computers and automation

The Significance of Computer Investment Decisions

Tracking Ships by Electronic Computer

Let's Be Honest About Automation

Computers in Soviet Economic Planning

SEPTEMBER 1962

Vol. XI — No. 9

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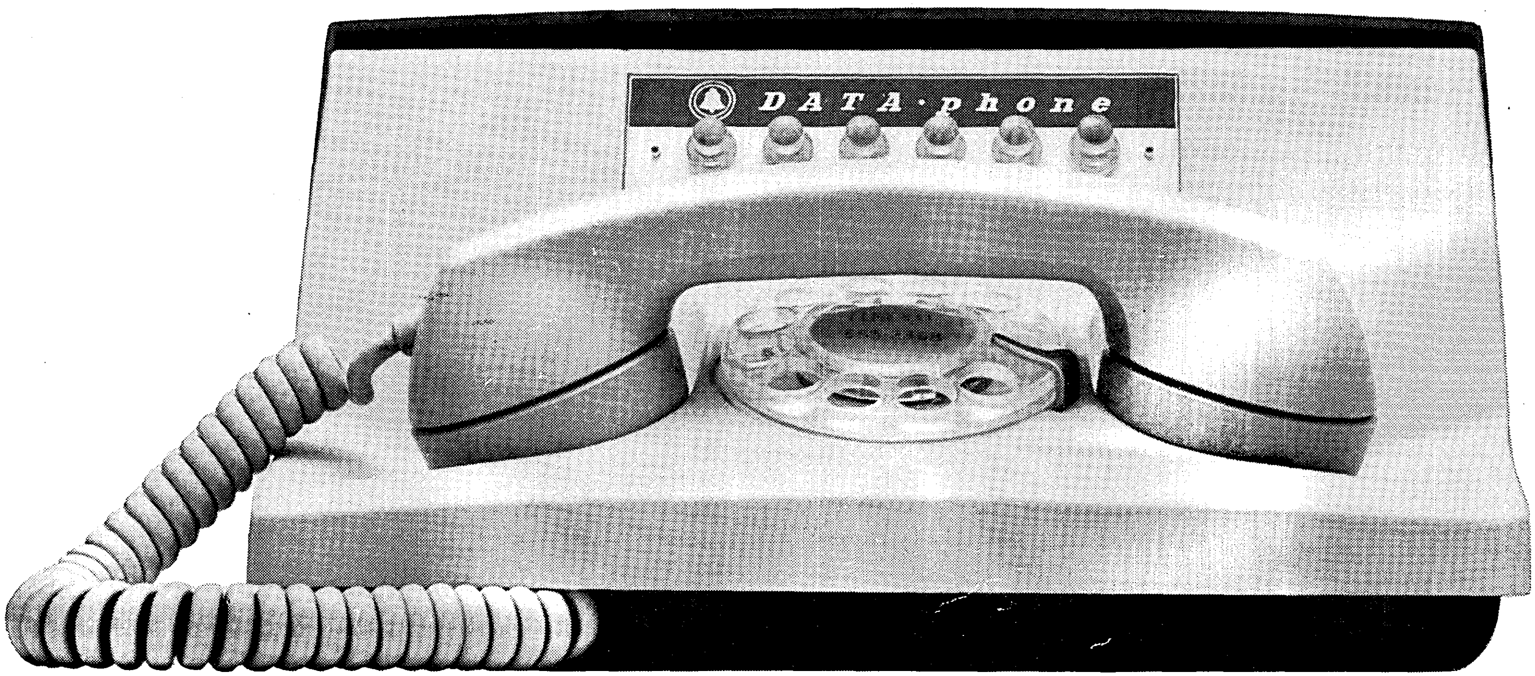

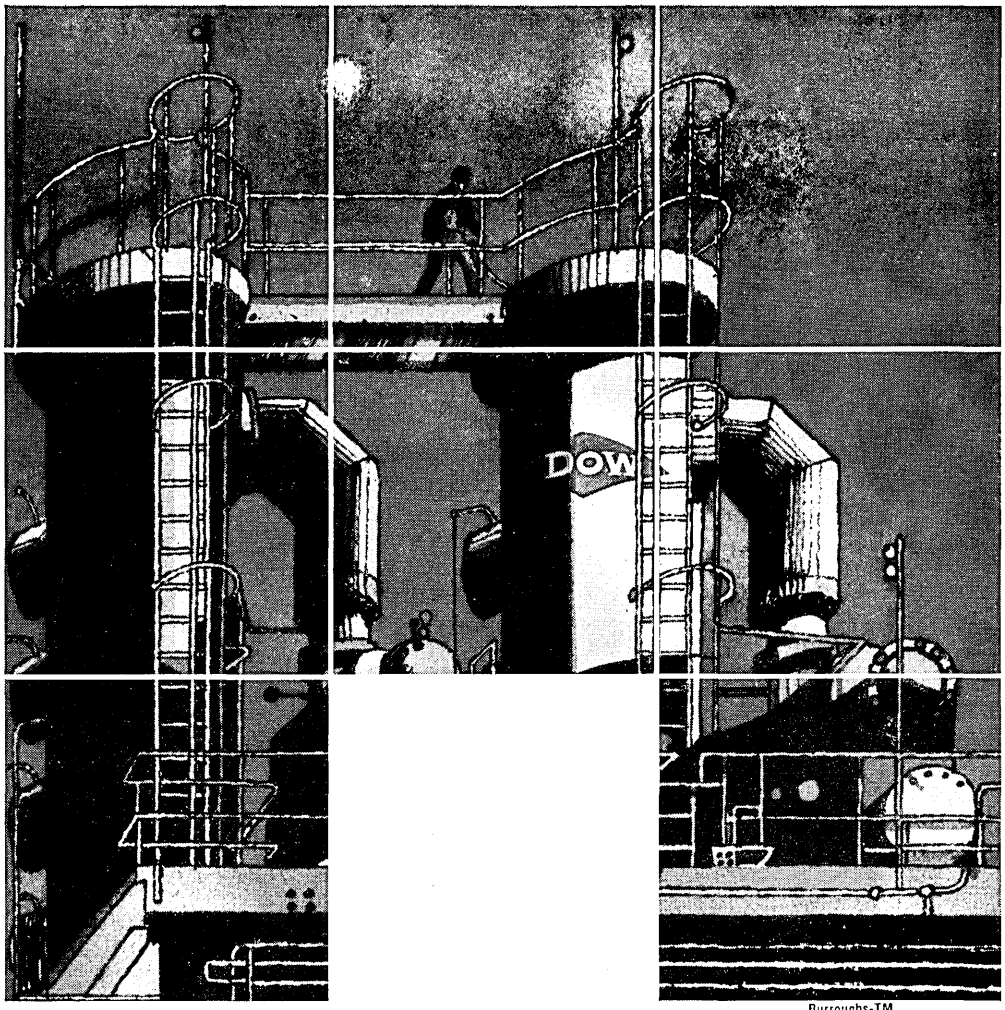

why Dow Chemical ordered a Burroughs B 5000

Burroughs-TM

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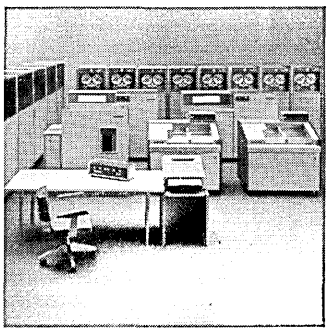

Burroughs B 5000 Electronic Computer System

so many data processing problems end with Burroughs B

COMPUTERS *and* AUTOMATION

COMPUTERS AND DATA PROCESSORS, AND THEIR CONSTRUCTION, APPLICATIONS, AND IMPLICATIONS, INCLUDING AUTOMATION

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Progress Is Our Most Important Product

GENERAL ELECTRIC

Readers' and Editor's Forum

FRONT COVER: COMPUTER SCORES WORLD SKYDIVING CHAMPIONSHIPS

The front cover shows Russell L. Gumby (left), executive secretary of the Parachute Club of America, discussing scoring arrangements for the Sixth World Sport Parachuting Championship with Stanley C. Olsen, Sales Manager of the Digital Equipment Corp. of Maynard, Mass.

The company established a computing center at the world skydiving championships in Orange, Mass., to provide instantaneous electronic scoring for the first time in the history of the event. This was also the first time the championship, held from Aug. 11 through Sept. 3, had been held in the United States. In previous meets, when all the scoring was done by stop watches and score pads, it sometimes took hours of work by officials before the final results could be determined.

The directors of the meet invited DEC to handle the scoring on one of its general purpose Programmed Data Processors, the PDP-1. During the competitive events, the computer received data from the field judges through an electronic relay system, and converted the data into point scores for each contestant in each event. It also added the latest score to the total already achieved by the contestant and reported the current standing of the contestant in the over-all competition.

In some events, judged on the way certain prescribed maneuvers are performed during the descent, the computer completed the scoring even before the jumpers reached the ground. All results were announced immediately over a public address system at the computing center, eliminating the long delays which were customary when the point totals had to be calculated from stop watches and score sheets.

The program for the meet was written to enable the computer to report the contestant's name, sex, country, age, lifetime total jumps, and standing in the current event, as well as his individual standing and his country's standing in the meet.

The programmers and the engineers also devised a set of portable scoring controls which permitted the judges to transmit scoring information directly to the computer from observation points as far as 1650 feet from the computing center. The PDP-1 has an operating speed of 100,000 additions per second, and an expandable 4096-word core memory.

ROBOT BECOMES POPULAR GREENWICH VILLAGE ARTIST

Patrick J. McGovern
Asst. Editor

Some of our readers who follow the novelties in automation will remember the automatic artist of the French painter Jean Tinguely which was displayed in New York a few years ago. His contraption, which spread, splattered, smeared, and splashed paint with several degrees of freedom, and occasionally at the canvas, produced one lasting by-product in the United States: an idea.

A few weeks ago the inevitable occurred. A sign reading "Automatic Art Show" was put outside of a little shop on Macdougal Street in Greenwich Village, New York. A closer inspection revealed a shingle which read "Take home a machine-made painting while U want it." Inside, amid a labyrinth of multicolored wires, jacks, plugs, transistors, springs, stands, and levers, one can find control engineer, turned Bohemian, Raymond Auger. His robot artist is controlled by a wide ribbon of punched paper, similar in form to the piano-rolls of another era. The rolls dictate the action of a robot-arm which uses its metal fingers to grab brushes, stab them into paint pots of red, blue, yellow, and black, and attack the canvas set-up nearby with animated determination. The results vary from some very respectable contributions to the motion painting school to what looks like a fairly competent Japanese dry-brush composition.

Mr. Auger collects $2.00 each for his robot's creations, and his shop has attracted large crowds each evening his robot toils. This off-beat application of automation may mark the beginning of a new generation of art collectors who, when comparing their paintings, will remark: "The sensitivity in that composition is remarkable." "Yes, it was done with a rare, high-precision, double-cammed lever with a tantalum bearing."

HYPHEN DELETION CAUSES MISSILE DEMISE

Last month an $18 million dollar rocket rose gracefully from its launching pad at Cape Canaveral. The launching went perfectly, and all the indications suggested another successful U. S. space shot. Then suddenly the rocket veered sharply off course. The detonation button had to be pushed which instantly destroyed the wayward missile.

What went wrong? On the instruction tape that was fed into the automatic guidance computer, a hyphen was omitted. The hyphen meant: "stop task X; begin task Y." The omission of that one hyphen ⟶ The instructions to the computer were incorrect ⟶ The guidance signals to the missile were incorrect ⟶ The missile's flight path became incorrect ⟶ An $18 million dollar investment in the U. S. space program became a blast of flame. Yet precautions had been taken. The faulty tape had been proofread hundreds of times, by experts!

This incident sharply points up the fact that even though computer system designers have armed their

creations with parity bits, redundancy checks, and diverse error-checking codes, man has not yet completely satisfied the need of a computer to know accurately what it needs to do, or how it can find out what it needs to do. The reliability of the hardware has increased greatly; today it is seldom to blame for tragedies such as the recent one at the Cape. The finger now points squarely at the people who prepare the information that programs the machines.

An outsider's view of this challenge is illustrated by a recent editorial in the Boston Globe (August 10, 1962) which, after describing the rocket destruction incident, concludes:

"The pioneer conquered the wilderness with ax and rifle. With these he needed to be fairly accurate, but not to a hyphen's width. With a hoe the farmer could hack away as long as he didn't chop down the turnips. If the carpenter whacked a nail the wrong way, he could pull it out and drive it again.

"In place of such crude tools we now have the computer, a contraption sinister in that it will follow orders blindly. Tell it to zig and it will never zag, no matter how desirable the latter course may be at the time. This means that those who feed orders to the machine must be themselves infallible.

"Consider that man is aiming a rocket at Venus, that Earth and Sun and Venus are all in motion, that the distance is vast in both space and time, and that if the enterprise is to succeed there must be no errors at all. Dotting of i's and crossing of t's is no longer deemed fussy. It has become stark necessity, no matter how much it may disturb people who can remember when the horse, left alone, would find his own way home.

"Write directions carefully, egghead!"

COMPUTERS FLY DOWN UNDER

Computerized scheduling and reservation systems are helping to increase the effectiveness of commercial airlines. The airlines had a chance to give a boost to computers recently and they took deft advantage of it.

Two giant cargo planes carried a pair of Honeywell 800 computers, valued at more than $2 million, from Boston's Logan International Airport to Australia. The two computers represented a gross shipping weight of over 37 tons. They monopolized the shipping capacity of both planes.

The computers went to the Australian Department of Defense where they will equip the largest EDP center on that continent. The Canberra computer installation will be the first of several large centers planned by the Australian DOD. It will handle the accounting and administration associated with an inventory of 500,000 stock military items dispersed througout Australia and overseas—which are affected by some 60,000 individual reports a day.

THE U.S.S.R. HAS "PEOPLE PROBLEMS" IN THE USE OF COMPUTERS, TOO

Hardly a week goes by without a speech or talk bemoaning the shortage in the United States of well-trained programmers and computer operators.

(Please turn to Page 42)

The Significance of Computer Investment Decisions

Robert B. Curry
Vice-President, Group Executive
Remington Rand Division
Sperry Rand Corp.
New York, N. Y.

The decision to buy or rent a computer need no longer be a highly speculative judgment. Well-defined factors are shown to govern the profit potential in the use of a computer.

The essence of the computer investment decision is the economics in managing the growing investment in computers. This requires attention to the profit-making attributes: cost savings; and money making.

What is most significant about the computer investment decision is that it embodies investment in three areas: planning; equipment; and people. Planning includes applications, systems, procedures, feasibility study, conclusion, and decision. Equipment includes hardware, software, and the mechanics of the method of acquisition. The subject of people includes organization, management, and operation.

Of course, of ultimate importance in the computer decision is the actual execution of the decision—"The proof of the pudding is certainly in the eating"—and the degree of success in the execution of the plan, the preparation, the installation, the operation, and the forward look for future cost savings and money making.

The first line of the regular economics textbook declares that "The purpose of a business organization is to make a profit." It follows that the first aspect of the computer investment decision is—"Will it assist in making a profit?" Of course, there are some who believe that to make a profit is not viewed with favor by the present administration in Washington.

Profit Improvement

The major concern of business management today, and their most pressing and troublesome problem, has been the general decline in profits over the last decade. Profit deterioration has taken place in all segments of the economy; while there has been a steady increase in sales volume and large investments in plant and equipment, the profit decline has persisted.

