COMPUTERS
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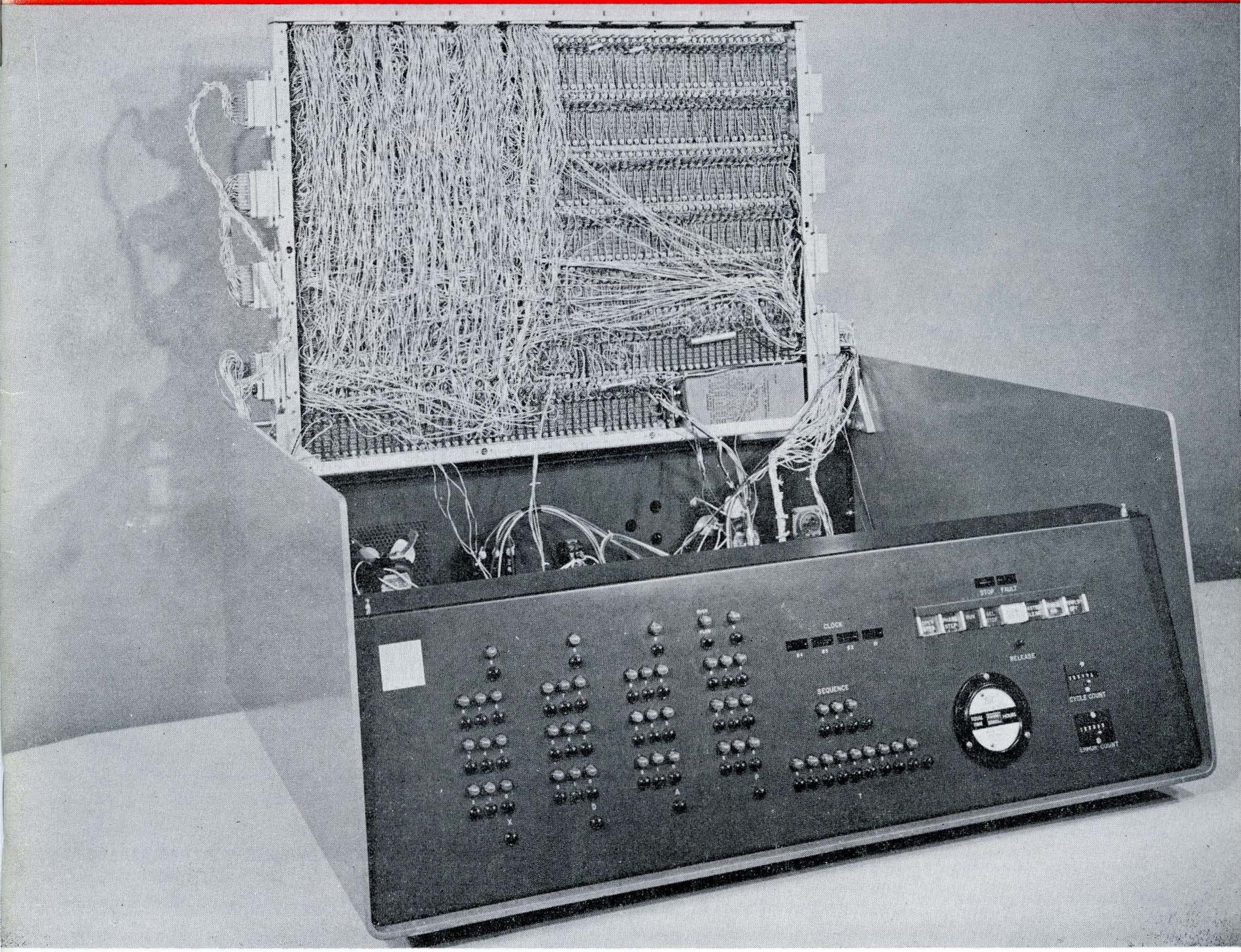
DATA PROCESSING • CYBERNETICS • ROBOTS



SOME IMPORTANT APPLICATIONS OF COMPUTERS

A Common Language to Program Computers for Business Problems

The 1960 United States Census and Data Processing

Handling Naval Tactical Situations

OCTOBER
1960

VOL. 9 - NO. 10 & 10B

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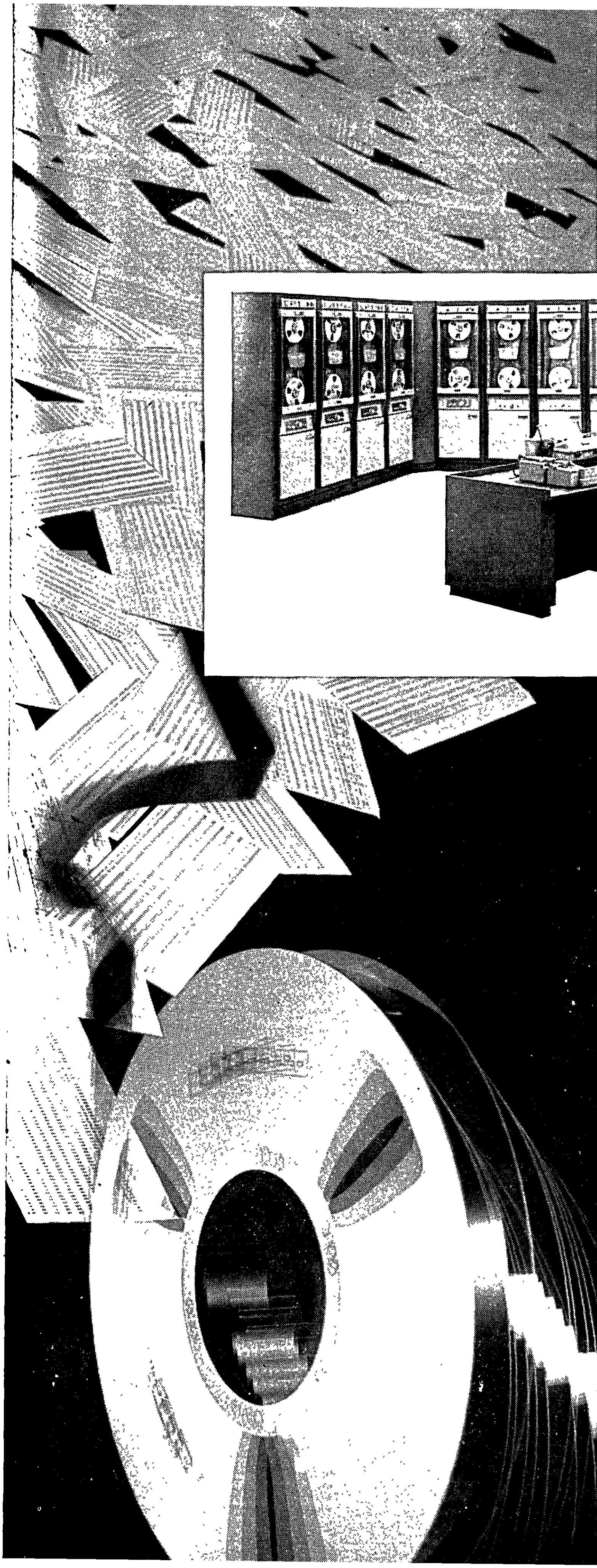

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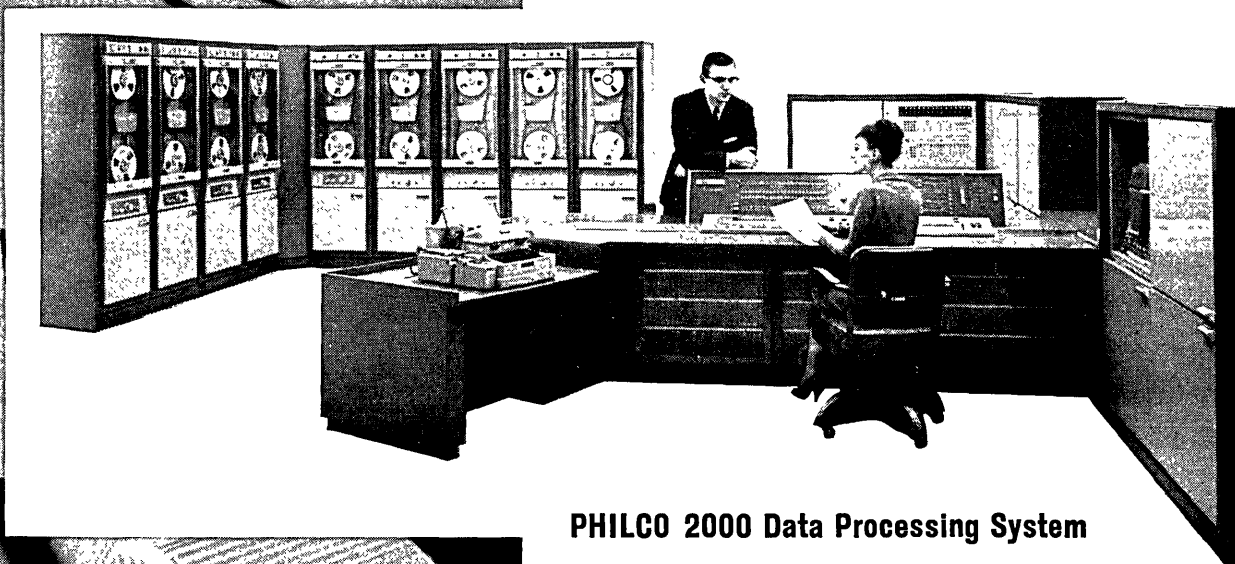

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Vol. 9, No. 10B

News of Computers and Data Processors:
ACROSS THE EDITOR'S DESK

. . . . inserted between pages 16 and 17 and between pages 24 and 25

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A Common Language to Program Computers for Business Problems

Second Report

Charles A. Phillips

Director, Data Systems Review Division
Office of the Assistant Secretary of Defense (Comptroller)
Washington 25, D.C.

(Based on a talk given at the Meeting of the Association for Computing Machinery, Milwaukee, Wisc., August, 1960)

At the Annual Meeting of the Association for Computing Machinery held in Cambridge, Mass., September, 1959, a report was made on the initiation of a joint effort of computer users and manufacturers, to improve communications between men and machines. This joint effort is now called the Conference on Data Systems Languages or CODASYL. This article is a report of developments under such joint effort during the past year.

This spontaneous and voluntary effort was motivated by a very widespread and pressing need for a common problem-oriented language that could be used to express data-processing problems for digital electronic computer applications. By coupling "automatic compiling" techniques with such a language, there appeared to be a great potential for reducing the high costs of computer programming in both government and industry and of getting computer programs "on the air" more quickly.

At the suggestion of a group of computer people from the University of Pennsylvania, the Department of Defense sponsored the first organizational meeting in May 1959, and undertook to give support and leadership to the resulting program. In addition to the problems of high cost and excessive time for computer programming, Defense had another related problem (which was shared by many of the large industrial users). This was the problem of interchanging computer programs between installations using different makes or models of equipment. Understandably, not all computer manufacturers could be expected to recognize the importance of this problem or to enthusiastically support efforts leading to its solution.

As reported last September, and published in the January 1960 issue of **Computers and Automation,** the CODASYL program was divided into three parts. Each had a different time schedule and task group. Everyone was given the opportunity to work with the group of his choice. The Short-Range Task Group was charged with studying the strengths and weaknesses of existing automatic programming languages, such as FLOWMATIC, AIMACO and COMMERCIAL TRANSLATOR, and coming up with a composite of these, or something else that would work; it had a target date of September 1959. The Intermediate-Range Task Group was to pick up where the first group left off and develop a systems-oriented language with a target date ending in 1961. The Long-Range Task Group was to explore fundamentals and philosophies of computer languages, whether used for scientific or business-type problems, and look into the feasibility of developing a Universal Computer Language which might combine ALGOL with the new business-oriented language. It was recognized that the objectives of these three task groups paralleled work that was going on in ACM and other organizations. It was expected however that a high degree of cooperation could be worked out with other such working groups, and that the CODASYL effort would be complementary rather than competitive. It was also believed that the initial efforts might proceed more smoothly and faster if unhampered by the rules, relationships and procedures of a formally chartered organization. Considerable emphasis was placed on the need for speed in the early phases of the CODASYL program.

The Short-Range Task Group

On the last day of the 1959 ACM Conference, the Short-Range Task Group made an interim report to the CODASYL Executive Committee meeting at the Harvard Business School. This Task Group was composed of representatives of six computer manufacturers — Burroughs, IBM, Minneapolis-Honeywell, RCA, Remington-Rand, and Sylvania — and three Government agencies — Navy Bureau of Ships, Air Force Air Materiel Command, and the National Bureau of Standards. The Computer Science Corporation also worked with the group from time to time. Joe Wegstein, who had done considerable work on the ALGOL language, was Chairman.

COBOL

In the first three months after its formation, the Short-Range Task Group held over a dozen working meetings. They concluded that it would be feasible to develop a common business-oriented language that was machine independent, open-ended, and used English or pseudo-English. The Group had gone beyond their original terms of reference, which would have limited them to a study of existing languages, and had considered the work being done to improve these languages and to develop others. They presented to the Executive Committee a framework upon which they believed an effective language could be based and asked that their target date be extended to December 1959. This was done. Through intensive work at a series of meetings, the Short-Range Task Force completed their work and submitted their final report in December. This report contained the initial specifications for a language which they suggested be called COBOL, for COmmon Business Oriented Language.

Meeting January 7-8, 1960, in Washington, the CODASYL Executive Committee reviewed and accepted the Report and proposed that arrangements be made for its publication by the Government Printing Office, thus avoiding any commercial exploitation of the results of this joint voluntary effort. The Executive Committee also appointed an ad hoc Editorial Board to review the Report and specifications, rewrite parts of the introductory chapter, and correct all typographical, grammatical or other obvious errors. The Board went somewhat beyond this and suggested twenty or so substantive changes which, after clearing with the members of the former Short-Range Task Force, were incorporated in the final draft submitted to the printer in April 1960. The Department of Defense arranged to have COBOL printed as a Government Report. It became available July 1st and was distributed to the entire CODASYL mailing list. The COBOL report may be ordered from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., and the single copy price is 75¢.

In all, thirteen months elapsed from the conceptual meeting in 1959 until COBOL was published and distributed. Of this time, seven months represents the period of development in the Short-Range Task Group. The remaining time was for editorial review, set-up and publication. The speed with which the development work was done is striking evidence of the strong support and the highly cooperative approach of all participants, which has characterized the CODASYL program from the very beginning.

This report will not attempt to describe COBOL or its application, since other sessions at the 1960 ACM conference will do so.

Maintenance of COBOL

It is however, desirable to point out that the Short-Range Task Group and the CODASYL Executive Committee recognized that there were deficiencies in the initial specifications of COBOL. In fact, the introductory chapter identifies several features that should be added as rapidly as possible, such as sort-merge functions, table-handling functions, and report-writing extension. COBOL has not been offered as a panacea for all program writing ills; and refinement and improvement will come through experience in its use.

To be effective, a programming language must be dynamic and quickly responsive to questions involving ambiguity, error, or needed improvement. This was recognized in the report of the Short-Range Task Group, which recommended dissolution of that group and the formation of a committee to maintain COBOL. Acting on this recommendation, the CODASYL Executive Committee set up a Technical Committee, composed of representatives of computer manufacturers, and a Maintenance Committee, composed of representative computer users, and charged them jointly with COBOL maintenance. As the result of experience over a few months, this structure has been modified slightly to streamline the maintenance function and to identify more correctly its membership composition. The two previous committees have been merged into a single COBOL Maintenance Committee, with a dichotomy composed of a Manufacturers' Group (the former Technical Committee) and a Users' Group (the former Maintenance Committee). Ten manufacturers and twelve major users are now represented on these two groups. They meet concurrently (with at least one joint session) as frequently as needed. Meetings are held about once every three weeks and are usually of two or three days' duration. This change in maintenance technique should result in quick resolution of problems arising in the development of compilers or other questions arising in the further implementation of COBOL.

Changes or additions to COBOL specifications that are agreed to by the COBOL Maintenance Committee are reproduced and distributed to the CODASYL mailing list. Two groups of supplements, with fifteen supplements in each group had been released through August 20. Periodically, these supplements will be combined and printed as revised pages of the COBOL manual. On the basis of experience to date, it appears that such revised pages will be distributed to the CODASYL membership about once each six months and will simultaneously be available for purchase through the Government Printing Office.

Conversion of COBOL into Particular Codes

To convert the source program written in COBOL into an object program in the machine code of a particular make or model of computer requires a compiler or processor. Such compilers are developed by the manufacturer of the computer and represent a substantial investment in technical skill. All of the computer manufacturers who have representation on the COBOL Maintenance Committee have indicated their intent to develop compilers for COBOL; some have made public announcement on this subject. In addition to these ten manufacturers, several others in this country and abroad have indicated their intent to develop COBOL compilers. At the June 1st meeting of the CODASYL Executive Committee the Chairman was directed to obtain as much detail as possible from computer manufacturers on their plans to develop compilers, including a time schedule. Some of the schedules indicate that compiler development is nearing completion and at least two such compilers should be ready before the end of the calendar year.

Several components of the Department of Defense, as well as a number of large industrial users of computers, are now writing source programs in COBOL. The standard Government rental contract now being negotiated with computer manufacturers by the General Services Administration contains a clause in which the manufacturer is asked to indicate whether he will or will not provide a compiler for COBOL. The three military departments now have under consideration the issuance of policy statements to provide that the source program for most business-type applications shall be written in COBOL, regardless of whether or not it can be automatically compiled into an object program for a particular make or model of computer. Proponents of such a policy argue that such a standard narrative statement of a source program will foster a better understanding of computer programs on the part of managers and facilitate the interchange of programs between installations having the same basic data processing problems. Another advantage to be gained from such wide-spread use of COBOL as a source program language would be in the early discovery of weaknesses or deficiencies in the language and the prompt inauguration of corrective action through the COBOL Maintenance Committee.

The Development Committee

With the acceptance of the COBOL Report by the Executive Committee, the CODASYL program was reorganized into two major efforts; one to maintain and strengthen COBOL through the COBOL Maintenance Committee as just described; the other to continue the promotion and conduct of research into the more advanced aspects of communications between men and machines, and to develop a systems-oriented, computer-independent language for the expression of business problems in procedural form. This second major effort of the CODASYL program is the responsibility of the Development Committee which was formed by the consolidation of the Intermediate-Range Group and the Long-Range Planning Group. Mr. Robert B. Curry of the Southern Railway System, former Chairman of the Long-Range Group, became the Chairman of the Development Committee and Mr. A. E. Smith of Navy, former Chairman of the Intermediate-Range Group became the Vice Chairman.

There are over forty active members in the Development Committee with about one-fourth from computer manufacturers, another fourth representing industrial computer users, and the remainder from Government, educational institutions, consultants and research activities. The scope of interest of the Development Committee is very broad and has many ramifications.

Systems Group

To deal with the problems effectively the Development Committee has been organized into two task groups — a Systems Group under the chairmanship of Les Calkins of U. S. Steel and a Language Structures Group under the Chairmanship of Roy Goldfinger of IBM.

The Systems Group is further divided into East and West Coast Sections with Les Calkins heading the Eastern Section and Jack Strong of North American Aviation, the Western Section. These two sections jointly have the responsibility of reviewing or conducting research on business problems and procedures and providing guide lines for the Language Structures Group in the pursuit of its task. Working through sub-committees these groups will study and analyze better methods of expressing and documenting data processing problems, the requirements of advanced data processing technology such as decision making and the management sciences, problems of data arrangements and data forms, and present their findings and recommendations to the Language Structures Group.

Language Structures Group

The Language Structures Group will work in two areas: Current Languages, and Future Languages. The objective in the current language area is to examine, compare, and attempt to classify existing languages in order to advance the understanding and development of language structures. The prime goal in the future languages area shall be to investigate the feasibility of a problem-description language (as opposed to a procedures-description language) and, if feasible, to develop such a language, the characteristics of which would include: 1) complete machine independence, 2) a strong orientation toward the Systems Analyst, 3) a broad range of applicability and 4) minimal redundancy. With such a language the Systems Analyst would describe his problem input data and required results. The Compiler should then be capable of determining a) the procedures required, b) content and organization of intermediate files, and c) instructions for the computer operator.

CODASYL Development Advisory Board

Recognizing that the Development Committee had a very ambitious undertaking, the CODASYL Executive Committee approved the formation of a CODASYL Development Advisory Board as a means of broadening the base. Such a Board would be composed of representatives of organizations of computer users who are actively concerned with the problems of business language development, together with selected individuals from Universities that are conducting research and training programs in this area. The Development Advisory Board will be asked to contribute advice and counsel on the basis of the collective knowledge of the organizations and Universities they represent. They will in turn be informed in detail of developments within the working groups. The Board members would thus constitute an effective liaison between the organizations and Universities and the CODASYL effort.

The first meeting of the CODASYL Development Advisory Board was held August 22nd in Chicago and was attended by representatives of GUIDE, SHARE, UNIVAC Users Association, UNIVAC Scientific Exchange, the Association for Computing Machinery, Massachusetts Institute of Technology, and the University of North Carolina, together with the Chairmen of the CODASYL Development Committees and Groups.

From the very beginning the CODASYL effort has been dependent upon a high spirit of cooperation. Without this spirit — particularly between the computer maunfacturers — COBOL could not have been developed. The continued success of the venture, maintaining and strengthening COBOL and developing new methods of improving the communications between men and machines will equally depend upon this same cooperative spirit.

SOME IMPORTANT APPLICATIONS OF COMPUTERS

NAVY AIRCRAFT MAINTENANCE -- OPTIMAL SCHEDULING

I. J. Seligsohn
C-E-I-R, Inc.
Arlington, Va.

Scheduling of the various maintenance jobs on Navy aircraft has entered a more scientific stage, making use of large digital computers. This company has devised a system that essentially reproduces the entire maintenance cycle for all Navy aircraft and finds solutions that provide the absolute minimum total maintenance time.

