Zorch, Vice President of Corporate Futures of Inscrutable Atomic.

"By gad, Bruno, I'm sorry. I didn't see you coming in here."

"You idiot, Pooble! You nearly fractured my skull," Zorch muttered.

"Here, let me help you get that doorknob out of your pocket."

"Never mind. I'll make it all right."

"I'm certainly sorry. I had no idea . . ."

"Quite all right, Pooble. No harm done. Have a happy evening."

"Yes, thanks, I . . ."

"See you around the shop, Pooble."

"Yes, well I. . . ."

The next morning Pooble decided the Nemo thing had been bugging him long enough. He went to work full time on it. With the cooperation of Cicero Beam, Pooble succeeded in having a full set of termination procedures added to the Administrative books in the record time of one week. Then he filled in the papers and filed all fourteen copies, distributing them properly. Come next Friday, Horton Nemo was as good as fired.

Pooble gave great thought to the matter. He scheduled his valedictory interview for 10 a.m. and notified Miss Campylos to notify Mr. Nemo to come in at that time.

Pooble alternated back and forth between the two attractive phraseologies, "You are fired, dammit!" and "I am by George firing you!" Finally for the sake of propriety he settled on, "Mr. Nemo, your services will no longer be required," and wrote this into his speech.

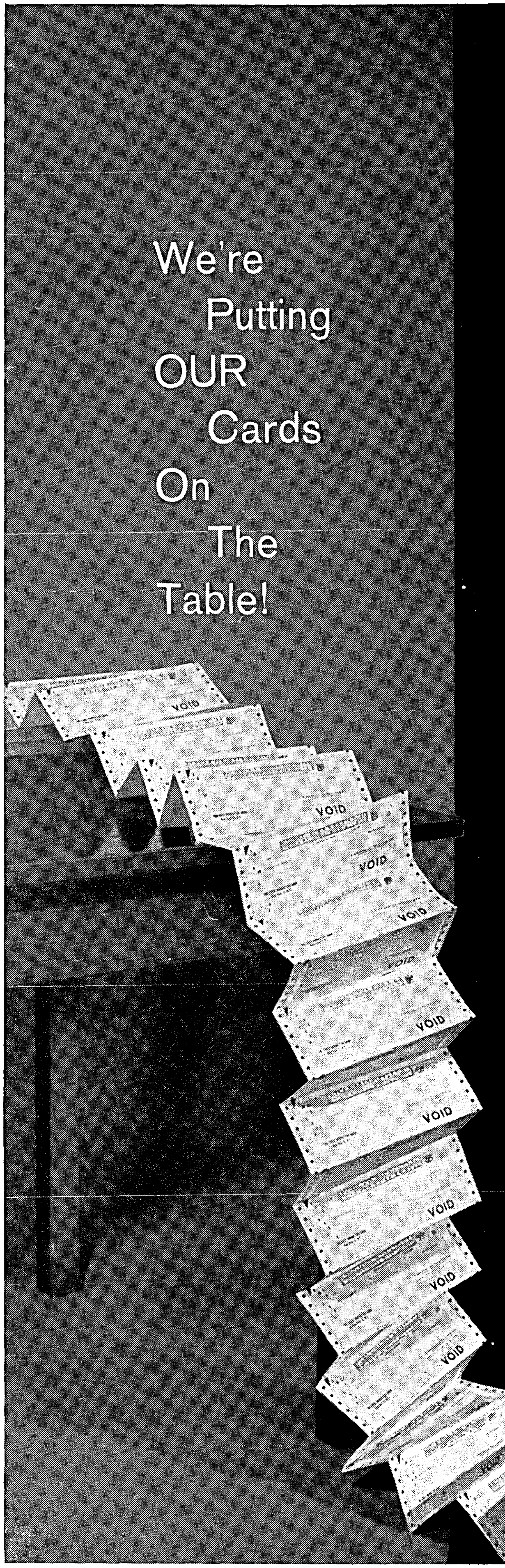
Rupert B. Pooble awoke Friday morning with anticipation. This was the day Nemo went down the tubes. The sun was shining. The birds were singing.

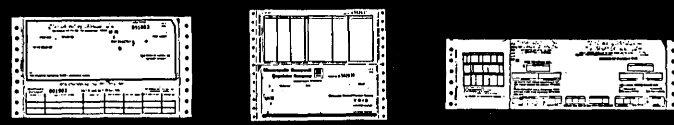
Pooble arrived at his desk, humming. In his IN basket was a plain envelope of Inscrutable executive stationery. Pooble opened it.

It was a brief note from Bruno Zorch. The key words leaped out at Pooble.

"Your services will no longer be required."

Horton Nemo had been insubordinate only in the proper places. ■





Sometimes a frank statement of fact is needed to clear up mis-information and confusion generated by an industry as fast-moving as the data processing industry. THIS IS SUCH A TIME.
The confusion deals with Continuous Tab Cards, Medial Strips and Vouchers. The mis-information relates to "short grain or long grain."

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is the ONLY Continuous Tab Card made **without** Medial Waste Strips and WITH vouchers of any length at side, top or bottom.

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3 FORMSCARD®

is available pre-punched, easily separated, manually or on any burster. Can be used in multiple part sets.

4 FORMSCARD®

can be fed at MAXIMUM SPEED, with trouble-free operation, on any and every high-speed printer.

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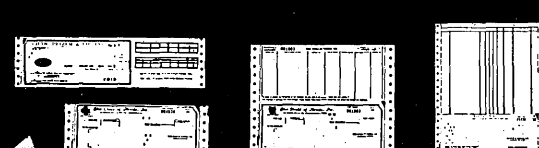
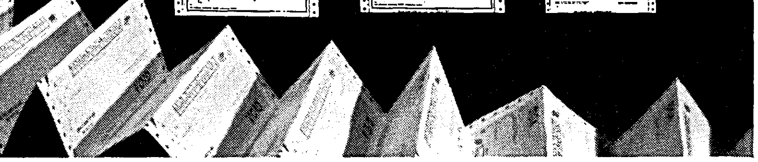
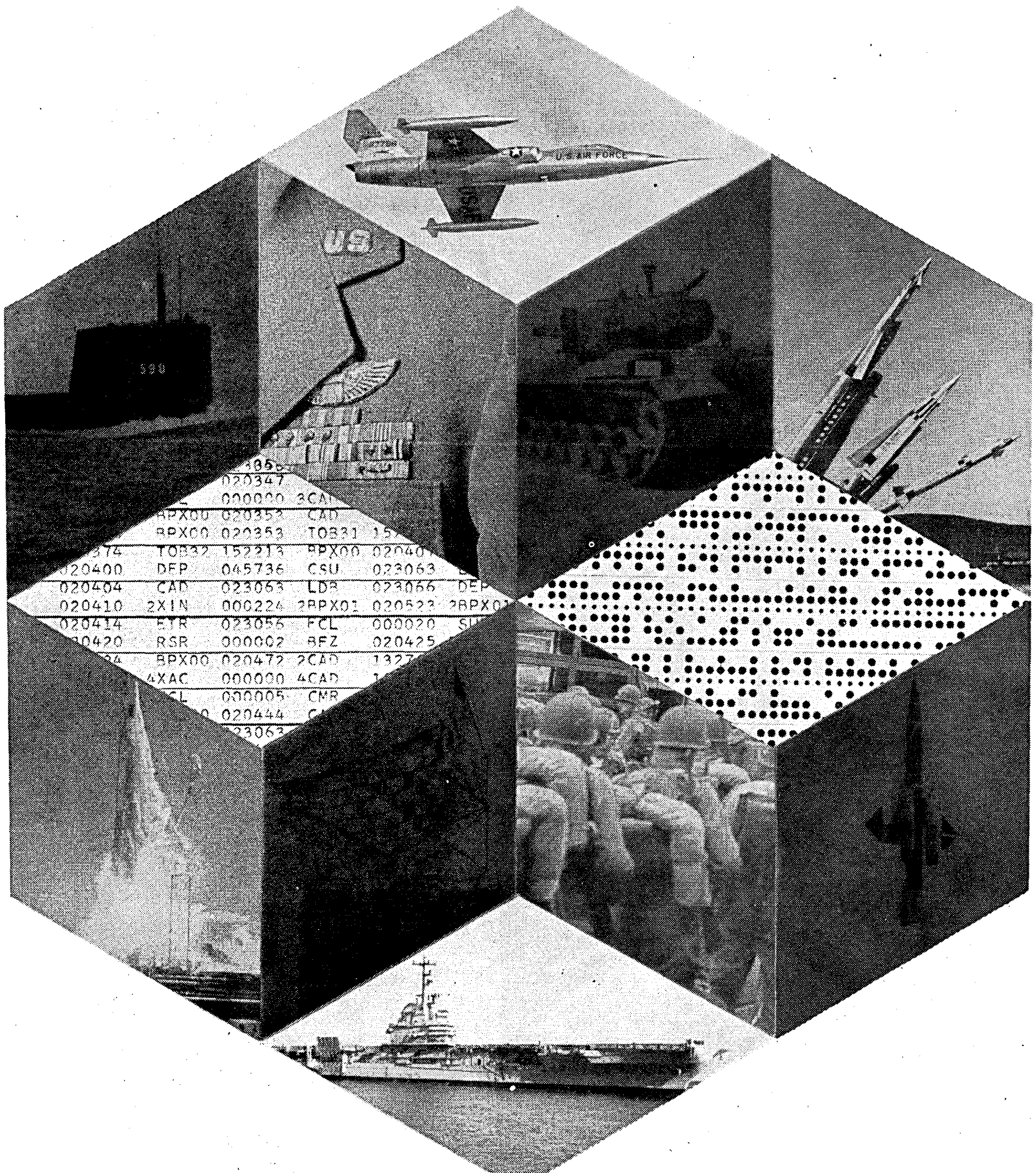




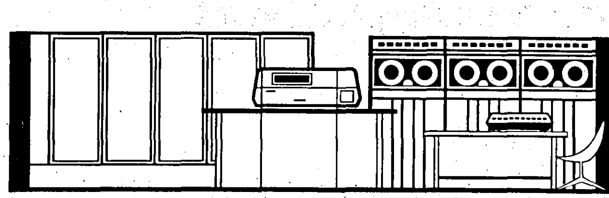
Manufacturers of line-hole continuous business forms. Samples on request—sales representatives in principal cities.



Honeywell 400 Cobol: mighty strong language

COBOL, by definition, is a common business-oriented programming language for computers. As intended, there is a relatively high degree of compatibility between COBOL compilers designed for specific computers. It does not follow, however, that all compilers are of equal caliber.

Just as there are differences in computers, COBOL compilers vary in scope, speed and effectiveness.



CIRCLE 24 ON READER CARD

Last summer a course in computing was given to a class of 25 gifted seventh graders at the Lincoln Junior H.S., Santa Monica, Calif. This was the third such class and for each an important feature was the presence of an operating computer in the classroom (an LGP-30 in 1960 and an IBM 1620 during the last two summers).

The following diary edited by the author, represents an unusually readable account of one instructor's experience in this field. Its function in a long range solution to the personnel problem should be apparent from the accomplishments of this tidy group of 11, 12 and 13-year-old embarrassments to the population of mature computerites.

applicable today

A DIARY FOR TOMORROW'S PROGRAMMERS

by FRED GRUENBERGER, The Rand Corp.,
Santa Monica, Calif.

June 18. Class began, and time was spent on mechanical chores of seat assignment, issuance of machine manuals and flow chart templates, etc., and the filling out of the numerous forms that schools use these days. Much of this nuisance was handled by the (accredited) teacher, Mrs. Marjorie Mims, assigned by the school to the class. We had agreed in advance, however, that she would participate in the class as one of the children — take the tests, go to the blackboard, etc. A student number was assigned to each student, for various purposes.

Two rooms were used this summer; one for classroom and lecture; the other for laboratory use with the 1620. Arrangements had been made for Mrs. Dorothy Parkin to supervise the lab room while I conducted the lectures. This physical setup proved to be beneficial; in fact, the effectiveness of the teaching seemed to be up 50% over the summer of 1961, when only one room was used with one instructor.

The course began with a short lecture on the history of automatic computing, plus demonstrations of a hand-crank Ohdner-type machine and a modern, electric desk calculator.

The first two-hour session ended with a demonstration of the computer. We had stored in the machine a set of rules for the students to observe, and the computer had been programmed to type out these rules — a personal copy for each student. They are:

1. IF YOU DON'T KNOW WHAT YOU ARE DOING, DON'T DO IT.
2. ONLY ONE PAIR OF HANDS ON THE MACHINE AT ANY ONE TIME.
3. STAY OUT OF THE INSIDE OF THE MACHINE . . . TRY NOT TO KICK IT, STEP ON ITS CABLES, ETC.
4. WE EXPECT TO HAVE A CERTAIN AMOUNT OF FUN WITH THE COMPUTER, BUT IT IS NOT A TOY – DON'T TREAT IT LIKE ONE.
5. THINK BEFORE YOU PANIC.
6. PUSH NO BUTTONS UNLESS YOU KNOW WHAT WILL HAPPEN WHEN YOU DO.

June 19. Explanation of the sequencing scheme of the computer and the format of an instruction. (Note: throughout most of the course, we operated as though the 1620 were the only computer in the world. There seemed little point in confusing the class with details of other machines. Of course, questions that arose about other and bigger machines were answered as fully as possible. For example, the question was asked later, "Would these codes operate on the 7090?")

Coding sheets were handed out and explained. A routine was developed at the board to develop and type successive powers of 2 (this takes 4 instructions) and the routine was run on the machine. The entire loading process was carefully explained for the first time (this was to be repeated many times as we went along), and the students observed both single cycle sequencing and full speed operation. The routine (operating on 12-digit numbers) was allowed to run until the machine halted on overflow (on the 40th power). They were asked to observe only that the computer stopped by itself and that a light labelled "overflow" came on.

June 20. The students began to ask questions in class. The pattern here is fairly normal; it takes several sessions with any class to get them warmed up enough (or confused enough) to ask questions. This particular group probably got there sooner than most.

Another powers-of-2 routine was developed at the board and the students were given their first independent task. Each student was given a unique location and told to rewrite this routine at his own location. At this stage, it is far from a trivial problem.

The process by which the 1620 does its artihmetic (table lookup) was explained. Normally, this topic would have been deferred until later. However, at the start of yesterday's use of the machine it was found that storage had been cleared just prior to use and the arithmetic tables were not in storage. Several students wanted an explanation of what had happened.

Simple flowcharting was explained and work proceeded in class on a new problem: calculation of a table of squares by multiplication. The flowchart was developed at the board by the instructor, and the students worked out the code, with plenty of help. At this point in a course, nearly everything is confusing; the students simply follow directions more or less on faith. A few of them express in various ways the thought, "This makes fair sense when you do it, but *I'll* never be able to do it by myself." Like all students at this point, they need lots of encouragement, along the line of "stick with it – it gets clearer as you go along."