There are many influences back of this profit decline and no single correction is likely to resolve the problem. However, the central core of the difficulty is productivity, which has not kept pace with increases in direct costs and investment in plant and equipment. It is amply evident that management's attention will have to be directed to increasing productivity while reducing costs and, at the same time, installing controls which will maintain costs at their new levels. This difficult task requires the full use of available resources—internal and external—if the problem is to be effectively met. The computer and its increased uses come within the available resources.

Economic Aspects

The too familiar "profit-squeeze" situation is illustrated by these facts: The growth of corporate profits has not kept pace with the growth of other segments of the economy; corporate profits are declining as a per cent of the gross national product and national income. Of the various influences which have contributed to this erosion of corporate profits, probably the most pertinent to the consideration of computer investments is the pronounced *rise in wage and salary costs.*

Intensified International Competition

U. S. investment in plant and equipment has recently tended to constitute smaller proportion of gross national product than is the case for our principal competitor nations in Western Europe and elsewhere. Thus, the U. S. "plant" is becoming "older" relative to that of these competitor nations. Add to this the fact that the European Common Market will provide continental manufacturers for the first time with a mass market comparable to that open to U. S. domestic enterprise and you have powerful forces working toward reduction of European unit costs relative to our own.

Many believe the depth, the violence and the endurance of the current decline in the stock market is due to the prospect of a profitless period of "prosperity" for industry and business. Thus today, more than even, the significance of the computer investment decision is the basic economics of the situation.

Failures in Computer Decisions

There are no acceptable reasons—shall I say excuses—for failures in computer decisions now. There were reasons in the early 50's; then everyone was pioneering. Today, there are no acceptable reasons—merely excuses—since too much experience is available and too much information is at hand. It has been said, "A smart man profits from his own mistakes but a wise man from mistakes of others."

Significantly, there is a growing body of knowledge of how not to install a computer. The latest May/June issue of the Harvard Business Review lists and describes a number of deadly dangers in EDP in an article by L. R. Fiock, Jr. They include: poor procurement; ignorance of procedures; middle management resistance; inadequate staff; poor staff location; and evaluations having bias.

In a Remington Rand Univac study of the early installations, observations indicated that failures were directly traceable to one of the following reasons:

1. Failure to understand and delineate purpose
2. Enthusiasm with hardware
3. Improper placement organizationally
4. Errors in delegation of management
5. Insufficient research and applications study
6. Too much emphasis on immediate savings

Based on a talk before the American Management Association Briefing Session on Computer Economics, June 27-29, 1962.

An example of management error and too little study: An insurance company insisted on a clause in a contract for "one month's free rent for each month of unsatisfactory installation." They then sat back and did nothing to assure success. After 28 months of free rent they abandoned their computer, the president saying, "I just can't understand it."

Computer Payout

There is a fallacy in always expecting an immediate payout. Companies must be prepared to pay for some research in methods and possibly management organization. In many cases, the expense for this was long over-due; and, to a degree, not all the expense is chargeable to the computer decision. It will reflect in computer savings however.

Financial Improvements

Many financial improvements are possible beyond the cost-saving concept, the clerk-saving concept—basically, doing things that were being done before, but faster, cheaper and more accurately. Financial gains also come from the money-making concept—doing things not done before because they were too costly or too time-consuming or, in some cases, couldn't be done at all. In these latter cases, the questions must be studied: How much is the solution worth? At what price will it make money?

Decisions in Regards to People

In the total personnel equation; in the over-all leadership; at the first line of supervision; in the line and staff of middle management areas; and last, but not least, in top management levels—the decisions about people require attention to management and labor relationships, organization and especially reorganization, applications, feasibility studies, etc., including the material questions of hardware and software.

Rental vs. Purchase

This question of rent or buy—or, in some cases, build—carries connotations of being readily solved by mathematics with a computer program. Indeed much use is being made of such analysis—and is forming the basis of making decisions in this area. With some stabilization and passing of the "prove-in" phase of computers, and the certainty of extended use of individual computers, the question of rental vs. purchase will become a more significant part of the investment decision.

Growth of the Computer Market

Early in the computer era, there were some famous miscalculations as to use, price, and cost of computers. These added up to some fantastic misjudgments (in hindsight):

1. One manufacturer held up its entry into the business data processing field because of the certainty that while the Government, particularly for scientific projects, would use large computers, business and industry would not pay the price for business data processing. Yet there are now 5,500 computers in use.
2. A serious Univac study of customers' needs in the early 1950's developed the fact that only six companies in the United States thought they could use a computer of the capacity of a Univac I.
3. One manufacturer's top sales manager told one of the 100 largest industrial corporations that they were not big enough for a computer. Yet they now use three made by a competitor.

It is freely predicted that there will be between 10,000 and 15,000 computers in use in the next 5 years.

Growth in Technology

Technology has been constantly pushing management—management of the computer supplier and management of the computer user. As a young, dynamic, and emerging new industry, rapid technological obsolescence has been a dominant factor in the little over ten years since the first electronic business computer was delivered. In this period the computer industry has increased the computational ability of man by one million times.

In *1952* we talked excitedly about circuit speeds of milliseconds. *Then* microseconds. *Now* nanoseconds. In one nanosecond electricity travels one foot over a length of copper wire. And in the laboratories they are starting to discuss picaseconds (trillionths of seconds). Indeed, we are approaching situations where the speed of light itself is a limiting factor.

Recently, a computer manufacturer announced computer memories 15 times faster than the present through new microferrite technology.

The technological chain in memory elements has been: tubes, then drums, then ferrite cores, now thin film deposits, and tomorrow cryogenic devices.

Not a single computer which we will be marketing in 1970 is known today even in our laboratories.

Obsolescence and Technological Advances

Unquestionably the major impetus creating computer obsolescence in recent years was the adoption of solid-state equipment in the late 50's, which superseded the tube-type system.

However, what is meant by obsolescence is important. The users and the manufacturers have different problems. The tube type system, while obsolete in the technical sense, is not necessarily obsolete when it can continue to be used on important production applications and jobs for which the company is already programmed and for which it is performing quite satisfactorily with an acceptable cost-to-performance ratio. There is nothing inherently wrong in operating with fully depreciated equipment or full obsoleted equipment. This question is no more than the question of driving a new model automobile every year or so. Of course, from the manufacturer's standpoint, obsolete models cannot be built, and, as for the new user, they should not be bought, purchased and installed.

Obsolescence can be a great benefit to the earlier users, particularly when he is able to purchase the equipment already installed at prices reduced as compared with what the manufacturers currently are offering for sale. In many situations apparently users are continuing to use such equipment on basic work and applications, and will experience great profits and savings compared with what would result from adop-

tion of the more costly and newer solid-state equipment. The new equipment has inherent requirements for new systems design, new programming and additional user and supplier support.

The key to obsolescence is, of course, the acceptability of the cost/performance ratio on old equipment versus the cost/performance ratio on new equipment, with the amortization of program conversion costs properly considered as well as basic savings of newer and faster equipment.

Real-Time and On-Line

A computer decision must take note of two new ingredients which carry significant promise for the future of business data processing—the Real-Time and the On-Line concepts applied to operations and management.

However, we must also consider the possibility of too much information. Having a computer which is "on line" and reporting in "real time" can give a continuous flow of information, in fact, more than can be easily used—even a quantity that just cannot be digested or assimilated. It is important to direct reporting to the changes and variations from established norms, to avoid being smothered in detail.

If you ever watched a construction crew for any period, you realize that quite frequently something fairly minor goes wrong and is patched up in a practical way by the foreman on the spot without the upper levels of supervision ever knowing of it. The cost of this patch-up is seldom reflected in reports. In daily operations there are many minor slips and adjustments. Being too close to operations can inundate management with facts and data without significant knowledge. The principles of management by exception are being given a rebirth by new "real time" and "on line" capabilities.

Side-Effects

The computer decision with newer equipment, more now than before, will entail some very interesting and important side-effects.

What will happen organizationally?

a) Fewer levels of authority will be possible.

b) Decentralization, at least to some degree, seems to be a by-product.

c) Management by exception on a continuous flow basis will develop.

d) Some blurring of staff and line will happen—at least some of the distinctions will be less pronounced.

e) Marketing will become stronger—more assured, because facts will be at hand more quickly.

f) Decisions will be less arbitrary, because facts will be at hand more quickly and accurately.

g) The keeper of information will have a more important position.

h) Financial control will be more effective and timely.

i) All levels will be better informed—more consistently so and thus more responsive because problems will be more apparent and isolated.

Regardless of the computer decision, there are three current organizational trends.

a) Greater decentralization of authority within corporate units.

b) Corporate mergers and acquisitions, increasing the size of corporate units.

c) Product diversification.

Each of these changes in corporate organization structure accentuates management's problems in the areas of—

a) Information—where large and relatively indigestible masses of data must be processed and presented in coherent form, so that management will have timely and comprehensive knowledge of what is going on within the organization.

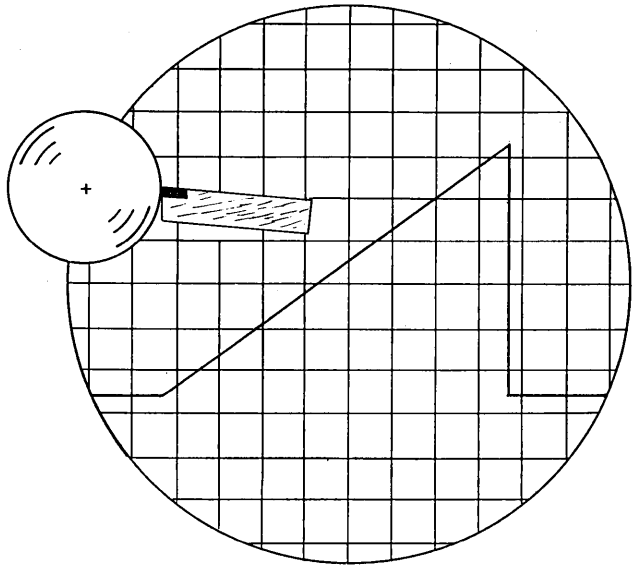
b) Control—which, obviously, cannot be effectively exercised unless the information requirements are satisfactorily met.

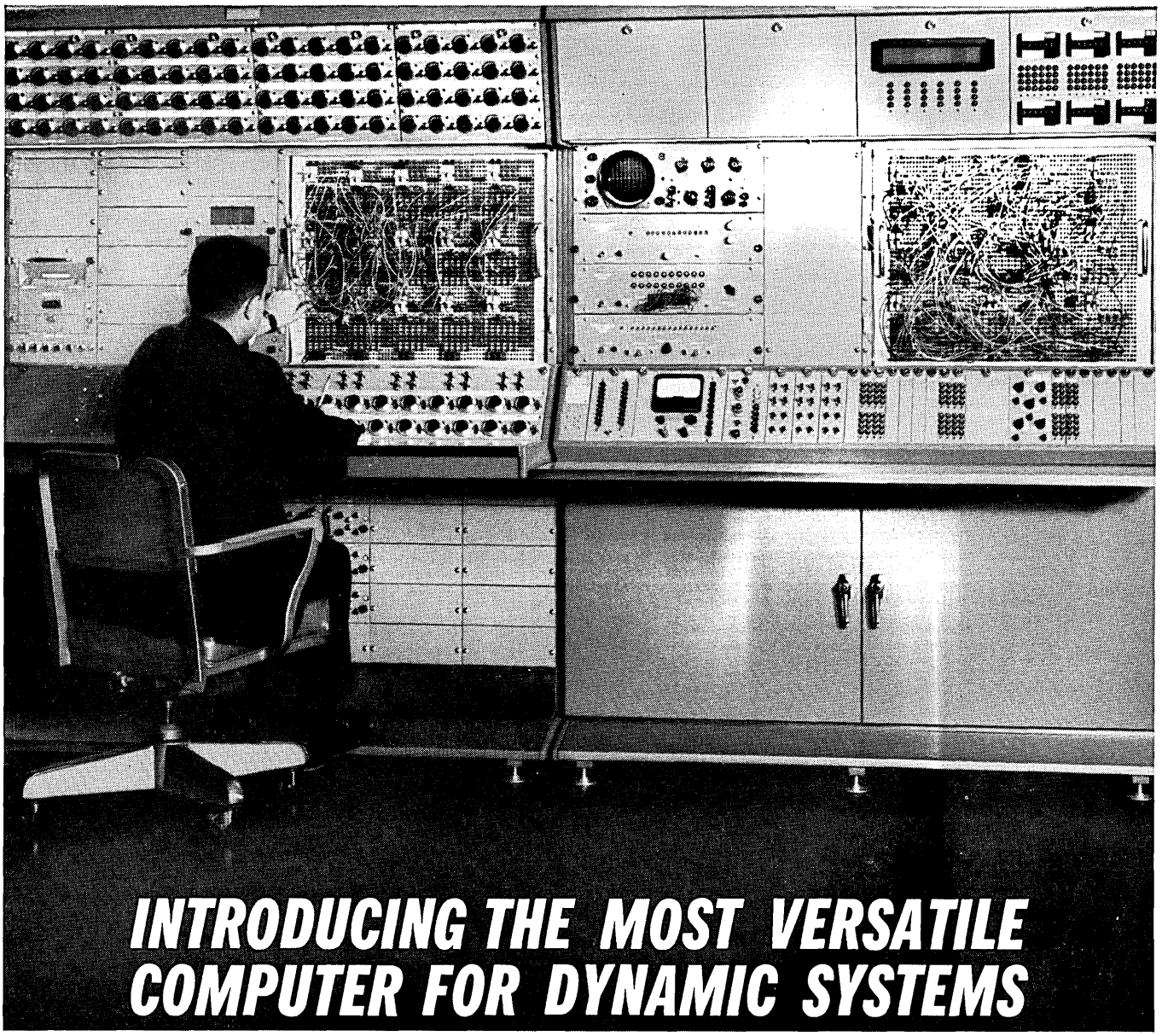
In response to these stimuli, business is turning increasingly to the use of electronic data processing techniques. This has made the data processing field one of the most dynamic sectors of the economy. Continued substantial growth is the prospect.

Top Management Levels

In any new undertaking, the need of knowledge, understanding, encouragement, and leadership on the level of the makers of company policy is of paramount importance to the realization of the advantages planned in the computer decision. When the top level of management is steeped in mistrust and dismisses the computer as a mysterious and perhaps unnecessary innovation, that concept will permeate the entire installation, and the chance of a successful installation is greatly reduced.

It is significant that some of the country's leading companies have treated their computers not just as a cost-saving venture but as a money-making venture, with the full blessing of top management.





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

Tracking Ships by Electronic Computer

Thomas A. Throop
Applied Mathematics Laboratory
David Taylor Model Basin
Washington, D. C.

One of the information problems that traditionally perplexes planners and strategists in the Navy Department is a knowledge of the location and destination of all friendly ships at sea. This information is especially important today when ballistic missiles launched at sea could be a major factor in national security. Computers are now being put to the task of filling this information gap by tracking vessels throughout the world.

1. The Positions of All Ships at Sea

The tracking of ships by an electronic computer involves two problems. The first problem is generating a route which the ship is known or presumed to be following in sailing from a point of departure to a point of destination. The second problem is the determination of the latitude and longitude of the expected position of the ship at any time during the voyage.

The generation by electronic computer of ship routes was one aspect of a large system of programs for certain Navy Operational Control Centers, which are analogous to the Strategic Air Command Centers of the Air Force. At these Navy Control Centers, one of the objectives is to keep track of all friendly ships at sea and thus be in a position to detect enemy ships, make air-sea rescue operations, and answer queries from Navy officers about previous or expected locations of ships.