The model simulates the entire complex of Navy aircraft, the plants for maintenance, and all the possible shipping routes from the fleets to maintenance plants and back to fleets. The computer (IBM 704 at present, but it will be an IBM 7090 in the near future) determines the routes and plants for each of the many thousands of aircraft, paying attention to priorities, items in process in the plants, inventories, expected fleet releases, man-hours available at plants, efficiency of plants, learning curves, and many other factors. Consideration is even given to the weather at each plant. The model involves some ten thousand variables. The magnitude of the problem can be seen from the fact that in any quarterly period some one thousand airframes and three thousand engines come in from the fleets all over the world for cyclical overhaul at eight maintenance facilities in the U. S.

The computer seeks optimality - the minimum total out-of-service time for all the items; finding the best routings, and in effect providing an optimal work loading schedule for the eight maintenance plants, a shipping schedule and a schedule of completions by the plants. Each schedule is determined through the optimality feature - to minimize out-of-service time.

Besides scheduling the aircraft, the computer model provides a new planning method for the Navy. Since the model is indeed a sensitive reproduction of the entire operation, policy changes can be tested on the model without ever disturbing the real life operation. For instance, multi-shift operations can be tested to gauge what advantages and disadvantages would take place in the real life operation.

Since the computer scheduling method will provide the minimum maintenance cycle time for all the aircraft and engines, extensive reductions in requirements for procurements are anticipated. The model has been fully tested and approved for operation by the Navy. Expected savings to the Navy are several million dollars per year.

The model can readily be applied to any industrial operation with proper changes in the inputs (tasks, resources, transportation, etc.). The optimality feature can be changed at will to minimize costs, maximize profits, minimize distances, minimize idle time, or any combination of these.

TEACHING MACHINE SIMULATED BY COMPUTER

John E. Coulson and Harry F. Silberman
System Development Corporation
Santa Monica, Calif.

A very versatile teaching machine, controlled by a computer, has been developed by a team of psychologists, educators, engineers, and statisticians at this organization. The control and basic decision-making element of the teaching machine is a Bendix G-15 computer.

The study of factors important in teaching and learning processes, specifically, which factors most influence man-machine learning, is the basic problem being investigated. The physical goal is a flexible, automatic, teaching machine that can release teachers from their roles as paper graders and drill masters so that they can teach more creatively, and increase the learning efficiency of individual students.

The teaching machine -- a man-machine system, where man is the student and machine the teacher -- offers the advantage of insuring more exact control of the experimental situation. Every nuance of teaching machine behavior can be precisely specified and, if necessary, precisely repeated.

An important aspect of machine teaching is the method of presenting subject matter. Once a subject for study has been selected, the material is analyzed into conceptual elements. The elements are placed on photographic slides for presentation to the student. From 20 to 40 slides may be required to complete instruction on a given topic. A single course may include up to 500 of these topics or principles (or up to 20,000 instructional slides).

The computer can be programmed variously to suit varying experimental requirements. A slide selection program designates the instructional materials to be presented to the student. These materials are contained on 35mm slides, which are mounted in a large random-access slide projector of a new type developed by SDC. Each slide consists of instructional information and a question. The student inserts his response to the multiple-choice questions in the computer typewriter. The computer then records and evaluates his response and notifies the student of the results of the evaluation. The slide-selection program selects subsequent slides based on the student's pattern of errors, time required to answer questions, and the student's indication to the machine of how well he understands the material.

Teaching machines in the past have been characterized by their simplicity of operation and their inflexibility. However, the greatest advantage in using a teaching machine may lie in its ability to adapt to individual differences in learning ability. This requires a considerable degree of flexibility, of the type exemplified by SDC's experimental machine. With this machine the faster students are moved ahead rapidly, while those having difficulty are given extra remedial instruction. Individual abilities are taken into account in order to determine the nature and order of subject matter, the rate of presentation, the nature of reinforcement, and the amount of practice required.

The probable outcomes of the project are: (1) development of an improved teaching machine with additional diagnostic capability as well as tutorial capacity and improved modifiability; (2) development of a research tool able to provide answers to questions regarding the nature of man-machine learning; and (3) additional knowledge of program and hardware development of these machines.

THREE IMPORTANT APPLICATIONS OF COMPUTERS

P. A. Walsh
IBM Data Processing Div.
White Plains, N. Y.

I. Sea Search Operations

One of the most dramatic applications of an IBM RAMAC 305 has been made by the U. S. Coast Guard. Installed in the Eastern Area Command Headquarters in New York City, the Coast Guard RAMAC is being used to expedite search and rescue operations in the North Atlantic Maritime Region, which also includes the Caribbean Sea and the Gulf of Mexico.

Everyday, the computer charts the course for all merchant vessels in this area, regardless of nationality. In case of emergency, the latitude and longitude of the ship in distress is entered in the computer. The RAMAC 305 automatically determines which vessels are in the immediate and surrounding areas so that the best situated ships can be contacted and requested to participate in rescue operations.

II. Computer Aims Echo Beams

An IBM 709 at NASA's Goddard Space Flight Center is playing an interesting role in the Project ECHO experiment, which may lead to global TV and new forms of world wide communications.

By tracking and computing orbits of the 100-foot sphere as it passes over the U. S. from west to east, the IBM computer tells primary stations in California and New Jersey where and when to aim their antennas to bounce radio signals off the ECHO sphere. Two other IBM 709's also are involved in Project ECHO. One, at Cape Canaveral, forecasts information on the flight of the Delta three-stage rocket. The other 709, at the IBM Space Computing Center, Washington, D. C., produces timetables on the balloon satellite for global cities.

III. IBM and the Olympic Games

The XVII Olympic Games in Rome will rank as one of the most important Olympic Games in history to date. A very great number of athletes are participating. Many new countries are represented for the first time in an Olympiad.

In order to provide a complete and detailed analysis of information concerning every event and of all the athletes who are participating, IBM set up in Rome at their offices in Via Veneto "The Olympic Games Electronic Information Center". The Center is equipped with a RAMAC 305, a data processing system with a 10 million character magnetic disc memory.

Every result is flashed immediately through the Olympic Games network to this Center. There the results are analyzed, compared, and stored in the machine's vast memory. At the end of each day, all results are summarized and published in a daily bulletin. This bulletin is issued to all members of the press, radio, and TV present in Rome during the Games.

THE APPETITE FOR INSTANT NEWS — ELECTION PREDICTIONS

Stephen E. Wright
Applied Data Research
Princeton, N. J.

(Based on a report given at the meeting of the Association for Computing Machinery, Milwaukee, Wisc., August 26, 1960)

As a new presidential campaign begins to gather steam, the country will soon be caught up in a rising wave of excitement. The horses are making the final turn, the stretch run will soon begin. As in recent years, the culmination of the race on Election Eve will be watched by that new phenomenon, the electronic tout. All 3 major networks will employ computers in a desperate race to report the news before it happens.

Predicting elections on computers must rank high in the list of useless activities, Professor Jackson's Bridge-Playing Program notwithstanding. Outside the gambling profession, there is no possible benefit in making a good guess 6 or 8 hours before the vote is known with certainty. Besides, why should people in their right mind stick their necks out before millions of kibitzers when events may prove them wrong before the night is out?

The answer lies in our appetite for instant news, magnified by the power of the broadcasting industry. A public that waited in agony for news about Princess Margaret's wedding gown cannot be allowed to learn the identity of our next President from the morning papers.

And so it was that in November, 1952, UNIVAC marched, or stumbled, on the political stage. Its advent was made propitious by the extreme caution that its predecessors, the pollsters, displayed that year. That election took place, you will recall, during the final months of the administration of President Dewey.

Besides, Gallup and Roper are only human, whereas the electronic computer is endowed with big magic. The admiration of the public for the giant brain is mixed with the sly hope that it will fall on its face and thus confirm the ultimate dominance of man over machine. I must also mention the undeniable fact that statistics somehow smacks of un-Americanism. Obviously, the ability to predict the future action of people is a negation of the democratic process, leading to thought control and socialism.

Needless to say, these factors increased the news value of the computer's performance to the television networks. This interest of the networks was matched by that of Remington Rand who undertook the election project in 1952 in the hope of publicizing their then new prodigy. In this they succeeded brilliantly and overnight. "IBM's UNIVAC" became a household word. It is unfortunate that the household market was not ready for this product.

Now let us dismiss for a moment the frivolous nature of this activity and see how such predictions are actually made.

Our historical model is the old-time wardheeler (nowadays even poll-watchers are states-men), who watched the votes come in from the doubtful precincts, those with real live voters. He might say "We got 200 more votes in Ward 16 than this time last year. With that kind of lead we usually pile up a majority of 2,000 in the district. They have a lead of 3,000 in the suburbs, but our vote always comes in late there. I better go pay my respects to the new Mayor."

In national elections, the volume of data is too great and the vote comes in too randomly to make evaluations at the ward and precinct level. But some basic ideas behind this analysis are used; the extrapolation of the current vote in time, the comparison with past results, and the extrapolation in space. And of course, the computer can make a quantitative analysis, both of past data and current returns.

It thrives on digesting large chunks of data and emitting simple-minded summaries. It does so quickly and accurately. Whether it also does so correctly depends on the statistical model used, the skill of the programmers, and, I must confess, luck.

Probability being what it is, a perfectly sound prediction may be wrong, and in making a flat prediction between two candidates, to be wrong is to be 100% wrong, to the delight of newspaper editors, political pundits, and broken-down horseplayers.

In the previous elections, we were lucky; but, with the exception of the contests for the 1954 Congress, the races were not too close. (I find myself developing a callousness toward politics, to the point where I hope for a landslide victory, regardless of who wins. And I have become a fervent advocate of the two-party system; I shudder at the thought of predicting 3-way races!)

The statistical model we used in predicting elections on UNIVAC was developed by Dr. Max Woodbury of New York Univ. Since Dr. Woodbury is currently on a good-will tour of Europe and can't fight back, I must warn you that my knowledge of statistics is not only negligible but strongly biased. As a defrocked electronic engineer, I have always suspected that there is something fishy about probability theory. I had many battles over the years with Dr. Woodbury in programming his statistical models, battles that I fought for common sense versus statistics; it is galling to admit that he was always right, so far.

The kind of model we choose is restricted by the nature of the available data. It is desirable to get final votes from a number of properly chosen key precincts or districts, politically stable and uniformly distributed among the major regions of the nation. As this kind of data is available only after the last viewer has gone to bed, we must make do with anything that we can get, as early as possible. This means that we must rely mainly on the two major wire services, supplemented by special phone and teletype reports.

The wire services report national races primarily in the form of totals for each candidate in a given state, and the number of precincts reporting.

A typical return from the last presidential election is: Vermont — 243 precincts out of 720, Eisenhower 5120, Stevenson 30. In states with large metropolitan areas, the vote may be broken down by city and upstate.

Information about finer subdivisions is theoretically available, but usually excluded because there are limitations in feeding huge volumes of data, all manually transcribed, to the computer; difficulties in analyzing past data; etc.

Hence the state is our basic unit in handling predictions in Presidential and Senatorial Elections.

Within each state, we have two possibilities:

a. If some reports from this state are available, we ask, knowing the 2-party vote at this time, what will be the distribution of the final vote.
b. If no reports from this state are available, we ask, knowing what the trend is in reporting states, and knowing how this state voted in the past, what will be the distribution of the final vote.

That is, within each reporting state, we (1) extrapolate the current votes of each party to the final vote; (2) compute the predicted Democratic percent and compare it with past averages in this state; (3) compute a difference; (4) summarize these differences to produce a national trend; (5) then apply this trend to non-reporting states to predict their Democratic percents. This description of course is a greatly simplified version of the model actually used. In practice, these curves have a scatter that introduces an uncertainty, and this leads us to estimate a degree of precision of the extrapolation; this precision is a function that increases as more precincts are counted.

A state prediction is not all black and white. We have some reporting votes but we also consider the trend in other states. Many states are broken down into city and upstate vote, and we combine the predictions.

We thoroughly analyze past date. We have information back to 1944 for states and back to 1952 for some metropolitan areas. We make use of this information for assigning weights. Other objective factors besides past history could be taken into account, such as incumbency. Some subjective factors have been suggested: stands of candidates on the farm issue, labor, local issues, ..., but no quantitative measure exists. Time limitations have prevented the inclusion of these factors.

Gathering past data is an enormous job, but there are some references: Scammon's "America Votes", the Clerk of the House, etc. Data analysis must be repeated in each election, since the preceding elections furnishe the most reliably correlated data. Analysis of past data is back-breaking work even with computers. A mathematician like Dr. Woodbury is never satisfied with past programs, but always seeking "minor changes" to "improve" the program. Until you've programmed computers, you'll never know how major a minor change can be!

The program for the computer deals with control over the correctness of the data, especially mistakes in the teletype and telephone returns — mistakes in votes, in races, in areas. If there is an extra digit in the vote count, either the vote count is corrected or it is excluded; perhaps the parties have been reversed; the wrong area may have been reported; or the figures may have been invented.

We have to rely on human beings to transcribe the information into a form that the computer can accept. Therefore we have the information typed 3 times, and the computer accepts the information on a best 2 out of 3 basis. It is hoped that by 1962 computers capable of direct input will be available.

The computer checks that the total vote reported in the area this time is not less than the total vote reported last time. It also checks:

— that the number of precincts reporting is greater than last time;
— that the total number of precincts reporting is less than the total number of precincts in the area;
— that the total vote is reasonable;
— that the total Democratic percent is reasonable.

This year not only the major networks but three of the major computer manufacturers are caught up in the prediction rat-race. In fact, election prediction is now a required part of the news coverage. So far have we come in eight years!

SOME APPLICATIONS OF COMPUTERS

Service Bureau Corporation
425 Park Ave.
New York 22, N.Y.

I. School Registration and Grade Reporting

School registration and grade reporting programs have been prepared for use by the great number of school districts that can't afford to rent or buy their own punch-card or computing equipment. These programs cut the teachers' time in filling out report cards, and clerical time in preparing administrative reports.

Records and reports produced include: multiple copies of report cards for office and counselors; permanent records; student rosters; class rolls; grade analyses; rapid class loading; and a wide variety of statistical analyses.

II. Demand Deposit Accounting

Demand deposit accounting on a rental basis can bring almost all the advantages of high-speed computers to the small and medium sized banks, yet with no capital investment in equipment. Equipment for recognition of magnetic ink characters will be available for the first time in the Los Angeles SBC office in November.

Currently 18 banks in 14 cities use SBC's demand deposit accounting. Here is how the system works:

- All checks and deposits are automatically recorded on computer input cards. At the end of the day, the cards are sent to the computing center.
- Overnight, the high-speed equipment processes the bank's bookkeeping.
- The next morning, six management reports on the previous day's business are delivered to the bank. Depositors' statements are prepared as a by-product of the system.

III. Analysis of Flexibility of Piping

A piping flexibility analysis can be produced within 48 hours with "do-it-your-self" computer service. If needed, an analysis can be turned out in a few hours.

The piping system is described by the client on special data sheets, and sent to the SBC office in New York or Los Angeles. The computer program using an IBM 704 analyzes the piping system. Complete reports are then sent back to the client that include:

- anchor and restraint reactions;
- forces, moments, and stresses at all intermediate points;
- displacements and rotations.

Tangents, bends, and closed loops in any combination having any orientation are permissible. Flexibility and stress intensification factors are automatically introduced by the program. Changes to a system are easily specified since coordinates are not used in the input data.

LOW COST BOOKKEEPING FOR SMALL MACHINES

Charles A. Bail
President, A. S. C. Tabulating Corp.
Lake Bluff, Ill.

This company, a data processing center in a suburb near Chicago, is making electronic data processing available to the small businessman -- from the small manufacturer to the butcher, baker, and corner grocer -- for as little as $10 a month.

Feeling that everything done in the field to date had been for the bigger company, A. S. C. opened its door to the man who had been left out. The breakthrough came when A. S. C. succeeded in programming a Bendix G-15 computer to process large volumes of data at high speeds making use of punched paper tape input.

The recent advent of punched tape accounting was the first step in business machine processing of data for small businesses, eliminating the need to post records manually and do mathematical calculations. A. S. C., however, went one step beyond existing methods: instead of transferring current information from tape to punched cards as required by business machines, they fed the tape directly to the computer. This allows faster handling of more data. The individual, therefore, gains the benefits of large-volume processing on low-cost electronic equipment.

A monthly financial report requiring 8 hours for an accountant to complete manually -- assuming no errors are made -- can be processed by existing punch card machine methods in approximately 2 hours. By feeding the punched paper tape directly to the computer, however, the same report can be processed and printed in about 15 minutes. Approximately 300 bookkeeping entries, such as occur in a monthly financial report for a small account, can be processed electronically for a cost of $10. In addition to speed and economy, these reports offer the businessman more detailed and complete reports. For 1, 000 entries, the cost would be about $35. This is not just in the experimental stage; A. S. C. has been actively proving for nearly a year that electronic data processing is both practical and economical for the small businessman's general and specialized accounting needs.

Other types of punched paper tape applications (besides general accounting) already processed electronically by A. S. C. include specialized accounting such as sales analysis, inventory control, construction cost account, time accounting for certified public accountants and legal firms, and accounting for unions. For the individual entrepreneurs operating small stores, the service is available through their accountants. A. S. C. can also do branch accounting, such as preparing complete reports for the operation of a chain of gas stations or grocery stores, giving an individual breakdown of results at each location.

In this accounting application for A. S. C., the Bendix G-15 computer performs four operations simultaneously. It (1) reads current information from the tape, (2) reads informations about previous operations from punched cards, (3) does the sorting and calculating, and (4) punches updated information on cards from which the report is printed.

METEOROLOGICAL MEASUREMENT -- AUTOMATIC SYSTEM FOR OBSERVING AND DATA COLLECTING

J. F. Stephens
Data Handling and Control Systems
Bendix Pacific
North Hollywood, Calif.

The research and missile-firing activities at the White Sands Missile Range require collecting an appreciable amount of accurate meteorological data. To attain statistical significance, these data must be collected in a form which provides simultaneous correlation of parameters and ease of further reduction.

Old methods of recording on analog chart paper lacked accuracy, ease of evaluation, and ease of reduction. A different method was sought which would provide a greater quantity of more accurate micrometeorological information in the desired form.

A 220-foot tower was erected and instrumented at 10 levels. The sensors were directly wired to a console located nearby. Measurements include: horizontal wind direction and speed, vertical wind direction, air temperature, differential temperature, relative humidity, and barometric pressure. The number of instruments totals 65.

The system console is able to collect the data automatically, according to a preset program and on demand. The program panel permits the selection of parallel measurements to be observed, frequency of observations, and number of observations. Sampling cycles are continuous, and every 1, 5, 10, 30, or 60 minutes. Recording periods are 30 seconds, 2.5, 7.5, 15, or 30 minutes.

Simultaneous signals from the instruments are both analog and digital. They are generated as pulse train, voltage, and binary code. The console operates on each of these signals -- storing and translating them to a common language for feeding a typewriter and tape punch. In addition to logging the weather parameters, the system automatically enters into the log: time and date (second, minute, hour, day, month, and year); and computer program codes.

With the new system (an ELECTRO-SPAN product of Bendix-Pacific) 500,000 to 700,000 observations annually are expected as compared with but 1040 from the old chart method. Direct labor savings of approximately 3900 manhours per year are to be realized from eliminating laborious manual transfer of chart data to punched paper tape -- based on the old 1040 observations per annum. An equally important asset of the new system is its ability to make data available when it is needed.

A BLENDING SYSTEM CONTROLLED BY COMPUTER

J. F. Stephens
Data Handling and Control Systems
Bendix-Pacific Division, Bendix Corp.
North Hollywood, Calif.

A blending system has been fabricated by this company to demonstrate the feasibility of applying computer control to continuous, multi-channel, blending processes.

The primary function of a blending system is to maintain proportions of the ingredients according to a desired recipe. However, the system must also be able to recognize other intelligence and take appropriate action. Thus, a blending system can assume as many characters as applications.

The demonstrated system is composed of: the Bendix G-15 Computer; an input/output buffer; typewriter; turbine meters; and piston-type valves. These system elements are standard equipments. The demonstration system uses all techniques required in a large system but for convenience of demonstration controls only two streams. Water is used for the fluid, although typical applications would include the products of such processes as petroleum refining, chemical blending, food processing, missile propellant controlling, etc. Connected in a closed system, the turbine meters in each line supply pulses to the computer at a frequency proportional to actual flow. The computer has been programmed to control each stream flow according to a certain proportion. If the actual flow differs from the desired, a DC signal is supplied to the valve actuator. Each valve control signal is brought up to date every 5 seconds (nominal time for a complete cycle of sequence calculations for a multi-channel system).

The manner in which such a computer system operates is dependent upon information contained in the memory of the computer. There are two ways to insert data into the memory:

1) General blending parameters, such as meter and valve factors, and instructions are entered by tape;

2) Special information concerning the particular operation are entered by typewriter.

In this way, the computer-controlled blending system can assume the character that each user needs for his own present and future requirements.

ANIMAL MEDICINE MANUFACTURING

Floyd J. Ritchie
Royal McBee Corp.
Port Chester, N. Y.

When an epidemic threatens a farmer's livestock he can't be put off with the excuse that the serum needed is "on order."

Meeting everyday and epidemic animal medicine needs is a complex problem but Anchor Serum Company, St. Joseph, Missouri, a leader in the manufacture of biologicals and pharmaceuticals for animals, has put an electronic computer to work keeping distributors' shelves amply stocked with fresh medicines.

The computer is being applied not only for this purpose but also to handle sales analysis, finished and raw material inventory, payroll operation, production planning, and cost control. The computer is an LGP 30 made by Royal Precision and marketed by Royal McBee.