June 21. This was the fourth day, and we began taking the students into the lab (in groups of two to four) with those routines they had relocated. Mrs. Parkin showed them the loading process again, and then one student in each group loaded and executed his code.

Several students raised the question "Is it all right if we take coding sheets home and work out our own routines?" This is a bit of a problem. What teacher would ever want to discourage such enthusiasm? Nevertheless, they had to be warned that they weren't quite ready for this and that the results would be messy. They also had to be warned not to try to work past 10 p.m. We had trouble last year on that.

In lecture, the action of core storage was explained, and the students examined two core planes – one of the 1953 vintage, and a modern one. They seemed delighted to hear that beadstringing is one of our major industries today. (It seems fair to state that we string more beads in one day now than all the American Indians ever did in a year.)

The movie "How a Digital Computer Works" was shown.

Since they would write their first quiz tomorrow, there was a short discussion on the reasons for testing (feedback to the student; feedback to the instructor; some learning while testing; and ranking of the students) and a set of simple rules for taking a test:

1. Do the easy ones first.
2. Write in English, and label all answers.
3. Something is better than nothing.
4. If you don't know how to do a hard problem, do an easy problem just like it first, and then generalize.

June 22. A flowchart and code was developed by the instructor and class working together, to calculate and type a table of squares. The process now, though, was addition – building up the squares by working from the constant second differences. Besides showing that there's more than one way to skin a cat, this shows that a little thinking can save a lot of coding effort and perhaps a great deal of machine time (though at this point, they're not much concerned with saving time on a machine that strikes them as blinding fast and which, moreover, seems to have unlimited availability).

Interesting new questions were popping up. The most intriguing were of the type: "Why did they design the machine this way? Wouldn't it have been simple, (and more logical) to do it *this* way?" Others were along the lines of "But how are *we* ever going to think up our own flowcharts?"

During the lecture part of class, several new groups were running their first code on the machine. We have found that this doubling up on their time seems to cost very little. Since the lecture material doesn't rush too fast, the ten minutes or so that it takes them is easily caught up, especially with help from their clasmates. It must be kept in mind that these students are brilliant; generally, one tells them each new thing just once.

This being Friday, we had our first quiz. Some of the quiz questions, and comments on them, follow.

1. How long would it take our machine to multiply a 16-digit number by a 4-digit number? (A mechanical question, but these students had had little practice in plugging numbers into formulas.)

2. For the problem we ran together on the machine, what terminated the calculation? (Had they picked up the concept of overflow yet? About half of them had. This is the type of question that provides feedback to the instructor.)

3. What action does the machine take when the INSERT key is depressed? (And here is feedback to the

student. They had all seen it demonstrated and explained at least twice, but now they had to face up to explaining it back in words.)

4. When you go to the computer, what may you assume is in storage?

5. Explain the difference between first level and zero level addressing, using examples. (Three of the brightest students were able to answer correctly. Obviously, much reteaching and review were called for.)

6. The attached routine will generate and type a series of numbers, beginning with 000003 and 000006. What are the next three numbers to be typed? (Many guessed 9, 12, and 15, which is at least better than not guessing. The code built up a second degree function from differences. Several did the proper decoding, to arrive at 6, 10, and 15 as correct results. And at least two caught on to the differencing scheme and produced the correct answers without walking through the code five times.)

June 25. The quiz sheets were returned and all questions were discussed. The students were cautioned that any or all of the questions might appear again on the next quiz; this provides some motivation for them to make sure they knew what they did wrong (and how to do it right next time).

Mrs. Parkin had written a neat routine called Autograde to handle the bookkeeping chores of the class records. (A sample printout is shown in Figure 1, for the results of the second quiz.) Autograde computes the mean and standard derivation of a set of grades; updates the totals to date; and computes the mean and standard deviation of the grades-to-date.

QUIZ #2
June 29, 1962
X(BAR) = 0091.50
SIGMA = 0029.38
X(BAR) = 0166.23
SIGMA = 0041.16

STUDENT	THIS GRADE	TOTAL GRADE
01	061	0117
02	063	0106
03	165	0290
04	058	0148
05	073	0143
06	073	0144
07	078	0145
08	072	0148
09	110	0210
10	135	0231
11	002	0002
12	107	0166
13	113	0178
14	070	0155
15	085	0183
16	071	0148
17	095	0168
18	153	0215
19	095	0198
20	078	0126
21	068	0138
22	083	0136
23	106	0164
24	046	0105
25	125	0193
26	105	0178
27	[091]	0189

Figure 1. Autograde

June 26. The class was in urgent need of more practice in analysis, flowcharting, coding, debugging, and testing. We took a simple minded method of square rooting and carried through to the machine the calculation of a table of 12-digit square roots of the integers from 2 through 100.

Thus, the day was essentially a pause for breath, since no new concepts were covered. The pause was badly needed.

Early in the class period, the last two groups met with Mrs. Parkin to put their short codes on the machine. One of the boys had a clear bug in his code; he had instructions which referred to data and had made no provision to enter that data into storage. Mrs. Parkin thought it would teach him a good lesson to go on the machine and have it hang up on the reference to the (missing) data. Unfortunately, it wasn't missing. The previous group had carefully left the proper number in storage for him at that exact address. Who learned what?

After class one of the boys stayed over (through his lunch hour) to try a code he'd written at home. Not an earth-shaking code (calculate and type the first ten powers of any integer less than 20), but it was the first student-generated code to go on the machine. After a few small bugs were deduced out, the code flew. This student had missed the first two days, due to illness. We were impressed.

June 27. It was time to move on to new ideas. At the start of class we showed them a film on looping. In the film the classic case is demonstrated on the 1620; namely, a loop to sum 100 numbers. At the end of the film it was mentioned that the 100 (consecutive) numbers had been generated in storage by another loop.

That other loop was selected – on the spur of the moment – as the one to have the class code together. (They told me back in my education courses to plan my lessons. I should have listened.) The whole thing was messy and badly presented.

June 28. No attempt was made to dwell on yesterday's debacle. Instead, we started fresh, working on a loop to generate, in 1000 consecutive positions of storage, the character 6. Immediately after this was completed (and run on the machine), the class was assigned the job of writing a loop to create 7000 zeros in a given area of storage. Each of them had an independent location for his code, and drew his own flowchart. By the close of the hour, there were 6 perfect codes (the first of which was run on the computer) and at least 14 more that were nearly perfect.

It was suggested to one boy that he go further and write instructions to prove out his loop. He was given one hint: that the 1620 has a zero-test mechanism built-in. He reasoned correctly that the 7000 zeros could be made into a field; that a zero could be added to that field, and that the result could then be tested in one instruction. His resulting code flew properly.

June 29. We reviewed the reasons for and advantages of looping. Yesterday's loop (clearing 7000 positions to zero) convinced them that looping is necessary; there just isn't any straight-line way to do it.

We coded together (after analysis and flowcharting) loops to type without leading zeros a number that begins with an unknown number of leading zeros (a common need on the 1620). For one loop, we assumed knowledge only of the left-hand (i.e., flagged) end of the number to be typed; in the second case, we assumed knowledge only of the address (i.e., the right-hand end) of the number. The second loop uses the first; thus we covered the concept of cascaded loops (but not loops within loops – that comes later).

Not only are the concepts getting quite sophisticated quite rapidly, but we are at the same time quietly acquiring our own private library of building-block routines.

Class ended with the second quiz. Included was a problem similar to one on last week's quiz: here's a code – what does it produce? In this case, the 7-instruction routine developed the Fibonacci series (2, 3, 5, 8, 13, 21, . . .). About half the class managed to figure it out; one had named the series (they're not raising kids the way they used to).

In a second problem, they were given a code that had been previously developed in class (table of squares by multiplication), and told to find and correct the nine bugs that had been inserted. (Due to a typing error in preparing the quiz sheets, several of them found *ten* bugs—wouldn't you know?) This problem seemed to be an all-or-nothing proposition. Either they saw the point and did a fine job or they missed it completely. It's a fine go-no-go gage, but a poor way to rank them. We'll think of a better one for next week.

July 2. We had covered two of the basic building blocks: straight line coding and looping. It was time to turn to subroutining.

First we reviewed looping once more, by flowcharting and coding a loop to double the contents of each of 200 consecutive fields in storage. The code for this loop was then turned into a closed subroutine, and the mechanics of producing a linkage was explained.

This the class didn't appreciate at all, and with good reason: the situation was too artificial. It would have been far better to use the classic case (square root). Next time.

The parts of the mechanism were explained and given names (i.e., "linkage," "create the escape," and "the escape"). The whole thing was gone over several times, to try to drive it in. ("We store our current location and branch to the subroutine. The first thing we do there is create the exit address by adding, and then transmit that address to the exit instruction down here at the end. Notice that we need to store the information only for the length of time it takes to transfer control to the subroutine, etc., etc.")

July 3. After a review of the concept of subroutining, the class was divided into four groups, to work out in each group one of the following subroutines:

(1) Create the 200 consecutive numbers from 43 through 242 as 5-digit fields in storage, from address 19004 through 19999.

(2) Increase each of the 200 numbers (addressed at 19004, 19009, 19014, . . . , 19999) by *one*.

(3) Reverse, in storage, the 200 numbers (i.e., the number addressed at 19019 should be moved to address 19984 and vice versa, for all 100 pairs).

(4) Sum the cubes of the 200 numbers and type the sum.

It was important to get across the idea that each subroutine except the first had to operate on whatever numbers were stored (previous classes got confused by the particular numbers generated by subroutine number one).

All groups were warned to give serious attention to the problem of testing out their work. They were told that it is not good form to rely on typing out the results and testing by eyeball.

The third and fourth subroutines are the most difficult, and the instructors spent most time helping those groups. The group involved with subroutine three got particularly jammed up on how to test out of the loop (since they had never seen it done, it never occurred to them to count their way out; they were determined to address test out, and what is the address of the right-hand member of that last pair to be reversed?)

The larger groups tended to more talk than thinking or action. Before the close of the hour, the first two subroutines had been checked out on the machine. With a few hints, they had discovered that a good method of testing was to add the results (using another loop) and predict the sum by means of the formula for a progression.

All this activity seemed worthwhile. New ideas popped up at a rapid clip (e.g., "Why not build a safety factor in your loop test by going out when address A is *greater than or equal to* the limit, rather than simply equal to?"), in an atmosphere highly receptive to such ideas.

There is still great confusion as to the difference between an address and the contents at that address. This is not news to anyone who has taught computing.

July 5. During class lecture, three of the students were finishing debugging and testing of the last subroutine. They came back to class with wide grins, and the proud announcement, "The computer is broken! We have machine trouble!" They had to be told that (a) it was highly unlikely, and (b) they had just joined a very large club. As it turned out later, it *was* programmer trouble.

The film "Piercing the Unknown" was shown. This is an old IBM sales film, extolling the glories of the (then) new 701. It is now a splendid film to show beginners, since it shows many aspects of the computing world from 1940 to 1953. The pitch on the 701 need not be taken too seriously; indeed, a class can feel quite superior to the technology of that day (for example, the film shows CRT storage as the latest development).

We assumed that by now the concept of subroutining was familiar enough to be comfortable. They can appreciate one use: avoiding rewriting instructions over and over. The second big use (freedom to segment a big problem) is clear as an abstract idea, but they wouldn't think of using it yet. They were now introduced to a third use: the subroutine library. Brief mention was made of a subroutine on file which suppresses typing of leading zeros in large numbers. Several of the students found this a great idea to save work. Most of them shrugged – who needs it? Like anyone else, they have to be motivated.

July 6. A loop (to compute the sum of products of 100 pairs of numbers) was flowcharted and coded at the board in machine language. Slowly, the code was changed to show the advantages of symbolic locations, symbolic addresses, relative addresses, and mnemonic op-codes, to lead gently into assembly language.

There were many questions this day on review matters: linkages, flowcharts, loops, etc. Incidentally, in all three years of teaching gifted seventh graders, I have never had a foolish question in class; I cannot make the same statement about my college classes.

We had our third quiz today. An interesting point came up. The students were following the sensible rule "Do the easy ones first," and were nearly all avoiding question 4 ("How long does the 1620 take to cube one 6-digit number?") Eventually I found that the trouble was the word "cube," which was foreign to them. I got their attention, explained the problem better, and let them go back to writing the quiz. Later, I found that this procedure itself caused confusion; the interruption upset several persons. I've been doing this for years; is it wrong? Obviously, one should word quiz questions properly, but what should one do in this situation?

Question 1 on the quiz was "When do we address information at its *right* end?" for which the correct answer would be "In all cases *except* for input and output commands, locations, and the transmit record command." One boy wrote "In all cases except the exceptions," and I guess he's right.

We tried a new stunt on this quiz. We've had coding problems of the form "Here's a correct code; what does it do?" and "Here's a code with at least nine bugs; you find them and correct them." This time we gave them a correct code (one we'd done in class) and told them to *insert* four good bugs. As one might guess, the responses covered a wide range. At one extreme, a typical reply was "change this 5 to a 9 (picking any digit in the code) and the routine will hang up." The better students thought up clever, real and subtle bugs to make the loop endless.

July 9, 10, 11. I had to leave town for two days. George Armerding, of RAND, took over the class on Monday and Tuesday and showed them the elements of FORTRAN. They wound up by writing a FORTRAN routine to do jobs (1) and (4) of July 3. On July 11 we took the class to RAND to see their routine compiled and executed on the 7090.

This was all a pleasant interlude to the tedious business of learning the fundamentals of computing. Perhaps it was too rushed, but the students were not much impressed. In fact, operation of the 7090 under a monitor system intrigued them far more than the use of FORTRAN.

July 12. We started class by examining in detail the subroutine in our library that suppresses printing of leading zeros in large numbers. This is a very neat and tight routine, written by Tom Parkin. Besides practice in decoding, I wanted them to appreciate how the work of others can be used easily in computing, as well as the idea that the instructions didn't come to Mr. Parkin out of the blue – he had to work hard to get it all packed so neatly. The points seemed to go over well.

We started work on another library subroutine – a random number generator. Here I got a big surprise; these kids were quite at home with modular arithmetic as a result of their SMSG (School Mathematics Study Group) course the preceding semester. Well, good for SMSG!

We tried another looping exercise in class. The problem was different from preceding ones (of a set of 2-digit numbers, count how many exceed 50 and how many are less than or equal to 50; the number of numbers is unknown, but the set ends with a record mark). One might be led to believe that they understand how to flowchart a simple problem. One might be wrong.

July 13. At the start of class, we discussed programmed switches – flip-flops, and slam-the-door switches in particular. Then we went on to drop-dead halts:

```
  LOCATION      OP
      A         HALT
    A + 12      BRANCH TO A.
```

These tricks of the trade made a big hit. So I tried the world's shortest loop:

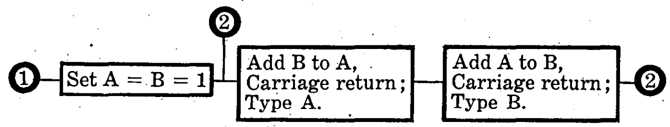
```
      A         BRANCH TO A,
```

but in machine language form:

```
    17856     49    17856.
```

This got a laugh from most of them; I told them that not many people in the world find a string of 12 decimal digits very funny. And they thought *that* was a riot!