To fulfill this objective, the positions of all ships at sea are updated every hour. To update the position of a ship along its route, the computer must first know (or calculate) the route the ship is expected to take. Navy ships usually specify a route; but merchant ships only specify the point of departure, the port of destination, estimated time of departure, speed of advance, and estimated time of arrival. Furthermore, sometimes a report received from a Navy or merchant ship gives an unexpected position for the ship and states that it will return to a previous point on its original route. Therefore, the computer must be able to generate a route between any two ports or two ocean points in the seas anywhere on the globe.

2. The Generating of Routes

Of the two problems, the generating of routes, and the determination of positions along routes, the first is by far the more difficult.

It is necessary that the electronic computer be cognizant of the land masses of the world in order that it may generate a ship's route consisting of one or more rhumb lines (or rhumb line approximations to arcs of great circles), each of which avoids crossing any land.

A *rhumb line* is a straight line on a Mercator map; the route of a ship at sea is regularly constructed as a succession of rhumb lines, since a rhumb line course is maintained by sailing on a constant compass direction. A *great circle* on a sphere is a circle whose plane passes through the center of the sphere; in general, an arc of a great circle represents the shortest distance between two points on the surface of the sphere, analogous to the straight line on a plane.

Once the route has been generated and a known or assumed speed of advance is given to the computer, the calculation of positions for the ship at desired times is comparatively straightforward. Knowing the speed of advance, the rate at which the ship advances along each rhumb line may be calculated. From this information, the position of the ship corresponding to any length of time after the time of departure may be calculated.

The Tangential Technique of Route Generation is one of the first methods devised to generate on an electronic digital computer a route between any two ocean points in the world consisting of rhumb line legs.

The method has been programmed successfully for the UNIVAC 1 computer. A version of the program is to be used by the U. S. Navy at certain Operational Control Centers.

Basically, the method represents the land masses of the world by a certain number of circles, drawn on a Mercator map projection with modified latitude coordinates. The method divides the world into various "sectors" and "linking points" between sectors. Finally, for any point of departure and point of destination, the method provides algorithms for "navigating" around land masses. The route generated by the computer is a minimum in regard to distance traversed, since each ship that the computer is tracking is supposed to sail the shortest route. The method gives consideration to canals or potentially stormy seas by equating them to a rhumb line distance which it is worthwhile to traverse in order to avoid the canal or stormy sea in question.

3. Description of the Technique

The continental land masses and principal islands of the world are represented by approximately 200 circles. These circles contain this land in their interior and the coastlines of the world are approximated by arcs of these circles. The fundamental criterion that the computer follows in generating a route for a ship between a given point of departure and a given point of destination is to ensure that the route avoids

crossing any of these 200 circles and at the same time is as short and direct as possible.

The circles described above are known as "minor" circles. Associated groups of minor circles are enclosed within larger circles known as "major" circles. These major circles are divided by radial lines into "sectors." Each such sector or combinations thereof form a sector of the world.

These world sectors provide a basis for determining a critical intermediate point or set of points via which the generated route between the point of departure and point of destination should pass. These intermediate points are termed "linking points." A typical single linking point is the Strait of Gibraltar while a typical set of linking points would be a set of points from the Strait of Gibraltar through the Mediterranean to the Suez Canal.

The first phase in the generation of a route is the determination of the sector for the point of departure and that for the point of destination, and, knowing the exact coordinates of these points and the possible linking points or sets thereof for the sectors in question, the determination of the linking point or set of linking points consistent with a minimal route between the point of departure and point of destination. This first phase of generating a route is accomplished by the Perspective Routine, which is described in greater detail below.

The second phase in the generation of a route involves "navigating" around the world land masses which lie between the point of departure and the first linking point and then around those which lie between the last linking point and the point of destination. This second phase of generating a route is accomplished by the Navigation Routine, which is also described in greater detail below.

The point of departure and/or the point of destination may be given as a port name rather than by latitude-longitude coordinates. In this case, the coordinates of the port and of any channel points en route to the open sea, as well as the sector of the port, are found by referencing a port dictionary which contains this data for whichever ports of the world it is desired to include in the port dictionary.

On the Mercator Projection, the system of coordinates for the circles representing the world land masses and for the route-generating routines is that of (1) longitude and (2) "pseudo-latitude." The *pseudo-latitude* of a point is simply the number of degrees from the equator to the point as measured by the longitude scale, which is the same as the number of meridional parts of the latitude in question.

The UNIVAC 1 program consists of 60 blocks of coding. One block contains 60 words of data or 120 instructions. 45 blocks of the coding comprise the 5400 instructions of the program, while the remaining 15 blocks comprise the 900 words of data.

Land Mass Representation

As mentioned briefly in the preceding section of this article, the principal land masses of the world are represented by approximately 200 circles with respect to a Mercator map projection with the latitude coordinates to the same scale as the longitude coordinates. These are the circles which are termed "minor" circles and associated groups of them. For example, all the minor circles of South America or all of those of the West Indies, are enclosed within "major" circles. Figure 1 shows the minor circles of South America, Central America, the West Indies, and the United States.

CHART OF NORTH AND SOUTH AMERICA

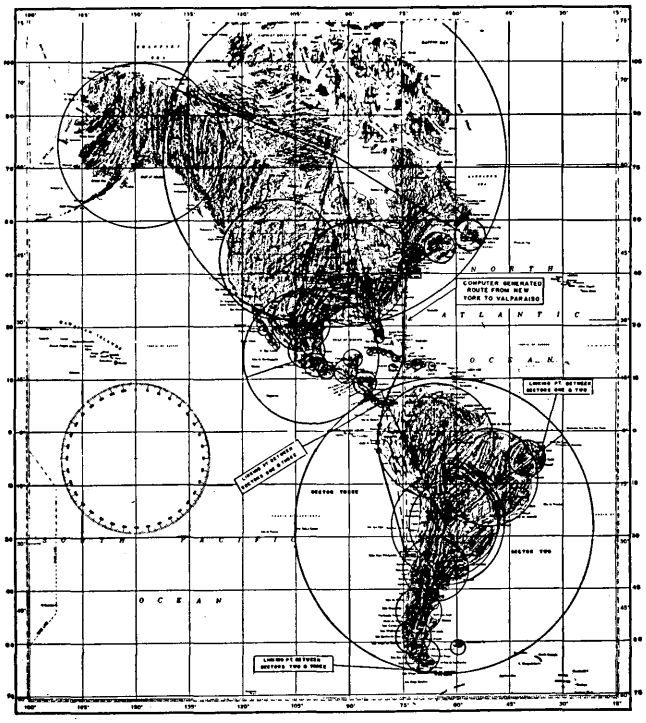


Figure 1

Each minor circle falls into one of three classifications, these being "island," "outbound," or "inner" circles. An *island circle* is, as the name suggests, a single isolated minor circle which represents an island, such as the circle representing Puerto Rico or that representing Jamaica. An *outbound circle* is one which is situated at the tip of a continent, peninsula, or an island represented by more than one circle, such as the southernmost minor circle of South America, the southernmost minor circle of Florida, or the westerly or easterly minor circle of Cuba, respectively. All other minor circles are termed *inner circles.*

Radial lines divide most of the major circles into one or more sectors, as mentioned previously. Each such sector or combinations thereof form a sector of the world; the world sectors providing a basis for linking points between sectors.

Perspective Routine

The first phase in the generation of a route is accomplished by means of the Perspective Routine. The function of the Perspective Routine is to determine, if appropriate, an intermediate point or set of points lying between the point of departure and point of destination and via which the generated route should pass. These intermediate points are termed "linking points." A typical single linking point is the Strait of Gibraltar while a typical set of linking points would be a set of points from the Strait of Gibraltar through the Mediterranean to the Suez Canal.

The routine proceeds in the following manner. The world is divided into sectors as previously described. The sector in which the point of departure lies and the sector in which the point of destination lies are first determined. Between these two sectors there may exist more than one linking point or set of linking points as determined by a table within the routine. Knowing the exact coordinates of the point of departure and point of destination and the possible linking points or sets thereof for the sectors in question, the routine then determines the linking point or set of linking points consistent with a minimal route between the point of departure and the point of destination.

The chosen linking point or set of linking points is that for which the rhumb line distance from the point of departure to the first linking point plus the "effective" rhumb line distance along the linking points plus the rhumb line distance from the last linking point to the point of destination is minimum. The effective rhumb line distance along the linking points makes allowance for canals or potentially stormy seas.

Whenever the point of departure and/or destination does not lie in one of the defined world sectors, the routine determines which sectors are the first and last crossed by the rhumb line between the point of departure and the point of destination. The first and last sectors crossed are then the sectors for the point of departure and/or the point of destination.

For example, suppose a route is to be generated between New York and Montevideo. Without the Perspective Routine or its equivalent, the route generated would head directly toward Montevideo from New York, pass between Haiti and Puerto Rico, and then obstructed by South America proceed around the coast of South America to Montevideo. However, it should be clear that a ship may proceed directly on a great circle group of rhumb lines from New York to the northeast tip of Brazil which is the point toward which the ship departing from New York should originally head. With the benefit of the Perspective Routine a seaward point off the northeast tip of Brazil is provided as the linking point between the sector in which New York lies and the sector in which Montevideo lies.

"Navigation" Routine

Once a linking point or set thereof has been determined by the Perspective Routine, the Navigation Routine generates the portion of the route between the point of departure and the first linking point and that between the last linking point and the point of destination. For certain sector combinations or whenever both the point of departure and point of destination are in the same sector there are no linking points. In this case, the Navigation Routine generates the entire route between the point of departure and the point of destination.

The algorithms for circumnavigating the minor circles encountered in generating one of the partial or complete routes mentioned in the preceding paragraph will now be discussed. The possible major circles which may be crossed have been indicated by the Perspective Routine. The Navigation Routine determines which of these major circles is the first one crossed by a rhumb line between the two points in question and then determines which of the minor circles of this major circle is the first one crossed by the rhumb line.

When the first minor circle crossed is an island circle, the circle is circumnavigated by proceeding on a rhumb line tangent to the circle and then proceeding around the circumference until reaching the point on the circumference from which to proceed via the tangent line toward the first linking point or final destination. When the first minor circle crossed is an outbound circle, the circle is circumnavigated by proceeding on a rhumb line tangent to the circle and then proceeding around the circumference until reaching either the point from which to proceed on a common tangent to the next outbound circle or the point from which to proceed via the tangent line toward the first linking point or final destination. For an island circle there are two ways of circumnavigating the circle to consider, namely, in a clockwise or counter-clockwise direction; the direction which results in traversing the shorter arc of the circle is chosen. For an outbound circle there is but one way to consider.

To circumnavigate an island or outbound circle, points on the circumference of the circle between the arriving point of tangency and the departing point of tangency are calculated at angular intervals around the circle.

An inner circle has identified with it one, two, or three "sea arcs." The sea arcs of inner circles are those portions of the inner circles which are part of the coastline representation of the land mass in question. Radial lines drawn to the extremities of the sea arcs then form corresponding "sea sectors" of the inner circles. For instance, for a minor circle of Cuba, other than the extreme westerly or easterly minor circle (see Figure 1), one sea sector corresponds to the Atlantic Ocean arc of the circle and the second sea sector to the Caribbean Sea arc of the circle. For either of the two most northerly minor circles of Florida, one sea sector corresponds to the Atlantic Ocean arc of the circle and the second sea sector to the Gulf of Mexico arc of the circle.

When the first minor circle crossed is an inner circle, the rhumb line between the two terminal points of the route or portion thereof being generated may enter and leave the same sea sector of the inner circle. In this case, the procedure for circumnavigating the inner circle is the same as that described above for an island or outbound circle.

However, when the rhumb line does not enter and leave the same sea sector, a ship is not able to circumnavigate the inner circle in the manner described for an island or outbound circle, but rather must proceed around a related outbound minor circle. There may one, two, or three such related circles. For instance, for one of the two most northerly minor circles of Florida, there is only one related outbound minor circle, namely, the southernmost minor circle of Florida. (See Figure 1). On the other hand, for one of the inner minor circles of Cuba, there are two related outbound minor circles, namely,

(Continued on Page 16)

the two minor circles at each end of Cuba. In the latter case, the proper outbound circle to circumnavigate is the one which will result in the shorter route to the first linking point or the final destination.

To illustrate the various algorithms of the Navigation Routine, consider the generated route between New York and Valparaiso. From the port dictionary are obtained the latitude-longitude coordinates for the port of New York and the additional channel points down to the Ambrose Lightship, the latitude-longitude coordinates for a point associated with Valparaiso which is slightly to the west and outside of the minor circle in which Valparaiso lies, and the world sectors for New York and Panama. The Perspective Routine provides the northern and southern end of the Panama Canal as the first and last linking points, respectively, and indicates that the major circles to consider are North America, Central America, the West Indies, and South America.

The first minor circle and two different sea sectors which are crossed by the rhumb line between the Ambrose Lightship to the northern end of the Panama Canal is one of the inner minor circles of Cuba. There are two related outbound minor circles, these being the extreme westerly and easterly minor circles of Cuba. Both choices are considered and in this case circumnavigating the easterly outbound circle will result in a shorter route to the northern end of the Panama Canal. The point of tangency of the rhumb line from the Ambrose Lightship to the easterly outbound minor circle of Cuba is determined and no other minor circles are crossed by this rhumb line. The easterly outbound circle is then circumnavigated via circumferential points calculated at angular intervals. From the departing point of tangency the rhumb line to the northern end of the Panama Canal crosses no minor circles, and therefore there are no other points of the route to be determined between the departing point of tangency for the outbound circle and the northern end of the Panama Canal.

The first minor circle crossed by the rhumb line from the southern end of the Panama Canal to the point associated with Valparaiso is the most northerly inner minor circle of South America. The rhumb line enters and leaves the same sea sector, and therefore the circle is circumnavigated via the rhumb line from the southern end of the Panama Canal tangent to the circle and the points at angular intervals around the circumference to the departing point of tangency. The route is completed by the tangent rhumb line to Valparaiso's associated point, which crosses no minor circles, and finally the rhumb line from this point to Valparaiso.

Time for Running

As mentioned above, the ship route generation program is one aspect of a larger system. The larger system has been programmed to run on an IBM 704. The system must run in real time and use only 5 or 10 minutes every hour to generate new routes and update the ship positions, since a number of other functions must also be performed every hour.

CALENDAR OF COMING EVENTS

Sept. 3-7, 1962: International Symp. on Information Theory, Free Univ. of Brussels, Brussels, Belgium; contact Bruce B. Barrow, Postbus 174, Den Haag, Netherlands

Sept. 3-8, 1962: First International Congress on Chemical Machinery, Chemical Engineering and Automation, Brno, Czechoslovakia; contact Organizing Committee for the First International Congress on Chemical Machinery, Engineering and Automation, Vystaviste 1, Brno, Czechoslovakia.

Sept. 4-7, 1962: ACM National Conference, War Memorial Auditorium and Hotel Syracuse, Syracuse, N. Y.

Sept. 4-7, 1962: British Computer Society Annual Conference, Cardiff, South Wales (immediately after I.F.I.P. Congress in Munich); contact G. J. Morris, International Computers & Tabulators Ltd., Putney Bridge House, London, S.W. 6, England

Sept. 10-Oct. 8, 1962: Seminar on Data Processing Techniques for Certified Public Accountants, Multnomah Data Processing Center, 430 N.W. 10th, Portland, Ore. (Sept. 11-27); Seattle, Wash. (Sept. 10-Oct. 8); contact Northwest Data Systems, 337 Pittock Block, Portland 5, Ore.