In the production area, the computer shows raw material stocks and requirements, finished products inventory, what serums are "on test" and "off test", labor costs, and overhead distribution. The computer reveals where slippage may be occurring; automatic backorder reporting keeps scheduling related to needs.

In the sales area, finished inventory in plant and branches is known at all times; inventories may be balanced to meet demand and overstock eliminated; the types and sizes of products moving through different marketing outlets are known; each salesman's performance is pictured; size of stocks on hand for special sales efforts are known; and sales can be scheduled readily to cut over stocked items.

In the area of financial control, the value of finished and raw material inventory represents the actual picture not historic events weeks prior. Labor and material costs are readily compared to selling costs and variance checked; credit checks are easily handled on distributor or branch level since accounts receivable are automatically aged; sales trends picture capital needs accurately.

Two payrolls are prepared each week, each totaling more than 150 persons, time card information, employee's code number, hours worked, wage rate, number of exemptions for tax purposes, any special overtime rates, identification of special deductions such as savings bonds or insurance, and amount of deduction are all part of the input information.

OIL REFINERY PRODUCTION AND STORAGE

Floyd J. Ritchie
Royal McBee Corp.
Port Chester, N. Y.

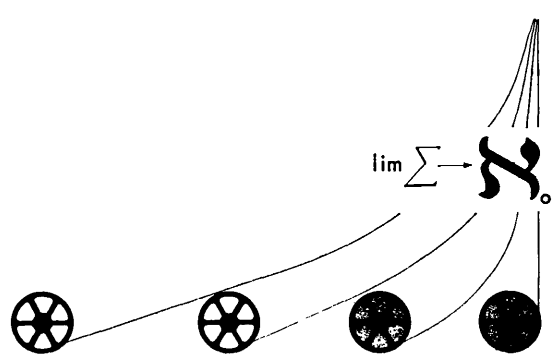
Big or little refinery design problems are being answered by a desk size electronic computer at J. F. Pritchard & Company, Kansas City, Mo.

Proof that size of the computer is no measure of its ability or agility, Pritchard engineers can calculate equipment design parameters for a gasoline plant from feed to product streams by just telling the computer what the input conditions and output requirements are.

As presently programmed the computer (a Royal McBee LGP-30) can handle the design of a plant with multiple feed streams, including internally recycled streams, and print out the component material balances of up to 54 streams of 9 components or 30 streams of 15 components.

Two novel programming techniques devised by Pritchard engineer, L. K. Swenson, make it possible for the computer to handle problems that would normally require costly large-size computers or take weeks of an engineer's time using manual design methods.

Complex programming techniques, "track sharing", and "interpretive coding", give the normally single-address LGP-30 the problem manipulating ability of a four-address computer. A highly interlooped set of subroutines provides a capacity equivalent to more than two and one-half times the LGP-30's normal 4096-word memory size.



NEWS of Computers and Data Processors

"ACROSS THE EDITOR'S DESK"

COMPUTERS AND AUTOMATION

Volume 9
Number 10 B

OCTOBER 2, 1960

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September 1951

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U.S. NAVY-AIR FORCE HIGH SPEED DIGITAL SIMULATOR CAN DEPICT MORE THAN 50 EMERGENCY JET CONDITIONS

Navy Pilot, Commander John H. Bahlman, receives a final instruction from instructor Erwin Day, Sylvania engineer, prior to taking a simulated flight in the UDOFTT (Universal Digital Operational Flight Trainer, Tool) F-100A Super Sabre jet. This is a $2,000,000 high-speed digital computer, and was developed by Sylvania Electric Products, Inc., under a joint Navy-Air Force contract.

During a simulated flight the instructor can introduce more than 50 emergency conditions similar to those experienced during actual jet travel.

UDOFFT is able to simulate in real-time, and responds so that the pilot can react immediately to any given problem. One or more problems such as flame out, icing, landing gear failure or instrument failure, may be inserted in the simulator at different times or the same time.

UDOFTT can extract information or calculations already made and make new ones in 5 millionths of a second.

MOLECULAR ELECTRONIC FABRICATION

Alloyd Electronics Corp.
Cambridge, Mass.

Television circuits the size of a quarter are expected to be possible soon, as a result of development, and manufacture of new electron beam equipment. This equipment employs high density streams of electrons to vaporize, melt, refine, and/or weld not only metallic elements, but also high-melting-point ceramic materials such as alumina, silica, and ferrites. The processes are used to build complete electronic circuits. The circuits thus created are of microscopic size, yet they are able to perform functions heretofore requiring a myriad of separate diodes, condensers, and resistors.

Through this new molecular electronic fabrication technique utilizing the electron beam machine, whole new circuits for computers, amplifiers, radio, television sets, and a host of military and industrial equipment can be designed with revolutionary compactness, high reliability, and extremely low weight.

Other applications of the Alloyd Modular Electron Beam Apparatus (AMEBA) include molecular thin deposition of beryllium on the surface of nose cones and space capsules. The application of tungsten to specific uses such as transducer elements, temperature probes, and other surface applications requiring high temperature materials can now be effectively employed.

Dr. B. L. Averbach, President of Alloyd, is a Professor of Metallurgy at the Mass. Inst. of Technology. The AMEBA will allow electron beam techniques to be applied to molecular electronics; it supplies an unusually versatile fabrication tool to replace the lathe, drill press, and spot welder now important to production of conventional electronics devices.

SIMPLE WORD INSTRUCTIONS FOR COMPUTERS -- COBOL BECOMING OPERATIONAL ON RCA 501 IN EARLY OCTOBER

Donald H. Kunsman, Vice Pres. and Gen. Mgr.
Electronic Data Processing Division
Radio Corp. of America
New York 20, N.Y.

Substantial reductions in both programming time and costs will occur for electronic data processing users, as the result of a new system that employs simple English words to instruct computers.

The system, which replaces the complicated numerical instructions understood only by computer programmers, is one of the most important steps yet taken by the computer industry.

In addition to taking the mystery out of machine-coded programs -- instructions that tell the computer what to do and when to do it -- the new system will cut in half the time required to write such programs.

For the first time, management will have unusually practical control of the problems it wants solved through data processing -- a factor especially valuable in those areas where computations provide the basis for important management decisions.

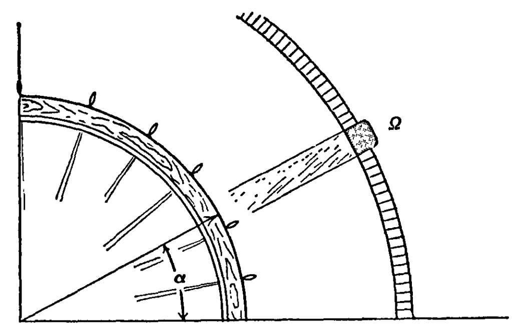
This language is called COBOL (for Common Business Oriented Language) and was created by a committee of computer manufacturers at the request of the Department of Defense, largest single user of computers in the country, to provide a standardized language that would be interchangeable among computer systems of various manufacturers. RCA is the first company to implement the language for its computer.

The implementation is called the RCA 501 COBOL Narrator and was designed by RCA for use initially with the RCA 501 computer.

The new system will shorten the training time from six months to as little as one week.

Among the systems other advantages, are the elimination of detailed machine flow-charting, introduction of "programming discipline", reduction in program maintenance, and program compatability within RCA's computer product line.

Under the system the computer is programmed to accept, in place of present numerical code, words chosen by the user that are related to his business such as "payroll file," "wage," "employee number," "tax," and so forth.



THE WEATHER PLOTTER

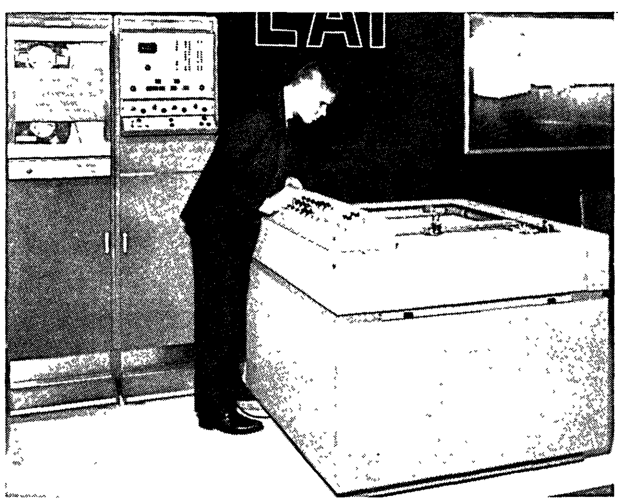
Electronic Associates, Inc.
Long Branch, N.J.

The weather plotter was displayed and operated at the Western Electronic Show and Conference held in Los Angeles in August. It was developed by this company in cooperation with the U.S. Joint Numerical Weather Prediction Unit, Suitland, Md., for the U.S. Weather Bureau. The only unit of its type, this machine plots weather contours on maps from digital information on magnetic tapes.

This particular unit is to be installed at Pt. Mugu, Calif., for plotting weather maps to be used by the Pacific Missile Range in planning missile shoots. A similar unit will be installed at Monterey, Calif.

Data for the plotter comes from weather stations all over the world.

A magnetic tape handling mechanism and converter are seen in the rear.



DETECTING AND CLASSIFYING CONCEALED SIGNALS

Dr. Guy Suits, Director of Research
General Electric Research Laboratory
Schenectady, N.Y.

A new system for detecting and classifying unknown or concealed signals has been developed at this laboratory. The new system has detected signals buried in random noise that could not be detected by trained observers, even when they knew what to look for. Moreover, the system can detect these buried signals even when their full characteristics are previously unknown, and in the process of detection it determines those characteristics.

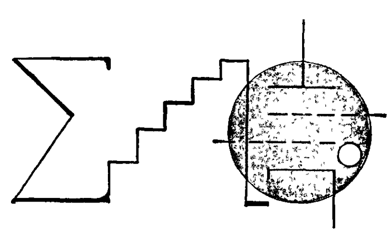
With but limited prior knowledge of the characteristics of the signal it is supposed to detect, the system can, with experience, separate the signal from the random noise in the input data. It does this by associating those elements of the input data which are similar, and modifying itself to detect optimally these similarities.

Details of the new system which is called "adaptive waveform recognition," were presented on September 1, 1960 at the Fourth London Symposium on Information Theory, at the Royal Institution, London, England. The system was developed by R. L. Shuey, C. V. Jakowatz, and G. M. White of the General Electric Research Laboratory.

The essential element of the adaptive waveform (or signal) recognition system is a self-adapting matched filter. This element learns with experience to adjust its impulse response so that it automatically forms a matched filter for the signal. The system can be extended to handle a multiplicity of fixed signals.

The powers of the self-adapting filter can be explained by considering the following situation. The filter is confronted by a waveform or signal that is fixed in shape (or perhaps changing slowly), that occurs randomly in time, and is buried in random noise. The filter has essentially no knowledge of the signal shape or its time of occurrence. It knows only that the signal is in a given band-width. In this situation, the filter is capable of detecting the presence of the signal, obtaining, with experience, a better estimate of what the signal is, and adapting itself to changes in the signal.

Applications of the new system are expected to be primarily in the various detection and classification areas involved in defense. A number of applications in the general area of information handling may be possible through special adaptations of the system.



ELECTRICAL TECHNIQUES IN MEDICINE AND BIOLOGY -- 13TH ANNUAL CONFERENCE

Institute of Radio Engineers
New York, N.Y.

A program with 51 papers, reporting on the advances in medical electronics, has been scheduled for the 13th Annual Conference on Electrical Techniques in Medicine and Biology. This conference will be held at the Sheraton-Park Hotel, Washington, D.C., on October 31 and November 1-2, 1960.

In eight sessions, over 90 authorities will discuss the latest developments in: analytical methods and instrumentation; electroanalytical methods; digital computers; telemetry of physiological data, both long and short range; physiological measurements; analogs; systems analysis; and instrumentation. In addition, four informal discussion sessions will be held on polarography, nuclear and electron magnetic resonance, and computer methods.

For further information, please contact Lewis Winner, 152 W. 42nd Street, New York, N.Y., BRyant 9-3125.

ELECTRONIC DATA LOGGING

James G. Miles
Control Corp., Subsidiary of Control Data Corp.
Minneapolis, Minn.

This company is building a new electronic data logging system for Boston Edison Company, Boston, Mass. Once each hour the system will automatically read 140 electric meters and type the results on a station log sheet. The operation is far more rapid and accurate than can be achieved with human operation. In between automatic readings, the operator can cause any individual value to appear on an illuminated screen by pushing a button.

The data logging system will be installed at Boston Edison Company's Mystic Station. In addition to relieving operators of the tedious job of routine meter reading, it will also provide valuable data for planning future growth.

All of the equipment of this system will be located at one station. This corporation has installed several other systems for remote automatic meter reading, some of which automatically read and transmit data from meters as far as 500 miles from the central station.

HONEYWELL 290 DIGITAL COMPUTER FOR INDUSTRIAL PROCESS CONTROL

Minneapolis Honeywell Regulator Co.
Industrial Division
Philadelphia 44, Pa.

This instrumentation system, designed for one of the nation's major power producers, includes a Honeywell digital computer. The system will: (1) calculate the least expensive pattern of allocating generation to meet system demands; (2) automatically assign this allocation to generating units; and (3) provide cost data for billing computation on the power exchanged with neighboring electric companies.

1960 TURNING OUT TO BE A GOOD YEAR FOR THE BUSINESS MACHINES INDUSTRY

"The Value Line Investment Survey"
Arnhold Bernhard & Co.
New York, N.Y.

This year is proving to be a relatively good year for most business machine companies. The industry is experiencing a rising demand for an impressive array of new equipment. Profit margins have been well sustained. In some cases they are actually improving. The forward momentum that has developed in 1960 seems likely to carry on into 1961, even if the general economy slips off its current plateau.

Because their product combinations have been enriched by the development of electronic data processing equipment, which has opened a new and potentially vast market, the business machine companies are no longer as dependent as they once were upon replacement demand. Moreover, as volume increases in the newer lines, continuing heavy investments in research and development and in employee training will be more readily absorbed. Profit margins should widen.

The sales growth potential of modern office equipment is phenomenal. In this highly competitive business world every medium and large-sized enterprise represents a potential customer for the business-machines industry. Over a period of years, many businesses will probably find it essential to employ these electronic aids in order to merely keep pace with their competitors. A 100% increase in shipments of modern business machines over the next 3 to 5 years may be expected.

Investors, however, must be cautioned that current prices of business machine stocks are discounting prospective earnings improvement several years ahead.

EMPLOYMENT TRIPLING AND PRODUCTION LEAPING AT DATAMATIC

Walter W. Finke, President
Datamatic Division, Minneapolis Honeywell
Wellesley, Mass.

Employment at this company, which manufactures electronic data processing systems, is expected to more than triple during the current year.

Datamatic has added more than 1,500 people to its payroll since January 1, 1960.

We estimate that by the end of 1960 we will have total employment at Datamatic of over 2,600 men and women. This compares with just under 900 people at the beginning of the year.

Datamatic's physical facilities are expanding to keep pace with the Division's mushrooming operations. Its growing employment and expanding facilities are the direct result of sharp step-ups in the Division's manufacturing and marketing operations.

Production of the Honeywell 800 electronic data processing system is progressing at high tempo at our Brighton, Mass., plant. We have recently doubled the amount of floor space devoted to manufacturing.

Plans for expansion of facilities, include construction of a 25,000-square-foot office building at Datamatic's Marketing and Training Center, Walnut Street, Wellesley. This new building, to be ready for occupancy about December 1, will house about 250 people. We opened a similar building at the Wellesley site in February.

We have also moved into an additional 18,500 square feet in the Needham Industrial Center for use of our Product Engineering Department. Over 200 engineers, draftsmen and other technicians will occupy this facility.

Datamatic's main manufacturing facilities are in a large plant at 30 Life Street, Brighton. We also maintain an extensive Engineering and Research Center at 151 Needham Street, Newton Highlands.

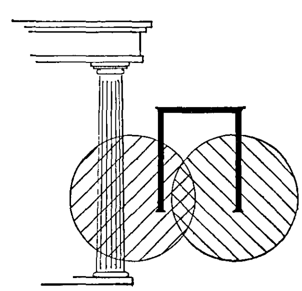
TELEVISION CAMERAS INSTALLED WITHIN MISSILES

Lockheed Aircraft Corp.
New York, N.Y.

A device, known as a Video Telemetering Camera System, will enable missile designers on the ground to actually SEE what's going inside a missile during flight. The system has been built by this company and turned over to the military.

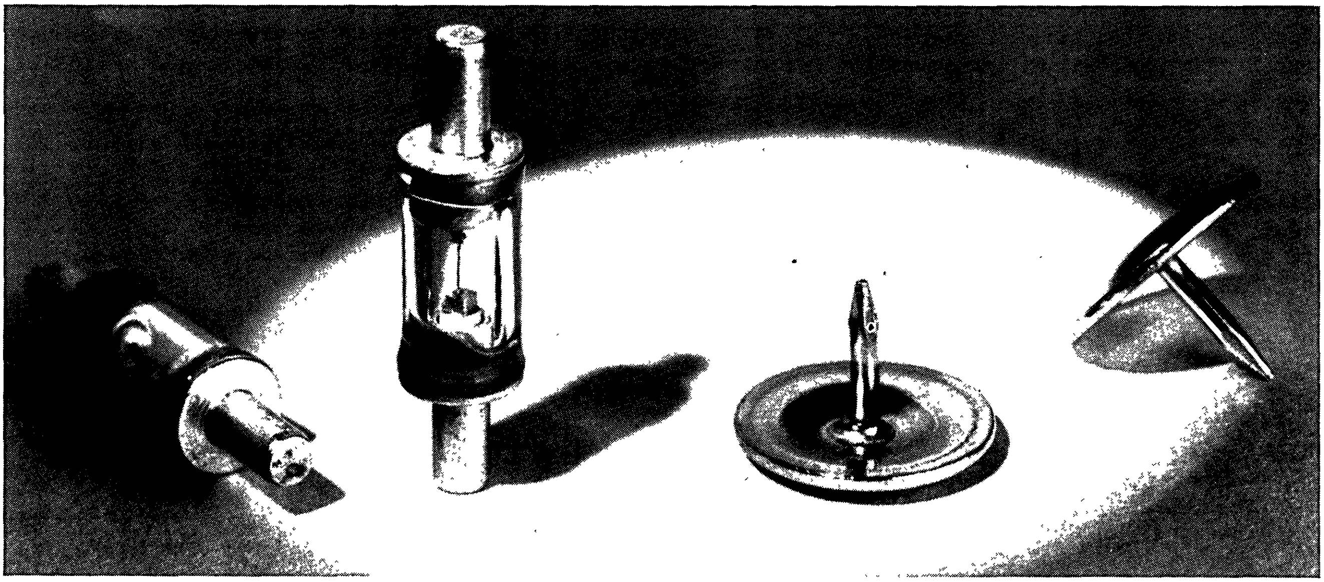
The Camera system functions like a television set, but is many times more refined. Before a missile is launched, TV cameras are placed in strategic locations to view happenings both inside and outside the missile as it soars through its 18,000 mile per hour trip.

Once launched, the functioning of the missile is viewed on a device like a TV-screen by engineers, and the screen is photographed on motion picture film. If something goes wrong, the designers have a visual record and are better able to prevent the same trouble from occurring during the missile's next flight.



DIODES SWITCHING IN ONE BILLIONTH OF A SECOND

Philco Corp., Lansdale Div.
Lansdale, Pa.



This company has introduced the first microwave crystal diode designed to switch power up to 100 milliwatts at speeds of less than one nanosecond (one billionth of a second) -- the 1N3093. The picture shows it compared with ordinary thumbtacks.

The device can be used in a simple "On-Off" application, and can also be used to produce amplitude modulation of the signal.

The device is a germanium crystal, and is packaged in a symmetrical, hermetically sealed case.

NEW COMPUTER MODEL WITH LOWER TAPE COSTS

International Business Machines Corp.
Data Processing Division
White Plains, New York

High-volume punched-card users may now economically change to magnetic tape for their data input and data output requirements.

The IBM 1401 E Data Processing System increases the speed and efficiency of electronic data processing; it costs twenty per cent less than higher-speed tape systems. The saving is made possible by the use of the new, low-cost IBM 7330 Magnetic Tape Unit, shown at the left.

In a typical system, the 7330 will read data up to 20 times faster and write out results at more than 60 times the rate of punched card equipment. This results in substantially greater throughput than is possible with punched card installations.

The tape code is compatible with IBM 727 and 729 magnetic tape units. The 7330 has dual-density reading and writing speeds of 7,200 and 20,000 characters a second; the tape is fully interchangeable with tapes for all other IBM units.

HIGH-SPEED DATA COMMUNICATION SYSTEM

Stromberg Carlson
Division of General Dynamics
Rochester, N.Y.

A high-speed data communication system able to handle the vast amounts of data used with an electronic computer has been placed in operation by the Convair Division of General Dynamics Corporation, linking the Division's facilities in Pomona and in San Diego, California. The system was designed and built by the Stromberg Carlson Division.

The system transmits scientific data at a rate of 2400 bits per second -- more than 30 times the speed of a conventional teletypewriter -- over a regular leased telephone line more than 200 miles long.