For class drill, we took a simple flowchart out of the book:*



and embellished it to fit our machine. To enable us to type many terms of the Fibonacci series, A and B had to be set up as 200-digit numbers. (We had a library routine that creates long strings of zeros on demand.) Further, the two typing commands had to call on the subroutine that suppresses leading zeros. What appears extremely simple in the flowchart develops into a 20-instruction code.

This sort of exercise builds up steam at a high rate of speed. Without anything being said, the class exercise soon develops into a race: the first code that passes inspection will be put on the machine. The students who charge off without thinking never get there.

Even such a simple exercise can drive home many lessons and tricks. The impetuous students, for example, go to all the work of creating the fields A and B in identical fashion. The slower, more thoughtful student creates field A and then moves it with one instruction to B. A clear case of slow and steady wins the race. Or, brains over brawn does it every time.

We are starting to get ready for our open house on July 25th, for which each child was expected to write an independent routine. (The weaker students will simply paraphrase a problem done in class. The better students will work in teams and perhaps do several problems. The top students will ask for some problem that will make their parents take notice. In fact, the top students want to do several problems.)

July 16. Last Friday's quiz contained 5 problems. Four of these were strictly review of mechanics (e.g., "What are the five parts of a loop?")

The fifth problem was this: "We have 300 3-digit numbers in storage, addressed at 10003, 10006, 10009, . . . , 10900. We wish to write a loop to find the sum of these numbers. Draw a flowchart."

This was chaotic. Evidently the class needs lots of practice in *producing* flowcharts. This seems to be the one thing I can't teach at all. All I can do is show them. Some of them pick it up rapidly. Some of them, I'm afraid, will never get it. But since a good flowchart is a picture of the logical thinking on a problem situation, there are no rules. We'll keep trying.

July 17. The time had come for the students to bear down on their independent problem for open house. We spent the first hour getting them organized and started on their work. Their reaction is amazing, particularly in contrast to the reaction of a college group to the same assignment. They were teamed up and hard at it within ten minutes, and most of them had made wise choices; that is, they had selected problems suitable to their individual abilities. Two extremes show up, of course: the student who elects to do a problem far beyond his capabilities (e.g., verify the Goldbach conjecture for the first 5000 even numbers), and the student who chooses

*Manuscript copies of a text, "Introduction to Electronic Digital Computing" were furnished.

a completely trivial problem (e.g., raise 17 to the fifth power). One boy didn't pick a problem at all; he decided to wait. Two girls chose to calculate the 2003rd power of 2. We started to sell them the idea of picking 4423 or 3217 as exponents (these powers of 2, less one, are the last two known largest primes), or some number bigger than had ever been calculated, but they were adamant. *They* had selected 2003 and 2003 was the power they were going to use. So be it.

We promised them all plenty of help on their project, but only on condition that they make a decent flowchart first.

George Armerding had given them a brief introduction to floating point a week before. Today we brought it up again, more seriously. After some discussion and examples, we got around to meaningful examples, such as their age:

52 10000000 (a few frowns, but no outcry).

(52 is the power of 10, plus 50; the remaining 8 digits represent the fractional mantissa.)

My age:

52 82000000 (some snickers, but no objection).

Their mother's age:

52 23000000 (*now* they begin to object).

July 18. We took up all the calling sequences for floating arithmetic, and coded a simple problem in floating point.

The SDC film, "Computer Programming" was shown. Class ended with independent work on their open house problems. Some of them are deep into coding. It is painful to watch.

July 19. I felt they needed some comic relief by now. On the blackboard at the start of the class was this quotation from Hao Wang: "It seems that the machine, when cursed for being too slow or too small, may often in justification demand in turn that the user do some more thinking."

Also on the board were some well-known constants in floating point form:

64 31556925	length of a year
62 17999300	speed of light
47 56721447	TV wavelength
65 25435806	volume (cubic mile)

Eventually one of the boys woke up and asked what the units were (micro-seconds; furlongs per fortnight; miles; and cubic inches). They haven't been labelling answers on their quiz papers, either.

I wrote on the board the "largest known twin primes:"

1,000,000,009,649
1,000,000,009,651

followed by a pair of larger twins:

1,000,000,010,489
1,000,000,010,491

This started some discussion. Could they, maybe, break this world's record? Not on the 1620, son, in the time we have available.

Several students got on the machine today to start debugging their own problem. One of the girls met me at the door of the machine room with a look of consternation on her face. "It overflowed, on my problem!" That was very unkind of the machine. Welcome to the club, Nancy.

July 20. Open house is getting closer. We now have five different sign-up lists going on the blackboard:

1. Those needing help with their codes.
2. Next on the machine.
3. Next on the machine after lunch today.
4. Next on the machine after lunch Monday.
5. Next on the machine during second period (our class is first period, and some of the students are taking only one class).

One of the girls had chosen to calculate and type the first 500 terms of the Fibonacci series. I showed her a tab listing (dated 1950) of the same series, run to 400 terms, that had taken hours to produce on punched card equipment.

We have a new rule: the student getting help (particularly at the console) will have our undivided attention. The corollary, of course, is that there should be no interruptions and no onlookers.

In listing reasons for using loops, one boy wrote, "To help increase accuracy." Let us always strive for *accuracy*.

July 23. In another problem, the students were given a code (a loop) and a description of what it should do. (Our brightest student promptly pointed out that the code contained a bug.) The problem was to fill in the "remarks" column for the code. It's an interesting assignment, and produced the widest spread of responses. The better students have caught on to the use and beauty of symbols:

Set M = 19004
c(M) − 8→c(M)

and so on. The middle students treat the whole thing in terms of absolutes. The bottom students don't get the point. This is not to belittle those who didn't get the point. It is probable that their mental development is just short of that sharp line where symbolism and abstraction can be absorbed. In a few more weeks it would be clear to them, too.

After the quiz I tried a little oral review and got a surprise. I asked the question, "What are flags used for, in the 1620?" and got the correct answers:

1. To define fields,
2. To signify negative numbers,
3. To indicate a carry in the addition tables,
4. To mean anything you want them to mean;

in so many seconds. How did they learn *that* one so fast? Students will never cease to amaze me.

We took up a simple problem requiring use of floating point arithmetic (the Birthdate problem; the flowchart was given in the textbook) and analyzed it. We then proceeded to code part of it together.

Now, I mentioned before that the calling sequences for the floating point subroutines we had available are particularly foul. That's all right, though. They might as well be exposed early to canned packages like this. They wince at having to use "current location plus 35" (and flagged, at that), and ask, somewhat reasonably, why the subroutine couldn't take care of that chore. I'm for them.

Anyway, the Birthdate problem requires only a few floating operations. I forced them to code the thing to the point where they had sweated through four of these calling sequences. (Later we ran off the completed problem on the machine.) They were then more than ready to hear about interpretive routines.

This illustrates a pattern I try to follow most of the time. It goes like this:

1. Yesterday we were in trouble because X was messy and hard to use,
2. But here we have a way out: new tool Y, which was created to handle just such a mess. Notice how easy it makes the job?
3. But notice also that now we have new trouble, because Y isn't the perfect tool either.
4. Tune in tomorrow, when we'll explore tool Z.

So we started to explore the concept of an interpreter, which in this case is a subroutine to control the construction and execution of all those other subroutine calling sequences. The idea went over fairly well. So we advanced a bit more: while we're at it, why don't we add a few more pseudo-ops to the system? Perhaps a floating compare operation? Or square root?

We developed the flowchart of a simple interpreter on the board and coded together the first part of it; that is, up to the point at which it is necessary to code separate routines for each pseudo-op to be interpreted. Then I coded on the board the complete routine (six instructions) for the floating ADD part of it. The class was then broken into teams to produce the corresponding routines for SUBTRACT, MULTIPLY, DIVIDE, MOVE, EXIT, and SQUARE ROOT.

July 24. Tomorrow is the open house. About eight codes are checked out and ready to go. The day was thus devoted to independent work and machine checkout for those who still needed it, plus work on the interpretive routines for those who had time for that. This balances nicely: just the ones most capable of attacking the interpretive routines are the ones already checked out on their independent problems.

The team working on square root needed special attention, of course. We explored together the mathematical recursion in Newton's method and devised a flowchart for it. Eventually, the students working on this routine noticed the implementation of the mathematical recursion would require the use of floating operations. Thus, from within one routine in the interpretive system, they would have to link to the interpreter itself. What do you know! — recursive subroutines. The first reaction is, "We'll never get out of this loop." We soon discovered, however, that there would be in storage (scattered around) a neat device called a push-down list (consisting of all the subroutine escape instructions) that would guide us properly and get us out of the complex path we were creating.

During all this discussion, I failed to use big words like recursion, and push-down list. As long as you never tell 'em how difficult it is, it looks simple.

July 25. The last minute panic was on to get ready for this evening's open house. Include me in the panic; I thought I had arranged for a serviceman to come and check out the machine, just as a precaution. In fact, I'm damned sure I arranged for it. But no serviceman showed up. (One drifted in at 7:30 in the evening.)

To decorate the room, we ground out a few thousand feet of tape with the names of the students appearing every few inches. A committee sprang up to festoon the room with it.

Two of the girls had elected to write a routine to verify the Goldbach conjecture for the first few hundred even numbers. This one took a lot of help to get checked out.

The last codes were debugged anl tested by 4:00 p.m., which is shaving it a bit close.

The open house was quite a success. On arrival, each student signed up for machine time in turn. When his turn came, he took his parents (and brothers and sisters and uncles and friends) to the machine, loaded his tape, and ran his code. There was much excitement, since many of them were not fully convinced that this whole operation would really work dependably. One incident is typical. A boy was running a routine to develop a table of prime numbers (it had been checked out only hours before). He sat at the console, fascinated by the long string of primes appearing on the typeout. Eventually it was suggested that he get off the machine to make room for the next in line. He asked me, "May I run it for just ten more numbers?" His parents were quite impressed; it was only recently that he was pleading for just one more lollipop.

July 26. Every student now has a checked-out routine of his own. Suddenly there is a demand for production runs. They were receptive now to the idea of an operator's check sheet. Five of them promptly produced written directions for an operator (me) to use in running production. I agreed to follow their directions, with a maximum of ten minutes of machine time per problem.

Several of the students had run into trouble through having to load a tape bearing many records. We discussed ways of making a tape self-loading (bootstrap techniques).

We are still working on their floating point interpreter. We discussed the flowchart (in the book) for solving the following problem:

Out of a rectangular sheet of tin, squares are to be cut out of the corners so that the remainder of the tin can be folded into an open box of maximum volume. What size should the squares be?

By carrying through a few stages of the cut-and-try method by hand at the board (in fixed point arithmetic), they seemed convinced that floating point arithmetic had a place after all. Moreover, we now had a tool (our own interpreter) to make the use of floating arithmetic easy.

July 27. Last day of this course.

We first ran off on the machine the solution of the box problem. It would be nice to be able to report that it was run with the students' interpreter. However, there was not enough time to debug each routine and tie them all together. Each routine contained several mistakes, and the net result is messy. So we used an old interpreter that I'd written.

There were some keen lessons to be learned from yesterday's batch of production runs. For example, here was a routine for cube roots, apparently debugged and tested, that blew up on an overflow on the number 125. Why should a routine work perfectly for 124 values and be no good on the 125th? (Ah, haven't we all had these!)

Then, here was a tape with the complete instructions "Load into 07000." I handed the boy a blank sheet of paper in class, and told him that I'd followed his instructions to the letter. He was crestfallen, until I then gave him the long table his code had produced. He'll never make that mistake again.

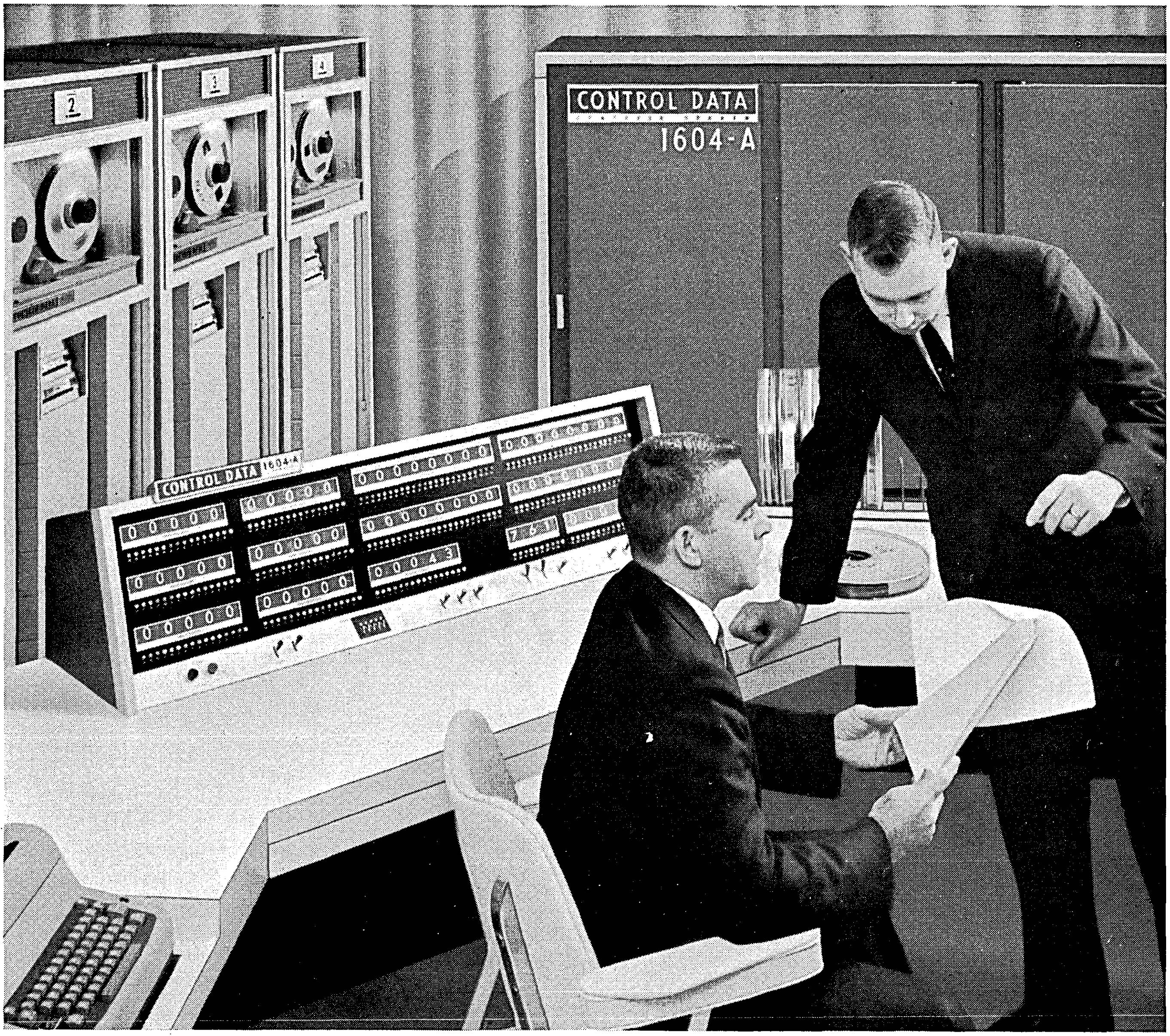
The SQUARE ROOT team had done a fine job. I described to the whole class the concept of recursive subroutines. They didn't believe it.