Sept. 19-20, 1962: 11th Annual Industrial Electronics Symposium, Hotel Sheraton, Chicago, Ill.; contact Ed. A. Roberts, Comptometer Corp., 5600 Jarvis Ave., Chicago 48, Ill.

Sept. 19-21, 1962: 7th National Conference of the Bendix G-15 Users Exchange Organization, Sheraton Hotel, Philadelphia, Pa.; contact Dr. Arthur L. Squyres, Chairman, Bendix G-15 Users Exchange Organization, E. I. du Pont de Nemours & Co., Inc., Eastern Laboratory, Gibbstown, N. J.

Sept. 19-22, 1962: Institute on Information Retrieval, Univ. of Minn., Minneapolis 14, Minn.; contact Director, Center for Continuation Study, Univ. of Minn., Minneapolis 14, Minn.

Sept. 20-21, 1962: JUG-CODASYL Decision Tables Symposium, Barbizon Plaza Hotel, New York, N. Y.; contact L. V. Parent, Trunkline Gas Co., P. O. Box 1642, Houston 1, Tex.

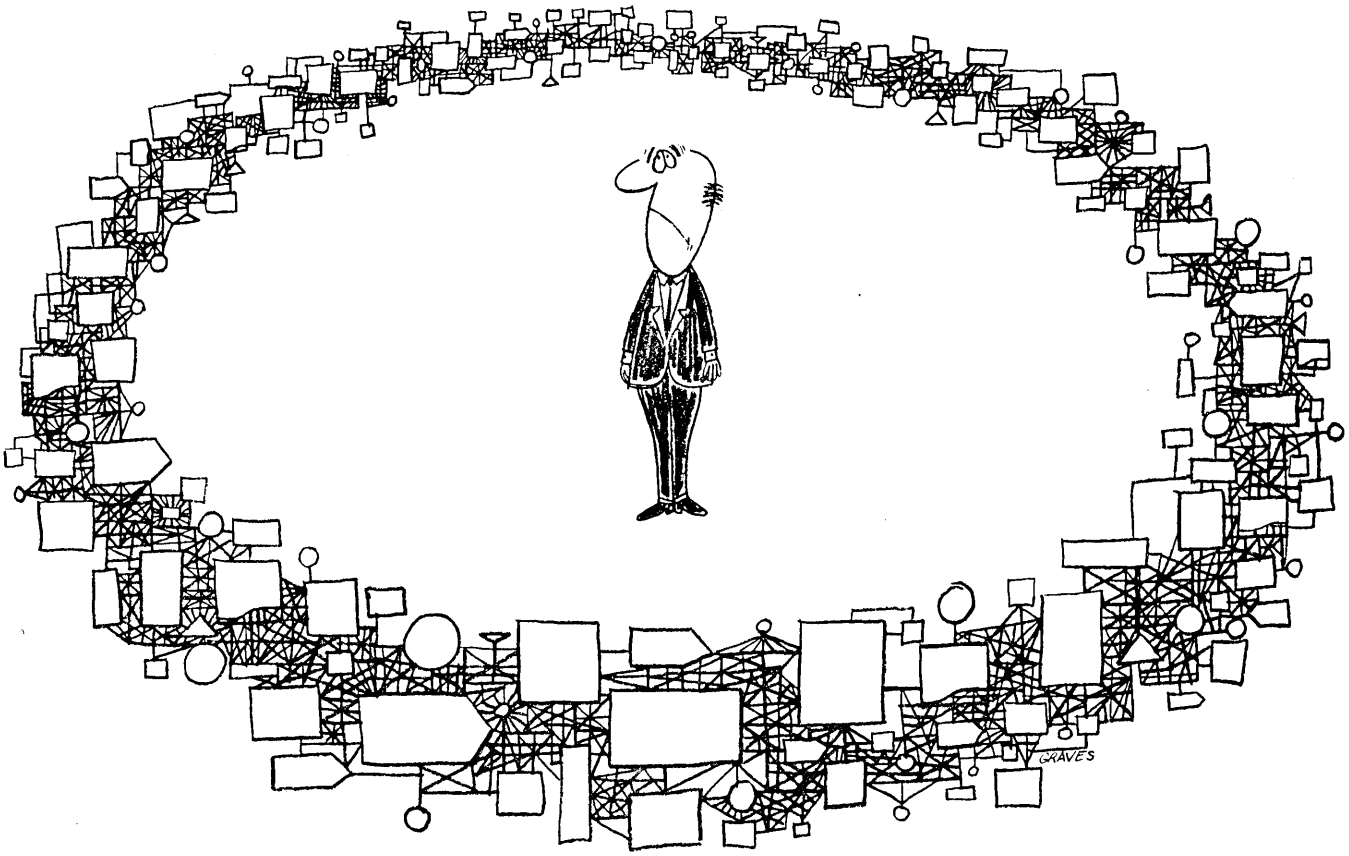
Sept. 25-28, 1962: Operation Compete, the 1962 Iron & Steel Convention and Exposition, Cleveland Public Auditorium, Cleveland, Ohio; contact W. C. Friesel, Assoc. of Iron and Steel Engineers, 1010 Empire Bldg., Pittsburgh 22, Pa.

Oct. 2-4, 1962: National Symposium on Space Elec. & Telemetry, Fountainbleu Hotel, Miami Beach, Fla.; contact Dr. Arthur Rudolph, Army Ballistic Missile Agency, R & D Op. Bldg. 4488, Redstone Arsenal, Ala.

Oct. 8-10, 1962: National Electronics Conference, Exposition Hall, Chicago, Ill.; contact National Elec. Conf., 228 N. LaSalle, Chicago, Ill.

Oct. 8-26, 1962: Seminar in Search Strategy, Drexel Inst. of Technology, Philadelphia, Pa.; contact Mrs. M. H. Davis, Seminar in Search Strategy, Graduate School of Library Science, Drexel Inst. of Technology, Philadelphia 4, Pa.

(Please turn to Page 49)



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MEET US AT THE ACM CONFERENCE, HOTEL SYRACUSE, SYRACUSE, NEW YORK

LET'S BE HONEST ABOUT AUTOMATION

William B. Floyd
Bridge, Inc.
Philadelphia 4, Pa.

Automation emphasizes two national weaknesses. One is economic: we are not recession-proof. The other is psychological: our industry doesn't provide a sense of belonging.—Not all will agree with the viewpoints in this "hard look" at automation, but the ideas merit honest discussion.

Not Benefiting Workmen

As an engineer, I spend my time, as do a great many other engineers, trying to devise new methods, new systems, and new machines to "save labor." I *believe* in what we are doing. That is, I know, as everyone does, that what we are doing is "socially useful."

Where previous civilizations were based on human slavery or on animal labor, ours is based on machines. Where, in all previous civilizations, only an infinitesimal number of people had the wealth and leisure for graceful living, such wealth and leisure is now extended to many. Soon, if we continue what we are doing (and control our birthrates), such graceful living will be within the reach of all. Today's automation is only the current phase of the continuing improvement of man-made tools, which started with the spinning jenny and the steam engine—in fact, many years earlier, with the wooden club and the stone ax. These often stated facts cannot be stated too often.

But "the good of society" is a euphemism indeed to the man who is left without a cash income because it is *his* labor that has been saved. Many times I have seen the look of distrust, or even of fear or hatred, in the eyes of workmen in plants in which automation studies were being made. We may have been benefiting society. We *were* benefiting the stockholders. But we were not benefiting these men. They knew it and we knew it.

Not Hiding the Fact

Facts like these are not to be hidden, nor to be excused. We cannot, like the economists of the last century, rationalize individual deprivation on the grounds of "economic necessity." We know today that much of what they considered to be immutable law is, at most, an imperfect description of the workings of a particular economic system, devised by man and changeable by man. We cannot, like some societies, justify forced sacrifice of individual lives or livelihoods for the "greater good" of society. Some of the worst crimes of history have been justified on these grounds. Nor can we merely dismiss the problem as belonging to someone else: the company's personnel department, or the union, or the Government. We cannot help wanting to see the social benefits of our work realized without sacrifice or hardship on the part of others. We cannot feel that our job is done, or well done, until we can find practical ways to translate the ultimate, social benefit of automation into immediate, tangible benefit to *everyone* immediately concerned.

Retraining and New Jobs

We *might* argue, as some do, that since "society" benefits from automation, "society" should provide retraining and interim support for those who are displaced by automation. But where action is called for, "society" means the Government, and the machinery of Government is not notably efficient. The problems of automation are generated in individual companies and plants. We should like to see them taken care of there, without adding another burden on an already overburdened bureaucracy.

Actually, much automation displaces no one. A man's job may be changed, but he is not cut off from an income. Some companies have announced to their employees, when new machines are to be installed, that no one is thereby to be laid off. The company merely stops hiring. Labor-saving machines and methods are installed no faster than business expansion and normal quits and retirements permit. Often this is about as fast as the new machines and new methods could be installed in any event.

True, some people's work may be changed, the company bearing any retraining expense that is involved. Change of any kind is painful to a certain type of individual, found among workmen as well as among the rest of the population. But we cannot feel too sorry for those who resist change in this changing world, as long as their incomes are not hurt.

If a company does wish to install automatic machines faster than business expansion and normal turnover permit, the company itself might reasonably be expected to assume the burden of finding agreeable jobs for those who will be displaced and of furnishing or paying for such retraining as may be required. Replacement and retraining are two of the costs of automation. If stockholders are to reap the entire profit of automation, they might in all equity be expected to pay the entire costs, rather than sloughing part of them off onto the workers who are displaced or onto the Government. Some companies might not voluntarily take on this added financial burden, but they could be forced to do so by union action or by law.

Recessions

The real problem of automation, however, if we wish to be entirely honest, is that it accentuates basic weaknesses in the way our economy is presently organized. It calls attention to two such weaknesses, first, that our system is not yet recession-proof, and second,

that not all of the people in most organizations have a sense of "belonging."

The effects of automation in a period of business expansion are rarely serious. When jobs are plentiful, the man who is fired because machines have taken over his job may not be particularly distressed. He merely steps out into another job, possibly a better one. He has little complaint and we hear little about the evils of automation. But in a recession or in a depressed area the story is quite different, when a man is laid off coincident with the installation of automatic equipment. *He* cannot see the chain of events that led to the recession or depression. Few of us can with any clarity. What he can see, with his own eyes, is that the new machine is now doing the work he used to do. So, obviously, automation is the villian.

How to prevent recessions in the United States and other countries is a presumably solvable but as yet unsolved problem. Until it is solved, we might say that during a period of recession we should declare a moratorium on automation. This may be too simple an answer, however. A moratorium on automation, if it could be enforced, would mean wholesale layoffs of the people who build automatic machines. Their number probably is greater than the number of people who would be laid off as a result of installing the machines. Automation involves a capital expenditure, and, according to some economic theories, greater capital expenditures are precisely what we need to pull out of a recession. Thus, very likely, automation will continue to be a whipping boy, as also the employment of married women and of senior citizens, until we do find some way to avoid recessions and to maintain more job opportunities than there are people to fill them. In periods of recession, automation will be a whipping boy not only among those who "lose their jobs to machines" but also to those who newly come into the labor market and are unable to find jobs, "because everything is done by machines." Again, however, it is difficult to argue with much conviction that where there are unfulfilled human wants there is no human work to be done. Somewhere we have lost, where the economists should be able to find it, the direct relationship between wants and the opportunity to work to satisfy them, which obviously exists in any primitive or pioneer society.

"Belonging"

The problem of "belonging" is an equally difficult problem, which automation emphasizes. Pretty speeches about cooperation, communication, and common interests cannot hide the fact that in most companies the people who are doing the actual work do not "belong" or do not feel that they do. Their interests are, in part, the same as those of stockholders and managers. But in part they are different: diametrically opposed, in fact.

It is to the advantage of stockholders and to lenders generally for the businesses in which they have invested to operate at as low costs and at as high profits as possible. This means greater efficiency in all cases and automation in some. Greater efficiency is also to management's advantage, partly to satisfy stockholders, partly to enhance the prestige, job security, and income of managers themselves, and partly from pride in a job well done.

Efficiency

Again, however, if we wish to be entirely honest, efficiency is almost never to the immediate advantage of the workmen in an organization or to labor leaders. They may not wish to force wages and extras so high as to put the company out of business. Workers and labor leaders have as much sense of social responsibility as anyone else. And workmen take pride in the success of "their" company if they are permitted to feel that the company is in any way theirs. But short of these rather intangible considerations, the advantage of the people working in an organization (in many countries) lies in securing the highest wages and the greatest security, for the least time and the least effort, that they can possibly obtain, by collective bargaining or in any other way. Labor leaders share these aims, *plus* the aim of maximum total employment and hence the maximum number of dues-paying members.

We do not blame stockholders and managers for striving for their maximum advantage. That is the principle on which our free enterprise system is based. In the same spirit, we can scarcely blame workmen or labor leaders for striving for *their* maximum advantage. Looked at from their point of view, why *should* the people working in a company go out of their way to increase efficiency, stop featherbedding, or make automatic equipment work, when *they* have nothing immediate and tangible to gain and when they may thereby lose their own jobs or those of their fellows? Why should unions support or even permit automation, as far as the immediate self-interest of the leaders or members is concerned? What does a man owe to an organization to which he does not belong?

Sharing in the Benefits

Profit-sharing plans and employee-stock-ownership provisions are two of the more formal ways in which a few companies have made their employees members of the organization. Such formality is not essential, however, and may be irrelevant.

The essential element seems to be consistent, everyday actions by management that *show* employees that they are thought of as members of the corporate group. Applied to automation, belonging means being told in advance what is being planned and how those who are affected will be retrained for higher-paying positions, or will be rewarded with shorter hours, or will receive pay increases, as their share of the savings from automation. Belonging means that *no* one is laid off in periods of recession or when automatic equipment is installed. Lower income in a recession may force lower pay, but proportionately for all, including management and stockholders.

At least this seems certain: there will continue to be strife over automation, work rules, and all forms of efficiency, to the detriment of society, until everyone directly concerned does feel, because he has tangible reason to feel, that *he* is sharing in the benefits; that he belongs.

ACROSS THE EDITOR'S DESK

News of Computers and Data Processors

NEW APPLICATIONS

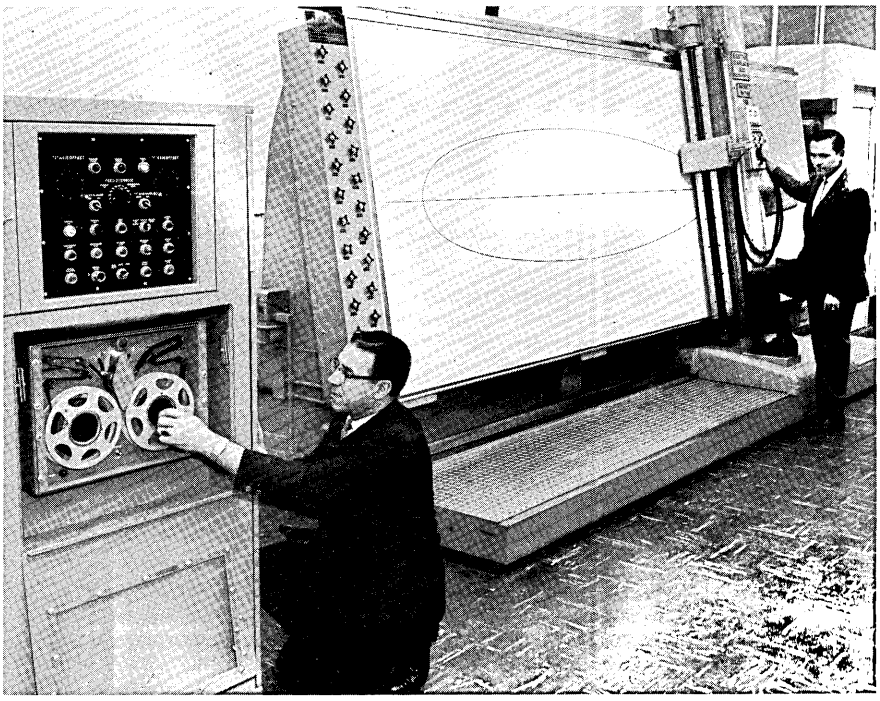
DRAWING BY THE NUMBERS

Drawings for aircraft and missile parts and assemblies are produced automatically by a new numerically controlled engineering drafting machine. From information fed into it by punched paper tape, the device can make design drawings and lofting layouts more quickly and accurately than can human draftsmen, and at less expense.