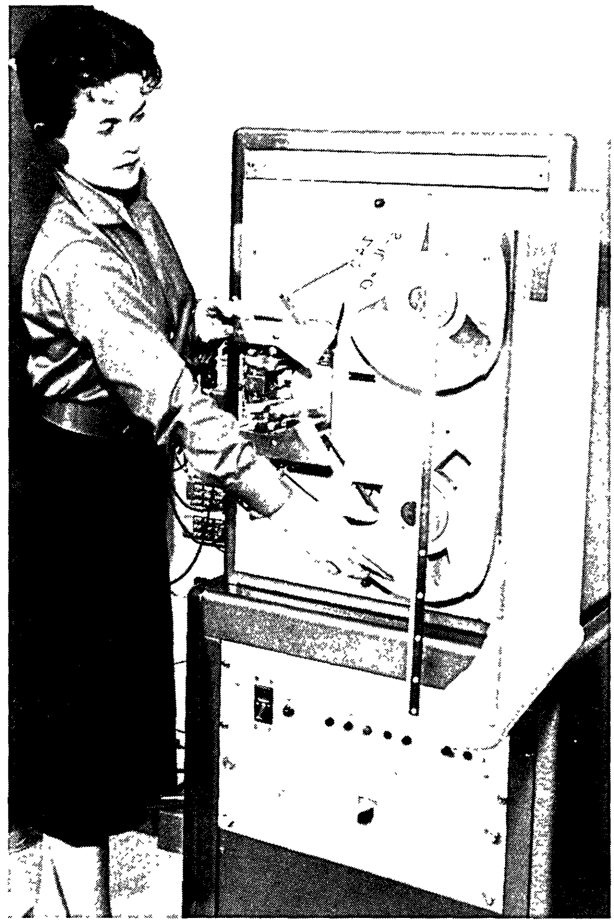
Convair uses the new communication system to transmit data from Pomona to its computer facilities at San Diego for processing. Punched cards containing the input data are fed into a high-speed card reader at Pomona. The transmission logic in the system takes the data from the card reader, converting it to a serial train of binary pulses. Check bits are added, and the data is modulated for reliable transmission on telephone facilities. At the receiving end in San Diego the data is demodulated, checked, and recorded on a magnetic tape recorder which makes the data available in the proper format for immediate entry into computer facilities. Accuracy of transmission is assured by both lateral and longitudinal parity checks.

Actual operating experience indicates an error rate of less than one error per one million bits transmitted, and even these errors are detected by the system logic before entry of the data into the computer.

The communication system, utilizing the Stromberg-Carlson Model S-C 301 High-Speed Data Transceiver, is highly flexible in the type of input and output devices which may be used with it. Punched card, punched tape, magnetic tape and keyboard inputs are available, and outputs may be on magnetic tape, or on the S-C 3000 High-Speed Electronic Printer. Slow inputs can be stored for rapid transmission and output, thus realizing significant savings in transmission time. The system also provides voice communication over the same leased wire.

One of the system's unique featues is a modulator-demodulator which reduces the effect of interference and distortion commonly found in transmission over telephone facilities. The entire data communication system uses standard circuit modules which make maintenance easy.

This new Stromberg-Carlson system makes it possible to transmit data at high speeds, thus eliminating the need for additional telephone lines. By automatically converting the data from punched card input to a magnetic tape output the system eliminates additional conversion equipment presently required in many other types of data communication systems.



-- Technician in Convair's computer facility in San Diego prepares magnetic tape recording equipment to receive data transmitted from company's plant in Pomona, Calif., 200 miles away, over special system built by Stromberg-Carlson Division of General Dynamics Corporation. Data can be sent at rate of 2400 bits per second over regular commercial telephone lines.

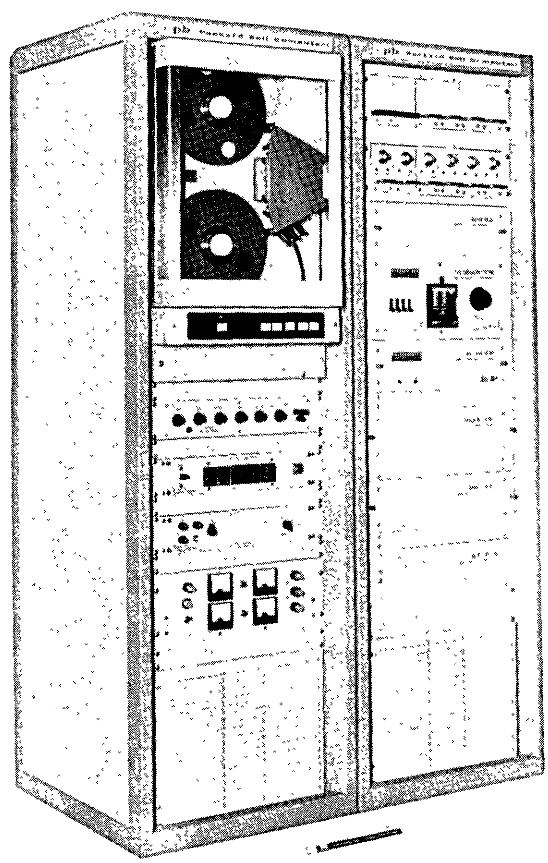
INCREASING POWER RATING OF A NUCLEAR REACTOR THROUGH ANALOG-DIGITAL CONVERSION AND DATA STORAGE

Max Palevsky, Vice Pres.
Packard Bell Computer Corp.
Los Angeles 64, Calif.

A new analog-to-digital conversion and data storage system was recently delivered to Argonne National Laboratories, Lemont, Ill. The new system, developed and manufactured by Packard Bell Computer Corp., will be used on nuclear reactors for data acquisition related to reactor power measurements.

Analog measuring techniques currently used are of limited usefulness when poor signal-to-noise conditions prevail. Argonne engineers have effected substantial improvement in accuracy of measurement by utilizing a digital computer and statistical methods known as cross-correlation techniques.

This approach has made possible a substantial increase in power rating of the Argonne EBWR (Experimental Boiling Water Reactor). The new Packard Bell Computer data system will help determine the advisability of further increasing the power rating of the reactor.



AUTOMATION OF MAIL HANDLING

U.S. Post Office Department
Washington D.C.

The Department laboratory in the City Post Office Building in Washington continues to test a high-speed electronic scanner, capable of reading more than 10,000 addresses on mail envelopes per hour and sorting them. The machine is scheduled for installation by February, 1961. Intelligent Machines Research Corp., a division of Farrington Mfg. Co., Needham, Mass., has the contract. The machine will automatically reject hand-written addresses; envelopes bearing them will still have to be sorted by conventional hand methods.

In October a new facsimile machine will be tested between Washington and Chicago, but it will be restricted to government communications during the test.

Mechanical mail handling systems have now been installed in 15 major post offices. Bids for 14 others have been authorized.

TWO MAJOR STANDARDIZATION PROGRAMS FOR THE OFFICE EQUIPMENT INDUSTRY

Alfred J. Ball, Pres.
Office Equipment Manufacturers Institute
Washington, D.C.

Two broad programs for the international standardization of data processing machines (including electronic computers) and office machines were announced on Sept. 12 by the Office Equipment Manufacturers Institute, the trade association of the office equipment industry. Both programs will be sponsored by the Institute and organized under the procedures of the American Standards Association.

The value that these two standardization programs will have to both customers and manufacturers will be very considerable. The results should be reflected by savings of millions of dollars annually for the customers of the office equipment industry.

Dr. Joseph W. Barker, former Dean of the Columbia University School of Engineering, will be technical consultant to the Institute. Dr. Barker will give guidance to both standardization programs and will actively direct the organization of the data processing program. Mr. Carl P. Ray, Vice President of Royal McBee Corporation, will direct the organization of the office machines program.

The two standardization projects are based upon proposals submitted before a recent American Standards Association conference by the Institute. At that time, the Institute was designated as sponsor of both projects--X3 for data processing equipment and X4 for office machines.

UNIVERSAL CIRCUIT CARDS TO SPEED PRODUCTION

Librascope Division
General Precision Inc.
Glendale, Calif.

A universal circuit card which can be prefabricated and adapted to different circuit requirements has been developed by this company.

The card contains a universal etched pattern which can be modified by interconnections to form any desired circuit function.

Many engineers in the computer field have long been of the opinion that the standardization and prefabrication of components and subassemblies which can be used in more than one model of a computer was impossible. But engineers at this company made a careful and analytical study of the basic design parameters of each class of computer to determine the general circuitry needed.

On the circuit cards developed from this study, components may be added to form logic modules before the final design of the computer is ready. Then, when the design is settled, these modules may be interconnected to form the required circuits.

Such a technique is particularly adaptable to short run and prototype production, where lead time between design and actual start of production is usually excessive.

A good example of the use of this new technique is in the prefabrication of the four huge data-processing central computers this company recently completed for the Federal Aviation Agency's air traffic control program.

Each computer card is capable of taking 33 individual modules, and interconnection was made after the final computer design had been settled.

BASEBALL STRATEGY CALCULATED BY COMPUTER

A large electronic computer has been used to calculate which of different baseball strategies is likely to be the best under stated conditions. The program has instructed the computer how to make decisions for playing individual innings. The report on this program was given by Richard E.Trueman of the University of California at Los Angeles to a meeting of the Operations Research Society of America.

Batting statistics of a representative major league lineup form the starting point. From these, tables are made showing the desired probability of selecting each of thirteen possible plays. Individual innings are then "played" by the computer, using random numbers to select the plays.

Some 5,000 innings are played for each possible combination of initial conditions, Mr. Trueman reported. The initial conditions can be varied according to the lead-off batter in the inning, location of base runners, and number of outs.

For each initial condition, statistics are kept on the probability of scoring a given number of runs, the average number of runs scored, and the probability of a double play occurring.

With this information, such strategies as the sacrifice, stolen base and intentional walk can be quantitatively analyzed.

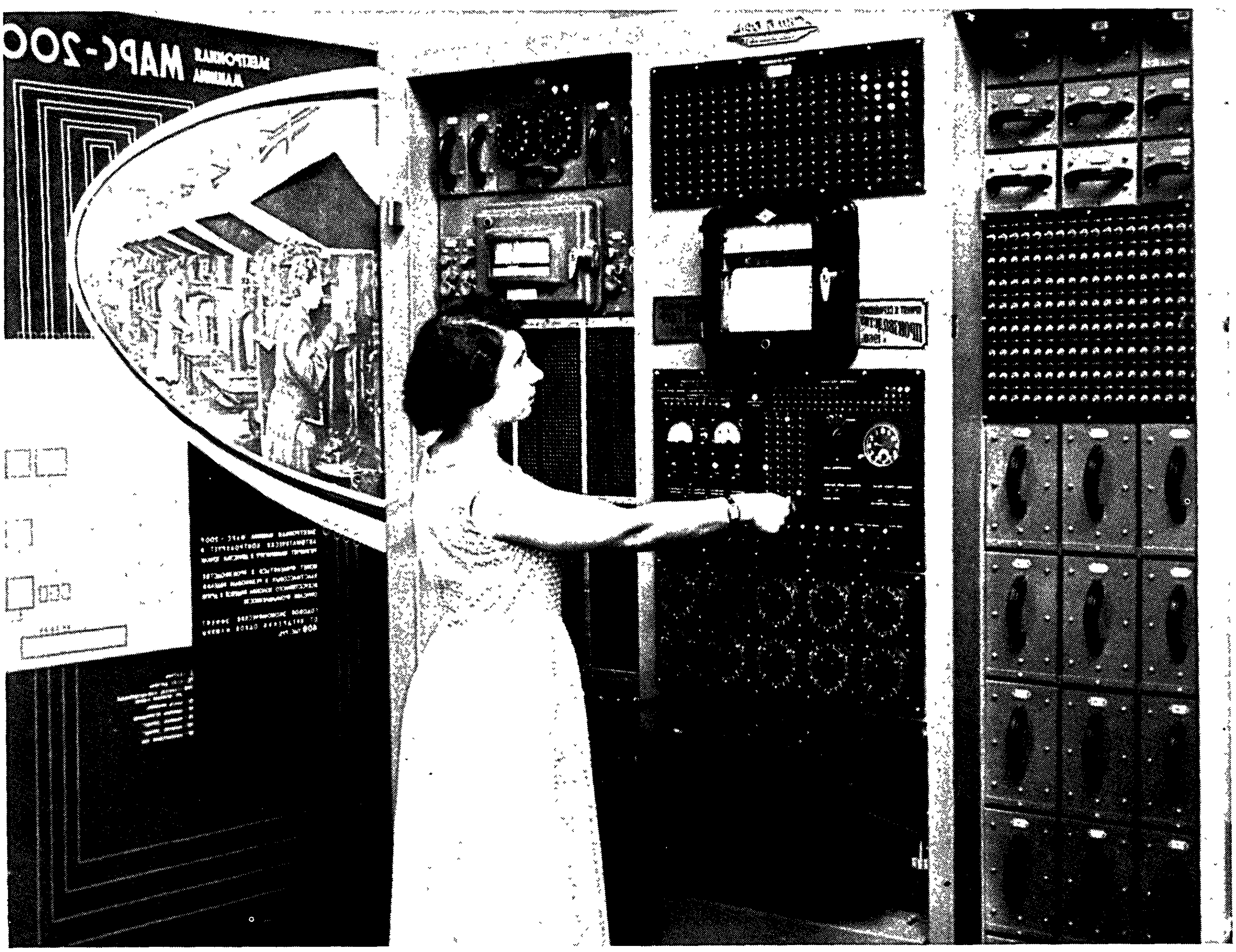
AUTOMATIC ELECTRONIC CONTROL OF TEMPERATURE IN SOVIET RUBBER AND PLASTIC MANUFACTURE

Embassy, U.S.S.R.
Washington, D.C.

Complex electronic devices are finding growing applications in Soviet industry. A short while ago the Biophysical Equipment Designing Office produced an electronic machine for automatically controlling temperature and timing in the manufacture of rubber and plastic articles and chemical fibres, the MARS-200-R.

The machine maintains temperature down to one-degree accuracy in each of 200 points where its temperature transducers are located. Its scanning circuit consecutively connects each of the 200 transducers to the electronic unit. Each connection takes 0.3 sec. This is sufficient time for the machine to compare the transducer reading against the set value and relay a signal to the performing units. The machine can also give a light or sound signal and switch on an automatic recorder. The recorder puts down on a card the time of the reading, the temperature and the condition of the technological process. Any faults in the process are recorded in red print.

The MARS-200-R machine will be mass manufactured by the Energopribor Plant.



SIMULATION OF EQUIPMENT REQUIRING CONSTANT HUMAN ATTENTION --SO AS TO STUDY THE HUMAN BEING

Battelle Memorial Inst.
505 King Ave.
Columbus 1, Ohio

A "problem making" analog computer and a control panel are helping scientists at this organization to understand better the effects of attending a machine upon the men who supply the necessary human element in complex man-machine systems. This equipment has been used for more than a year at the Columbus, Ohio, research center in a study sponsored by Wright Air Development Division's Aerospace Medical Laboratories -- a part of the Air Force's Air Research and Development Command.

The computer-fed control board, with its array of lights and buttons, is designed to simulate the kind of equipment which requires constant human attention in a man-machine system. For instance, the control board can simulate the conditions facing the operator of a radar-alert system or the operator of the controls used in a chemical processing plant.

People who serve as subjects in experiments conducted by Battelle psychologists watch a delicately balanced needle of a dial mounted on the control panel. When the control system is fully automated, no decisions are required of the subjects. However, with the flash of a light, the operator may be asked to control the needle. During these periods of manual control, the operator must determine whether the needle is properly aligned on the dial. If it is not, the operator must indicate, by pressing a button, whether the needle is high or low. The operator may then be called upon to push one of eight buttons to align the needle. Finally, the operator may be asked to indicate whether he was successful in realigning the needle by pressing either a button labeled "effective" or one labeled "not effective". During automatic control, the machine makes these decisions.

The control panel, in effect, demands that the operator remain constantly alert to answer three questions: "1. Is the system operating as it should be? 2. If it isn't, what correction should be made? 3. Was action taken effective in correcting the system?" These questions are basic to automation problems; it appears that they will have to be answered in the control of systems no matter how sophisticated machines become. Indeed, with more complex automation systems, it will become increasingly important to designers to know how well, how quickly, and how often a man can be relied upon to answer these questions.

A man may be "overworked" with too many decisions and unable to do his part in a man-machine system, thus making the whole system ineffective. It is equally possible that the man may not have enough to do. That is, the machine may require human decisions so infrequently that the operator becomes inattentive and fails to respond promptly when human action is required.

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12 MILLION AGRICULTURAL CENSUS CARDS FROM THE UNITED ARAB REPUBLIC TO BE FED INTO ITALIAN COMPUTERS

Dr. P. V. Sukhatme, Director, Statistics Div.
Food and Agriculture Organization
Rome, Italy

About a hundred countries and territories are participating in FAO's 1960-61 World Census of Agriculture; one of these countries is the United Arab Republic.

A saving of two years or more in time will be gained by processing in Rome the census of agriculture data collected in the Egyptian Region of the United Arab Republic. This processing will result from an arrangement recently made between the U.A.R., the Central Statistical Institute of Italy, and the Food and Agriculture Organization.

In connection with this census and with promoting improved handling of national agricultural censuses and other agricultural data, FAO is seeking better ways of data processing, so as to provide more timely information on the structure of agriculture, available food supplies, assessing the problem of hunger, and ascertaining suitable remedies.

During the entire operation, some 12 million punched cards containing data will be brought to Rome, tabulated, and the results flown back for the use of the UAR authorities.

The UAR is collecting information on all aspects of its agricultural economy, such as land holdings, acreage under various crops, the size of the agricultural population, the number and frequency of vegetable crops and even the proportions of foreign-bred and indigenous poultry.

ELECTRONIC MAP PREPARER

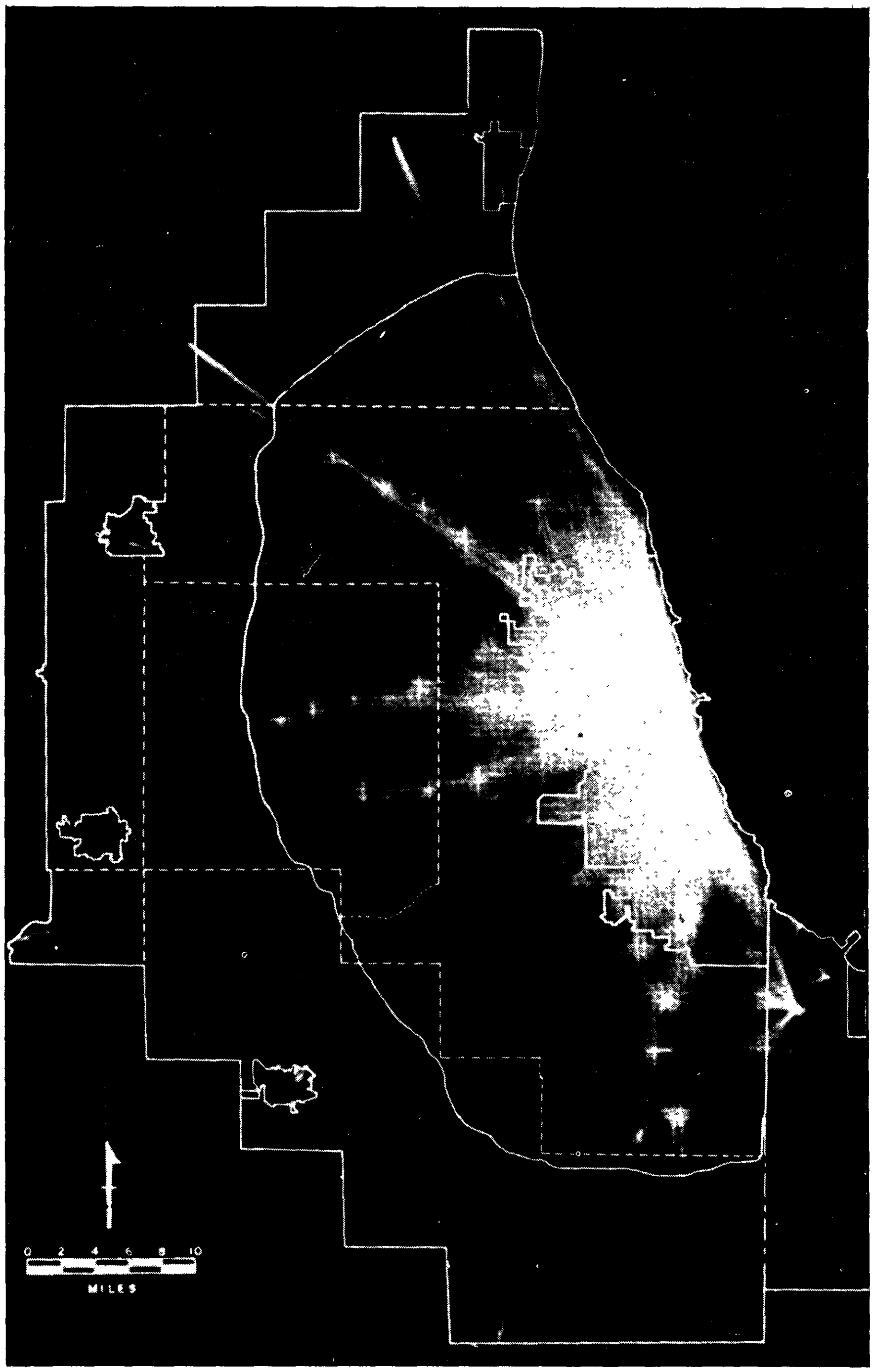
Armour Research Foundation
Illinois Inst. of Technology
35 West 33 St.
Chicago 16, Ill.

A device has been designed and constructed for the Chicago Area Transportation Study which has made it possible to process complex data that previously were impracticable to process. This device is called a Cartographatron; it displays data in a form that eliminates the need for preparing of extensive maps.