We had some awards to hand out to the top students. For one boy who had worked hard on a primes routine, we presented a printed table of primes. For two other boys, we had large tables of square roots. To one of the girls we gave a copy of the book *Principles of Programming*. For the top boy in the class we were able to present a year's subscription to *Datamation*.

The sixth and final quiz ended the class. A simple problem was presented; they were to analyze it, flowchart it, and then code it. This was the first time they had been required to deal with several phases of a problem solution at one time. The results seem to indicate that a great deal had been learned.

It would be fatuous to draw extended conclusions from the work of this class. They had not worked with assembly language, nor had they done any extensive problem analysis; in fact, there is a long list of things for which we wish we had just a little more time.

Nevertheless, I think they are now trained in the basics. That is, they have been taught *computers* (as opposed, say, to answer-getting, or magic languages, or circuit design, or systems analysis, or console operation, or numeric analysis, or Boolean algebra). In some sense, they are better informed than many of our current college graduates. ■



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ORGANIZING A LOCAL PROGRAM IN COMPUTING EDUCATION

by GEORGE G. HELLER**, National Education Chairman, ACM & AIEE
Education Chairman, Computing Devices Committee

Last May *Datamation* presented the report, "A Computer Curriculum for the High School" which described a large scale experiment on teaching computer science to high school students, conducted under the auspices of the Washington, D. C. Chapter of ACM. Many inquiries have since been received concerning this program. Questions most frequently asked were:

"What can *I do* in my own community about starting a program in education for information processing? How do I get started? What resources can I use?"

The answer to the first question is that there are a great many things one can do, including the showing of movies, giving brief talks, setting up a speakers bureau, conducting field trips, arranging library exhibits, organizing career guidance sessions, volunteering as science fair judges, teaching a short or a full term course. There are excellent resources available in each of these areas, and they are described in detail below. To the question, "How do I get started?" here are the answers:

movies & their availability

Would you like to tell a church, club, PTA or a class of interested youngsters what information processing is all about? To begin, all you need is a 16 mm. sound movie projector.

There are many suitable movies readily available, most of which are free of charge, and the one-way mailing cost is just a few pennies (at the educational materials rate). In fact, many of these movies are no further than a telephone. For example, call the local telephone company business office. They will be pleased to provide a print of "Memory Devices," one of the finest movies in the field. The local branch offices of computer manufacturers will also be pleased to lend many of their films without cost.

The movies shown in Figure 1 are those included in the "Computer Science Theater" of the 1961 EJCC. This is a selected list that offers a good cross section of movies available on computer science. These films are entertaining and informative and they will add a light touch to a program of this type. Annotated copies of the "Computer Science Theater" (CST) and the "Sources of Movies for the CST" are available from ACM National Headquarters, 14 East 69th St., New York City 21. An annotated Audio Visual Aids catalog listing additional titles and sources is available from DPMA, 524 Busse Highway, Park Ridge, Illinois.

addressing a group

You can talk about computers to math clubs, science clubs, scout groups, or any other interested audience. It is not recommended that you use a "canned talk," but you *can* prepare your own presentation by obtaining several of the inexpensive or free publications listed in Figure 2. Several of these booklets also show how to develop the visual aids you might like to use.

At a modest cost you can easily set up a "Resource File for Brief Talks About Information Processing."

speakers bureau

For schools, clubs and many other organizations, the availability of a qualified guest speaker is welcome news. Make your availability known and encourage others to participate. Set up a list of available and qualified speakers, their topics, length of talks and other pertinent information. In Washington, D. C., such a speaker's bureau was organized by the Joint Board on Science Education of the Washington Academy of Sciences. For additional information, write to: Dr. John K. Taylor, Director of Science Projects, Joint Board on Science Education, 1530 P Street, Washington 5, D. C.

field trips

Many local installations are pleased to show off their computer(s). If you have direct access to one, so much the better. A field trip is to be taken neither lightly nor without preparation. An excellent guide on how to conduct your field trip was recently published in the ACM Communications.*

library exhibits

Public libraries are generally eager to have educational exhibits. Assist your library in setting up an educational exhibit about computers. The local branch offices of computer manufacturers will be particularly pleased to supply you with display items. One of many useful sets is "Mathematics Serving Man," available from IBM as form

*A One-Day Look at Computing by G. W. Armerding, F. J. Gruenberger, S. L. Marks and T. R. Parkin. *Communications of the ACM*, September 1962, pp. 486-487.

**The author has recently been appointed Provisional Education Chairman of AFIPS. He is employed by IBM Federal Systems Division, Bethesda, Md.

#520-0937. For your free copy write to: Mrs. E. A. Davis, IBM CHQ, 590 Madison Avenue, New York City 22.

career guidance

Organizing such sessions may be accomplished by working with individual schools, school districts or school systems. Many schools have "career days" or "career nights"—and they will welcome and appreciate your participation. In some areas professional societies sponsor "Career Days." Write to ACM for copies of "Sources of Information on Career Opportunities in Mathematics, Programming, and Electronic Data Processing Occupations." ACM distributes

Figure 1

The Computer Science Theater and Sources of Movies

Most of these films are available free of charge. Those identified by an asterisk (*) are rented on a fee basis.

All About Polymorphics
Thompson Ramo Wooldridge, Inc.
8433 Fallbrook Avenue
Canoga Park, California

Celestial Mechanics and the Lunar Probe
A Voice for Mercury
NASA
Technical Information Division
1520 H Street, N.W.
Washington 25, D.C.

A Communications Primer
The Information Machine
Introduction to Feedback
Mathematical Peep Shows
Modern Talking Picture Service, Inc.
10 Rockefeller Plaza
New York 20, N.Y.

Computer in the Classroom
Secondary Schools and Computers
The RAND Corporation
1700 Main Street
Santa Monica, California

Computer Programming
Programming Languages
SDC's Automated Teaching Project
System Development Corporation
2500 Colorado Avenue
Santa Monica, California

Donald in Mathmagic Land*
Audio Visual Education Center
University of Michigan
720 E. Huron Street
Ann Arbor, Michigan

Electronic Computers and Applied Mathematics*
Colburn Film Distributors, Inc.
P.O. Box 470
668 N. Western Avenue
Lake Forest, Illinois

Electronic Computers Improve Management Control*
University of California
Public Film Rental Library
2272 Union Street
Berkeley 4, California

Electronics for Accounting and Business
Arthur Andersen and Company
120 S. LaSalle Street
Chicago, Illinois

Introduction to Digital Computers
To Hare is Human
Remington Rand UNIVAC
315 Park Avenue South
New York 10, N.Y.

Learning and Behavior (The Teaching Machine)*
Hamilton Film Service
245 West 55th Street
New York 19, N.Y.

Memory Devices
Your Local Bell Telephone Business Office

The National 315 EDP System Featuring CRAM
National Cash Register Company
Data Processing Systems and Sales
Dayton 9, Ohio

The Thinking Machine
Association Films, Inc.
561 Hillgrove Avenue
La Grange, Illinois

Thinking Machines
Educational Testing Service
Horizons of Science
Princeton, New Jersey

This is Automation
G. E. Film Library Service
3 Penn Center Plaza
Philadelphia 2, Pennsylvania

The Widest Horizons
North American Aviation, Inc.
9150 East Imperial Highway
Downey, California

Figure 2

Suggested items for your initial resource file for brief talks about information processing.

Computing Bit by Bit or Digital Computers Made Easy,
by A. L. Samuel.
"The Proceedings of the IRE," Vol. 41, No. 10, page 1223, October 1953. The rapid progress in the computer field makes this an old paper in terms of the numerical information without invalidating the explanation of basic principles.

Computing Devices, by Donovan Johnson and William H. Glenn.
Webster Publishing Company, 1961, 1154 Reco Avenue, St. Louis, Mo. 55 pages. Part of "Exploring Mathematics on Your Own" series. (85¢)

Digital Computers and Related Mathematics,
by Frederick H. Young.
Ginn and Company, Boston, 1961, 40 pages. Topics include: (1) The digital computer—key to a new world; (2) The Algebra of sets, logic, and switching circuits; (3) Logical design of digital computers. (80¢)

Digital Computers: Their History, Operation, and Use,
by E. M. McCormick.
Smithsonian Institution, Washington, D.C., 1961. Publication 4439 from the Smithsonian Report for 1960, pages 281-299. Available in local libraries.

The Electornic Brain and What It Can Do,
by Saul Gorn and Wallace Manheimer.
Science Research Associates, Inc., 1956, 57 West Grand Avenue, Chicago 10, Illinois, 64 pages. (60¢)

Games That Teach the Fundamentals of Computer Operation,
by Douglas C. Engelbart.
IRE Transactions on Electronic Computers, March 1961, EC-10, No. 1. Pages 31-41. Reprints available from Douglas C. Engelbart, Stanford Research Institute, Menlo Park, California, (Free)

Sets, Sentences and Operations,
by Donovan A. Johnson and William H. Glenn.
Webster Publishing Company, 1154 Reco Avenue, St. Louis 26, Mo., 1960. 63 pages. Part of "Exploring Mathematics on Your Own" series. (85¢)

Thinking Machines, by Irving Adler.
Signet Science Library Books, 1961, 501 Madison Avenue, New York 22, N.Y. 159 pages. A layman's introduction to logic, Boolean algebra, and computers. Paperback edition. (60¢)

Yes, No—One, Zero—The Language of Electronic Computers.
Prepared for teachers by Humble Oil and Refining Company, Eastern Esso Region, 60 W. 49th Street, New York 20, N.Y. 16 pages. (Free)

these publications free of charge and in quantity. Write to the Superintendent of Documents, Washington 25, D. C. for your copy of "Guide to Undergraduate Programs in Mathematics" (OE-56008). Price is 25 cents.

In addition to group activities, make yourself available to individual students seeking career guidance.

science fairs

Most communities sponsor science fairs in elementary and high schools. Offer your services for judging exhibits that fall within range of your competence and offer your assistance to interested students in the preparation of computer oriented exhibits. Find means to offer awards for unusual accomplishments. For more information, write to Mrs. Ethel C. Marden, Chairman, Subcommittee on Science Fairs and Special Projects, ACM Education Committee, c/o National Bureau of Standards, Washington 25, D.C.

teaching

If you feel more ambitious, plan a 3-5 hour extracurricular session course on computers. For the first hour course cycle, plan on spending 5 to 10 hours in preparation for each hour you spend in class.

Build an exhibit for the school's library announcing the course, and provide a bibliography for the school's librarian. Lend some books to her for the use of class members during the course. Construct visual aids. Confer with the school's principal and guidance counselors.

Let the school pick the students. Consider only those who are sincerely interested. A class of twelve is ideal. Fifteen is ample. Twenty is large. More than twenty is to be avoided.

Select your own topics. Discuss only subjects you know well. Invite some of your colleagues to discuss their specialties. Guest speakers will enliven your class. Their participation may also interest other professionals in your local educational program. What about the syllabus? This depends on your personal preferences. Do not attempt to teach anything you do not know well. It can be disastrous! And the topics you do know well will be easy to teach.

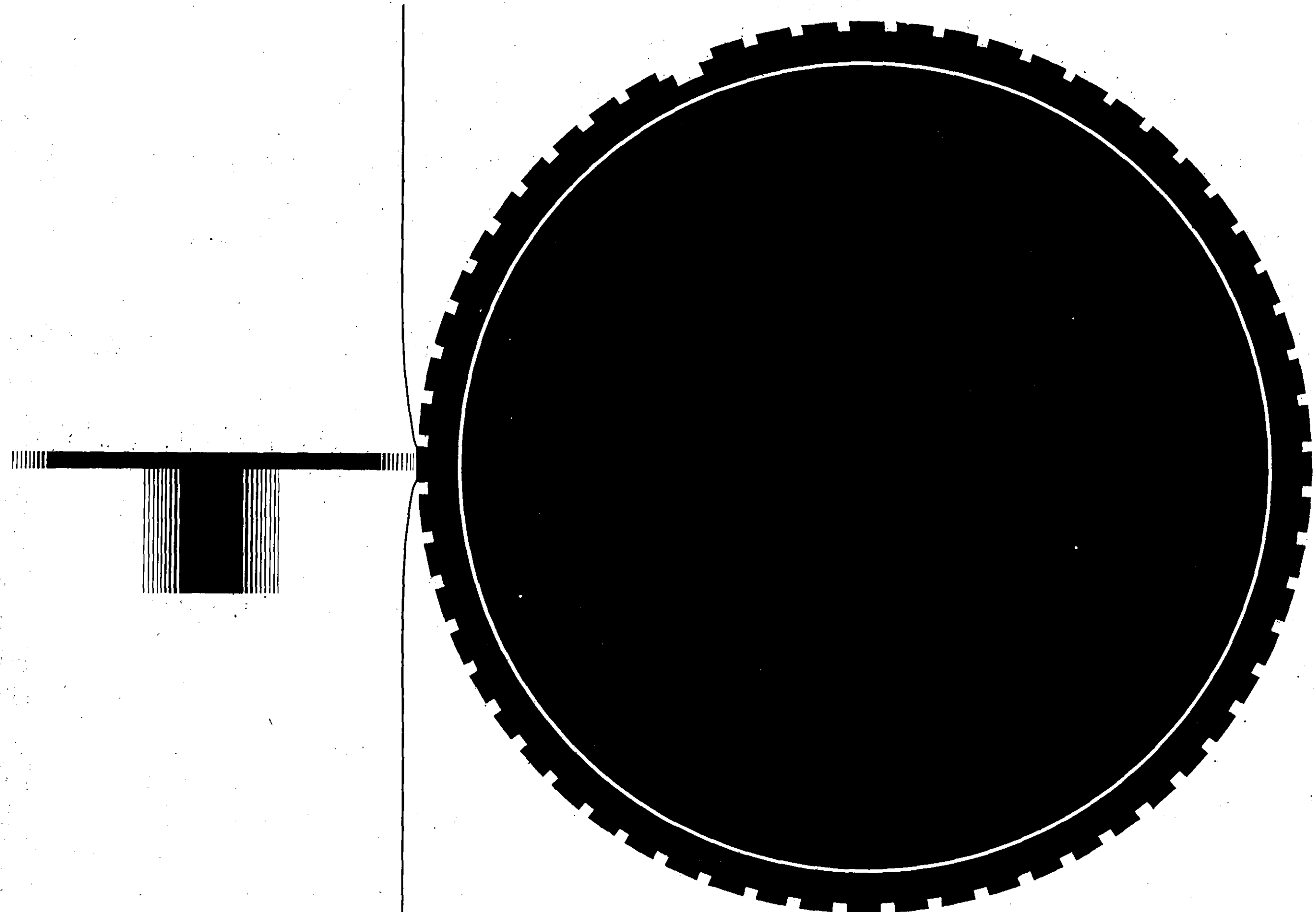
a full term

You will want to do this only after you have done most of the preceding activities. A full term course (12-15 weeks) is very time consuming and requires a great deal of preparation. Careful selection of the students is crucial to your success. You must be firm from the beginning; assign, correct and return homework regularly. Tolerate no unexcused absences. On the other hand, make the course so interesting that no one would want to stay away. *Use movies extensively.*