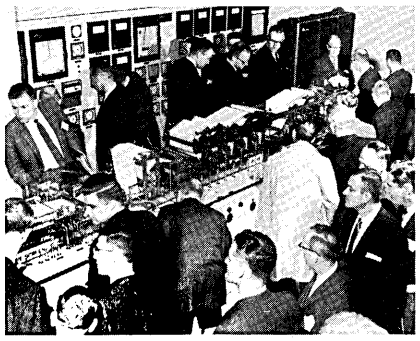
The automatic drafting machine will produce drawings at the rate of 10 linear feet a minute with a drawing accuracy of ± .005 inch, over a 12-foot span. Drawings can be produced with pencil, pen or scribe, and on vellum, glass cloth, clear or scribe-coated mylar. The working area on the machine's board is 5 x 12 feet, but larger drawings can be made for full-scale loft layouts of missile and aircraft parts on a single surface.

In operation of the system, a design layout is translated into engineering information in computer language. The computer then produces a punched paper tape to "instruct" the drafting machine.

The new system was designed to specifications prepared by the engineering and manufacturing research departments of General Dynamics/Fort Worth. It was built by Ekstrom, Carlson and Company of Rockford, Ill. U.S. Air Force funds were approved for the program.



A. Ocone (left) of engineering department and James Starnes of manufacturing department at GD/Fort Worth demonstrate the machine's drawing capability.



AUTOMATED PAPER-PRODUCING MACHINE

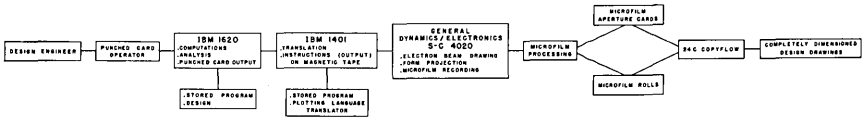
An experimental paper-producing machine under the control of an IBM computer recently gave paper mill men a glimpse of future automation in their industry. The "Papoose" (named for its birthplace at IBM's Kitchawan, N.Y. research center) is monitored by conventional Fischer & Porter instruments. The F&P instruments feed process information to a computer. The computer continuously interprets this information and sends corrective signals back to F&P pneumatic controllers. More than sixty inputs will eventually be analyzed by the computer for complete closed-loop control of the paper-making process.

"MEISENG" SYSTEM

A computer-plotter system has been introduced by Meissner Engineers, Inc., 300 West Washngton St., Chicago, Ill., which is capable of automatically designing a wide range of engineering and architectural projects directly from engineering specifications. The system is able to design anything which can be mathematically described.

In the MEISENG system, an engineer first fills out a data input form. This data is then fed into an IBM 1620 system for analysis. The basic design program informa-

tion is already placed in the computer's memory. The computer output is translated into a special plotting language developed by Meissner. Output in this form determines the type, length and direction of the drawing line to be placed by the electron beam within the cathode ray tube of a General Dynamics/Electronics S-C 4020 computer printer. The 4020 plots drawings at speeds up to 17,000 characters per second. Form projection (company symbols, logotype, etc.) are simultaneously superimposed over the design. The drawings are instantly recorded on microfilm and, after processing, are reproduced on ordinary paper as standard drafting prints. Robert C. Meissner, president of the engineering-contruction management firm, says that the system is virtually unlimited in its application to various industries.



Meissner Engineers' new "MEISENG" system produces fully dimensioned engineering designs from instructions by an engineer or computer expert.

DEFENSE ELECTRONIC SUPPLY CENTER COMBINES ORDER-PROCESSING EQUIPMENT

The new Defense Electronic Supply Center, Dayton, Ohio, will be equipped with computers which will process automatically incoming orders from any of eight distribution points. The system will accept card, punched tape or magnetic tape when fully operational.

Initial equipment will include an IBM 7080, a Univac I, a Sperry Rand step computer, punch card accounting equipment, and a large number of transceivers. A request for approval for a second IBM 7080 is pending. A third IBM 1401 has just been approved for delivery within the near future.

On priority items, the computer system will complete the entire cycle of receiving, locating, ordering, shipping, advising consignee, and billing within four hours and without any DESC employee actually seeing the requisitions. The only manual action involves transfer of magnetic tapes. In addition to order filling, the system will handle all cataloging, inventories and accounting procedures.

HOT STRIP MILL — COMPLETELY AUTOMATED

All operations of the 68-inch hot strip mill at the Spencer Works of Richard Thomas and Baldwins, Ltd., Wales -- from the slab reheating furnaces to the coil conveyors -- will eventually be under control of a GE-412 computer. The 2800 foot long mill will include speed regulators, automatic gage control, screwdown position regulators, automatic crop shear control, as well as the mill's overall process computer system. Basic inputs to the computer control system will include: steel grade, slap dimensions, desired finished thickness and width, finishing temperature and coiling temperature.

The complete GE system provides the functions of process control, production tracking and pacing, quality control and data gathering for mill accounting work. The computer-controlled continuous hot strip mill is linked to an automated information-handling system to form part of an overall business automation scheme.

International General Electric has assumed complete automation responsibility. The process computer is manufactured by General Electric's Industry Control Process Computer Section in Phoenix, Ariz.; the automatic gage control and other control equipment by the Industry Control Department in Salem, Va. The process and systems engineering is performed by GE's Systems Engineering Operation in Schenectady, N.Y.

TARGET INTERCEPT COMPUTER

The Army's Nike Zeus anti-missile missile launched Thursday, July 19, from Kwajalein Atoll in a successful intercept of an Atlas ICBM high over the Pacific Ocean, received its intelligence through the Target Intercept Computer, developed by UNIVAC, St. Paul, Minn.

The special purpose Target Intercept Computer, with its carefully conceived modular construction, low resistance terminals, error detection circuitry, and twistor memory, was built under a closely-guarded clean room atmosphere in UNIVAC's St. Paul laboratories. It contains 175,000 basic components, 90% of which are designated as "A-modules", standardized electronic packages about the size of a pack of cigarettes. It contains 20,000,000 electronic connections which are wire wrapped to avoid solder connections.

The TIC controlled the operation from the moment it was assigned the target by the Zeus Acquisition Radar. Once assigned the target, the TIC'S basic task was four-fold: (1) to predict an intercept point, based on the constant updating of the ICBM's current speed and position in space (2) to initiate the launch order for the Nike Zeus anti-missile missile (3) to issue necessary steering orders to keep Zeus on an intercept trajectory and (4) to instruct Zeus to burst its warhead and destroy the target. All of the computers actions were dependent on information accepted at split-second intervals from the Target Tracking Radar and Missile Tracking Radar . . . information which was compared with the 16,000 words of trajectory information pre-programmed into the computer's memory section.

TRANSCONTINENTAL PRODUCTION CONTROL AND DATA PROCESSING

The Simplex Wire and Cable Company, Cambridge, Mass., now controls production at its plants across the nation through use of an RCA 301 electronic data processing system linked to a teletypewriter network. The new system also permits processing paperwork on a daily rather than a weekly basis.

The computer processes order information from branch offices, producing a production list of orders and a branch office intake report. Reports are broken down by office, salesman, customers, product and inventory.

The 301 system's printer turns out paychecks, machine load reports, production department variance reports, invoicing on accounts receivable, and profit and loss statements. The computer system also produces sales and order analysis reports for management guidance.

NEW PRODUCTS

NEW COMPUTERS

Digital

UNIVAC 1107
THIN-FILM MEMORY COMPUTER

UNIVAC Div., Sperry Rand Corp.
315 Park Avenue South
New York, N. Y.

The first computer to employ thin magnetic film memory has been designed and developed to solve both complex problems off-line, and real-time problems on-line. The computer, the UNIVAC 1107, is a solid-state data processing system.

The thin magnetic film memory enables the UNIVAC 1107 to attain internal referencing speeds measured in nanoseconds, as compared to microseconds for previous computer systems. In addition to the film memory, the system employs a ferrite-core memory of from 16,384 to 65,536 words, depending on the requirements of the user.

The UNIVAC 1107 has a versatile input-output section which can accommodate a wide range of peripheral equipment. It can also communicate with many other real-time devices, such as analog-to-digital and digital-to-analog converters, printing telegraph equipment, display systems and other data processing devices.

Among the applications of the UNIVAC 1107 are scientific computation, digital communication and switching systems, logistics and intelligence systems, traffic control, and inventory and scheduling systems.

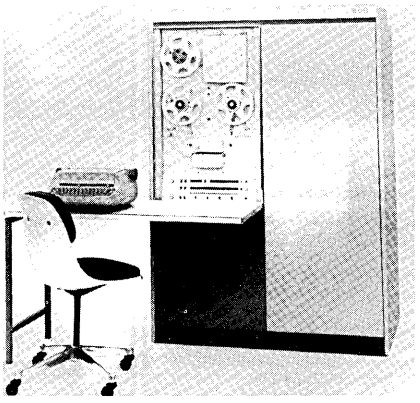
TWO FAST, LOW COST
DIGITAL COMPUTERS

Scientific Data Systems, Inc.
1542 Fifteenth St.
Santa Monica, Calif.

A pair of second generation, solid state, general purpose computers have been developed by this company. They are now in production.

The computers, Models 910 and 920, are single address, random access core memory machines intended for general purpose scientific computation, and special purpose system integration. Each have floating point operation capabilities, and 16 microsecond add times, including both memory access and indexing. Memories are expandable to 16,384 words, each word containing 24 binary bits plus one parity bit. Five separate input-output systems are incorporated into the computers; one of these, a buffered system, allows data transfer at rates in excess of 250,000 characters per second. An instruction technique titled "Programmed Operator" allows the programs from either machine to be run directly on the other.

The 910 digital computer, although designed primarily as a systems computer, can also be used for general purpose scientific use. It operates without special buffers with all standard input/output devices.



Model 920 is a fast scientific computer. Standard equipment supplied with this model includes a 300 character-per-second paper tape reader, 60 character-per-second paper tape punch, automatic typewriter, and manual control panel

NEW ON-LINE
PROCESS CONTROL COMPUTERS

Westinghouse Electric Corporation
Box 2278
Pittsburgh 30, Pa.

The PRODAC 500 Series, a new family of control computer systems, is now available from this company. The new computer systems, specifically developed for on-line process control applications, are the first to be announced under a joint design and development program between Westinghouse and the UNIVAC Division of Sperry Rand Corporation. The systems incorporate UNIVAC computers as a major component.

The PRODAC 510 and PRODAC 580 are the first two systems in the new line to be introduced. Both units are essentially identical, utilizing standardized components, a common language, and programming. Their primary difference is that the PRODAC 580 system is more flexible and has the capacity to process a much greater quantity of information concurrently.

The PRODAC 510 will find its principal application in controlling single-process systems, and in data logging, monitoring, and results computation on electric utility systems.

The PRODAC 580 will be used for computer control of automatic steam plants, automatic rolling mills for the steel industry, and applications where several processes are controlled by a single computer.

INEXPENSIVE, HYBRID
ANALOG-DIGITAL COMPUTER
SYSTEM FOR PROCESS CONTROL

Elliott-Automation Ltd.
London, England

This firm has demonstrated an inexpensive computing system for industrial process control. The purpose of the system, called ARCH (Articulated Computer Hierarchy), is to enable small and medium-size

firms to afford automation. The basic system costs $8400.

Both analog and digital computing elements are used in ARCH. No new electronic techniques are used. The analog line includes integrators, multipliers and transducer correction units. The digital modules connect together by means of a common digital busbar. Digital control units will use a fixed memory program.

ARCH has a wide range of application including such industries as chemical, oil, steel, iron, paper, rubber, plastics, and food preparation.

NEW COMPUTER ANNOUNCED FOR TEACHING DATA PROCESSING TECHNIQUES

UNIVAC Division, Sperry Rand Corp.
New York, N. Y.

A miniature computer system, the UNIVAC 422, complete with large-scale processor characteristics, has been developed. It is the first such system devised to teach electronic data processing techniques to student programmers, operators, technicians, engineers and businessmen.

The system is part of a new UNIVAC educational package, named PREP (PRogrammed Educational Package), which includes, in addition to the computer, a programmed teaching textbook that enables students to proceed individually according to ability, and a course outline on digital computers, their programming and their operation.

The 422 can be plugged into any standard electrical outlet. It uses solid-state components, magnetic core storage, parallel operations, and 16 basic instructions. Instruction times are: add, 12 microseconds; multiply, 30-60 microseconds; divide 57 microseconds. The computer has a 512-word memory. It is 54 inches in length; 26 inches in height; and 9 inches deep.

AUTOMATIC STATISTICAL COMPUTER

Boonshaft and Fuchs Inc.
Hatboro Industrial Park
Hatboro, Pa.

This company has introduced a low-cost, solid-state computer which accepts relay closure or manual entries as input. These can be of a frequency distribution in up to ten cells, with up to 99 entries per cell.

The unit computes mean value and standard deviation instantaneously and continuously. Operation is automatic, with correction of computations with each new entry. Optional input mechanisms permit manual or automatic sorting of input data. Automatic recording apparatus for recording output signals is also available.

Manufacturers can use the computer as a means of operating closer to tolerances. Others can use it to determine the actual precision of available automatic machinery and processes of many types.

Analog

STUDENTS USING PORTABLE ANALOG COMPUTERS

Case Institute of Technology
Cleveland, Ohio

About 200 engineering students this Fall will use a personal analog computer. The portable analog computers, whose components are a little larger than packages of king-size cigarettes, are being manufactured by Pastoriza Electronics, Boston, Mass. They were designed by Dr. James B. Reswick, Head of the Case Engineering Design Center, and by James Pastoriza and George A. Philbrick of Boston.

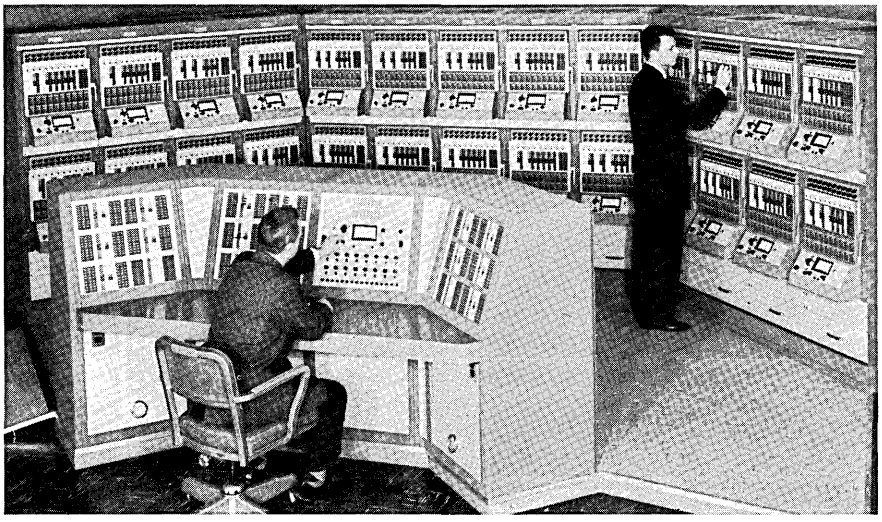
These computers allow the student to solve differential equations at his convenience instead of requiring him to go to a computing laboratory. The self-powered sets will perform mathematical operations of addition, subtraction, multiplication by a constant, and integration. The components can be assembled into groups to solve the problems commonly encountered in linear sys-systems courses.