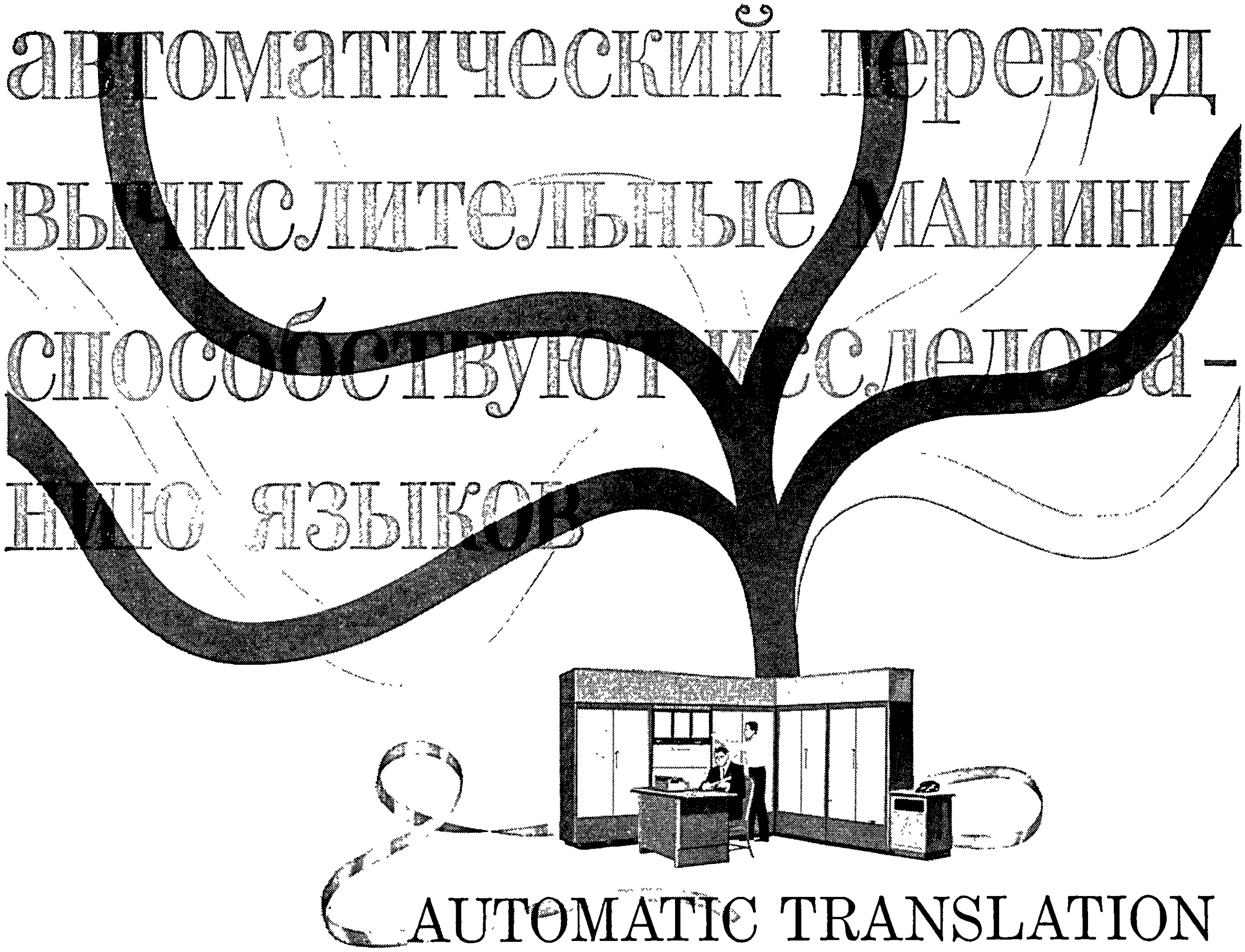
New super highways and transportation facilities are planned, in large measure, on the basis of where they are needed. In an attempt to measure and determine where these new transportation arteries should be built in the Chicago area and where they should originate and terminate, vast amounts of information were collected in a survey of citizens, transportation officials, and commercial trucking firms, in regard to normal trips made on weekdays.

The basic data is a "trip card" which contains the address of points of origin and points of destination. In the processing of some 370,000 original trip cards the need for such a machine as the Cartographatron was realized. An efficient and inexpensive way of actually mapping the "trip desire lines" -- lines stretching between an origin point and a destination representing one trip taken by one person -- was needed.

In operation, the Cartographatron plots trip-desire lines and then displays these lines in a composite photo. The input for the machine is a magnetic tape on which the necessary information (origin point, destination, direction of travel, etc.) is stored. The output of the Cartographatron is a photographic plate upon which the desire lines have been continuously recorded by means of a cathoderay tube. A system of grid coordinates is used in which the points of origin and destination are accurately plotted, and the composite photographic plate is literally a map.



Flexibility in design of the Cartographatron permits display of trip desire lines or of merely the origin dots of the desire lines. Another advantage of the machine lies in its facility for selecting only that information from the tape data that is required. For example, if only automobile trips from home to work during morning rush hour are desired for some purpose, the machine will, after proper setting, deliver the line or origin dot displays for just that type of trip.



AUTOMATIC TRANSLATION INDEXING ABSTRACTING

To formulate rules for automatic language translation is a subtle and complex task. Yet, significant progress is being made. During the past several years large amounts of Russian text have been translated and analyzed at Ramo-Wooldridge's Intellectronics Laboratories using several types of existing general purpose electronic computers.

Many hundreds of syntactic and semantic rules are used to remove ambiguities otherwise present in word-for-word translation. The considerable improvements that have been effected during the progress of this work indicate that it may be possible within the next year or so to produce, for the first time, machine translation of sufficient accuracy and at sufficiently low cost to justify practical application. Electronic computers are also invaluable for other language research activities at Ramo-Wooldridge.

Techniques for automatic indexing, automatic abstracting, and other aspects of communicating scientific information are also being investigated. Research and development at the Intellectronics Laboratories will eventually lead to electronic machines capable of carrying on self-directed programs of research and analysis and "learning" by their own experiences.

The accelerating pace at which these "communication of knowledge" problems are growing in importance has created challenging career opportunities in new fields of scientific endeavor.

For a copy of our general career brochure, "An Introduction to Ramo-Wooldridge," write to **Dr. Richard C. Potter,** *Head, Technical Staff Development.*

RAMO-WOOLDRIDGE
a division of ***Thompson Ramo Wooldridge Inc.***
8433 FALLBROOK AVENUE, CANOGA PARK, CALIFORNIA

The 1960 Decennial U.S. Census and New Elements of Data Processing

A. Ross Eckler
Deputy Director, Bureau of the Census
Suitland, Md.

(Based on a talk before the Associated University Bureaus of Business and Economic Research, at Eugene, Oregon, August 1, 1960)

New Enumeration Procedures

. . . As many of you know, the field procedures used for the 1960 census differed significantly from those used in previous years. A natural question arises as to whether these new procedures contributed to raising field costs above the original estimates. While a final conclusion about this cannot yet be made, the experience in general was too favorable to give *a priori* support for the conclusion that the new procedures were responsible for any increase in cost.

The results to date seem to support our decision to give individual householders a chance to fill out the forms pertaining to their families and dwelling units. A high proportion of the forms which were mailed out to all households in advance of enumeration were ready when the enumerator called. Even in the cases where they were not completed in advance of the enumerator's call, the forms had often served to advise the households concerning the kinds of questions included, and may have prompted some discussion of the proper answers.

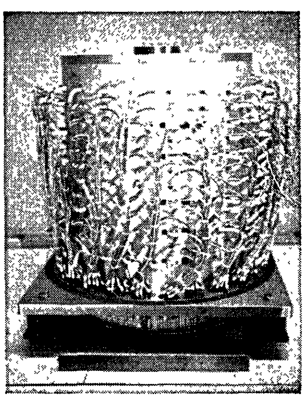
The system of two-stage enumeration which was used in most sections of the country also appears to have been successful. About 80 percent of the families with whom the sample questionnaires were left filled out their forms and mailed them into the District Offices. About two-thirds of the forms filled in were fully acceptable and required no further contact of any sort with the households. This proportion was in line with our more optimistic expectations regarding the amount of public cooperation we would get. It is much too early, of course, to evaluate the quality of the answers obtained by the new procedures, but we have no reason to modify our expectations on this point.

The Use of Electronic Equipment

This decennial census of population and housing will be the first to be processed completely by means of modern electronic equipment. An important auxiliary unit that was especially developed for this census is called "FOSDIC," standing for the initial letters of Film Optical Sensing Device for Input to Computers. This piece of equipment scans microfilm copies of appropriately designed census questionnaires, reads the positioned marks entered by the enumerators, and transcribes the information to tape in the form of magnetic spots, ready to be read by the electronic computer. The tape is then placed in the electronic computer, where the results are reviewed, tabulated, and finally transferred to other tapes that will be used in the high-speed printer. The FOSDIC operation not only is an important step in speeding up the compilation of the census, but also has made it unnecessary to hire and train nearly 2000 persons manually to prepare punch cards from which the data could be tabulated.

At the present time the process of microfilming our schedules and having the microfilm copies scanned by FOSDIC seems to be moving along quite smoothly. Thus far we have microfilmed over two-thirds of the returns and the microfilm record has been processed through FOSDIC for over half of the population. We are in line with our schedule, and expect to have the tabulations finished well in advance of the statutory date of December 1, 1960, the time when the final State figures must be certified to the President.

[Please turn to page 22]



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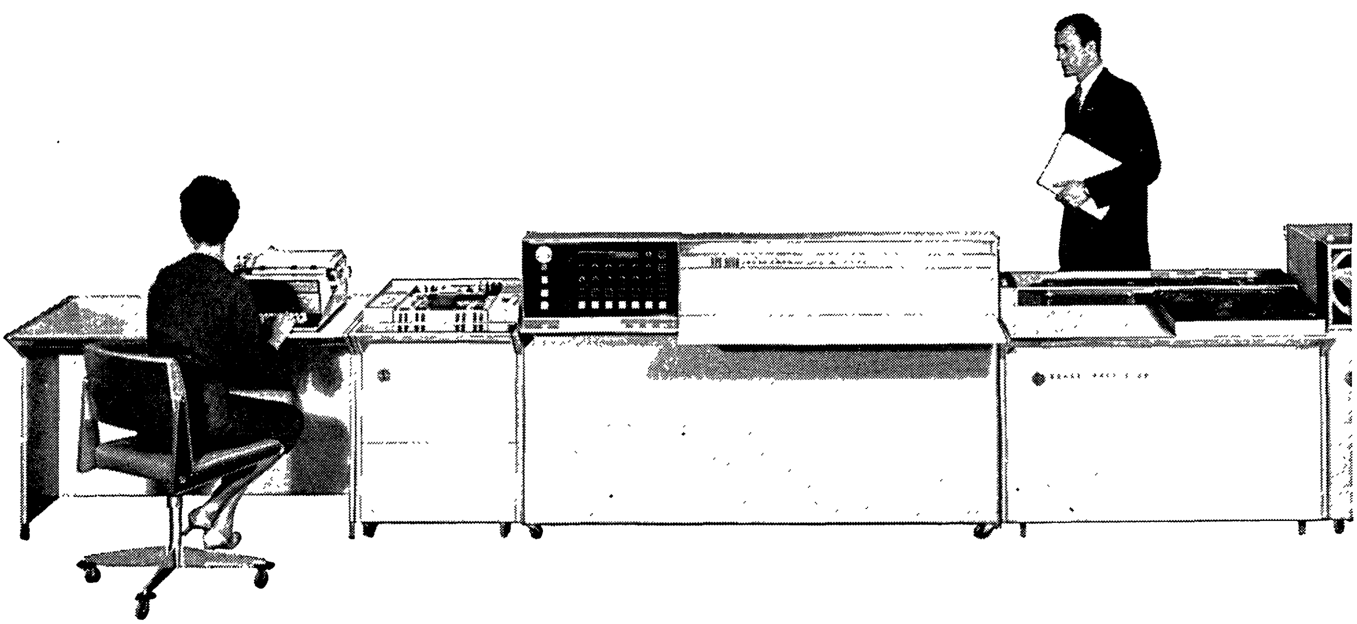
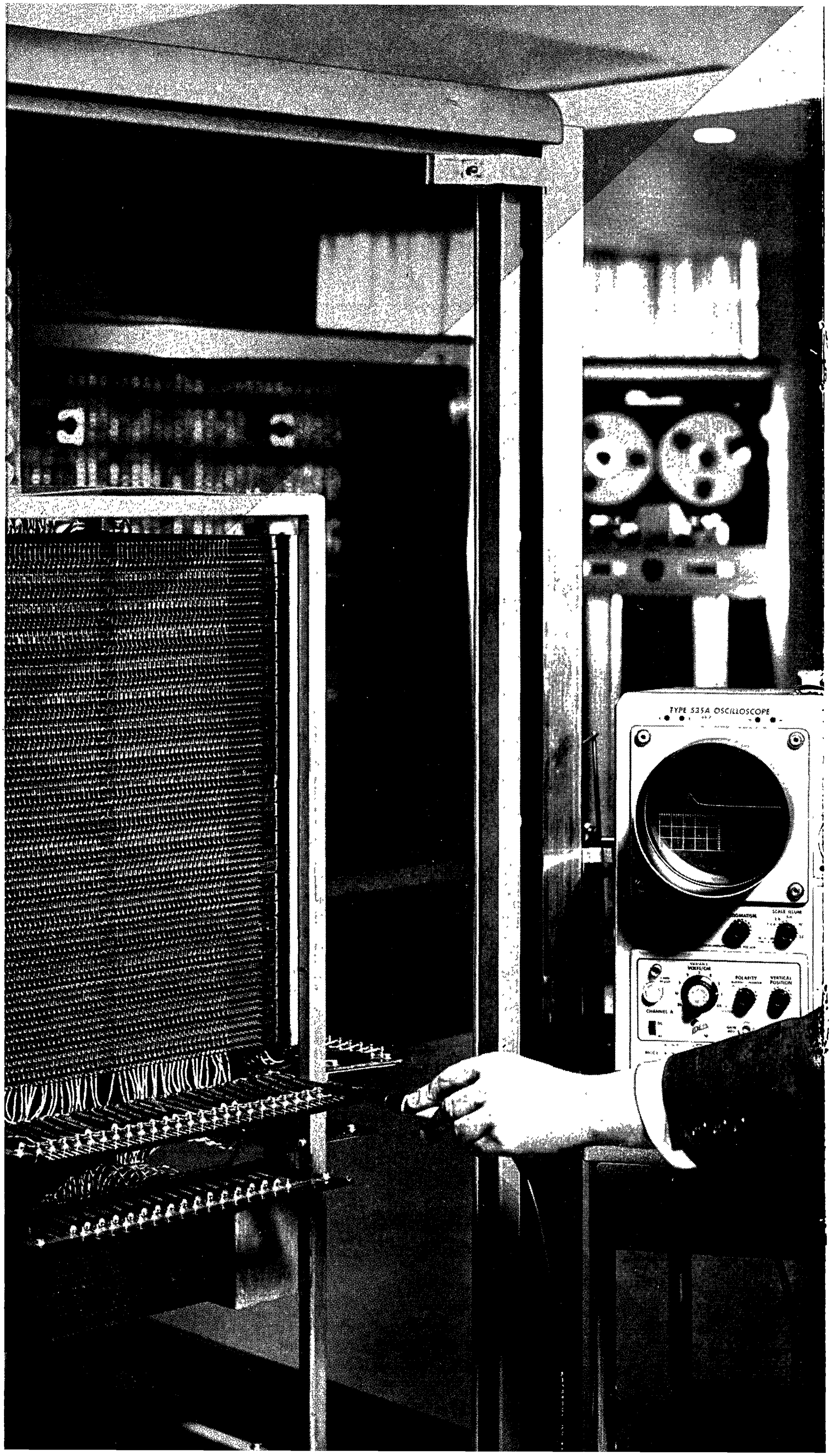
Royal Precision Corporation

Royal Precision—producers of the LGP-30, the RPC-4000 and the RPC-9000—is jointly owned by the Royal McBee and General Precision Equipment Corporations. Sales and service are available coast-to-coast, in Canada and abroad through Royal McBee Data Processing Offices.



MARKETED BY ROYAL McBEE, DATA PROCESSING DIVISION, PORT CHESTER, N. Y.

If you have sales ability, and are interested in electronic data processing contact your nearest Royal McBee Data Processing Office. or write Sales Administration Director, Royal McBee Corporation, Port Chester, New York.



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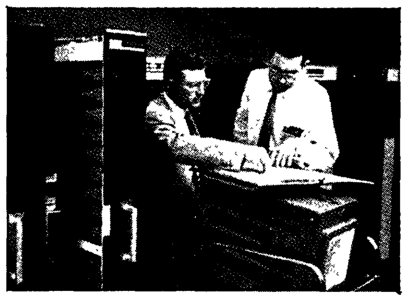
When you *Think* of data processing... *Think* of IBM and dedicated PM as your guarantee of more data processing per dollar...*this is a vital part of Balanced Data Processing.*

At a modern IBM education center, a class of Customer Engineers watches a technical demonstration on closed-circuit TV.



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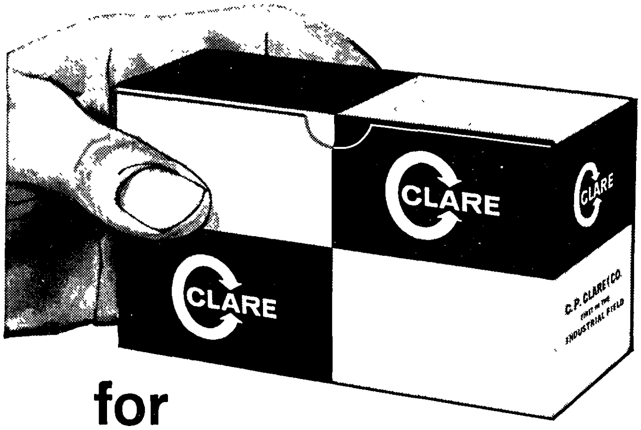

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CLARE

Relays and Related Control Components

[Continued from page 18]

Quality Control

Another important innovation in the 1960 census was the introduction of quality control methods into our field operations. We succeeded in developing procedures to enable the supervisory staff to detect faulty enumeration work more consistently and more promptly than ever before — in time to take action before the work had been substantially completed. The enumerators whose work was found to be deficient were in many cases given further instruction which enabled them to perform satisfactorily; in other cases, they were removed from the rolls and their work was reassigned. As a result of this operation over 4000 enumerators were replaced. This enabled us to eliminate some of the types of problems which would otherwise have delayed the later stages of the census and impaired the quality of the results.

New Inquiries in the 1960 Census

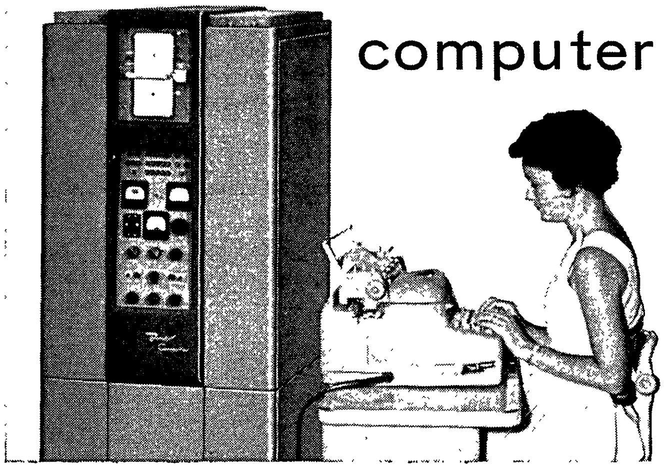
On the whole relatively few changes from 1950 were made in the content of this year's population and housing schedules. The most important new question was doubtless the one on place of work, which provides the basis for some tabulations highly useful to marketing people and to planning officials for metropolitan areas. The other new inquiries of chief interest are probably those pertaining to equipment items in the census of housing, such as home food freezers, clothes washing machines, clothes dryers, air conditioning units, water heating fuel, and the number of passenger automobiles available for regular use.

Status of Work

On the whole, our processing work on the 18th Decennial Census is about on schedule, but, as might be expected in a massive short-time operation of this sort, there have been some phases which did not conform exactly to our expectations. Perhaps the major development was the extent to which field costs exceeded the amount budgeted. There have been a number of factors which made the enumeration considerably more difficult and time consuming than in previous censuses. The congestion of population in a number of our very largest cities proved to be a more substantial obstacle than had been anticipated, and very large numbers of call backs and special clean-up work were required in these areas. The increase in the proportion of dwelling units with only one or two occupants delayed completion of canvassing in many areas. Such units are likely to have all their occupants in the labor force, and hence it was particularly difficult to make direct contact with them. To meet these and related difficulties we found it necessary to convert from piece rates to hourly rates much larger numbers of enumerators than we had anticipated, and costs were thereby considerably increased.

A further element of added cost was the need to spend additional time in a number of large cities which for the first time in decennial census history showed a decline in population. These declines almost uniformly proved surprising and disappointing to the elected officials, chambers of commerce, and civic groups in cities affected, and in many cases will lead to reduction in the amounts of funds distributed by State governments. The shock was particularly great since the changes indicated by the census were not in line with the 1950-60 changes shown in utility con-

...At the Dow Chemical Company, fiber research is optimized with a Bendix G-15 computer



Herman P. Briar

At Dow Chemical, Research Project Leader Herman P. Briar used the Bendix G-15 digital computer to speed research and reduce material costs in the development of the new synthetic fiber, *Zefran.* The versatility of the low-cost G-15 also permits its usage on other important Dow projects, including quality control, engineering, and market development.