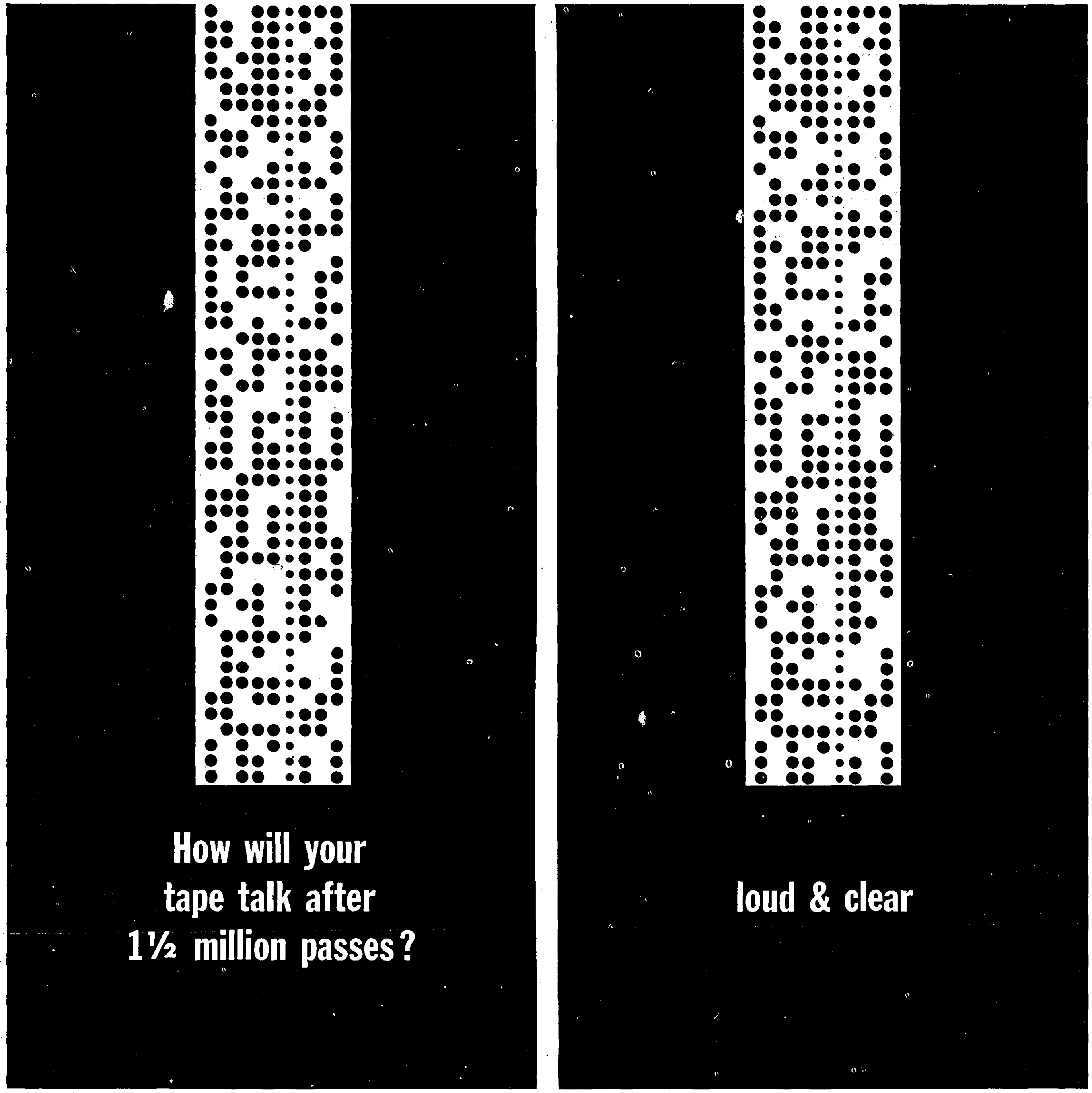
For details of what to teach consult "A Computer Curriculum for the High School" in the May, 1962 issue of *Datamation*, or write for your copy of "Business Data Processing — A Suggested 2-year Post High School Curriculum" to the U. S. Office of Education, Division of Vocational Education, Washington, D. C.

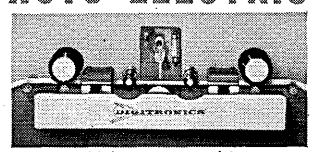
If you plan on using a computer during the course, be sure to obtain ample assistance. A debugging session with more than two students per instructor is virtually useless. Individual attention is the key factor.

These are only a few suggestions on organizing your local program in education for information processing. They represent the composite experience of the Education Committee of the Washington, D. C. Chapter of ACM during the last two and one half years. If you follow these suggestions and still have problems in conducting a program, or if you have suggestions that may help others, write to the ACM Education Committee at 14 East 69th Street, New York City 21. ■



CIRCLE 77 ON READER CARD


How will your tape talk after 1½ million passes?
loud & clear



NEWS BRIEFS

CODASYL REQUESTS DETAB-X COMMENTS

At a recent symposium on decision tables, the Systems Group of the CODASYL Development Committee asked for reaction from users of DETAB-X. The comments will be used in determining whether DETAB-X will be recommended to the CODASYL Executive Committee for formal adoption as an addition to COBOL.

Elected chairman of the Systems Group was Sol Pollack, The RAND Corporation, who succeeded L. W. Calkins, U. S. Steel Corp. The Group also formulated plans for continuing its research toward the specification of a systems-oriented, machine-independent language.

ANTI-TRUST CHARGES REFUTED BY IBM

IBM has denied the charges made by Business Supplies Corp. that it had violated anti-trust laws, and has filed a counter claim asserting injury to the tab card industry by improper pricing tactics by Business Supplies in violation of the Robinson-Patman act.

The counter claim asks for an injunction prohibiting Business Supplies from continuing its present pricing tactics and for treble damages in an amount to be fixed by the court.

AMERICAN U. SPONSORS FIFTH IR INSTITUTE

The Fifth Institute on Information Storage and Retrieval, sponsored by the School of Government and Public Administration of The American University will be held at the International Inn, Washington, D. C., February 11-15. Theme of the Institute will be the handling of technical data.

The program will include discussions of techniques for documenting, arranging, indexing, storing, retrieving and analyzing data in such fields as engineering, chemical-biological research, medicine and aerospace.

Additional information may be obtained from Dr. Lowell H. Hattery, Director, Center for Technology and Administration, The American University, 1901 F St., N.W., Washington 6, D. C.

UNIVAC TO MARKET MAGNETIC CORES

The UNIVAC Division of Sperry Rand has announced that it will market a variety of magnetic cores, and predicted that by June, production will be at the level of 200 million cores per year, with at least 10 types offered for sale.

A recently developed 20 mil core, with inside diameter of 0.012 inches and a thickness of 0.004 inches, designed for use in the coincident-current mode of operation, will be included in the UNIVAC line. Switching time for this core is less than 200 nanoseconds, and full drive current requirement is 550 milliamperes.

CIRCLE 100 ON READER CARD

B5000 & B270 ORDERED FOR BANKING SYSTEM

The South Carolina National Bank will install a B5000 and B270 to handle financial data processing and check processing for the bank's 250,000 customers. Full implementation of a statewide data processing program is forecast in two years.

Delivery of the B270 will begin within the next 12 months; the delivery date for the B5000 was not stated.

CIRCLE 101 ON READER CARD

PHILCO 2000-211 FOR AIR DEFENSE COMMAND

Philco Corporation has been awarded a $3,569,957 contract for developing data processing equipment for The North American Air Defense Command. The system will include a Philco 2000 and 211 processor.

To be installed at NORAD headquarters in Colorado Springs, Colorado, the system will be used for experimentation and testing of real-time information systems employed for air defense command decisions throughout North America.

CIRCLE 102 ON READER CARD

INFORMATICS SPONSORS FIRST DISC FILE SYMPOSIUM

A Disc File Symposium – the industry's first – will be held on March 6-7 in Hollywood, Calif. The Symposium is being sponsored by Informatics, Inc., Culver City, Calif., software and system design firm.

The two-day conference will feature discussions on recent disc file applications, techniques, programming, and characteristics. Papers to be presented will examine scientific, business, and on-line applications.

The speakers' list is scheduled to include: "Remote Computer Use and Disc Files" (keynote paper), by Al Perlis, Carnegie Tech; "Use of the Disc File on STRETCH," by Bengt Carlson and Ed Voorhees, Los Alamos Scientific Lab.; "Disc-Oriented 7094 System," by Lowell McClung, Applied Physics Lab., Johns Hopkins Univ.; "Design Criteria for an On-Line Nationwide Order Processing System," by C. DeGabrielle, General Electric, Phoenix; "A Computer System to Minimize Expected Turn-Around Time," by William F. Cervenka, Socony-Mobil Research Labs., Paulsboro, N. J.

According to Informatics president Walter Bauer, the Symposium will focus on "the new generation of disc files just now appearing – files with upwards of 20-million-character capacity, and access times as low as 100 milliseconds."

For additional information and registration, write to Dr. Walter F. Bauer, Informatics, Inc., 8535 Warner Drive, Culver City, Calif. Registration fee for the Symposium is $75.

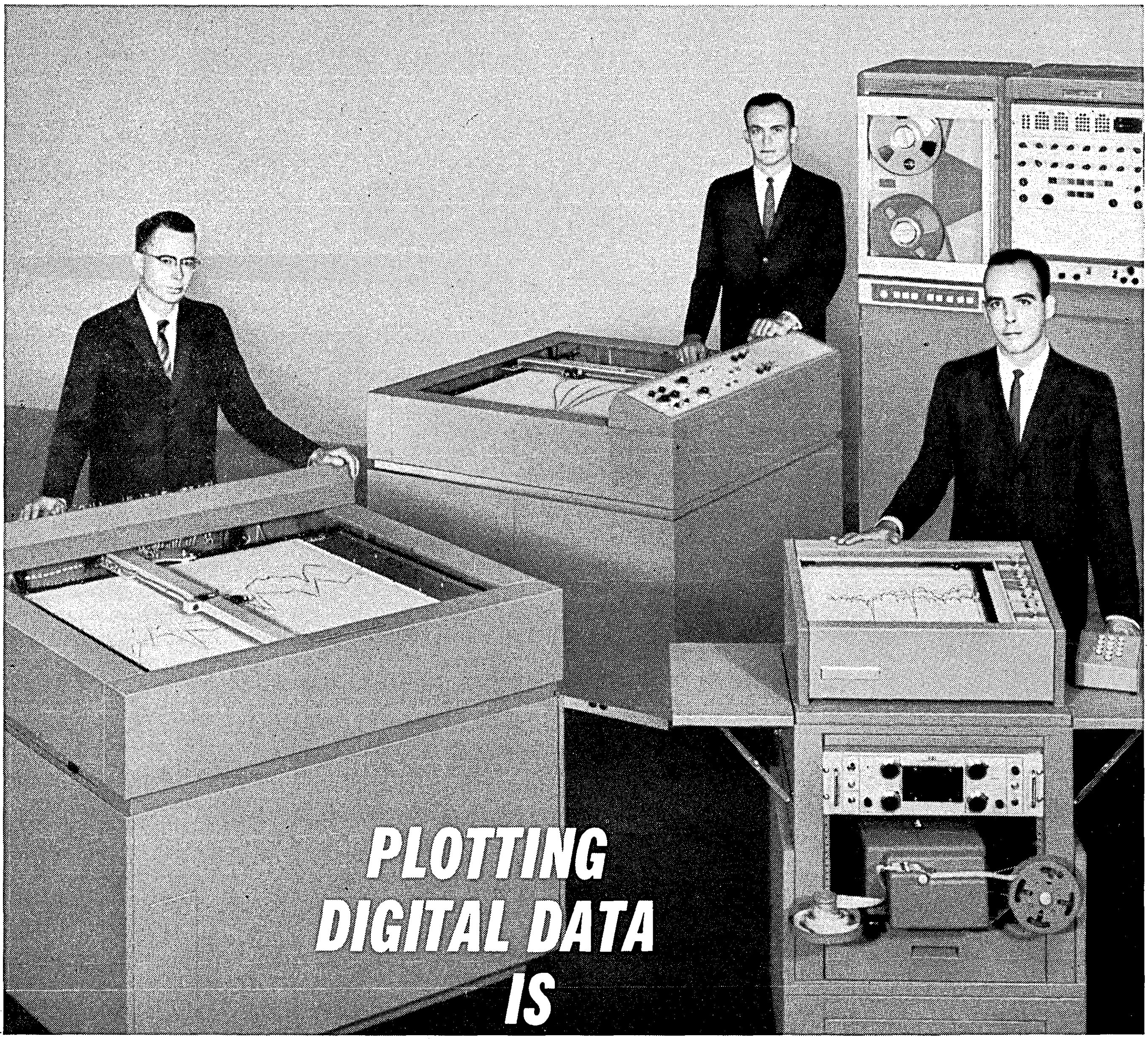
NASA PLANS 1107 INSTALLATION

A UNIVAC 1107 will be installed at NASA's Goddard Space Flight Center at Greenbelt, Maryland, and will be used to process telemetered data from satellites.

The computer will be installed this month and is expected to be operational by February. The system will be operated 24 hours a day, six days a week.

CIRCLE 103 ON READER CARD

● The first linear programming package for use with the Honeywell 400 has been announced. The package uses the Simplex Algorithm technique for mathematical computation and analysis of data, and will be tape-oriented to permit the handling of a large number of variables and con-



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EAI

ELECTRONIC ASSOCIATES, INC. *Long Branch, New Jersey* straints. Programs will be written as EASY subroutines. Equipment required for the LP packages includes: 400 with 2K memory; four mag tape units; high-speed printer; card reader; and multiply/divide option.

CIRCLE 104 ON READER CARD

● The California Department of Motor Vehicles has orderd a Philco 210, which will be used for motor vehicle registration. When installed this summer, California will be the first state to use large-scale dp equipment for auto registration. The system will include a 210 cpu with a 10 usec, 8K memory, seven on-line mag tape units, plus two off-line mag tape units, two high-speed printers, card reader and card punch, and two universal buffer-controllers.