Each set consists of six components: one adder, two co-efficients, two integrators and one meter control unit. The meter control device displays the answers on a numbered scale and provides control signals which freeze a solution at fixed time intervals so that numerical units can be accurately plotted by a student on his homework paper.

Twenty-five sets will also be used by students at the Thayer School of Engineering at Dartmouth College, Hanover, N.H. The students will use them to solve problems involved in engineering courses on electrical circuits and in mathematics courses.

ANALOG COMPUTER SYSTEM FOR U. S. SIGNAL CORPS.

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



A large, transistorized analog computer system is shown undergoing final inspection and check out at EAI. The system was built under a contract from the U.S. Signal Corps.

ANTISUBMARINE WEAPON COMPUTER

General Precision Inc.
Librascope Division
Glendale 1, Calif.

The development and delivery of an anti-submarine weapon computer for the Navy's first operational military hydrofoil craft, is announced. The computer, known as Attack Plotter Mk 16, was produced under contract from the Bureau of Naval Weapons for installation on a 110-ton hydrofoil subchaser being built by the Boeing Company, Seattle, Wash. The computer will be a major element of the subchaser's weapon system. It will solve antisubmarine warfare (ASW) problems.

Boeing's subchaser is designed to detect enemy submarines with underwater sensing devices, close in on the target at top foilborne speeds and launch over-the-side torpedoes for the kill. When sonar equipment spots an enemy, the subchaser will accelerate out of the water on two extended foils and speed to the attack. It can dip back into the water to get new sonar bearings if needed, then leap-frog back to the attack.

Librascope's computer includes an analog computing unit to provide target-motion analysis and ballistic solutions, and an optical unit to provide a visual display of the attack problem. The operator of the weapon system will be shown the position of his own ship, the present and predicted future position of the submarine, and the point at which the weapons must be fired for the kill. As the subchaser attacks, the computer will update the craft's position and transmit this data to the helm to assist in steering the ship to the correct firing point. The computer can be set to automatically track a target over a long period of time.

Memories

NEW "MICROFERRITE" TECHNOLOGY

Radio Corporation of America
30 Rockefeller Plaza
New York 20, N. Y.

The RCA Laboratories, Princeton, N.J. have developed a new "microferrite" technology for building computer memories up to 15 times faster than the fastest units now available. A mass production version of microferrite technology will be used by the RCA Semiconductor & Materials Division, Needham, Mass., to build a new family of high speed memories. These commercial memories will be medium capacity types actuated by low driving currents and capable of processing two million bits of information per second -- about five times the speed of present commercial memories. (Experimental devices able to process 10 million bits per second have already been built.)

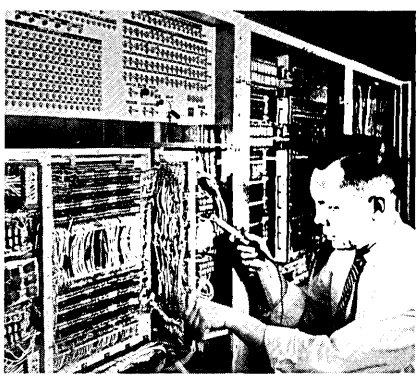
The experimental microferrite memories that have been built consist of tiny ferrite squares assembled in flat mosaics and interconnected by evaporated metal paths. Each square has two central holes -- each 1/8 the diameter of a human hair -- through which electronic pulses pass, bearing information to or from the memory. It is the small diameter of the holes in the ferrite squares, plus the use of "impulse switching" -- an electronic means for changing the polarity of the magnetic fields induced around the holes -- that accounts for the exceptional speed of microferrite memories.

With the larger units now in development, the new memory is expected to afford access to and read out from any of 4096 stored words in .1 microseconds.

IBM BREAKS "MICROSECOND BARRIER" IN FULL-SCALE COMPUTER MEMORIES

International Business Machines Corp.
Data Systems Division
Development Laboratory
Poughkeepsie, N. Y.

Two full-scale, special-purpose computer memories that work in less than a microsecond have been developed by this company. One, completely operational, reacts in 0.7 microsecond, while the other, a larger system (shown in photo), has reached 0.75 microsecond under testing. Both use advanced magnetic core technology.



The new machines permit electronic reading and writing at the rate of over 11 million alphabetic characters a second -- equivalent to 22 full-length books. The new solid-state memories actually have access times of between 0.55 and 0.6 microseconds. A computer system using more than one of the memories could achieve a memory rate far in excess of 0.7 microsecond. Both new memories are asynchronous core storage units. The smaller memory contains 1024 words (73,728 bits) while the larger will contain 16,384 words (1,179,648 bits).

In both memories, three key technological changes produce the increased speed: (1) the means of locating information is simplified; (2) partial core-switching is used; and (3) fast-recovery diodes are used in address selection.

IBM does not plan to sell either memory in its present form. The technology used in these memories may be adapted for future computer systems requiring fractional microsecond rates. Such speed would be valuable in solving problems of the greatest complexity. Because the technology is generalized, it could be used for any type of system -- scientific or commercial.

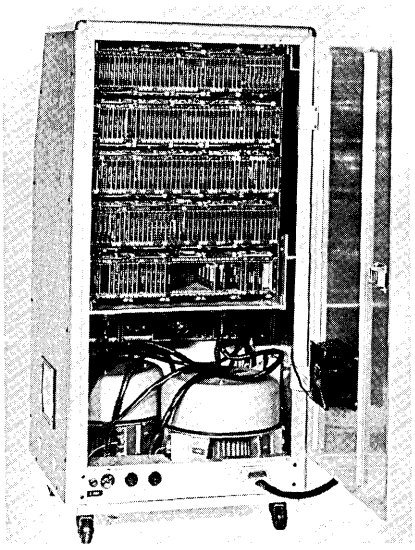
SINGER OFFERS TRANSISTORIZED MEMORY SYSTEM

HRB-Singer, Inc.
396 Fifth Avenue
New York, N. Y.

A low cost memory system designed to add high speed data processing capabilities to electric accounting machine equipment has been developed by this company. The system, the SEMA 2000, is connected directly to IBM accounting machines, collators, punches, calculating machines, and reproducers to perform important data processing functions and reduce the high cost of maintaining and operating punch card accounting systems.

The SEMA 2000 is completely transistorized, and uses random access memory drums. One to five memory drums can be used, depending on specific requirements. Each drum has a capacity of 2000 ten-digit words and two "flags" per word. A flag is an identifying symbol stored at each number location. It controls selector switches, stops a sequence read-out operation at predetermined addresses, operates IBM selectors for special program changes and recognizes non-existent or non-allowed addresses. Flags are also used to control punching and collating operations. Using a control switch, memory capacity can

be doubled to 4000 five-digit words with one flag per word.



The use of the SEMA 2000 with basic IBM accounting machines will provide: order allocation, inventory control and sales analyses -- as a result of a single collator pass; inventory control and sales analyses as by-products of invoicing operations; automatic pricing and extending of line items as by-products of an invoicing run; order confirmation, inventory control and "goods in process" interrogation as by-products of a single accounting machine run; and elimination of calculating machine passes for payroll computations -- by means of stored deduction tables.

MAGNETIC STORAGE DRUM

Bryant Computer Products
852 Ladd Rd.
Walled Lake, Mich.

A magnetic storage drum, Model C-675, has been introduced by this company for applications ranging from real time monitoring systems to laboratory research.

Operating frequency of the drum at 1800 RPM is 73.5 KC, with a maximum of 2450 bits per track on 12 tracks. One read/write head serves each track, and any head or track may be used for timing. Register tracks are optional, with each register reducing by two the number of tracks available for general storage. The economy drum is 6" in diameter, by 3/4" long with overall dimensions of 11" in diameter, by 8" long.

Input - Output

HIGH-SPEED TELEPRINTER SYSTEM

Motorola Inc.
Military Electronics Division
Washington, D. C.

A teleprinter system capable of printing 3000 words per minute has been introduced. It is called the TP-3000.

The Teleprinter System prints digitally encoded messages onto high-contrast electro-marking paper. Printout is in alphanumeric characters. Line width is 72 characters on 8½ inch wide paper. The use of a "Moving Matrix" print head eliminates the need to set up a separate print head for each character position. No type, inks, fluids, or powders are needed for printing. Individual characters are formed electronically by selecting dots from a 5 x 7 matrix. Characters are clear and well formed in standard ten point size.

-- Motorola's TP-3000 High-Speed Teleprinter is at home in a variety of roles, be it with a communications system, or with a computer.

The basic system consists of a translator and the page printer. The translator decodes the message and delivers the proper signals to the printer for marking the paper. The system is modular in construction and designed for easy servicing. It has been manufactured to rigid military specifications.

TAPE DRIVES FOR HONEYWELL

Honeywell Electronic Data Processing
60 Walnut St.
Wellesley Hills 81, Mass.

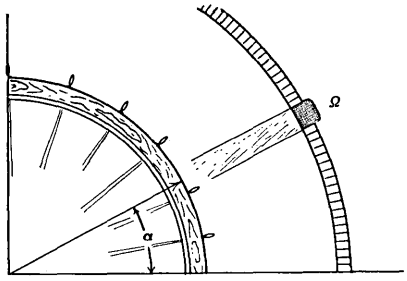
This company has developed low-cost magnetic tape drives and an-off-line printing configuration for use with the Honeywell 800.

The development of the "Economy" magnetic tape drives brings to four the magnetic tape systems which are now available for use with the Honeywell 800. They are the Economy, Standard, High Density and Super Density systems.

The Economy magnetic tape drives read and write information at a rate of 48,000 decimal digits or 32,000 alpha-numeric characters per second. All standard Honeywell 800 programs and automatic programming aids may be used with these tape units.

The off-line printing configuration is designed for such EDP applications as public utility billing, and subscription processing. These involve a large volume of printing, but do not require on-line operation of the printer.

The printer's equipment consists of a control unit (model 818) used with Honeywell's high-speed printer, and either a Standard or Economy magnetic tape transport. The high-speed printer operates at a rate of 900 lines a minute. A total of 160 print positions per line are available. Of these, 120 positions may be "active" in any given print run.



SELF-CONTAINED PUNCHED-CARD ACCOUNTING MACHINE

UNIVAC Division of Sperry Rand Corp.
315 Park Avenue South
New York 10, N.Y.

An inexpensive business data processor, which offers reading, processing and printing speeds, previously associated only with medium- to large-scale electronic computers, has been developed.

The new transistorized UNIVAC 1004 Card Processor is a single, self-contained accounting machine. It links an ultra-fast 8 microsecond magnetic core internal memory

with a simple, yet powerful, external program plug-board. The UNIVAC 1004 can perform alpha-numeric comparisons, numeric magnitude comparisons, addition, subtraction, program multiplication and division, sign tests and program variations. Its striking feature is that it can simultaneously read cards, print the results of computations, and punch new cards as output. It will process either 80 or 90-column cards, with a reading speed of 300-400 cards per minute and a printing speed of 300-400 lines per minute. The unit has 132 printing positions, each including 63 characters.

The systems program plugboard control eliminates the need for skilled programmers and lowers total system cost. The programming power of the system can be illustrated by the fact that a complete print line of 132 characters can be edited for printing purposes in one program step.

THREE-IN-ONE CARD PUNCH

International Business Machines Corp.
Data Processing Division
White Plains, N. Y.

A new IBM card punch, which performs single-line interpretation as well as punching and printing data, has been developed.

The new IBM 26 interpreting card punch, alphabetical model 21, performs the interpreting function at the rate of 18 columns per second. It is able to interpret in a single line up to 80 columns of data stored in pre-punched cards, the interpretation appearing above the respective column on the card. The model 21 prints and punches data on IBM cards in the same manner as a regular IBM 26 printing card punch. Setting the switch from the "punch" to "interpret" mode on the model 21 suppresses punching so that pre-punched cards can then be interpreted.

PUNCHED TAPE AND READER EQUIPMENT

Royal McBee Corp., Industrial Products
850 Third Avenue
New York 22, N. Y.

Two completely new models of punched tape and reader equipment have been added to Royal McBee's 500 Series. The new models (520 and 570) consist of Royal McBee's basic punch and reader mechanism housed with drive motors, shaft position indication, electrical connectors, tension and tape feed switches. The units are composed of solid state logic modules. The new systems will be for users who desire the complete asynchronous-controlled package employing low level logic. The punch and reader mechanisms are available separately, with drive motors and timing supplied by the user.

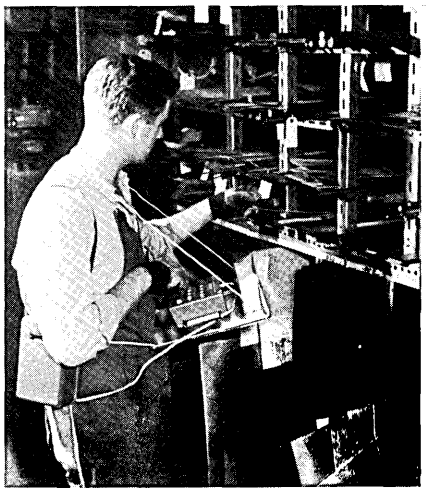
The Series 570 Punched Paper Tape Reader System is suited to message relaying, data collection, business machine and computer input, as well as machine tool and plotter control. It reads 5 to 8 channel tape, in either direction, and is designed to operate at a speed of 50 characters per second. A semi-automatic tape insertion feature reduces tape loading and unloading time. The system also accommodates tape loops.

The Punched Tape Perforator System (Model 520), as a companion unit, feeds in either forward or reverse directions at the same speed as the reader. It uses the holding power of small electromagnets in combination with off center springs to engage the selected punches.

NEW BOOK-SIZED KEY PUNCH MACHINE

Varifab, Inc.
High Falls, N. Y.

A book-sized key punch machine for on-the-spot data recording that helps to eliminate costly tool and parts inventories in industrial plants has been developed. The new machine, called the Vari-Punch, punches and prints on standard 80 column data cards. These cards may be fed into conventional tabulating and computing machines for quick and accurate recording of information.



Shop personnel, with a minimum of instruction, can use the machine to check and punch out stock information right in the tool shop, or in the parts bin. The Vari-Punch has a 12-key adding machine or tabulator keyboard. It prints as it punches, providing visual display of punched data. A column indicator provides a visual check, assuring placement of data punched in proper column.

The Vari-Punch, weighs five pounds, and operates from 115 volt A.C. outlet or 12 volt D.C. portable battery power-pack, as shown in the photograph.

NEW STATIC CARD READER

Industrial Timer Corporation
'Highway 287
Parsippany, N. J.

A static card reader, Model 4000, is available. It reads from 1 to 960 circuits simultaneously. It can be supplied to read an entire standard IBM, Rem-Rand, or similar card. Without changing card's position, the 4000 reads either 12 rows or 80 columns through 960 individual contact pins.

The punched card is inserted through a door in the front of the unit. Correct card placement is produced by a position sensing mechanism. Operation of the reader handle moves the card and printed circuit board into contact with the contact pins. Those areas on the card which have been punched will allow contact to be made between the contact pins and the printed circuit matrix.