More than 350 G-15's are currently in use, many in the chemical process industries. One reason for this popularity is that the new user, through the G-15 EXCHANGE Organization, may take advantage of the work already done in applying the G-15 to his type of work. For instance, in the chemical field, the new G-15 user would have access to a wide variety of programs including:

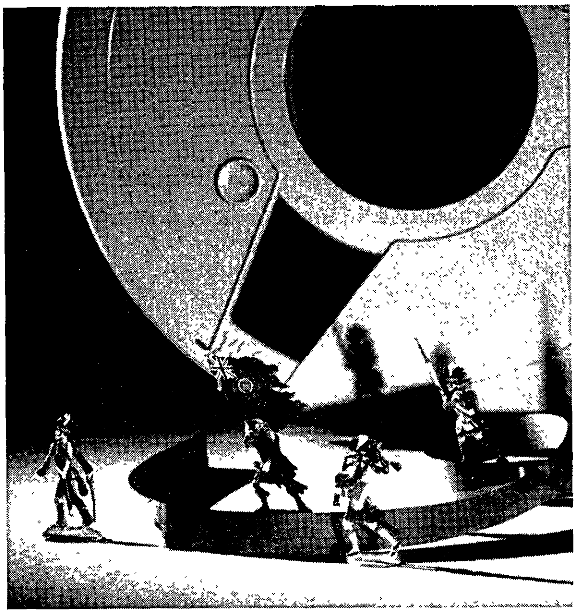
Process simulation • mass spectrometer calculations • pressure vessel design • column design • linear programming • probability analysis • statistical analysis • viscosity calculations • heat exchange calculations • information retrieval • regression coefficients • multiple linear regression • pipeline analysis • analysis of variance • numerical differentiation • quality control • random number generation • Fourier synthesis • and many more in engineering and business fields.

The G-15 has many other valuable features: very low price, the widest variety of standard accessory equipment of any computer, alphanumeric typewriter and paper tape input-output as standard equipment, simplified programming systems, nationwide service organization, and fast availability.

A Bendix Computer representative will be happy to discuss your computing needs in detail. Or, write for descriptive literature.

Bendix Computer Division
DEPT. D 22 LOS ANGELES 45, CALIF.

THE Bendix CORPORATION



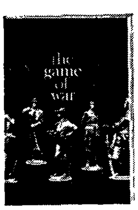
wanted:

WAR GAME PLAYERS

Very large-scale air-battle digital computer simulations are now going on at *tech/ops'* Project Omega, in Washington. Present operations call for ***top-flight mathematicians, mathematical statisticians, senior programmers, operations research analysts.***

These computer air battles are stochastic models which involve design and evaluation, and development of unusual techniques for studying sensitivity of these models to input changes. Associated activity involves design of advanced programming systems and of common language carriers which are expected to be independent of the first computer used—the computer itself augmenting and improving the language for use on later and more sophisticated computers. A fascinating new book by ***tech/ops,*** THE GAME OF WAR, traces the history of war gaming from ancient chess of 3,000 years ago to modern computer gaming, illustrated with authentic warriors of the periods. For your free copy, write:

Kingsley S. Andersson tech/ops



Technical Operations, Incorporated

3600 M STREET, NORTHWEST
• WASHINGTON 7, D. C.

nections, dwelling units, school enrollment, etc., all of which under present circumstances are unreliable indicators of population change. In a number of cities very active campaigns were carried out to locate persons who might have been missed in the census. We believed it necessary to carry out a number of checks and special studies to assure us that the census had been carried out according to our specifications and that the coverage was not deficient or erratic. Because of these developments, the census enumerator in a number of our larger cities, especially, took considerably longer than originally planned, and the costs were naturally increased.

Publication Schedules

The publication schedules indicate the timing of the different series of reports from the decennial census. It may be worthwhile to point out that all the advance final population counts are scheduled to be issued in the remaining months of 1960. The advance reports on general population characteristics including race, age, sex, marital status, and relationship will be issued in the last quarter of this year and the first quarter of 1961. The more detailed tabulations of social and economic characteristics are scheduled to be issued in the form of advance reports in the second and third quarters of 1961. The final reports will, of course, come a little later, but the lag should not exceed 2 or 3 months. The more specialized subject reports, involving quite detailed tabulations on special subjects, will be issued in the last three quarters of 1962. The census tract reports, giving detailed information for small subdivisions of cities and standard metropolitan statistical areas will be published during the second and third quarters of 1961.

Thanks to a number of the innovations introduced this time, we expect that our publications will appear 6 to 18 months earlier than the corresponding ones in 1950.

Special Services Using Electronic Equipment

We believe that the use of electronic equipment opens up the possibilities of more extensive and useful special services than have been feasible previously, provided the necessary advance plans are made for such work. Two examples of this may be noted.

First, we are studying the possibility of making generally available a set of tapes (or alternatively a deck of punch cards) containing information for a fairly large national sample of households, consisting of perhaps 60,000 units (about 1/10 of one percent of the total). All identifying information will be removed from the tape so as to eliminate the possibility of disclosure of personal information. Such a set of tapes or cards could be used by specialized organizations to make additional tabulations on subjects of a special interest to them.

A second program being studied is the preparation of duplicate sets of tapes for 5 percent or perhaps even 20 percent of persons and dwelling units. If such a set were prepared at the time the regular tabulations are in process, it should prove feasible to carry out special tabulations for outside organizations, research groups, etc., without delaying the regular work of the census. It is believed that such a program, if found feasible, might very substantially increase the value of census results to the nation as a whole by speeding up the availability of tabulated information not included in the regular census publication program. . . .

HANDLING NAVAL TACTICAL SITUATIONS

— THE NAVAL TACTICAL DATA SYSTEM AND THE UNIVAC ADVANCED NAVY COMPUTER

R. E. McDonald, General Mgr.
Remington Rand Univac Military Div.
St. Paul 16, Minn.

The U. S. Navy revealed at the end of August the development of an automated Naval Tactical Data System (NTDS) that can process critical combat information in millionths of a second and will result in a tremendous increase in task force capability against enemy air attack and ship-launched missiles.

The Naval Tactical Data System represents a successful culmination of a joint cooperative effort between the Navy and industry. The overall responsibility and operational concept and guidance have come from the Office of the Chief of Naval Operations. The Bureau of Ships has been the prime executor in System Technical Design contract administration and hardware implementation; it has been aided in these duties by the Navy Electronics Laboratory with respect to test, evaluation, and design improvements of the experimental system.

The extremely compact electronic computing system collects, processes, and evaluates naval tactical data and recommends courses of action in almost "zero" time.

The new Univac Advanced Navy Computer is the heart of the new system; it is one of the smallest, yet most capable digital computers ever built.

Remington Rand Univac in St. Paul carried out the initial feasibility study, the design and development of six computer prototypes, and the development of at least 20 pieces of communicating peripheral equipment, each of which involved design efforts as demanding as that required by the computer itself.

The basic objective of the research and development phase was to determine the feasibility of automatic data processing for naval tactical situations. The computers and associated equipment - integrated with communications and sensor equipment - have undergone over a year of tests.

As systems contractor, Remington Rand Univac has been responsible for coordinating the efforts of other associated contractors on the program. All phases of the program - research, development, test - have been conducted with excellent coordination between the St. Paul operation, other prime contractors (Hughes Aircraft Co. and Collins Radio Co.), Navy officials, and the various naval installation sites.

Modular or building block construction contributes to the compactness and maintenance of the Univac Advanced Navy Computer. It contains 3,776 identically packaged electronic circuit modules. The entire computer measures only 3x3x6 feet - less than the space occupied by a businessman's desk. Rollout drawers permit easy and rapid access to the component packages.

The computer is a general-purpose, stored-program machine with a very high-speed, random-access memory containing 1,000,000 bits of information. Thirty bits, comprising a single word, may be extracted from any location in the memory in only 2.5 millionths of a second. The instruction list consists of 64 operations which the computer is capable of performing, such as: ADD, SUBTRACT, STOP, READ, STORE, etc. The machine carries out 50,000 instructions per second.

The computer is designed to meet rigid military requirements, even under the extreme environmental conditions inherent in shipboard operations. All units are "ruggedized" against the effects of shock, vibration, salt air, etc.

New design concepts and the use of transistor-diode circuitry, rather than the conventional vacuum tubes, are largely responsible for the computer's small physical size. Although it occupies only about nine square feet of floor space, the Univac Advanced Navy Computer does the work of two Univac 1103 computers, each of which occupies about 1,400 square feet of floor space.

Transistor-diode circuitry and new packaging techniques also minimize power consumption. The computer operates on 2,500 watts of electricity.

As long ago as 1950, the operational control of huge naval task forces and ships had already become too complex for rapid handling solely by human beings. Combat Information Centers (CIC's), consisting of small command groups aboard ships, served as shipboard or task force "nerve centers." CIC's were mechanized to a degree by radars, teletype machines, radios, plotting boards, etc., but the Navy realized that a much greater degree of automation was vital in order to sufficiently increase its naval power. Space age weapons dictated automation and high-speed equipment in shipboard tactical systems. Swift advances in the field of electronics offered solutions to these problems.

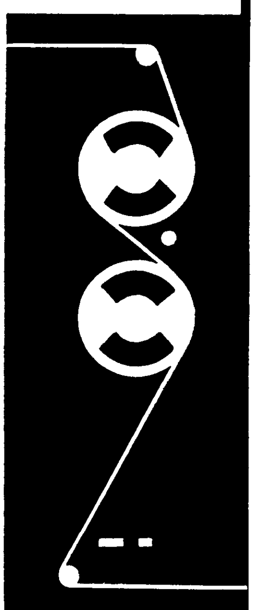
COMPUTER SERVICES

You can solve your computer problems quickly and economically by using our 32K-word storage IBM 704. Whether you need long or short runs, they can be readily scheduled on our machine at the same attractive rate for every shift—**$275 per hour,** including all peripheral equipment and operators.

Bring your program and work in our Client's Room between runs — Or mail us your program with instructions for running it and we will mail back the printout within 24 hours — Or simply leave your entire problem in the hands of our capable mathematical analysts and programmers.

If you need pipe stress, structural stress, flow analysis, or curve fitting, one of our general programs might well be just what you are looking for.

To use our prompt, efficient computer services, write or call us collect, HIlltop 5-4321, extension 1449.



ELECTRIC BOAT GROTON, CONNECTICUT
A DIVISION OF GENERAL DYNAMICS

From a naval tactical standpoint, the use of computers for the collection, display and dissemination of combat information permits the automation of many tasks, which can be performed enormously faster and more accurately by a machine, thus freeing men to concentrate on decision-making.

The computer processes and correlates information obtained from data-gathering sources such as radar and sonar.

Computers aboard the units of a widely-deployed naval task force exchange information which, added to that held internally in its computer memory, provides complete knowledge of the over-all tactical situation. All echelons of the command can disseminate their orders automatically and at high speeds.

The high-speed communication between computers enables all units in the task force to operate in a very well coordinated fashion, almost as if it (the task force) were one huge ship.

By simply inserting a new program, the computer can be made to handle new tasks and problems. Thus, the same computer can be used, regardless of the type of ship and its tactical responsibilities; the system will be fully adaptable to future changes in tactical environments.

CAN YOU TELL THE COMPUTER'S RESPONSES FROM THE PEOPLE'S RESPONSES? — KEY

In the September issue we published 25 comments on the weather and for each comment 10 responses, one made by a computer and the other nine made by people. We did not there indicate which one of the ten responses was the computer's response. But here is the key — the following list identifies the computer's response:

1.10	11.3	21.7
2.4	12.6	22.4
3.8	13.8	23.1
4.8	14.10	24.4
5.8	15.8	25.7
6.2	16.4	
7.4	17.9	
8.9	18.5	
9.4	19.5	
10.1	20.8	

We shall be glad to hear from any of our readers what his batting average was.

ROSTER OF ORGANIZATIONS IN THE COMPUTER FIELD

(Supplement, information as of September 8, 1960)

The purpose of this Roster is to report: organizations making or developing computing machinary or data-processing machinery; organizations supplying computing services or consulting services in the computer field; and organizations supplying components or services used in the computer field if related to the field (for example, magnetic drums would be such a component).

This listing is a supplement to the cumulative edition containing about 700 entries published in the 6th annual issue of "The Computer Directory and Buyers' Guide, 1960", the June 1960 issue of "Computers and Automation". This listing contains only additions or revisions as compared with previous entries.

Abbreviations

The key to the abbreviations follows:

Activities

- Ma Manufacturing activity
- Sa Selling activity
- Ra Research and development
- Ca Consulting
- Ga Government activity
- Pa Problem-solving
- Ea Educational activity
- Ba Buying activity
  (Used also in combinations as in RMSa "research, manufacturing, and selling activity")

Size

- Ls Large size, over 500 employees
- Ms Medium size, 50 to 500 employees
- Ss Small size, under 50 employees (no. in parentheses is approx. no. of employees)

When Established

- Le Long established organization (1930 or earlier)
- Me Organization established a "medium" time ago (1931 to 1950)
- Se Organization established a short time ago (1951 or later) (no. in parentheses is year of establishment)

Interest in Computers and Automation

- Dc Digital computing machinery
- AC Analog computing machinery
- Ic Incidental interests in computing machinery
- Sc Servomechanisms
- Cc Automatic control machinery
- Mc Automatic materials handling machinery

*C This organization has kindly furnished us with information expressly for the purpose of the Roster and therefore our report is likely to be more complete and accurate than otherwise might be the case. (C for Checking) / 60: information furnished in 1960)

Organization Entry Form

The form to be completed for an entry in the Roster of Organizations follows:

1. Your organization's correct name?________
____
2. Street address?________________
3. City, Zone, State?______________
4. Telephone Number?______________
5. Brief Description of your Product Lines and Services_________________________
____
____
____
6. Types of Activity that you engage in:
   ( ) Research
   ( ) Manufacturing
   ( ) Selling
   ( ) Other (please explain)____________
   ____
7. Approximate number of your employees?____
8. Year when your organization was established?
   ____
9. Listings for two of your executives:
   Name_______________ Title________
   Name_______________ Title________

Filled in by____________Title_____Date______

ROSTER

Bryant Computer Products, a Div. of Ex-Cell-O Corporation, 850 Ladd Rd., Walled Lake, Mich. / MArket 4-4571 / *C 60
Magnetic storage drums, disc files, associ-

ated electronics, magnetic heads / RMSa Ms(140) Se(1954) Ic

Cambridge Communications Corp., 238 Main St., Cambridge 42, Mass. / Ki 7-1997 / *C 60
Abstracting articles and reports on cards / MSa Ss(9) Se(1957) Ic

Computer Equipment Corp., 1931 Pontius Ave., Los Angeles 25, Calif. / GRanite 8-0464 / *C 60
Hybrid electronic systems combining analog and digital techniques; test instrumentation / RMSa Ss(25) Se(1958) DAIc

Computer Sciences Corp., Malaga Cove Plaza, Palos Verdes, Calif. / FRontier 5-2551 / *C 60
Complete computing. Data processing, consulting, including analysis, programming, training, staffing, documentation, machine processing (both commercial and scientific) / RCa Ss(30) Se(1959) Ic

Computer Systems, Inc., Culver Rd., Monmouth Junction, N. J. / DA 9-2351 / *C 60
Analog general purpose and special purpose computers, electronic multipliers, diode function generators, digital control systems / RMSa Ms(130) Me(1950) DAICc

Computronics, Inc., 5310 E. Pacific Pl., Denver 22, Colo. / SK 6-3608 / *C 60
Analog systems and components for instrumentation, computers, controls, and data handling / RMSCa Ss(16) Se(1959) AIc

Designers for Industry, Inc., 4241 Fulton Parkway, Cleveland 9, Ohio / Shadyside 9-0700 / *C 60
Research and development including pilot production of automation computers, time computers, point-to-point positioning controls for special purpose devices, special digital computers, steel mill data computers / RMSCa Ms(225) Me(1935) DIc

Digital Development Corp., 7541 Eads Ave., La Jolla, Calif. / GLencourt 9-1724 / *C 60
Magnetic memory drums to customer specifications / RMSa Ss(10) Se(1959) Ic

Electronic Counters, Inc., 155 Eileen Way, Syosset, L. I., N. Y. / WAlnut 1-5000 / *C 60
Computer programmed counters and digital meters, shift registers, high speed or quick look digital recorders / MSa Ss(16) Se(1960) DIc

Fairchild Semiconductor Corp., 545 Whisman Rd., Mountain View, Calif. / YOrkshire 8-8161 / *C 60
Diffused silicon transistors, diffused silicon diodes / RMSa Ls(1000) Se(1957) Ic

I T T Kellogg (formerly Kellogg Switchboard & Supply Co.), 6650 So. Cicero Ave., Chicago 38, Ill. / POrtsmouth 7-6900 / *C 60
Complete switching systems for industrial applications. Wire transmission equipment, telephone switching equipment, digital computing equipment, radio multiplexing equipment / RMSCa Ls(3500) Le(1897) DIc

Kellogg Switchboard & Supply Co., 6650 So. Cicero Ave., Chicago 38, Ill. — name changed to I T T Kellogg, which see

Landis & Gyr, Inc., 45 West 45 St., New York 36, N. Y. / JUdson 6-4644 / *C 60
Impulse counters, single decade impluse counters, add-subtract and totalizing counters, printing counters / RMSa Ls(over 9000 in this and associated companies) Le(1896) Ic

Litton Industries, Electronic Equipments Div., 336 No. Foothill Rd., Beverly Hills, Calif. (also Potentiometer Div., 215 S. Fulton Ave., Mt. Vernon, N. Y.) / CR 4-7411 / *C 60
Inertial navigation systems, digital differential analyzers, airborne data processing systems, airborne computers, flight control systems, analog-digital converters, accelerometers. Precision potentiometers, resistors / RMSa Ls(19,700 all divisions) Se(1953) DAICc

Management and Business Automation, 600 W. Jackson Blvd., Chicago 6, Ill. / DEarborn 2-3206 / *C 60
Monthly magazine devoted to business automation edited for corporate and systems executives in industry, institutions, government agencies / MS(publg)a Ss(35) Se(1958) Ic

Monroe Calculating Machine Co., Div. of Litton Industries, 555 Mitchell St., Orange, N. J. / OR 3-6600 / *C 60
Digital computers, data processing systems, desk calculators, adding machines, tape punch equipment, magnetic heads and drums / RMSa Ls(4500) Le(1911) DAICMc

Pennsylvania State Univ.: Computer Facilities, Electrical Engineering Dept., Penn State Univ., University Park, Pa. / University 5-7701 / *C 60
Digital computing service for the University; PENNSTAC digital computer; analog computers, network analyzer / RPEa Ss(13) Se(1952) DAc

Saab Aircraft Co., Electronic Div., Bureau for Engineering Data Processing, Linköping, Sweden / *C 60
Digital computers for process control and for numeric control of machine tools and data processing. Magnetic tape systems. Computing service. Saab Automatic Computer and Saab D-2 / RMSCa Ls(500) Me(1949) DIc

Telex, Inc., 1633 Eustis Ave., St. Paul, Minn. / Midway 6-7211 / *C 60
Random access disc files / RMSa ?s ?e Ic

University of North Carolina, Computation Center, Chapel Hill, N. C. / 7037 or 7038 / *C 60
Instruction in: computer-oriented mathematics; research in automatic programming, automatic numerical analysis, solution of partial differential equations, and linear equations; handling research and data processing problems of the three branches of the university; processing business and population data for the U. S. Bureau of the Census / RCGPEa Ms(50) Se(1959) DISc

WHEELER-FAIRCHILD, INC., 610 So. Arroyo Parkway, Pasadena, Calif. / MU 1-6721 / *C 60
Magnetic data storage drums / RMSa Ss(25) Me(1950) Ic

Zator Co., 140-1/2 Mt. Auburn St., Cambridge 38, Mass. / TRowbridge 6-6776 / *C 60
Theoretical research in information retrieval and artificial intelligence. Consulting in applications of information retrieval / RCa Ss(3) Me(1947) Ic

CALENDAR OF COMING EVENTS

Oct. 4-6, 1960: Meeting, Burroughs 220 Computer User Group (CUE), Philadelphia, Pa.; contact Merle D. Courson, First National Bank of San Jose, San Jose, Calif.

Oct. 9-14, 1960: 1960 Fall General Meeting of American Institute of Electrical Engineers, New York, N.Y.; contact Clarke S. Dilkes, Assoc. Dir., Burroughs Corp., Research Ctr., Paoli, Pa.

Oct. 10-12, 1960: National Electronics Conference, Hotel Sherman, Chicago, Ill.; contact Prof. Thomas F. Jones, Jr., NEC Program Chairman, School of Electrical Engrg., Purdue Univ., Lafayette, Ind.

Oct. 10-14, 1960: American Institute of Electrical Engineers, Fall General Meeting, Chicago, Ill.

Oct. 17-19, 1960: Symposium on Adaptive Control Systems, sponsored by Long Island Section, Institute of Radio Engineers, Garden City Hotel, Garden City, L.I., N.Y.; contact F. P. Caruthers, Symposium Chairman, c/o Specialties Inc., Skunks Misery Rd., Syosset, N.Y.

Oct. 19-26, 1960: Second Interkama — International Congress and Exhibition for Measuring Techniques and Automation, Düsseldorf, Germany.

Oct. 20-22, 1960: 7th International Meeting of the Institute of Management Sciences, with session "Use of Computers in Simulation," Hotel Roosevelt, New York, N.Y.; contact James Townsend, 30 E. 42 St., New York 17, N.Y.

Oct. 26-27, 1960: The 1960 Computer Applications Symposium, sponsored by Armour Research Foundation of Illinois Institute of Technology, Morrison Hotel, Chicago, Ill.; contact Andrew Ungar, Armour Res. Foundation, 10 W. 35 St., Chicago 16, Ill.

Oct. 31-Nov. 2, 1960: 13th Annual Conference on Elec. Techniques in Medicine and Biology, Sheraton Park Hotel, Washington, D.C.; contact G. N. Webb, Rm. 547, CSB, Johns Hopkins Hosp., Baltimore 5, Md.

Oct. 31 — Nov. 4, 1960: 7th Institute of Electronics in Management, featuring Current Developments in Automatic Data Processing Systems, American University, Washington, D.C.; contact Dr. Lowell H. Hattery, Director, 7th Inst. on Electronics in Management, The American University, 1901 F St., N. W., Washington 6, D.C.

Nov. 5, 1960: Meeting of the Society for Industrial and Applied Mathematics, Univ. of Pennsylvania, Physical Sciences Bldg., 33rd & Chestnut Sts., Philadelphia, Pa.; contact Dean Gillette, Bell Telephone Laboratories, Inc., Whippany, N. J.