● A 7090 is on the air at the National Bureau of Standards' Boulder Laboratories, Boulder, Colorado. The computer is used to prepare monthly radio propagation prediction tables showing the density of electrons in the atmosphere.

● IBM will build an 84,000 sq. ft. Systems Laboratory near San Jose, Calif. The facility will house activities of IBM's Advanced Systems Development Division. Completion is scheduled for early 1964.

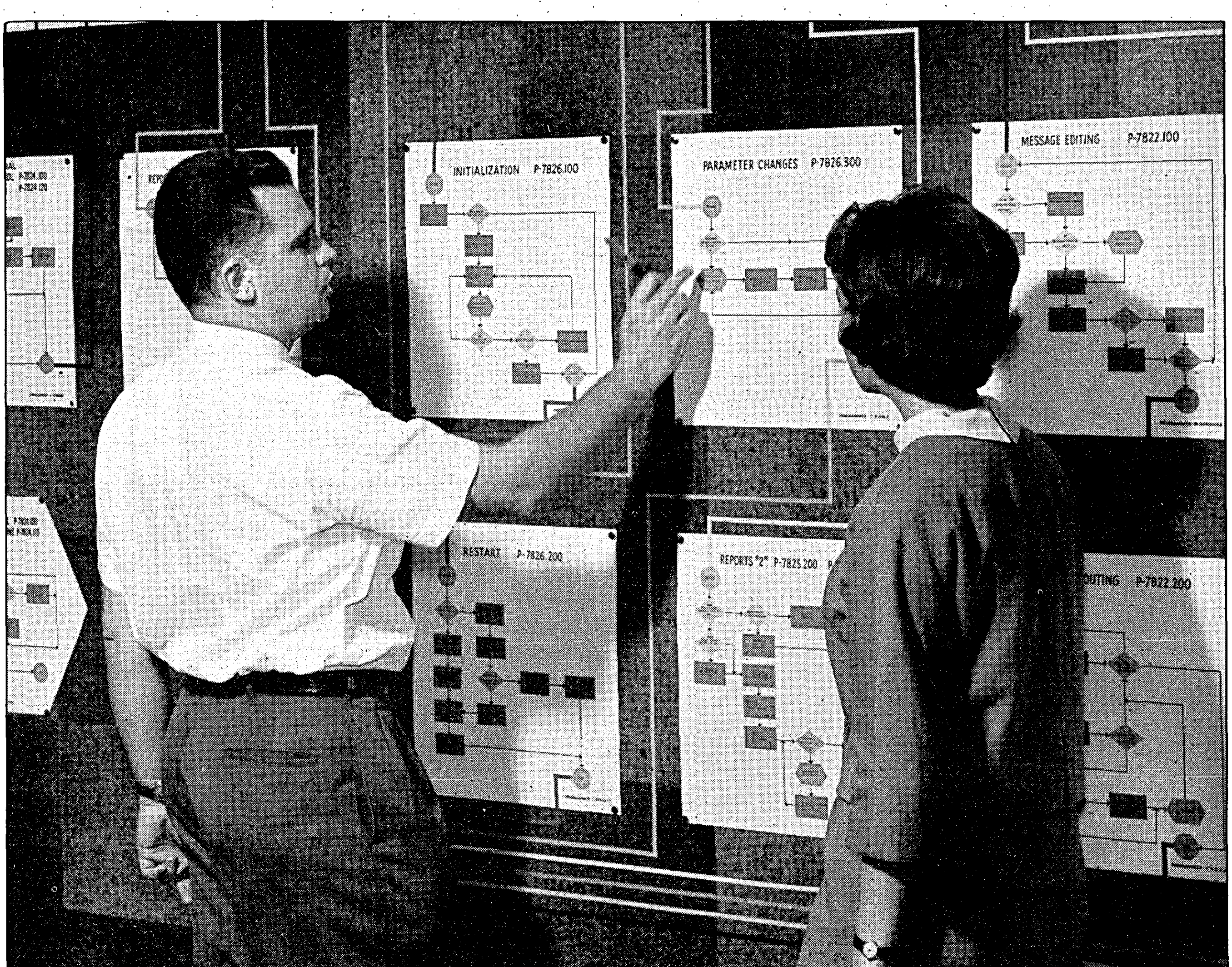
● The NDRO Evaluation Unit, made by UNIVAC, is a self-contained unit designed to facilitate the technical evaluation of the BICORE magnetic film memory element. The unit includes a special memory plane containing 16 24-bit words, with internal circuits provided for 12 8-bit words.

CIRCLE 105 ON READER CARD

● The Union Dime Savings Bank, New York City, has installed a Telefile system which is designed to process deposit and withdrawals for 160,000 accounts. The system, in operation at the bank's main office and connected to branch offices, consists of twin solid-state computers, five magnetic drums, four mag tape transports, and 31 teller machines. Off-line functions will include mortgage billing, statistical and other financial tasks.

CIRCLE 106 ON READER CARD

● Sylvania has delivered a mass memory unit for its MOBIDIC in operation at the Army's Newport Beach,



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CIRCLE 78 ON READER CARD

Calif., experimental electronic command post. The unit doubles the storage capacity, and provides the combined memories with 16.6 million words through a binary to alpha-numeric coding process. The second memory was produced by Sylvania under a $380,000 contract from Aeronutronics div. of Ford Motor Co., a prime contractor for development of the command post.

● An IBM 1410 with 1310 random-access disc files has been ordered by Connecticut Blue Cross. When in operation, a two-way data communication network will link the computer center in New Haven with 35 member hospitals. The 1410, to be installed by late 1963, will replace a 650.

● Lockheed Missiles and Space Co., Sunnyvale, Calif., has installed its fourth IBM 7090, which will be used to develop techniques and simulate flights for new satellite programs. In addition to the 90s, Lockheed Missiles operates ten IBM 1401s as I/O for the large-scale systems. Some 900 people support the installation in the Computation Center, Information Analysis Center, and Space Vehicle Information Systems.

● Two Bendix G-20 systems were installed recently in Japan, while a third G-20 is now in operation at the University of Naples, Italy. The Japanese installations will be at the Japan National Railway Technical Research Institute, Tokyo, and the corporate offices of C. Itoh and Co., Tokyo.

● Informatics, Inc., recently-formed computer software organization in Culver City, Calif., has received contracts for systems design, analysis and programming from Astrodata, Inc., Data Products Corp., Packard Bell Computer, and Data Systems Div. of RCA.

● Data Products Corporation, Culver City, Calif., has completed a $1,400,000 long-term financing program for the company and its subsidiary, Informatics, Inc. According to Erwin Tomash, president of the firm, $1 million in convertible subordinated debentures had been privately placed with Continental Capital Corp., Greater Washington Invest-

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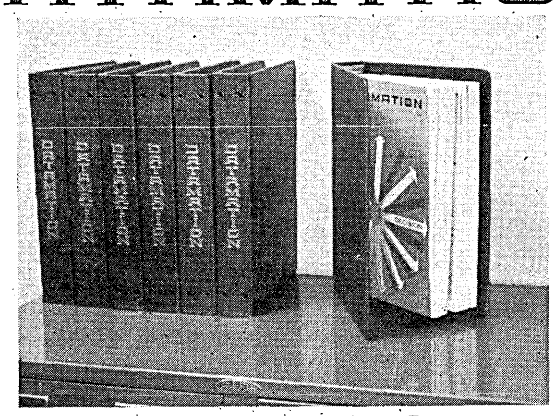

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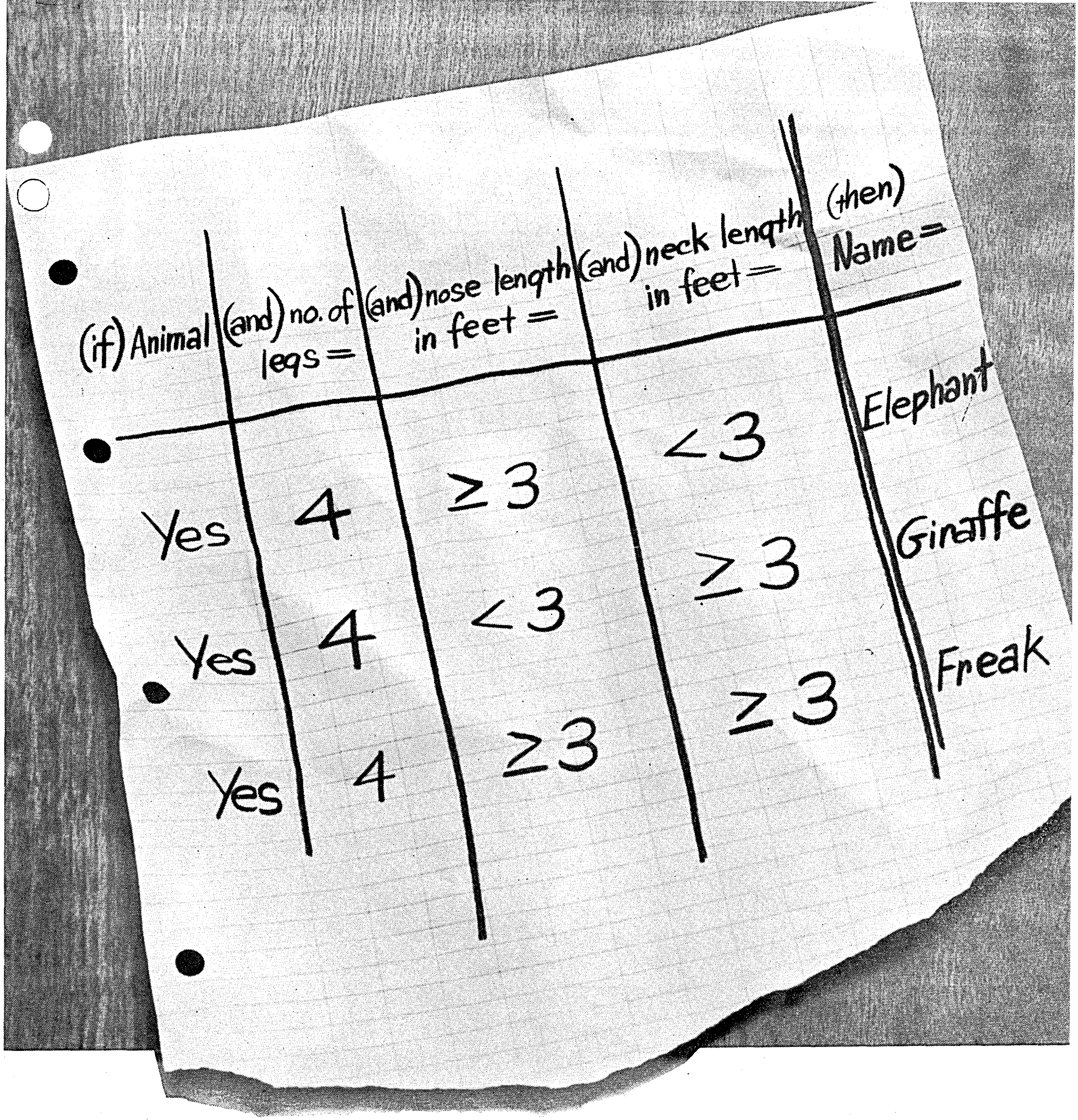

How to tell an elephant from a giraffe (without really trying)

Once you have written the problem in General Electric's TABSOL (Tabular Systems Oriented Language), and fed it into a GE-225 computer, you'll get the answer faster than you could by looking at the beast. TABSOL converts a complex decision logic problem, stated in English, into computer language. It eliminates complicated flow charts and hand coding, assures inclusion of all alternatives, and reveals ambiguities. Best of all, it *documents* the program. TABSOL is just one part of General Electric's powerful GECOM system—most versatile of all computer programming aids. Let General Electric show you how TABSOL and GECOM can go to work on your problems. Write for Brochure CPB-147A, General Electric Computer Department, Section J1, Phoenix, Arizona.

CIRCLE 31 ON READER CARD

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ments, Inc., and Small Business Enterprises. Additionally, a $400,000 short-term note payable to Telex, Inc., has been changed to long-term debt with designated conversion provisions.

● A Data Reduction Interpreter (DRI) and a Data Reduction Translator (DART) have been announced by Bonner & Moore Associates, Inc., Houston, as new programming systems designed to be used in process control applications. Operations monitoring and off-normal reporting, plant control analysis and exception reporting, and process plant yield accounting and analysis, will be used with this software.

CIRCLE 107 ON READER CARD

● A large-scale network simulation program has been delivered by Data Processing, Inc., Waltham, Mass., to Bell Telephone Laboratories. Developed for use with a 7090, the program simulates detailed network models of the telephone system. The program is written in two major sections: the first carries out the network simulation, while the second processes the resulting data and prints out the desired information.

● Control Data Corp. has been awarded a $4.5 million contract to produce classified electronic equipment for the U. S. Army Electronic Command, Fort Mead, Maryland.

● General Precision, Inc., has formed two new groups: an Information Systems Group, to be located in Glendale, Calif., and a Simulation and Control Group, Binghamton, N. Y. Additionally, the firm's GPL Division, Pleasantville, N. Y., will become a division of the Aerospace Group. The Information Systems Group comprises GP's Librascope Div., Glendale; Commercial Computer Div., Burbank, Calif., and a newly-organized Research Center, Glendale. W. E. Bratton, Librascope president, was named group president.

● The Carnegie Corporation has awarded a $150,000 grant for "Research on Learning and Thought Processes" to System Development Corp., Santa Monica, Calif. Major project goals include the development of improved techniques for predicting the behavior of organisms, and the use of these techniques to produce machine behavior that would be called intelligent if displayed by humans. The work will be performed by SDC's Artificial Intelligence Research Staff, headed by Frank Marzocco.

NEWS BRIEFS . . .

● Computers for Industry & Business, Inc., NYC, has made available a utility program for a tape 1401 which is used to create tape records from cards. The records may be blocked or unblocked. The major use of the program is expected to be in the creation of tape records for program testing.