Full utilization of existing data processing equipment for punching, storing, and sorting cards used for process control, as well as data processing, is possible. The contact pins and mated circuits can be wired to suit customer requirements.

BLOCK-TAPE READER/HANDLER WITH ISOLATED CONTACTS

Chalco Engineering Corp.
Gardena, Calif.

A block tape reader and handler designed principally for factory and field test applications has been developed.

The reader, called Model 623, operates without storage or isolation circuits. Output is read directly from the reading head which has 128 isolated single-pole, single-throw closures with gold-plated contacts. Tape life is rated at 3000 passes, and an inter-

locking reading head, which prevents tape movement during opening or closing of the head, minimizes tape damage. It uses standard 1" mylar tape, can be coded by standard 1" punch units, and is available with transport mechanisms for use either with AC or DC voltage.

The companion tape handler accommodates 8" reels, with a tape capacity of 8 bits per line, 16 lines (or 128 bits) per block, and 6500 blocks per reel.

Model 623 has a block accumulator which counts bi-directionally and is geared to a capstan drive. The reader is also available with photo-diode master bits for more complex search and program applications.

DOCUMENT-IMAGE RETRIEVAL SYSTEM

Electronics Corp. of America
Beverly Hills, Calif.

This company has contracted out what it claims is a complete document-image and retrieval system, called Electro-Stor.

The unit includes a microfilm machine which can move microfilm at the rate of 600 feet per minute. It can store 3.5 million images. Each image on the film triggers a photoelectric counter which counts each image during a search. When the desired image is found, photocopy is produced by a photocopy machine on top of the film reader. The indexing system is contained in a magnetic tape carrier, which stores a code number for each image.

The system just contracted has been let to a Beverly Hills lawyer. Over 100,000 documents consisting of about 500,000 pages will be filed for him.

ECA is also designing law libraries using the system. They will contain all federal laws and the laws of the state in which they are used. Nevada laws have already been stored on microfilm, and the company is currently working on California and Federal legislation. Called Lawstaff, the service will be rented to attorneys for $25 a month. Clients will be able to obtain data by telephone or through a facsimile machine installed in their offices.

DIGITEK 100 OPTICAL READER

Digitek Corporation
147 Lincoln Highway
Fairless Hills, Pa.

An optical reader has been announced by this company. The reader accepts 8½ x 11 inch paper and reads ordinary pencil marks for use in test scoring, personnel selection, market research, information search and automatic reading of input forms.

The Digitek 100 Optical Reader uses photoelectric scanning and solid-state digital-computer logic to eliminate the need for a special pencil. It discriminates against erasures, detects multiple responses, and performs accuracy-control functions by channeling sheets not scanned properly to a separate output stack. Optional attachments will include an Item Analysis Unit and Recording Units for transcribing scanned data (including alphanumeric identification grids) to punched cards or magnetic tape.

The Digitek Corporation is an operating affiliate of the American Research and Development Corporation, Boston, Mass.

Components

MARYLAND FIRM OFFERS 10-LINE STORAGE UNIT

Advanced Research Associates, Inc.
Kensington, Md.

This company has developed a 10-line input decimal storage register which includes write and read gating. Model 234 is designed for use with electronic counters in applications that require a buffer storage for readout while the counter system continues to operate without interruption during the readout period.

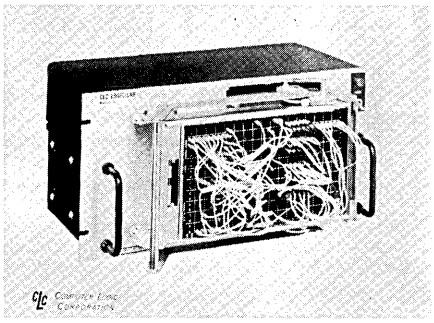
Each register contains the memory cells and their associated write and read gating, mounted on a 4x5 inch printed circuit card. It has a specially processed gas diode in each of the 10 memory cells to allow only one cell to be "on" at a time. Input is typically from a 10-position device, such as a glow transfer gas counter tube or Nixie display tube. No "memory clear" function is required in the writing operation.

The storage register cards can be inter-connected by back board wiring to form storage banks for several hundred decimal digits.

LOGIC-LAB

Computer Logic Corporation
11800 West Olympic Blvd.
Los Angeles 64, Calif.

This company has announced the introduction of LOGIC-LAB -- a new concept in universal digital logic units. The electronic LOGIC-LAB can be used for rapid digital system synthesis, logic circuit checkout, digital computation, and educational applications.



The LOGIC-LAB Model LL-101 enables an engineer to program a custom digital logic system for a quick-look or an extensive test, in the same manner as a prototype breadboard circuit might be constructed. The difference is that the LOGIC-LAB is composed of standard plug-in modules, complete with power supply. Only the signal interconnections are temporary.

The LL-101 contains 25 standard logic cards. Flip-flops, NOR gates, shift registers, AND gates, inverters, power drivers, counters, and a 250 kc clock are included. The entire unit is pre-wired so that all logic signals are available on the removable front program board.

Any number of LL-101 units can be used together, and additional program boards can be supplied.

PROGRAMMABLE LOGIC PANELS

Control Logic, Inc.
11 Mercer Rd.
Natick, Mass.

A new line of programmable digital logic panels has been developed by this company. The 3½" high, standard 19-inch RETMA logic panels are designed for rapid patch-cord connection of digital logic. Each panel is a pre-wired, complete sub-functional unit, available with modular products of Control Logic's 100KC or 2MC welded circuits.

Among the 28 standard panels available are: a storage register flip-flop panel, a control register flip-flop panel, a logic register

flip-flop panel, a clock generator panel, and a pulse forming circuit panel. Other panels include modules for NAND gate control, inverter gate control, amplifying, programming, and switching control. These panels are applicable to systems simulation, logic design, and to test equipment or training in digital systems techniques.

TEMPERATURE TRANSDUCER FOR EDP

Winsco Instruments & Controls Co.
1533 26th St.
Santa Monica, Calif.

A temperature transducer designed specifically for electronic data processing has been announced by this company. This miniature, surface temperature transducer features one volt output per 100°F span.

The Model 2521 transducer uses a 4400-ohm, wire-wound sending element, and, in conjunction with a matching bridge, provides an output which can be fed directly into a digital computer. Relatively high resistance allows the device to be located at remote distances from the computer. It meets military vibration and shock requirements.

COMPUTER DISPLAY UNIT ADAPTS TO TAPE WITH NEW STANDARD OPTION

General Dynamics/Electronics
P.O. Box 127
San Diego 12, Calif.

This company has developed a standard option which allows the S-C 1090 Direct View Display to be driven directly from computer tape or tape control units.

The option, the A-50 Tape Channel Adapter, adapts the S-C 1090 to the tape units of any computer using standard six-bit words. It is completely compatible with the IBM 729 II or IV tape transports and tape control units. The Tape Channel Adapter accepts the six-bit words in parallel from the tape or tape control units and formats this data into the 36-bit words used by the S-C 1090. It permits either on-line or off-line use.

DIGITAL ACTUATOR FOR MISSILE CONTROL SYSTEMS

Martin Company, Orlando Division
P.O. Box 5837
Orlando, Fla.

Two digital actuators for missile control systems have been developed. The actuators are capable of accepting the binary outputs of an airbourne digital computer directly, without the usual digital-to-analog conversion.

A prototype hydraulic digital actuator has been built which is capable of operating within temperature ranges of -65^0 to 400°F. The compact device can handle large loads with high inertia and requires no conversion of the output of an airbourne digital computer. Eight binary inputs allow 256 discrete positions of accurate actuator travel. The hydraulic digital actuator requires only a single time constant to effect command position. Mechanical feedback controls a spool valve to regulate flow to the actuator.

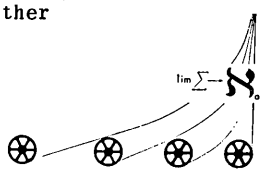
A pneumatic prototype device, now under development, can be used with either compressible or incompressible fluids. Operating temperature ranges are expected to be -250^0 to 2000°F. All components are self-cleaning, and insensitive to contamination and to radiation effects.

Converters

VOLTAGE-TO-DIGITAL CONVERTER

General Data Company
1250 North Parker Street
Orange, Calif.

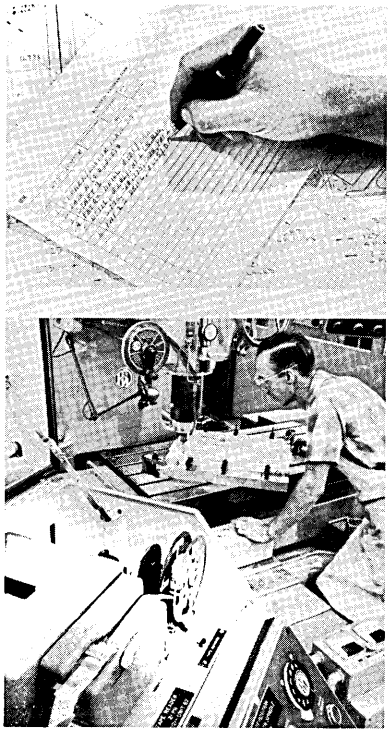
A new voltage-to-digital converter has been developed by this company. It has twelve binary bits including sign, a conversion time of less than 0.66 microseconds per bit, and an accuracy of .025% ± ½ the least significant bit. Input impedance is greater than 10 megohms and output is parallel binary. Construction meets military standards. No mechanical or solid-state choppers are used.



Software News

AUTOSPOT and AUTOMAP — NUMERICAL CONTROL PROGRAMS

International Business Machines Corporation, White Plains, N.Y., has developed two new computer languages, designed to broaden use of numerically controlled machine tools in smaller machine shops.



Controlled by instructions generated in the form of punched tape by an IBM small-scale 1620 computer, a Pratt and Whitney Company jig borer automatically machines a part at IBM's Space Guidance Center in Owego, N.Y.

The process begins when a parts programmer working from a blueprint (upper photo) writes a few statements in the English-like AUTOSPOT language. These statements, in the form of punched cards, are processed by the 1620. The tool operator looks on (lower photo) as the jig borer automatically machines the part under control of the computer output tape.

AUTOSPOT (AUTOmatic System for POsitioning Tools) was developed for point-to-point operations such as drilling, boring, tapping, reaming and some line-cutting operations such as pocket milling. AUTOMAP (AUTOmatic MAchining Pro-

gram) was developed for continuous path machining -- two and three dimensional milling.

Both languages are for use on the small-scale IBM 1620 data processing system. With a vocabulary of about 120 words, the parts programmer is able to write a few simple statements which describe specifications such as surfaces to be machined, coordinate points or tool sizes and feed rate. An AUTOSPOT or AUTOMAP processor program consists of instructions which enable the computer to generate automatically from the parts program the tool paths or points necessary to operate the numerically controlled machine tool.

The computer translates the English-like language into suitable computer codes, under control of the processor. Then it converts the tool positioning instructions to meet the special requirements of the machine tool being used. An auxiliary program, called a post-processor, performs this conversion. The final output is a punched tape or punched cards which are fed into the controller of the machine tool. The tool is thereby automatically instructed to machine the part within precise tolerances.

In both programs it is possible to modify individual sections of the parts program without rewriting the entire program -- only affected lines need be rewritten.

C-E-I-R ANNOUNCES RAMPS — NEW MANAGEMENT TECHNIQUE

An automated management technique for making the most of resources of men, materials, and money has been announced by C-E-I-R, Inc. RAMPS (Resource Allocations and Multi-Project Scheduling) makes it possible to schedule many resources in dynamic situations where there is competition for the resources among many projects. The original critical path techniques did not recognize the limitations on project scheduling of a limited supply of human and physical resources, nor were they able to consider many projects simultaneously.

RAMPS is said to be a sophisticated version of the basic critical path technique. It provides for such varying criteria as minimum cost, minimum time, level use of resources or combinations of these criteria. It can also tell planners at what points understaffing or overstaffing become inefficient; what it will cost to delay one project at the expense of another; what the value would be of having men work overtime or of subcontracting a part of the job.

Pre-RAMPS automated management systems are capable of dealing with only one goal and they treat resources as static quantities. C-E-I-R feels RAMPS is a major advance in the family of critical path schedule techniques.

STATUS, A NEW COMPUTER PROGRAM

ITT Data Processing Center of International Electric Corporation, Paramus, N.J., has announced a new computer program that permits processing of business statistics.

STATUS, the new program, uses time-series analysis, correlation and multiple regression, and econometric forecasting. The program analyzes monthly statistics to determine the nature and extent of fluctuations. It correlates these statistics with business indicators to determine an organization's position in the economy and projects the data to aid in forecasing.

CATALOG OF COMPUTER PROGRAMS FOR MANAGEMENT SYSTEMS

A catalog of computer programs written for PERT, CPM, and similar management systems, is now available free of charge from Operations Research Incorporated, 8605 Cameron St., Silver Spring, Md.

Most of the listed programs are available cost-free from the originating agency, and are in the form of a deck of punched cards or a computer tape.

ORI's "A Catalog of Computer Programs for PERT and Similar Management Systems" will be continually updated as new programs are created and come to the attention of the editor. The present catalog includes more than 80 per cent of all existing programs.

The catalog makes no attempt to evaluate the various programs; listings are solely to direct interested persons to sources of programs that may be suited to particular equipment and purposes.

NEW FIRMS, DIVISIONS, AND MERGERS

MEMBERS APPROVE PROPOSED MERGER OF IRE AND AIEE

Members of the Institute of Radio Engineers have approved plans to merge with the American Institute of Electrical Engineers to form the Institute of Electrical and Electronic Engineers on January 1, 1963. AIEE members approved the proposed merger on June 18 at their annual meeting in Denver.

The memberships of both societies voted their approval of the merger.

The way is now open for a 14-man committee, seven from each society, to proceed with plans to prepare for and implement the merger. When the merger becomes official, the resulting international society, to be known as IEEE, will be the largest professional engineering society in the world, with approximately 160,000 members in more than 80 countries.

HONEYWELL-EDP IN TECHNICAL AND PATENT AGREEMENT WITH NIPPON ELECTRIC COMPANY

Honeywell Electronic Data Processing has concluded an agreement with Nippon Electric Company under which Nippon Electric will manufacture and market Honeywell's full line of commercial electronic computer equipment in Japan.

Under the "Technical Know-how and Patent License Agreement", Honeywell will provide the Japanese firm with technical information and specifications to produce and sell in Japan its four computing systems -- Honeywell 400, Honeywell 800, Honeywell 1800, and Honeywell 290. The agreement includes information on the associated input-output devices provided by Honeywell EDP. Nippon Electric will also have access to Honeywell's package of automatic programming aids and may also purchase Honeywell EDP equipment for resale in Japan.

Honeywell, in turn, will have access to Nippon Electric's technical data and specifications in the

EDP area for its own use. Nippon Electric is Japan's largest and oldest manufacturer of electronic data processing systems and is also Japan's leading manufacturer of communications equipment.

NMAA CHANGES ITS NAME TO DATA PROCESSING MANAGEMENT ASSOCIATION

At the National Machine Accountants Association's Annual Board of Directors' meeting in New York City, June 19, a change of name to DATA PROCESSING MANAGEMENT ASSOCIATION was approved.

According to its newly elected President, Mr. Elmer F. Judge, "the widening use of digital computers and associated electronic equipment, as well as the rising managerial status of our membership has made this change necessary. The new name more accurately describes our membership and its functions".