December 13-15, 1960: Eastern Joint Computer Conference, New Yorker Hotel, New York City; contact Dr. Nathaniel Rochester, IBM, Yorktown Heights, N.Y.

Jan. 16-19, 1961: ISA Winter Instrument-Automation Conference & Exhibit, conference at Sheraton-Jefferson Hotel, exhibit at Kiel Auditorium, St. Louis, Mo., contact William H. Kushnick, Exec. Dir., ISA, 313 Sixth Ave., Pittsburgh 22, Pa.

Feb. 15-17, 1961: International Solid State Circuits Conference, Univ. of Pa. and Sheraton Hotel Philadelphia, Pa.; contact Jerome J. Suran, Bldg. 3, Rm. 115, General Electric Co., Syracuse, N. Y.

March 16-17, 1961: Conference on Data Processing Techniques and Systems, sponsored by Numerical Analysis Laboratory at the University of Ariz., featuring "Discussions of data processing problems in engineering and scientific research," Tucson, Ariz.; contact Miss Betty Takvam, Conference Secretary, Numerical Analysis Lab., Univ. of Ariz., Tucson, Ariz.

Mar. 20-23, 1961: IRE International Convention, Coliseum and Waldorf-Astoria Hotel, New York, N. Y.; contact Dr. G. K. Neal, IRE, 1 E. 79 St., New York 21, N. Y.

Apr. 19-21, 1961: S. W. IRE Reg. Conf. and Elec. Show, Dallas, Tex.; contact R. W. Olson, Texas Instruments Co., 6000 Lemmon Ave., Dallas 9, Tex.

May 7-8, 1961: 5th Midwest Symposium on Circuit Theory, Univ. of Ill., Urbana, Ill.; contact Prof. M. E. Van Valkenburg, Dept. EE, Univ. of Illinois, Urbana, Ill.

May 9-11, 1961: Western Joint Computer Conference, Ambassador Hotel, Los Angeles, Calif.; contact Dr. W. F. Bauer, Ramo-Wooldridge Co., 8433 Fallbrook Ave., Canoga Park, Calif.

May 22-24, 1961: National Telemetering Conference, Chicago, Ill.

Readers' and Editor's Forum

FRONT COVER: ARITHMETICAL SECTION OF THE UNIVAC ADVANCED NAVY COMPUTER

Making use of information communicated to it by all other parts of the computer system, this section of the Univac Advanced Navy Computer performs all mathematical computations. The entire computer in size is 3 by 3 by 6 feet, contains a random-access memory of 1,000,000 bits of information, and has an access time of 2-1/2 millionths of a second. See more information on page 25.

THE SOCIAL RESPONSIBILITIES OF COMPUTER PEOPLE -- REPORTS AND DISCUSSIONS AT THE MEETING OF THE ASSOCIATION FOR COMPUTING MACHINERY, AUGUST, 1960

At the meeting of the Association for Computing Machinery, Milwaukee, Wisc., August 23-26, 1960, one of the sessions -- a third parallel session on the afternoon of August 24 -- had for its theme the Social Responsibilities of Computer People. This session was attended by over 200 and perhaps 300 people.

The program was as follows:

Social Responsibilities of Computer People

Chairman: Arvid W. Jacobson, Detroit Research Inst., Detroit, Mich.

1. Ethical Background for Social Responsibility, Rev. Jerome E. Bruenig, S.J., Marquette Univ., Milwaukee

2. Toward a Computer-Contained Model of a Democracy, Louis L. Sutro, Mass. Inst. of Techn., Cambridge, Mass.

3. Social Implications of Automation, Edgar Weinberg, U.S. Bureau of Labor Statistics, Washington, D.C.

4. The Responsibility to Apply Computers and Computer Techniques for the Improvement of Business and Economic Conditions, Roger R. Crane, Touche Ross Bailey and Smart, Detroit, Mich.

One "short contributed paper", title "The Social Responsibilities of Computer People and Peace Engineering", was presented by E. C. Berkeley, Computers and Automation, Newtonville 60, Mass.

Considerable discussion took place. There was enough interest and desire to discuss so that a "Hall of Discussion" was arranged for the following evening.

This discussion, with about 15 or 18 people present, lasted 2½ hours, until the air conditioning was turned off.

Following are some brief reports or abstracts on what was said.

ETHICAL BACKGROUND FOR SOCIAL RESPONSIBILITY

Rev. Jerome E. Breunig, S.J.

Abstract

THE PROBLEM: Are technological advances such as automation and computing machinery becoming monstrous Frankensteins threatening the very existence of their human creators?

BACKGROUND FOR SOLUTION: By no means, if technologists intelligently recognize their position as trusted stewards of God's world and reaffirm and understand the basic essentials of the ethics of their profession:

1. respect for a personal God as man's final goal and the arbiter of good and evil;

2. recognition of man's immortal soul with an eternal destiny dependent on a temporal existence;

3. acknowledgement of the objective reality and immutable claims of moral values;

4. consequently, the formulation of the most basic conclusions in a code that expresses the essential content of the moral law.

Remark: .... "The tendency is also evident in our democratic, de-theocized West, where there is an increasing attempt to identify morality with the will of the majority or with mere legality. How else, for example, can we explain the calamitous current invasions of the sanctity of life, which was once regarded as the prerogative of God alone."

TOWARD A COMPUTER-CONTAINED MODEL OF DEMOCRACY

Louis L. Sutro

Abstract

The Constitution is a verbal model of a democratic government. It is orderly and easy to grasp. However, when we compare the United States' government as reported in newspapers and on television with the constitutional model, there is only a vague correspondence. The democracy that has evolved from the original design is now described by thousands of volumes of laws, legal decisions and descriptions of Americans' behavior. Here a computer could be helpful. It could store and run the model. A display system could show its structure and show the effects of various inputs.

Ideas: "We can imagine equipment for helping citizens look up the background for questions, so that they could understand them, and decide intelligently about them. Perhaps a few minutes a day, or a few hours a week, citizens could spend with a computer and find out what they wanted to know. ....

"A computer could probably furnish models of socio-economic systems and models of political systems."

SOCIAL IMPLICATIONS OF AUTOMATION

Edgar Weinberg

(Brief Report)

It is an important sign of the times that scientists are becoming interested in the social consequences of their work. Many years ago the English mathematician Babbage was interested in the statistics of jobs and of machines, and the displacement of workers by machines.

The Bureau of Labor Statistics has gathered experience on the displacement of people by automation in the form of case studies. The studies have examined the changes in productivity and are based on on-the-spot interviews. The case studies included: the radio and television industry, where printed circuitry has been applied; a petroleum refinery; a bakery; office automation in a large insurance company; an automatic airline reservations system. We studied 20 private companies which had pioneered in business data processing. Although we covered only a small area, some useful conclusions were reached.

There are cultural shock absorbers for reducing impact.

1. Avoiding layoffs. Layoffs are not inevitable. In the Dept. of the Treasury the work on payment and reconciliation of checks has in the last few years resulted in a decrease of 44% in unit cost. Yet only a negligible portion of the force was laid off. Some employees were used in work that could not previously be done.

2. Advance personnel planning. Usually three years pass between the feasibility study and the adoption of data processing machinery on a large scale. This provides a long period of preparation and can lead to orderly change through advanced personnel planning.

3. Prior notice. A year or more in advance, an employer can tell an employee "you will continue to have a job, but not necessarily in the same work."

4. Orderly procedure for reassignment. Reassignment to other jobs can be well planned and scheduled.

5. Turnover. Turnover can be used to cut out jobs. In one large insurance company, about 12% of jobs that were vacated by employees leaving were not filled.

6. Retraining clerical workers for other jobs. In one good example, the employer provided typist training and key punch training on the job.

7. Reassignment within the company. In one case four out of five employees found other jobs within the company, based on aptitude tests and personal interviews. Yet only 52 out of 2800 people were selected for electronic jobs and remained on the original work.

8. New, better jobs. In many cases, the new jobs were better than the old ones.

9. Use of older workers. In some cases, persons over 45 were retrained, the company

gaining the advantage of their experience and sense of responsibility.

10. Systematic procedure for layoffs. The employer offered displaced employees jobs in other cities, but also the employer canvassed local employers for new jobs for their people.

11. Severance pay. Severance pay can be provided. Allowances can be given for moving.

In sum, automation can create difficulties for people, but they can be solved.

For more information see Bulletin 1276 published by the Dept. of Labor Statistics.

THE RESPONSIBILITY TO APPLY COMPUTERS AND COMPUTER TECHNIQUES FOR THE IMPROVEMENT OF BUSINESS AND ECONOMIC CONDITIONS

Roger R. Crane

(Brief Report)

The Social Responsibilities Committee of the Association for Computing Machinery is engaged in a very important field. But I shall be talking about the responsibility of managers to apply computer technology for the improvement of business and economic conditions.

We are a firm that has 2000 clients. In the course of a year, we see perhaps 200 presidents or directors of companies. Most of the time we meet them at lunch. We discuss their responsibility to do something about the new technology -- their responsibility as managers to improve the corporation. These people together with four or five more people within a corporation are the people able to change a corporation; other people do not have the leverage.

The kind of response which we often get is something like this: "Well, computers are great, I am sure; but I learned a lot at the Harvard Business School 25 years ago, and many of those good ideas I have not yet used."

The desirability of applying computers is difficult for them to see; we try to explain that we are dealing here with lead-time, the time required to change an organization. They are interested in immediate tangible payout; but we tell them that management systems that cannot work without electronic computers are going to happen in the next four or five years, and they will have to have such systems or they won't survive. In fact, we talk to them more or less in terms of survival. We say "Your company is an important segment of the economy. You can control your company either well or poorly." We say to them "You don't own the company. You are supposed to exercise vision, to undertake risk. As a corporate president, you are supposed to take the risk. Your responsibility is to your stockholders and to produce profits for them."

We are not too concerned about employees, because a lot of competent people are concerned very much with employees.

For example, we come across companies that have no such thing as a cost-accounting system. The president says, "I don't know the cost of each product." But if you have a computer, it does not cost you $100,000 to find out the cost of each product.

There were more than 9,000,000 clerical workers in 1958, and one out of every 7 persons working is a clerical worker. But in 1910, one out of every 20 workers was a clerical worker. So we have a potential labor shortage in the next 20 years. In 1954, 50 million people were employed in industry; yet at the rate at which people were employed in 1947, 58 million people would have been needed.

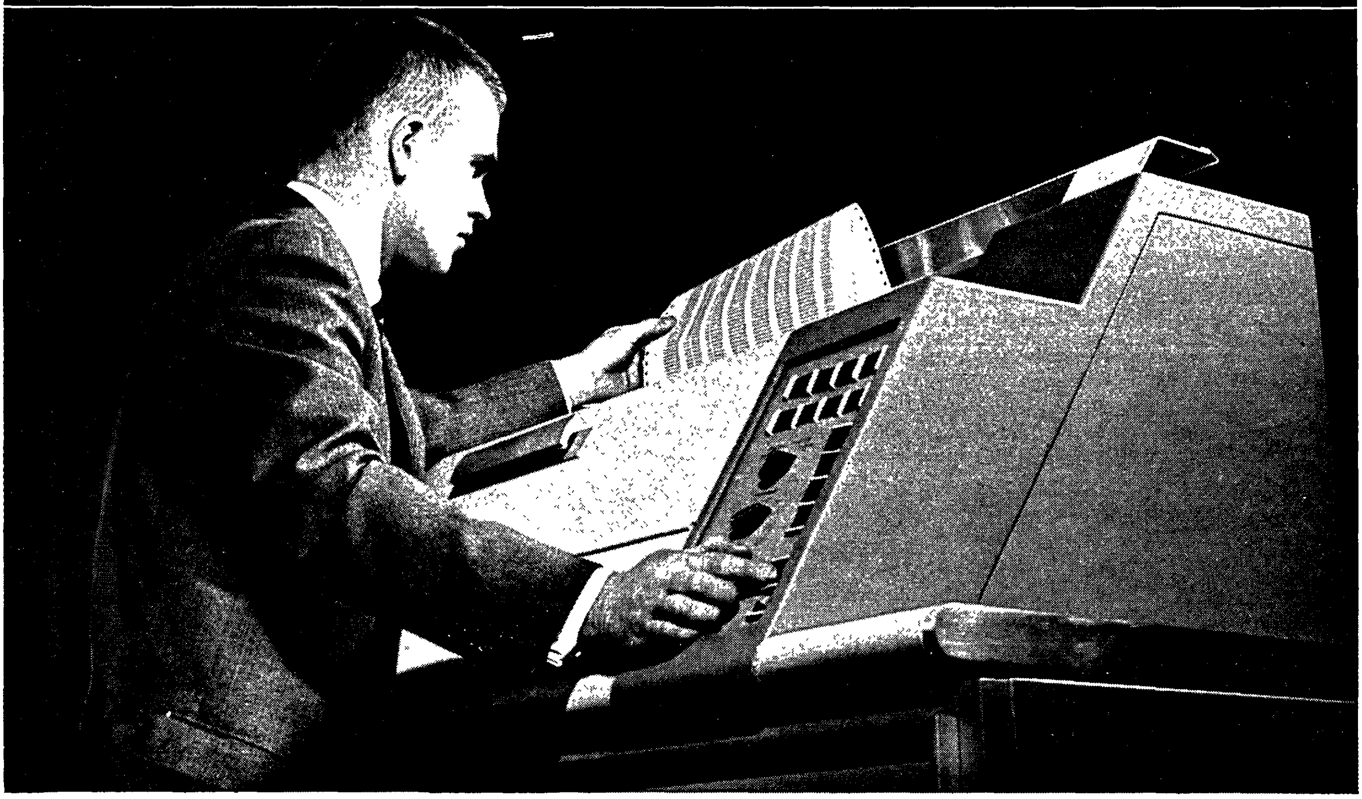
Improvement in the understanding of management problems is growing. For example, a company may place through several employees 100,000 purchase orders a year. Money tied up in inventory is not presently doing anything worthwhile. The analytical method plus the computer is much better than a human being. You can cut all costs, even with a very poor model; even with a manual system using mathematics you can cut costs. But it is not feasible to give a manual system using mathematics to the ordinary human being to apply. He has trouble applying it; he does not apply it well. He could apply it, of course; but with a computer you actually do apply it to a re-ordering system. Computers definitely apply to the management of inventory. The per cent of improvement is much more than 3 per cent.

We are approaching real-time knowledge about businesses and industries. When computers are used in more than 25 large companies, the results will be phenomenal.

The technical development, the hardware development, in the computer field is going at a terrific rate. The application rate should be higher. It is necessary to develop an understanding of routine decisions in business. It is necessary to watch models which simulate the operation of companies. A president or board of director, when he sees his own company simulated, is very much convinced.

(To be continued in the next issue.)

Another big plus for Honeywell Electronic Data Processing Systems



All new Honeywell printer sets down copy crisp and clean-- at a speed of 900 lines a minute

Printing is the final payoff in business data processing. All the electronic gymnastics and gyrations that go on within the complex equipment can be judged only by the finished product — the payroll check, the invoice, the market report.

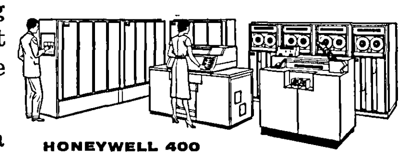
No ghosting, no smudges. Blazing fast, accurate, durable and easy to service, the new Honeywell high-speed printer writes a happy ending to every job. Its ultra-fast hammers are self-adjusting for perfect vertical and horizontal alignment. You get no ghosting or smudges with this one! And that goes for each of the five carbons you may need.

Double your printing speed. Fast? The new Honeywell printer dashes off copy at a speed of 900 lines a minute. And here's a bonus: its extra-long printing cylinder accommodates forms up to 22 inches wide. This means you can print many forms *two up* (business checks, for example), thus doubling your effective printing speed.

Built for uninterrupted service. To make sure this printer will maintain a proper adjustment and alignment indefinitely, Honeywell has built it of age-cast aluminum. All the stresses and strains are removed before machining. Replacements are easy to make, too. No other high-speed printer has so few moving parts, and most of these parts can be replaced within 15 minutes.

GET THE FACTS. *To learn more about this printer and the many other advanced features of Honeywell 800 and Honeywell 400, just write Minneapolis-Honeywell, Datamatic Division, Wellesley Hills 81, Massachusetts.*

HONEYWELL 800



HONEYWELL 400

Honeywell

Electronic Data Processing

Essential Special Terms in Computers and Data Processing — Suggested List, and Definitions

Part 2

(From: *Glossary of Terms in Computers and Data Processing,* 5th edition of the **Computers and Automation** glossary / Edmund C. Berkeley and Linda L. Lovett / Berkeley Enterprises, Inc., 815 Washington St., Newtonville 60, Mass. / July 1960, 96 pages, photo-offset, $3.95 to nonsubscribers, $1.85 to subscribers)

IV. Digital Computers

input — Computers. 1. Information transferred from outside the computer, including secondary or external storage, into the internal storage of the computer. 2. The sections of the computer which accept information from outside the computer, for example, magnetic tape readers or punch card readers. Same as "input equipment."

output — Computers. 1. Information transferred from the internal storage of a computer to secondary or external storage, or to any device outside of the computer. 2. The device or devices which bring information out of the computer.

memory — Computers. 1. The units which store information in the form of the arrangement of hardware or equipment in one way or another. Same as "storage." 2. Any device into which information can be introduced and then extracted at a later time.

PRODUCT PLANNER

Large, long established control manufacturer has opening for electrical engineer to plan products related to data handling in the industrial application of computers. Will be responsible for market analysis, product business analysis and product specifications. Understanding of computer technology and application required. Knowledge of computer marketing desired. Replies treated confidentially. Mail complete resume to Box 42, Computers and Automation, 815 Washington St., Newtonville 60, Mass.

arithmetic unit — Digital Computers. The section of the hardware of a computer where arithmetical and logical operations are performed on information.

control unit — Digital Computers. That portion of the hardware of an automatic digital computer which directs the sequence of operations, interprets the coded instructions, and initiates the proper signals to the computer circuits to execute the instructions.

address — Digital Computers. A label, name, number or symbol identifying a register, a location, or a device where information is stored. See also: absolute address, floating address, relative address, symbolic address.

access time — Digital Computers. 1. The time interval between the instant at which the arithmetic unit requires information from the storage or memory unit and the instant at which the information is delivered from storage to the arithmetic unit. 2. The time interval between the instant at which the arithmetic unit starts to send information to the memory unit and the instant at which the storage of the information in the memory unit is completed. — In analog computers, the value at time t of each dependent variable represented in the problem is usually immediately accessible when the value of the independent variable is at time t, and otherwise not accessible.

random access — Computers. Access to the memory or storage under conditions where the next register from which information is to be obtained is chosen at random, in other words, does not depend on the location of the previous register. For example, access to names in the telephone book is "random access"; the next name that anyone is going to look up in the book may be almost anywhere in the book with roughly equal probability.

pulse — Circuits. In general, a sharp difference, usually over a relatively short period of time, between the normal level of some physical variable corresponding to the average level of a wave or waves and a high or low level of that physical variable corresponding to the crest or trough of the wave; often, a sharp voltage change. For example, if the voltage at a terminal changes from −10 to +20 volts and remains there for a period of 2 microseconds, one says that the terminal received a 30 volt 2 microsecond pulse. A positive pulse is characterized by a rise or increase from one value of the variable to a greater value, a finite duration of the greater value, and a decay or decrease from the greater value back to the original value. A negative pulse is the same except that the change is to a smaller value.

channel — 1. Digital Computers. A path along which information, particularly a series of digits or characters or units of information, may flow or be stored. For example, in the machine known as a punch card reproducer, information (in the form of punch cards) may flow in either one of two card channels which do not physically connect. 2. Magnetic Tape or Magnetic Drums. A path parallel to the edge of the tape or drum along which information may be stored by means of the presence or absence of polarized spots, singly or in sets. 3. Delay Line Memory such as a Mercury Tank. A circular path forward through the delay line memory and back through electrical circuits along which a pattern of pulses representing information may be stored.

clock — Digital Computers. In a synchronous computer, the master circuit which provides pulses at equal times which schedule the operations of the computer. — In an asynchronous computer, there is no need for such a clock, since the closing or completion of one circuit initiates the operation of a subsequent circuit.

transducer — A device which converts energy from one form to another. For example, a slab of quartz crystal embedded in mercury can change electrical energy to sound energy (and vice versa), as is done in sonic delay lines in certain computer memory systems. "Any device which enables the conversion of any physical, chemical, or biological phenomenon into an electrical, hydraulic, pneumatic, mechanical, optical or other signal for transmission, recording, measurement, analysis, actuation, output or control. Transducers have been referred to as pick-ups, sensing elements, primary elements, command devices, sensors, detectors, and probes. As examples, transducers exist which convert pressure, temperature, acceleration, force, mass, time, distance, radiation and a multiplicity of other phenomena into electrical form. These signals are then readily fed to amplifiers, data processing systems, or output controllers. Many instrumentation problems may be resolved into the choice of input and output transducers with an interconnecting information-processing link. Transducers extend, refine, supplement, or replace man's senses in remote and hazardous locations where man himself cannot exist or survive, such as nuclear reactors and outer space." (From the Instrument Society of America) card — Computers. 1. A card of constant size and shape, adapted for being punched in a pattern which has meaning. The punched holes are sensed electrically by wire brushes, mechanically by metal fingers, or photo-electrically. Also called "punch card." One of the standard punch cards (made by International Business Machines Corporation) is 7 and 3/8 inches long by 3 and 1/4 inches wide, by 0.007 inches thick, and contains 80 columns in each of which any of 12 positions may be punched. Another of the standard punch cards (made by Remington Rand Division of Sperry Rand) is of the same size, but contains 90 columns in each of which any of 6 positions may be punched. 2. A thin board of plastic or similar material for mounting small circuit parts connected by printed circuits; a printed-circuit board.

magnetic tape — Tape made of paper, metal or plastic, coated or impregnated with magnetic material, on which polarized spots representing information may be stored.