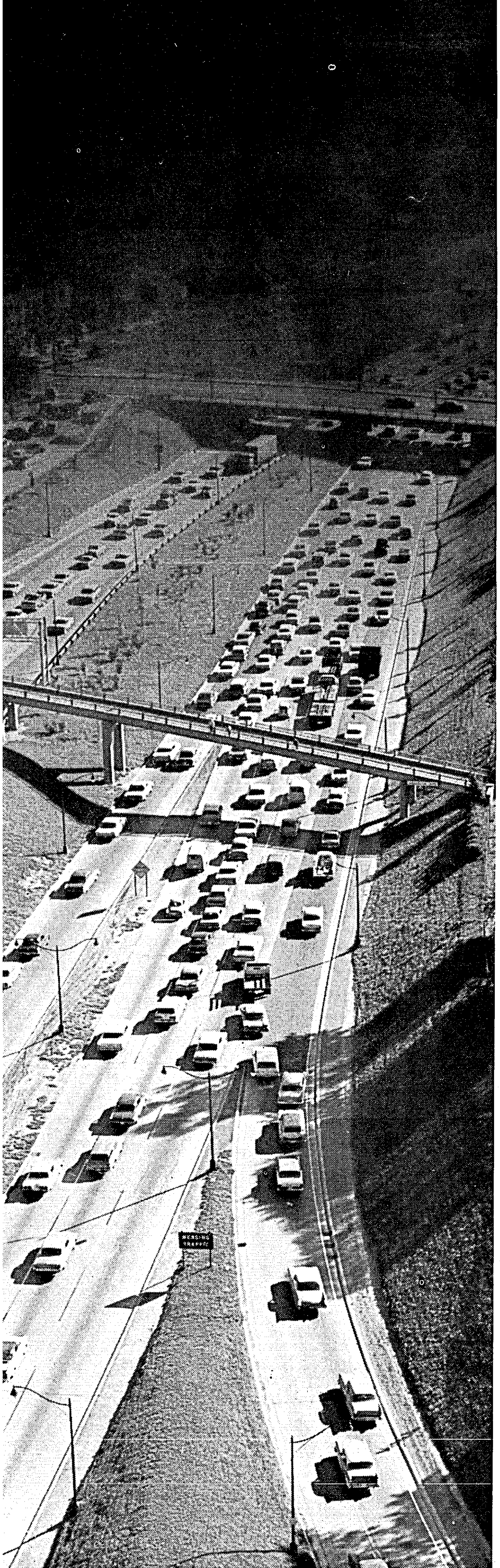
● A Control Data 1604-A and 160-A were installed at Oak Ridge National Laboratory this month, replacing the facility's ORACLE (Oak Ridge Automatic Computer and Logical Engine) in operation since 1953. The 1604 configuration will include 14,606 mag tape transports and 1,000 lpm printer.

● WIZ II, the latest version of GE's engineering compiler, is said to be 1.7 to 2 times more efficient in execution time than its predecessor. Compiling time remains virtually unchanged. According to GE, WIZ II requires 1K fewer words of memory for library execution phase than similar compilers. The execution phase library requires 3K words, as compared to 4K for WIZ I. The new version compiles and punches object decks at 1.6K instructions/minute.

● The California Department of Motor Vehicles will install a Philco 2000-210 for motor vehicle registration. The system will include a 10 msec 210 processor with 8K words of core memory and seven mag tape transports. Off-line hardware wil include two mag tape units, two buffer-controllers, two printers, card reader and punch. Installation is scheduled for the summer.

● The Des Moines (Iowa) Independent School District plans to use a Burroughs B260 to develop computer operating personnel from among the city's 5,000 high school business students. Courses will include programming, system development and design, and business simulation. Instruction in the use of keypunch and tab equipment is also planned.

● The Los Angeles Times has inaugurated an automatic typesetting system, centered around an RCA 301. In operation, editorial material is prepared on punched paper tape by the reporter. After editing, a correction tape is spliced to the front of the story tape and is input to the 301 at 1K cps. The 301 incorporates all editing changes, counts each character and the number of spaces in each line so that the right-hand margin is justified, decides where split words are to be divided, and prepares a final tape used as input to Teletypesetter machines.



NEW LITERATURE

LGP 21: An information sheet outlines the specifications and characteristics of this new gp computer including a 4K magnetic disc memory, an access time of 25 milliseconds and decimal, alphanumeric and hexadecimal I/O format. GENERAL PRECISION, INC., COMMERCIAL COMPUTER DIV., 101 W. Alameda, Burbank, Calif. For copy:
CIRCLE 130 ON READER CARD

225 SOFTWARE: Five brochures which describe the latest programming packages for the 225, include GECOM, WIZ, ZOOM and TABSOL. Flowcharts, forms and tables, explaining steps to take in solving typical problems for business, science and engineering are presented. GENERAL ELECTRIC CO., COMPUTER DEPT., Phoenix, Ariz. For copy:
CIRCLE 131 ON READER CARD

OPTICAL CHARACTER RECOGNITION: A reference guide for evaluation of optical character-recognition devices has been published as part of a special report which covers the state-of-the-art of readers and includes information on devices under development, in the prototype stage, and commercially available equipment. THE BUREAU OF NATIONAL AFFAIRS, INC., 1231 24th St., N. W., Washington, D.C. For copy:
CIRCLE 132 ON READER CARD

4000 COMPUTER SERIES: This illustrated brochure contains descriptions, uses, features, specifications and auxiliary equipment for the 4000 series. PHILCO CORP., 3900 Welsh Rd., Willow Grove, Pa. For copy:
CIRCLE 133 ON READER CARD

DOD/NASA PERT: A workbook used for PERT planning, matrix computation, and squared networks as well as slides discussing PERT and the DOD/NASA PERT Cost System is described in this leaflet. MANAGEMENT PLANNING SYSTEMS CO., 1122 106th Ave., N. E., Bellevue, Wash. For copy:
CIRCLE 134 ON READER CARD

PERIQUIP CATALOG: This 75-page book contains information on the company's accessories, card equipment, tape comparators, keyboards, key punches, readers, reproducers and verifiers. SOROBAN ENGINEERING, INC., Box 1717, Melbourne, Fla. For copy:
CIRCLE 135 ON READER CARD

PROGRAMMED DATA PROCESSOR-4: This six-page pamphlet includes diagrams, specifications, uses, examples of instructions and available options. DIGITAL EQUIPMENT CORP., 146 Main St., Maynard, Mass. For copy:
CIRCLE 136 ON READER CARD

NEW LITERATURE . . .

NANOSECOND MEMORY: A specification sheet gives information on a computer memory system which features a complete memory cycle time of 375 nanoseconds. RCA, SEMICONDUCTOR & MATERIALS DIV., SOMERVILLE, N. J. For copy:
CIRCLE 137 ON READER CARD

SWITCH CORES: Three four-page specification sheets give information concerning the #101-101 (small-size), #141-101 (medium-size), and #181-101 (large-size). Mechanical specifications, electrical specifications, core test specifications, and switch core definitions are included. ELECTRONIC MEMORIES, INC., 9430 Bellanca Ave., Los Angeles 45, Calif. For copy:
CIRCLE 138 ON READER CARD

MAINTENANCE PROGRAM: This brochure outlines a comprehensive maintenance program available to users and manufacturers of analog and digital computing, instrumentation, and data processing systems. TECHNISERV CORP., 8921 Supelveda Blvd., Los Angeles 45, Calif. For copy:
CIRCLE 139 ON READER CARD

HIGH SPEED PRINTER: A four-page catalog describes the uses, operation, features and specifications of the 4-1000, a system with two printing speeds of 1000 or 667 lines per minute. ANELEX CORP., 150 Causeway St., Boston 14, Mass. For copy:
CIRCLE 140 ON READER CARD

MULTI-CHANNEL RECORDING SYSTEM: Features, applications, and specifications for model TR-1510 system are presented in this booklet. MAGNASYNC CORP., 5546 Satsuma Ave., No. Hollywood, Cailf. For copy:
CIRCLE 141 ON READER CARD

DIGITAL CIRCUIT BOARD MODULES: This 48-page catalog includes circuit descriptions, electrical and mechanical specifications and a price list of the company's family of compatible 10 Mpps, 500 Kpps, and 25 Kpps active and logic circuits. ENGINEERED ELECTRONICS CO., 1441 E. Chestnut Ave., Santa Ana, Calif. For copy:
CIRCLE 142 ON READER CARD

DIGITAL SYSTEMS EQUIPMENT: This catalog gives information on the company's silicon and germanium circuit modules, analog-to-digital and digital-to-analog converters, commutators and multiplexers, differential amplifiers and the PB 250 computer. PACKARD BELL COMPUTER, 1905 Armacost Ave., Los Angeles 25, Calif. For copy:
CIRCLE 143 ON READER CARD

MAG TAPE UNIT: Features, physical characteristics and performance specifications of the D-2020 are detailed in this illustrated brochure. Block diagrams are included. DATAMEC CORP., 345 Middlefield Rd., Mountain View, Calif. For copy:
CIRCLE 144 ON READER CARD

ANALOG/DIGITAL BUILDING BLOCKS: This bulletin gives descriptions and specifications on the company's A/D converters, D/A converters, multiplexers, sample-and-hold and DC amplifiers. SCIENTIFIC DATA SYSTEMS, INC., 1649 17th St., Santa Monica, Calif. For copy:
CIRCLE 145 ON READER CARD

CIRCUIT MODULES: Mechanical, electrical, logical environmental and reliability specifications for these transistor diode logic building blocks are given in this technical bulletin. LABORATORY FOR ELECTRONICS, INC., 1079 Commonwealth Ave., Boston 15, Mass. For copy:
CIRCLE 146 ON READER CARD

DATAMATION

NEW PRODUCTS

microcard

A new miniaturized printing concept enables information to be photographically produced on 3" x 5" cards at five percent the original size in a permanent and non-erasable form. Microcards can be used as complete information systems or in combination with other retrieval systems. MICROCARD CORP., 30 E. 42nd St., New York, N.Y. For information:

CIRCLE 200 ON READER CARD

tape system

The TM-4100 series of self-contained tape memory systems combine the TM-4 tape transport with series DE-100 solid state electronics, designed to operate at densities up to 600 bpi or 800 bpi with digital clock. The system is able to read, write and check digital data in computer formats interchangeable with the IBM 729 II and IV tapes. AMPEX CORP., 934 Charter St., Redwood City, Calif. For information:

CIRCLE 201 ON READER CARD

alphanumeric optical reader

The 1428 is able to read all letters of the alphabet as well as 16 numeric and special characters. The scanner operates at a speed of 480 characters per second and can handle up to 400 documents per minute of both character-sensed and mark-read information. Model 1 has three sorter pockets and is priced at $138,600 and Model II, which can also be used for off-line sorting of documents, has 13 sorter pockets and is priced at $152,100. IBM CORP., DATA PROCESSING DIVISION, 112 East Post Rd., White Plains, N. Y. For information:

CIRCLE 202 ON READER CARD

programmable logic panels

These 3½" high, standard 10" RETMA logic panels have been designed for rapid patchcord connection of digital logic. A storage register flip-flop panel, a control register flip-flop panel, a clock generator panel, modules for NAND gate control, inverter gate control and switching control are among the 28 standard panels available. CONTROL LOGIC, INC., 11 Mercer Rd., Natick, Mass. For information:

CIRCLE 203 ON READER CARD

Recomp periquip

New additions to the RECOMP product line include magnetic tape units to expand the RECOMP II; a card adapter unit which allows tie-in of tab card equipment to either the RECOMP II or III; a high-speed FACITAPE paper tape reader for the RECOMP III, and an X-Y digital plotter for the RECOMP II or III. AUTONETICS INDUSTRAL PRODUCTS, 3400 E. 70th St., Long Beach, Calif. For information:

CIRCLE 204 ON READER CARD

readout display

The De-Me-Drive (Decoding Memory Driving) has been designed for use with single plane digital readout displays. Features include use of six volt, high current lamps, no DC power supply requirement, inherent storage and coding capability, and output signal capability. ADVANCED RESEARCH ASSOC., INC., 7428 Westmore Rd., Rockville, Md. For information:

CIRCLE 205 ON READER CARD

information storage-retrieval

The Mark II COMAC (Continuous Multiple Access Comparator) consists of a transistorized information retrieval machine and externally-stored punched cards. The system requires one minute to search a file of 100,000 items by internal comparison. DOCUMENTATION, INC., 7900 Norfolk Ave., Bethesda, Md. For information:

CIRCLE 206 ON READER CARD

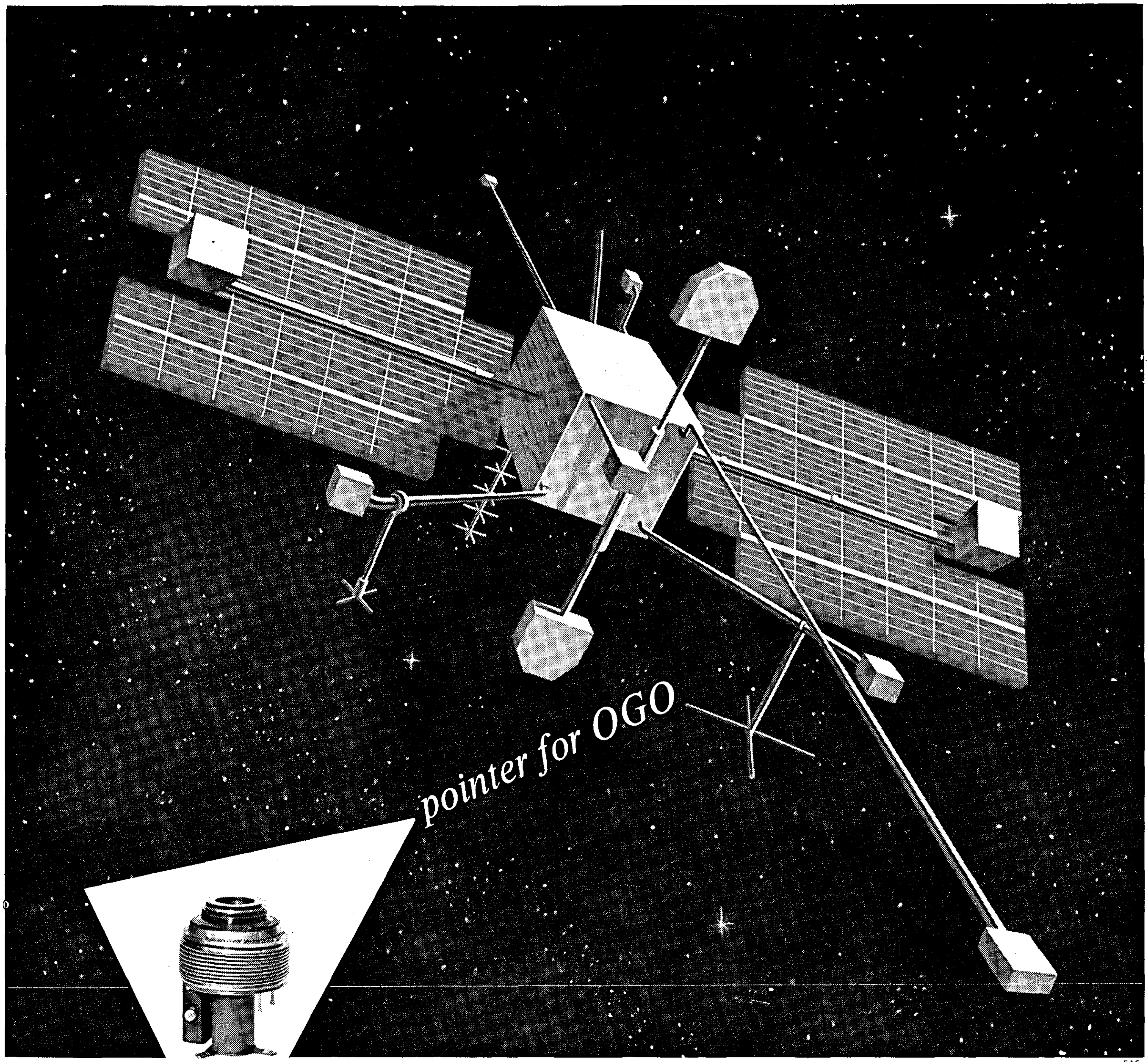
optical character reader

This new device is able to convert printed information directly to magnetic tape for computer input. The reader is of particular value in applications which require a high input volume of "turn around" documents. The reader sells for $157,500. REMINGTON RAND UNIVAC, 315 Park Ave. S., New York 10, N. Y. For information:

CIRCLE 207 ON READER CARD

nanosecond diodes

These nanosecond, gold bonded, germanium diodes CGD-1092 and 1093 are particularly suited for such applications as high speed computer circuits. Response times are in the nanosecond recovery region, with forward


pointer for OGO

conductance up to three times better than standard silicon diodes, it is claimed. CLEVITE TRANSISTOR, Waltham, Mass. For information:
CIRCLE 208 ON READER CARD

tape system
The TM-4100 series of self-contained tape memory systems combine the TM-4 tape transport with series DE-100 solid state electronics, designed to operate at densities up to 600 bpi or 800 bpi with digital clock. The system is able to read, write and check digital data in computer formats interchangeable with the IBM 729 II and IV tapes. AMPEX CORP., 934 Charter St., Redwood City, Calif. For information:
CIRCLE 209 ON READER CARD

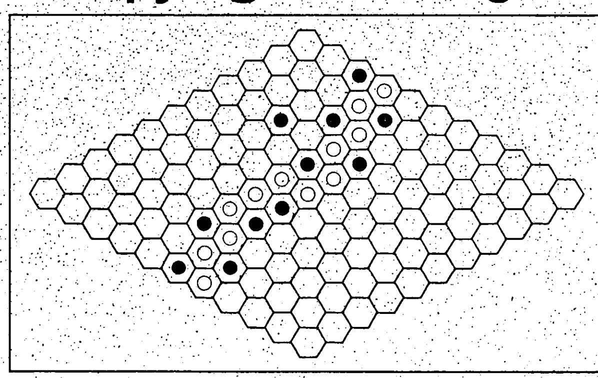
digital stepping recorder
The design of the DSR-1250 has made possible asynchronous operation at speeds up to 300 discrete steps per second. As many as 32 tracks can be recorded on one inch tape employing self contained electronics. DIGI-DATA CORP., 4908 46th Ave., Hyattsville, Md. For information:
CIRCLE 210 ON READER CARD

pert-o-graph
This pocket-size circular scale device has been designed for time/cost estimates in PERT management techniques. The Pert-O-Graph provides an inexpensive method for computing the "expected time" for many activities contained in an average PERT network. This device may be obtained by sending $1 to MERCHANDISING METHODS, INC., P. O. Box 2089, San Francisco 26, Calif.

tod & cdt readout
These systems modules have been designed to take binary coded decimal inputs directly from a system, convert this code and supply driving power to optical display or time of day and/or count-down time, either at remote locations or at the system controle. All modules operate from the binary coded decimal signal supplied by the central system. BINARY ELECTRONICS CO., 1161 E. Ash Ave., Fullerton, Calif. For information:
CIRCLE 212 ON READER CARD

orthomat
This numerically controlled engineering drafting machine automatically translates mathematical formula defined on punched or magnetic tape into engineering drawings at speeds up to 200 inches per minute. The Orthomat can operate independently or as an integral part of total engineer-

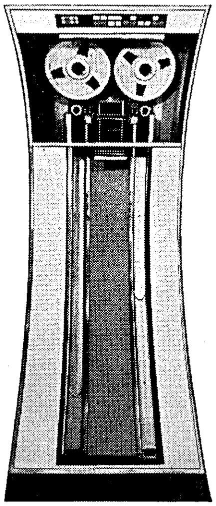
occupying the hexagons



White weaves an unbroken chain and a game of Hex* ends. Never a tie, for to block is to win, and one player is invariably blocked. Your opponent. Not chance, not guesswork, but a plan. A plan which takes chance into account, which conjectures all possibilities, and selects the best strategy from among alternative strategies. The winning one. So the winning of real conflicts becomes more of a science as we apply mathematical methods in selecting optimal military strategies, precise predictions on which the future shape of our military systems will be based. Such are the capabilities of our engineers and those we seek. If you would like to contribute to the determination of tomorrow's directions and the design of commensurable equipment and systems, you are invited to apply. Projects include sophisticated advancements in intelligence, detection, surveillance and reconnaissance systems for offensive and defensive missions. Send your résumé to Mr. Harry M. Laur and expect immediate attention. Litton Systems, Inc., at 6700 Eton Avenue, Canoga Park, Calif., is an equal opportunity employer.

LITTON SYSTEMS, INC./ DATA SYSTEMS DIVISION A DIVISION OF LITTON INDUSTRIES

*Invented by Piet Hein, Copenhagen, Denmark



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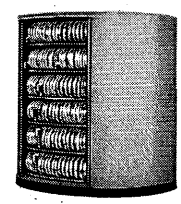
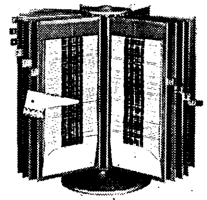
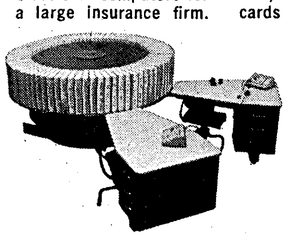
and organize its output of working energy. Slow, conventional files starve your computer into profit anemia . . . and fritter away its wonderful work output. For top results, team your automation with equally swift Acme input and output access units . . . rotaries, stands, cabinets. A single Acme Power Rotary puts 250,000 punch cards, thousands of feet of tape or printed sheets at your finger tips with push-button speed. For basic I.D.P., Acme Edge-Punched Cards (stock or custom printed) and flip racks let operators find, feed, file, faster than most machines can operate. Ask your Acme man to tailor a system to your needs. Meantime, mail the coupon.



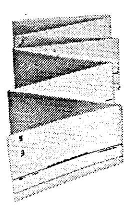
672 TAPES INSTANTLY ACCESSIBLE—One of six Acme Rotaries that feed electronic computers for a large insurance firm.



FOR I D P AUTOMATION — Acme Super-Visible frames let operators find, feed and file punch cards fast.



COMPUTER OUTPUT AT FINGER TIPS—This Acme Rotary houses 84 "print-out binders" to centralize all output data.



EDGE-PUNCHED CARDS —Acme produces the widest variety of single or continuous form edge-punched cards.

ACME VISIBLE

ACME VISIBLE RECORDS, Inc.
8805 West Allview Drive, Crozet, Va.
Please give me full facts on Acme equipment and systems for getting top profit results from large or small computers.

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TITLE__________
COMPANY__________
CITY__________ZONE____STATE______

CIRCLE 42 ON READER CARD

IBM® Data Systems Division Extends the Range of

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IBM's Data Systems Division offers experienced programmers unusual opportunities to make significant contributions in research, development, and applications. Listed below are some of the many interesting areas presently open to experienced programmers.

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Systems Supervisor	**Stack Job Scheduling**
Symbolic I/O	**IOCS**
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NEW PRODUCTS . . .

ing systems. UNIVERSAL DRAFTING MACHINE CORP., 1825 E. 18th St., Cleveland 15, Ohio. For information:
CIRCLE 213 ON READER CARD

automatic clock

A single or multiple clock system can be utilized to record usage time, determine time for billing or to record rental time on components. The time totalizers have been designed for use with the 1401. PACIFIC AERO SUPPLY, P. O. Box 3111—Olympic Station, Beverly Hills, Calif. For information:
CIRCLE 214 ON READER CARD

digital incremental plotter

The 656 is able to plot digital computer output in 1/100 inch increments at a speed of 300 steps per second. This equipment operates on-line with most medium-scale computers and off-line with large-scale models. The 565 is priced at $4,550. CALIFORNIA COMPUTER PRODUCTS, INC., 8174 E. Cleta St., Downey, Calif. For information:
CIRCLE 215 ON READER CARD

logic symbol kit

The SK-30 kit has been designed as an aid in the design of digital computers and systems which use S-PAC "NAND" logic. More than 1000 symbol stickers, in addition to technical information regarding individual S-PAC connections and applications are contained in the kit. COMPUTER CONTROL CO., INC., 983 Concord St., Framingham, Mass. For information:
CIRCLE 216 ON READER CARD

kard pack

This electronic control unit permits the joining together of two, three or four punched tag readers to a single summary punch to speed-up the conversion of data from punched tags to punched cards. A. KIMBALL CO., 8 Rewe St., Brooklyn 11, N. Y. For information:
CIRCLE 217 ON READER CARD

indicators and converters

The 1000 G indicator and the 1000 CG converters are available with a reflected binary to decimal input option. HOWARD INSTRUMENT CO., Red Bank, N. J. For information:
CIRCLE 218 ON READER CARD

decitrak

This new line of shaft-to-digital encoders eliminates the need for translation through "direct-decimal" format. Accuracy is one part in 4000

(±.025%) in a single speed system. DECITRAK will drive any commercial four-digit readout and is compatible with any digital printer. THETA INSTRUMENT CORP., 520 Victor St., Sadlle Brook, N. J. For information:

CIRCLE 219 ON READER CARD

digital word generator

Model 5140 is able to generate serial-binary information at bit rates to one megacycle and word lengths up to 40 bits. The output pulse width is variable from 200 nanoseconds to 1000 usec, ouput amplitude can be adjusted from 0 to 10 volts and rise time is 20 nanoseconds when operating into a 1000 ohm lead. The 5140 is priced at $3,750. RESE ENGINEERING INC., A & Courtland St., Philadelphia 20, Pa. For information:

CIRCLE 220 ON READER CARD

plug-in digital cards

The CS-series of digital circuit cards has been designed for counting and shifting operations. Model 1 operates from dc to 300 kc, model 2 operates to three megacycles and model 12 operates to 10 megacycles. Each card has two independent flip-flops with gates for counting either up or down, and shifting either right or left. Logic levels are OV and −10V ±2V. Prices range from $58 to $95. COMPUTER LOGIC CORP., 11800 Olympic Blvd., Los Angeles 64, Calif. For information:

CIRCLE 221 ON READER CARD

optical character reader

The Electronic Retina Character Reader is able to operate at rates up to 2,400 characters per second. It is of modular construction and is supplied with a variety of I/O devices to meet specific requirements. These include the rapid index page carrier, document carrier, journal tape carrier, card punch, microfilm carrier and magnetic tape control unit. RECOGNITION EQUIPMENT INC., Ross at Prarie Ave., Dallas, Texas. For information:

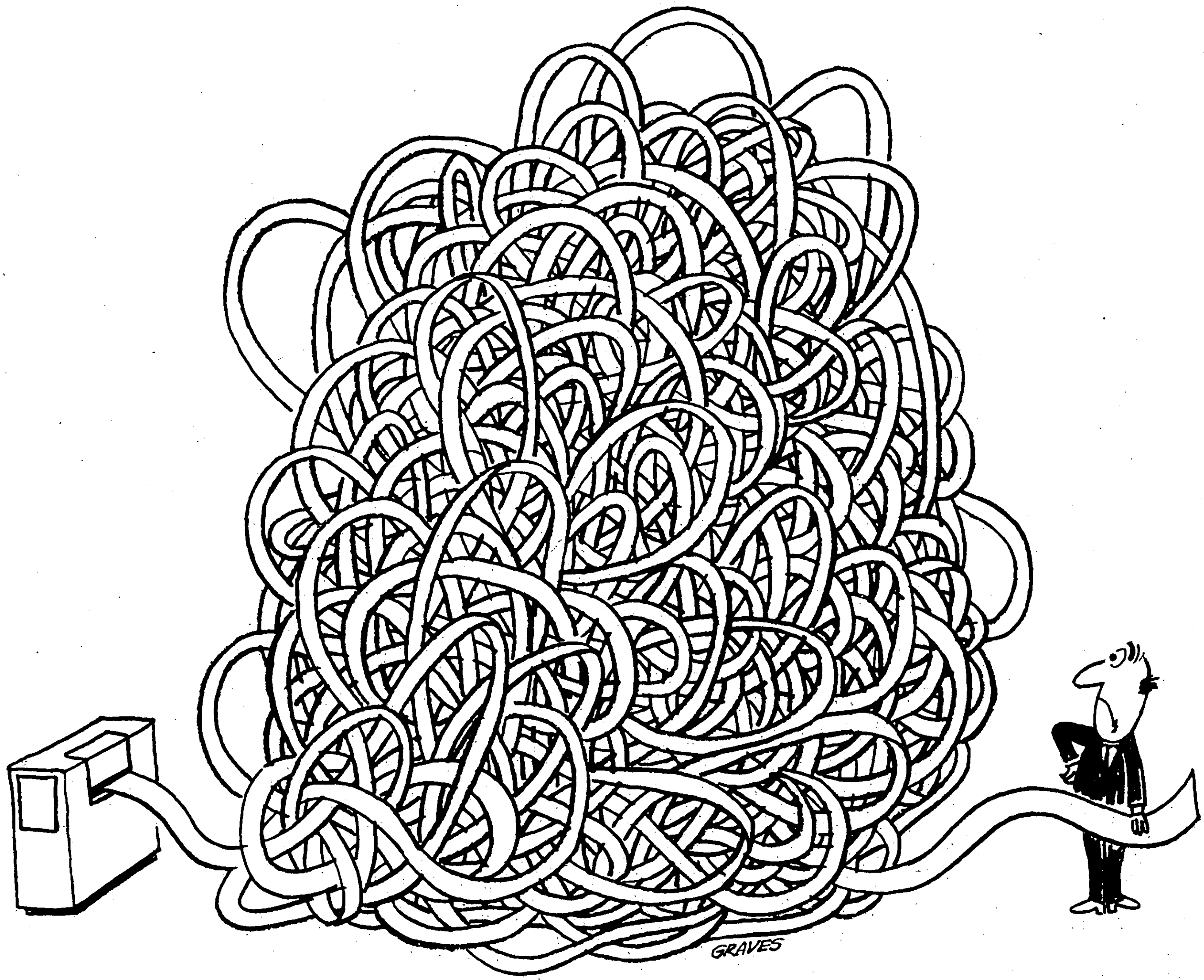
CIRCLE 222 ON READER CARD

tape processing console

The major components of this console are a tape punch, tape reader and two associated motor-driven, synchronized tape transports. The console, which features a 13-key keyboard input, is able to slot Mylar 35mm tapes for 13-channel time programmers. RYAN AERONAUTICAL CO., Lindbergh Field, San Diego 12, Calif. For information:

CIRCLE 223 ON READER CARD

DATAMATION'S FEATURE INDEX
JULY-DECEMBER, 1962


GRAVES

ADVERTISERS' INDEX