V. Programming

information — 1. A set of marks or an arrangement of hardware that has meaning or that designates one out of a finite number of alternatives. 2. Any facts or data. 3. Any marks, characters, or signals which are put in, processed by, or put out by a computer.

instruction — Computers. A machine word or a set of characters in machine language which specifies that the computer take a certain action. More precisely, a set of characters which defines an operation together with one or more addresses (or no address) and which, as a unit, causes the computer to operate accordingly on the indicated quantities. *Note:* The term "instruction" is preferred by many to the terms "command" and "order"; "command" may be reserved for electronic signals; "order" may be reserved for uses in the meaning "sequence," as in "the order of the characters."

code (noun) — Computers. A system of symbols for representing information in a computer and the rules for associating them.

program (noun) — Computers. 1. A precise sequence of coded instructions for a digital computer to solve a problem. 2. A plan for the solution of a problem. A complete program includes plans for the transcription of data, coding for the computer, and plans for the effective use of the results.

transfer instruction — Digital Computer Programming. An instruction or signal which conditionally or unconditionally specifies the location of the next instruction and directs the computer to that instruction. See "jump."

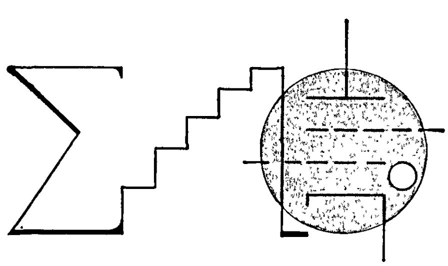
pseudo-code — Digital Computer Programming. An arbitrary code, independent of the hardware of a computer, which has the same general form as actual computer code, but which must be translated into actual computer code if it is to direct the computer.

automatic programming — Digital Computer Programming. Any method or technique whereby the computer itself is used to transform or translate programming from a language or form that is easy for a human being to produce into a form that is efficient for the computer to carry out. Examples of automatic programming are compiling routines, interpretive routines, etc.

compiler — Digital Computer Programming. A program-making routine, which produces a specific program for a particular problem by the following process: (1) determining the instructions intended in an item of information expressed in pseudo-code (an arbitrary code, independent of the hardware of the computer, which directs the computer to string together specified computer codes); (2) selecting or generating (i.e., calculating from parameters and skeleton instructions) the required subroutine; (3) transforming the subroutine into specific coding for the specific problem, assigning specific memory registers, etc., and entering it as an element of the problem program; (4) maintaining a record of the subroutines used and their position in the problem program; and (5) continuing to the next element of information in pseudo-code.

plugboard — 1. Punch Card Machines. A removable board holding many hundreds of electric terminals into which short connecting wire cords may be plugged in patterns varying for different programs for the machine. To change the program, one wired-up plugboard is removed and another wired-up plugboard is inserted. A plugboard is equivalent to a program tape which presents all instructions to the machine at one time. It relies on X-punches and other signals in the punch cards passing through the machine to cause different selections of instructions in different cases. 2. Computers. A similar board which may be used to guide or edit the handling of information in a computer or its output.

[To be continued in the next issue]



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"The Burroughs 220 Computer is a Potent Tool in Advancing Our Technology."

Dr. Charles D. Alstad, *Acting Director, Computations Research Laboratory,* The Dow Chemical Company

Why do it? There are many common denominators between the global Dow of 1960 and the infant Dow of 1897. Perhaps the most important one is a business philosophy stated by founder Herbert Henry Dow. He put it this simply: "If you can't do a thing better than it's already being done, why do it?"

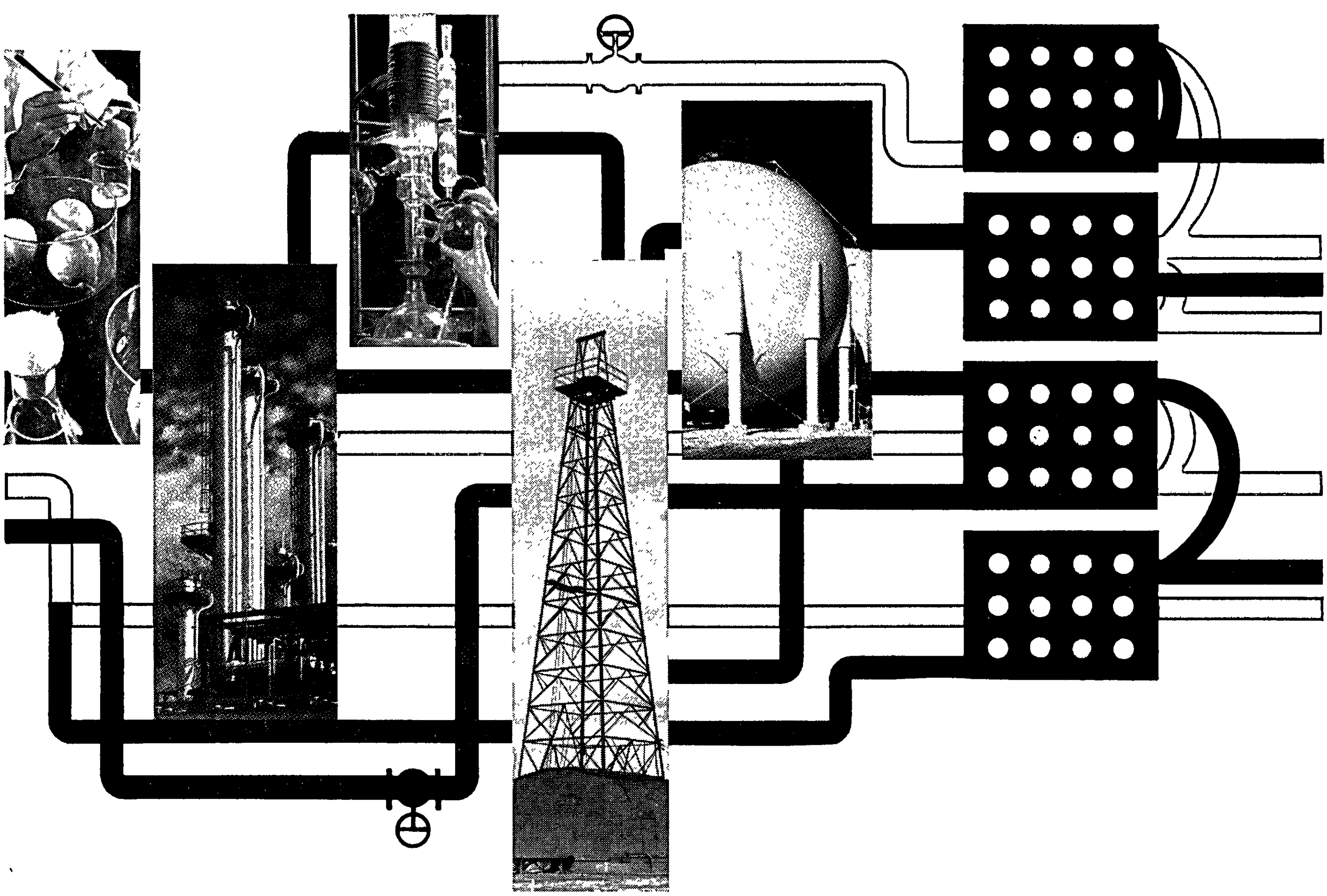
Under this pervading philosophy, Dow places heavy emphasis on new product research and operations research. And to help push advances in these areas farther and faster at less cost, Dow uses a Burroughs 220 Computer System.

THE BURROUGHS 220 AT DOW

This 220 system consists of the data processor with 5,000-word core storage, two supervisory printers, photoreader, two paper tape punches, three magnetic tape storage units, and a Cardatron sub-system for controlling punched card input and output. Selected for its greater capacity and speed, the 220 is one of two Burroughs Computers at Dow. The other: a Burroughs 205 Computer at Dow's Freeport, Texas, operation.

The 220 computer is at work in Dow's Computations Research Laboratory in Midland, Michigan, headquarters for the firm. As Acting Director Dr. Charles D. Alstad puts it, "Our use of the 220 is in scientific and engineering applications, where it is an important adjunct to all the scientific talents available at Dow."

Super screener. For example, Dow uses the computer as a screening tool in the development of higher energy solid rocket fuels under its contract with the Advanced Research Projects Agency. In pursuit of project goals, Dow chemists can envision many fuel combinations. But they can't, of course, subject each combination to exhaustive laboratory tests. Through the Burroughs 220, Dow gets all data necessary for preliminary evaluation of a fuel and gets it in anywhere from two minutes to a half hour. In this way, Dow scientists can select only the most promising combinations for laboratory evaluation, development and testing.



Turbine tamer. In another application, Dow uses the 220 in calculating turbine efficiency tests. The calculations, which were formerly performed by hand, took at least two weeks but now require less than five minutes on the computer.

Designing for profit. Plant design is another function of the 220. In today's hotly competitive chemical industry, it's essential to keep the cost per pound of product minimized. Consequently, a plant must be carefully designed for a specified capacity, minimum capital investment, and efficient operation. The computer is a useful tool in striving for these objectives.

Care and feeding of production. In an extension of plant design, Dow uses the 220 for plant simulation, using either a derived statistical model or a theoretical model to study an existing plant. The information obtained is valuable to Dow in maintaining quality of product and efficient use of facilities.

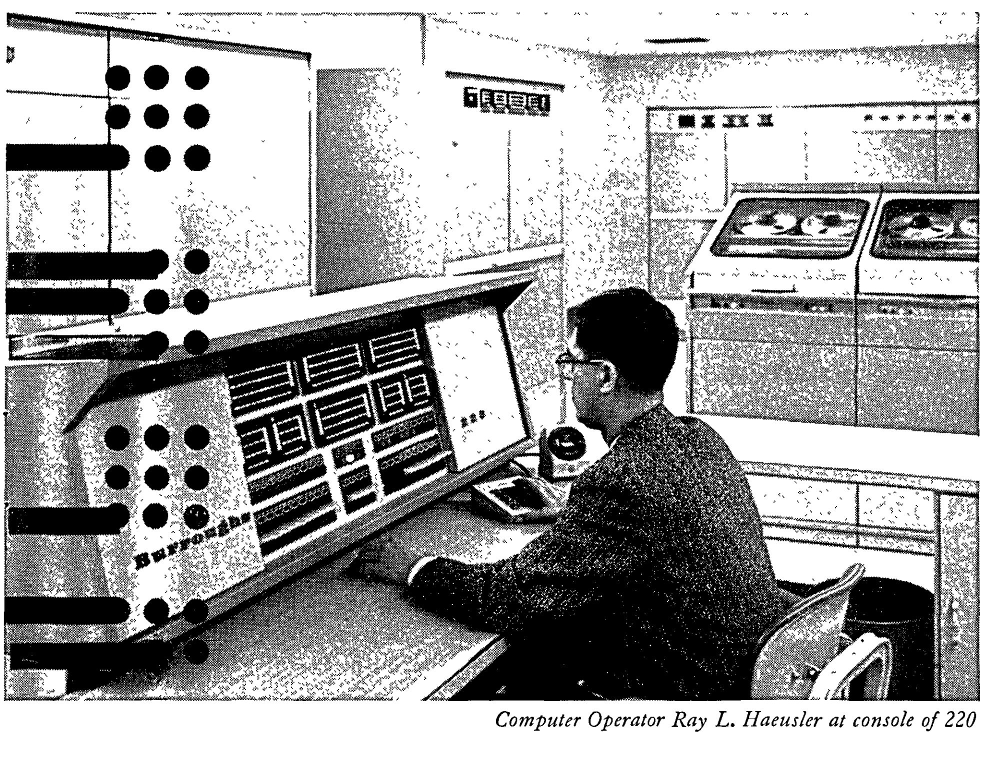
Dr. Charles D. Alstad

Masterminding molecules. The 220 at Dow is busy in pure research, too, where it is helping to advance the frontiers of science. For instance, Dow is investigating the bonding forces and links between the atoms in a molecule. And the Burroughs 220 performs the Urey-Bradley Force Constants Calculations that are required. These studies will supply the knowledge which will allow Dow scientists to make predictions on how a given chemical will behave in a reaction.

Long and short of it. There are many other aspects of the 220's work at Dow, such as its evaluation of pilot plant projects, information retrieval and other routine mathematical calculations. "Fundamentally," says Dr. Alstad, "our Burroughs 220 computer is a potent tool in advancing our technology. From the range of applications, you can get an idea of the computer's value to us. And you can see why we are most enthusiastic about the results and the potential of the digital computer in research and engineering applications."

FROM LITTLE, MUCH

Take five basic raw materials: sea water, brine, coal, petroleum, oyster shells. Add the talents, skills and knowledge of 29,000 people. Add generous helpings of research and progressive management attitude. Apply plants located throughout the world. And you get over 700 products in five categories: industrial chemicals, plastics, metals, agricultural chemicals, textile fibers. That, in brief, is Dow, the nation's fourth largest chemical company (1960 sales: $781 million).



Computer Operator Ray L. Haeusler at console of 220

The hundreds of other scientific and commercial users of Burroughs computers are getting equally impressive results, too. One reason is the capability of the equipment in Burroughs complete data processing line. Another reason is that the equipment is backed by a coast-to-coast team of computer specialists, who are primed to show you how thoroughly and efficiently they can help you. For information, write Burroughs Corporation, Detroit 32, Michigan.

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NEW PATENTS

RAYMOND R. SKOLNICK
Reg. Patent Agent
Ford Inst. Co., Div. of Sperry Rand Corp.
Long Island City 1, New York

THE following is a compilation of patents pertaining to computers and associated equipment from the "Official Gazette of the United States Patent Office," dates of issue as indicated. Each entry consists of: patent number / inventor(s) / assignee / invention. Printed copies of patents may be obtained from the U.S. Commissioner of Patents, Washington 25, D.C., at a cost of 25 cents each.

April 19, 1960 (Cont'd.)

2,933,253 / Frederick C. Hallden, Floral Park, N.Y. / Hazeltine Research, Inc., Chicago, Ill. / A binary adding circuit.

2,933,254 / Edwin A. Goldberg, Princeton Junction, and Arthur W. Vance, Cranbury, N.J. / R.C.A., a corp. of Del. / A computing device.

2,933,621 / Wolfgang J. Poppelbaum, Champaign, Ill. / Univ. of Ill. Foundation / A transistor flip-flop circuit.

2,933,626 / Ray E. Giboney, Amherst, and George E. King, Eggertsville, N.Y. / Westinghouse Electric Corp., East Pittsburgh, Pa. / A sample data control apparatus.

2,933,718 / William R. Arsenault, Pacific Palisades, Calif. / The Magnavox Co., Los Angeles, Calif. / A magnetic information member.

2,933,720 / Vernon L. Newhouse, Haddonfield, N.J. and William L. McMillan, Little Rock, Ark. / R.C.A. Corp., a corp. of Del. / A magnetic memory system.

April 26, 1960

2,934,262 / Samuel Lubkin, Brooklyn, N.Y. / Curtiss-Wright Corp., Carlstadt, N.J. / An electronic digital computer.

2,934,269 / Byron L. Havens, Closter, and Charles R. Borders, Alpine, N.J. / I.B.M. Corp., New York, N.Y. / A binary-decimal quintupler circuit.

2,934,270 / Joseph C. Logue, Poughkeepsie, and George D. Bruce, Wappingers Falls, N.Y. / I.B.M. Corp., New York, N.Y. / A binary counter unit using weighted winding logic elements.

May 3, 1960

2,935,251 / Arthur H. Dickinson, Greenwich, Conn. / I.B.M. Corp., New York, N.Y. / A data storage apparatus.

2,935,255 / Julius Reiner, Cambridge, Mass. / Laboratory For Electronics, Inc., Boston, Mass. / A high speed decade counter.

2,935,260 / George A. Philbrick, Dover, and Roger R. Noble, Norwell, Mass. / George A. Philbrick Researches, Inc., Boston, Mass. / A simplified analog multiplier.

2,935,609 / Richard Rabin, Stamford, Conn., and Kurt Merl, Bronx, N.Y. / Sperry Rand Corp., a corp, of Del. / A pre-trigger generator.

2,935,619 / Mortimer D. Rogers, Vestal, N.Y. / I.B.M. Corp., New York, N.Y. / A data handling system.

2,935,622 / Hewitt D. Crane, Palo Alto, Calif. / Burroughs Corp., Detroit, Mich. / A magnetic core logic element.

May 10, 1960

2,936,112 / Arthur H. Dickinson, Greenwich, Conn. / I.B.M. Corp., New York, N.Y. / A record sensing mechanism.

2,936,114 / Morris H. Brogden, Nashville, Tenn. / — / A computer for providing an electrical output proportional to the ratio of two quantities.

2,936,115 / James H. Alexander, New York, N.Y., Arthur W. Burks, Ann Arbor, Mich., and Donald A. Flanders, Chicago, Ill. / U.S.A. as represented by the U.S. Atomic Energy Comm. / An arithmetic unit for digital computers.

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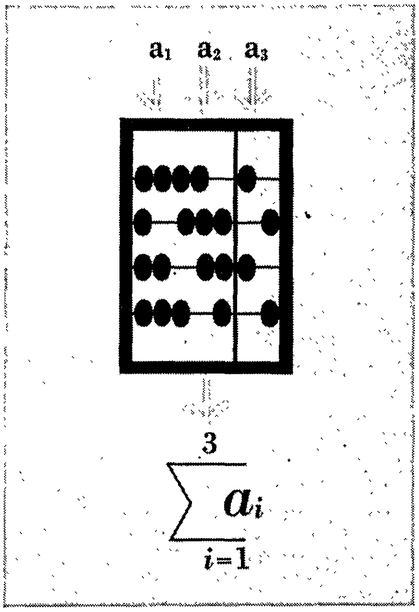

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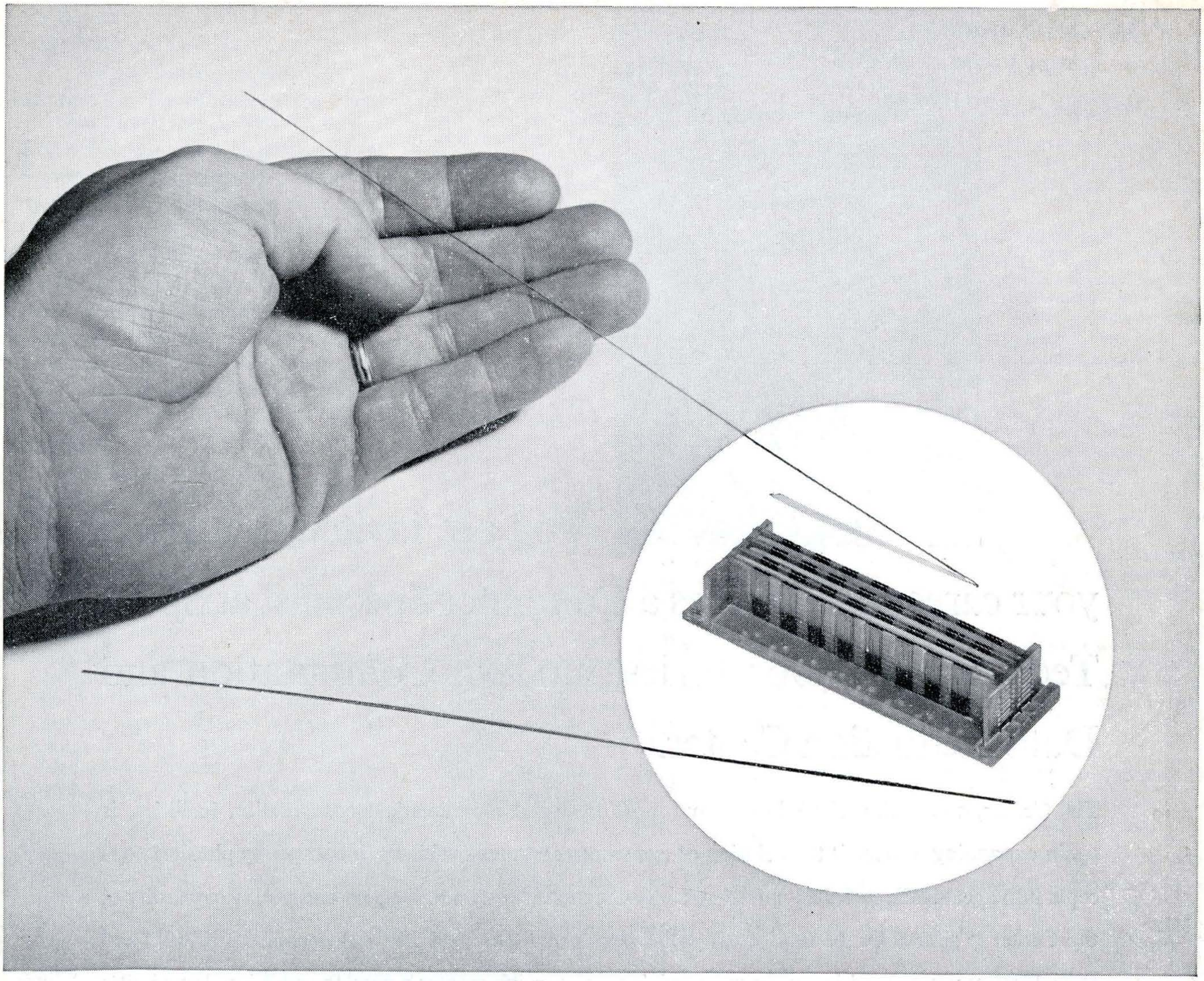

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DATA PROCESSING: Computer theory and component development, programming studies, high-speed non-mechanical printing and multi-copy methods, direct character recognition, systems design.

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