The organization has 16,000 members in 183 chapters in the United States, Canada, Puerto Rico, and Japan. Headquarters are in Park Ridge, Illinois.

NEW USERS ORGANIZATION TO BE FORMED

A new Burroughs computer users organization called CUBE (Cooperating Users of Burroughs Equipment) will be formed in October through the merger of DUO (Datatron Users Organization) and CUE (Cooperating Users Exchange). DUO (the 205 users group) and CUE (the 220 users group) realized a need for an organization to include the broader membership base of a general Burroughs users group. The membership will be made up of the 25 active companies represented by DUO, the 30 represented by CUE, and representatives of organizations that have installed or ordered the new B200 and B5000 solid state computers. The first general meeting of CUBE will be held in Los Angeles, Calif., in October.

NEW ORGANIZATION FORMED TO PROMOTE NUMERICAL CONTROLS USAGE

Numerical control equipment users and manufacturers are forming a new organization to be known as the Numerical Control Society. The purpose of the group will be the promotion of the automatic tool control field.

The founding convention met in New York and adopted the following aims and objectives: to act as a repository and disseminator of numerical control information; to aid the advancement and effective use of numerical control; and to recommend standards and coordinate numerical control activities.

Four officers and five committee chairmen were elected and charged with drafting a constitution and by-laws, establishing contact with existing related organizations and contacting organizations represented at the convention for the purpose of soliciting initial financing. These tasks are to be accomplished prior to the group's next meeting in December of this year.

NEW SOFTWARE COMPANY

Informatics Inc., 8535 Warner Drive, Culver City, Calif. is a new software company in the digital computer field. It is organized and equipped for consulting, design, analysis, evaluation, programming, and operating computer systems for scientific and business users. The five senior members have a total of 49 years' experience in the utilization of modern computers and information technology. The president is Walter F. Bauer.

The company already is fulfilling a number of contracts, covering: disc-file application analysis and product design; design analysis of a computer system; marketing studies for a large-scale computer; the analysis and evaluation of medium-speed computers for an on-line data reduction system; and the design and programming of a diagnostic routine.

H-W ELECTRONICS, INC. IS DIGITAL FIRM'S NEW NAME

H-W Electronics, Inc., is the official new name of Harvey-Wells Electronics, Inc., of Natick, Mass. The name was changed in order to prevent further confusion with the Harvey-Wells Corporation in neighboring Framingham, Mass. The (now) H-W Electronics is the manufacturer of the "Data Bloc" and "Data Pac" lines of high-speed digital-circuit modules. It also designs and manufactures digital control systems and computers. The Harvey-Wells Corp., of Framingham, on the other hand, manufactures magnets.

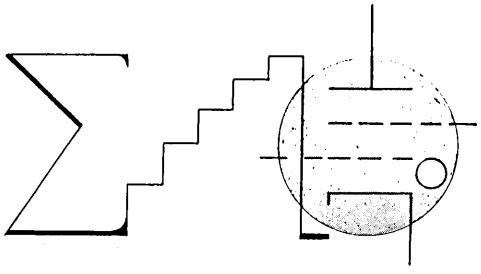
COMPUTER EQUIPMENT LEASE PLANS

Boothe Leasing Corporation, a Greyhound Subsidiary, has organized a Computer Leasing Division to provide an alternative to the rental arrangements available through computer equipment manufacturers. Headquarters of the new Computer Leasing Division will be at the firm's New York City office -- 445 Park Ave.

Terms of the new Division's leasing plans for data processing equipment or systems are scaled to reduce substantially the cost to clients of acquiring such equipment. A customer, upon leasing equipment, has the advantage of unlimited usage without extra computer time rental charges. Boothe's computer staff also provides guidance and assistance in equipment selection.

OVERSEAS FIELD SERVICE FOR ANELEX HIGH SPEED PRINTERS

ANelex, Boston, Mass., has announced the opening of a London field service office for the servicing of ANelex High Speed Printer Systems. The new office will serve as a parts distribution center and provide field service assistance to users and computer manufacturers. ANelex is currently supplying high speed printers to Ferranti and several other computer builders in Europe.



NEW INSTALLATIONS

FIRST POLARIS COMPUTER DELIVERED

Control Data Corp., Minneapolis, Minn., has delivered the first geoballistic fire control computer for the Navy's Polaris Missile program. A production contract, with General Electric Ordnance Department as prime systems contractor, calls for Control Data to deliver an additional 11 geoballistic fire control computers this year.

The Mark 84 Fire Control Computer is designed to control the firing of the Polaris missiles. Once the submarine debarks on a mission, the computer is given instructions for the entire cruise. Permanent target data, including such items as latitude and longitude, are read-in to the computer from punched paper tape. The more variable data, such as wind conditions at different altitudes are fed into the computer through dials on the computer instrument panels. The position of the submarine is given to the computer from the precise Ships Inertial Navigation System (SINS). The computer calculates trajectories to the assigned targets up to the moment each missile is fired.

S-C 4020 HIGH-SPEED COMPUTER RECORDING SYSTEM INSTALLED AT JET PROPULSION LABORATORY

The S-C 4020, a high-speed computer recording system, will be used by the Jet Propulsion Laboratory, Pasadena, Calif. for plotting missile trajectories and recording telemetry data from lunar and interplanetary space flights. The system is made by General Dynamics/Electronics, San Diego, Calif.

The S-C 4020 is used to provide a "quick-look" output from the IBM 7090 computer. JPL's computer laboratory technicians can then constantly monitor the performance of spacecrafts during flight.

The computer at JPL is one of the first to have the new F-80 option which produces paper size copies from the recorder for immediate viewing. The information can also be photographed on 35mm microfilm for compact storage and retrieval. The recorder operates either on-line from the computer at speeds of 17,500 characters per second or 12,500 graph plotting points per second, or off-line from magnetic tape.

HONEYWELL 800 TO HOLD TAX RECORDS

Title Insurance and Trust, Los Angeles, Calif., has installed a Honeywell 800 computer.

The EDP unit is programmed to handle tax information on the 1,800,000 parcels of land in Los Angeles County. The entire tax history of the county, which is three times the size of Rhode Island, has been committed to 37 reels of magnetic tape. These are updated each day in response to changing county taxes, tax sales, city assessments, bond issues, and tax service contracts. The computer also performs tax status searches and prints an average of 2000 special reports each day for internal use at Title Insurance.

Each "item" of information — one for every parcel of land in the county — indicates the exact location of the land, the assessments for city, county and special taxes and such information as the customer's name, address and beneficiary.

The computer is currently putting in a 16-hour work day, six days a week. The night shift is for basic tax recording and reporting operations; its day shift is used for the creation and check-out of new programs.

During the eight-hour night shift, the Honeywell 800 handles an average of 10,000 transactions, the load rising during peak activity periods to as many as 160,000 transactions.

VIETNAM ATOMIC ENERGY OFFICE RECEIVES ANALOG COMPUTER

An analog computer for solving scientific and engineering problems has been delivered by Electronic Associates, Inc., Long Branch, N.J., to the Atomic Energy Office of South Vietnam.

The PACE TR-10, a solid-state, desk-top-size unit, will be used by the Institute of Nuclear Research at Dalat to solve mathematical problems in science and engineering.

F. I. DUPONT INSTALLS IBM 7040

One of the nation's leading investment firms has purchased and installed an IBM 7074 computer. Francis I. duPont & Co., One Wall St., N.Y., is now handling a complete range of brokerage accounting with their new system. Additional equipment includes four IBM 1401 computers.

Among the jobs performed are the calculation of purchases and sales, stock records, margin and cash accounting, dividends and proxies, safekeeping and segregation of customer's securities, monthly statements, bookkeeping and interest. The computer also prepares the payroll for the firm's 2300 employees throughout the country.

UNIVAC COMPUTER SERVES SOUTHEAST TEXAS INDUSTRY

The UNIVAC Service Center, Houston, Texas, has completed the installation of a new UNIVAC Solid-State Computing System. The new system expands the capacity of the center approximately 10 times.

Data processing is available at the Center on an hourly basis to companies that do not have facilities of their own, or whose present facilities are overloaded. One of the largest jobs being done at the UNIVAC Center on a regular basis is the weekly payroll for the Master Stevedores Association of Texas. Each week the payroll for from 5 to 15 thousand stevedores is prepared on the new UNIVAC system. In addition a large Houston department store utilizes the Center to control its merchandise inventory. During the past year, businesses in southeastern Texas have increased their use of the UNIVAC Service Center 175 per cent.

NEW GE COMPUTING SYSTEM FOR ELECTRONIC TABULATING CORP.

A GE 225 computer system has been installed at Electronic Tabulating Corp., Detroit, Mich.

ETC is staffed by professional accountants and will perform a full range of machine accounting functions with the computer and other tabulating and key punch equipment. The firm's new computer system consists of a 4096-word central processor, a 400-card-per-minute card reader, and a 100-card-per-minute card punch.

RADIO FREQUENCY INTERFERENCE STUDY TO USE NEW UNIVAC COMPUTER

A UNIVAC 1107 Thin-Film Memory Computing System will be installed this fall at the Department of Defense's Electromagnetic Compatibility Analysis Center at Annapolis, Md.

The new system will be used in a tri-service program to study the effects of radio frequency interference (RFI) upon military radars and communication. The computer will determine environmental interaction, frequency allocation data, operational procedures needed to increase compatibility, and interference reduction measures for offending equipment.

ASI 210 W TO ARGONNE NATIONAL LABORATORY

Advanced Scientific Instruments, Inc., Minneapolis, Minn., has delivered an ASI 210 W computer system to Argonne National Laboratory, Argonne, Ill.

The ASI 210 W is a modification of the standard ASI 210. It will be used by the Laboratory's Applied Mathematics Division in an application in which the computer will make many decisions and judgements after "studying" photographs of experiments involving the use of atomic energy.

GE-225 COMPUTER INSTALLED AT EDPCO

Electronic Data Processing Co. (EDPCO), a division of Patterson-Dewar Engineers, Inc., Decatur, Ga., has installed a GE-225 computer.

EDPCO, a large commercial electronic service bureau in the deep south, will sell computer time, programming, system analysis and data processing to companies which do not have their own computer and professional staff. The GE-225 is available to all types of business, industrial and engineering firms in the Southeast.

NEW AIR FORCE EDP SYSTEM AT CAPE CANAVERAL

Details of a new electronic data processing system to be installed by the Air Force Missile Test Center on Grand Bahama Island off Cape Canaveral, Fla., have been disclosed by the E.D.P. Corporation, Orlando, Fla.

The new system features a centralized digitizer which can handle up to six different doppler signals simultaneously, converting the analog data to digital code with a resolution of 10 million cycles per second. The complex digitizer converts tracking data to binary code and adds necessary timing and correlation information.

A 228 channel multiplexer feeds the code serially to a tone transmitter which sends the data to Cape Canaveral via submarine cable at a data rate of 5760 bits per second with a 3 KC bandwidth. Other E.D.P. Corp. equipment at Cape Canaveral will perform the processing functions necessary to feed the code data directory into an IBM 7090 computer for instantaneous impact prediction.

NORTHERN ILLINOIS FIRST GAS COMPANY TO GET FARRINGTON OPTICAL SCANNER

Northern Illinois Gas Company, Aurora, Ill., will be the first gas utility company to install a Farrington Optical Scanner to process payments from its customers. The optical scanner will actually read the remittance stubs which are returned with the customers' payments to the gas company, and then update the computer files quickly and accurately.

Farrington Electronics, Inc., Alexandria, Va., has 75 electronic character reading machines in commercial operation to date.

PEOPLE OF NOTE

COMPUTER USAGE COMPANY NAMES BOARD CHAIRMAN

Dr. Cuthbert C. Hurd has been elected Chairman of the Board of Computer Usage Company, Inc.

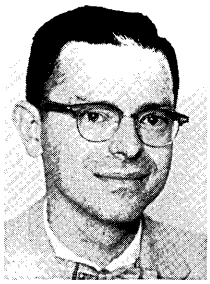
Dr. Hurd, a pioneer in the electronic computer field, was previously employed by IBM in a number of executive, technical, and systems positions since 1949.

As Director of electronic data processing machines at IBM, he coordinated activity on the development and programming of the 700 series. He is a Fellow of the American Association for the Advancement of Science, and was one of the founders and a president of the Foundation for Instrumentation Education and Research. He also has served as a member of the Computation Committee of the National Research Council, and as a council member of the Association for Computing Machinery.

In his new position, Dr. Hurd will be concerned primarily with long-range planning for Computer Usage Company, Inc.

JOINS IBM WORLD TRADE CORP.

Dr. Morton M. Astrahan of International Business Machines Corp., San Jose, Calif., has joined the IBM World Trade Corporation in Paris. His new assignment is as senior technical advisor to M. E. Femmer, manager of WTC laboratories.



NEW COMPUTER SCIENCES CENTER HEADED BY NOTED MATHEMATICIAN

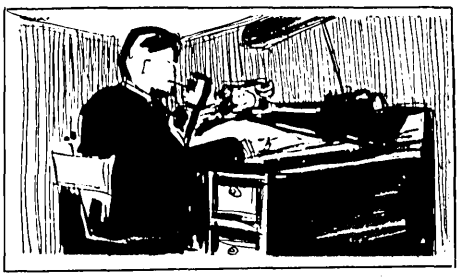
Dr. Sam Conte has been appointed as director of the Computer Sciences Center at Purdue University, Lafayette, Ind. Dr. Conte is a prominent computer scientist. He was previously manager of Aerospace Corporation's mathematics and computing group, and before that, manager of the mathematics department of the Space Technology Laboratories.

Dr. Conte is slated to set up the Computer Sciences Center as a graduate program leading towards the M.S. and Ph.D. degrees.

IBM APPOINTS DIRECTOR OF PROGRAMMING

International Business Machines Corporation has appointed Donald H. Furth as director of programming. He was formerly manager of programming systems development for the company's Data Systems Division.

In his new position, Mr. Furth will be responsible for staff supervision of programming activities throughout IBM.



APPOINTED TO EDITORSHIP OF SABE DATA PROCESSOR

Dr. John Damgaard has been appointed editor for the SABE (Society for Automation in Business Education) DATA PROCESSOR, in place of Enoch J. Haga who has recently resigned. Dr. Damgaard will not only be editor for the DATA PROCESSOR, but will be teaching courses in Data Processing at Colorado State College, Greeley, Colo., during the coming year.

SABE was organized two years ago for the purpose of bringing to the attention of business educators and others items of interest and importance about automation.

NEW DIRECTOR ELECTED

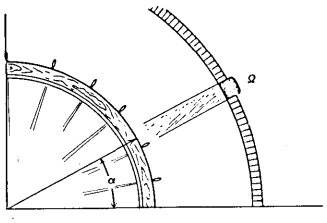
National Computer Analysts, Inc., Rte. 206 Center, Princeton, N.J., has announced the election of Dr. H. N. Laden as a director. NCA is engaged in operations research, systems analysis and design, computer programming, computer time rental, and other services to prospective and actual users of computers for scientific and business applications.

Dr. Laden is known as a pioneer in business data processing and for his contributions to the development of several large scale computers. He is co-author of a forthcoming book on computer systems design.

HEAD OF DATA PROCESSING FOR SRDS-DATA, INC.

E. Paul Anderson has been named director of the data processing division of SRDS-DATA, Inc., New York. He will be responsible for all of the company's data-processing operations.

Anderson has specialized in automatic and electronic data processing, with more than 14 years of experience in the analysis and automation of business and industrial problems. He is credited with being among the first to develop, patent, and manufacture an information retrieval device.



COMPUTING CENTERS

EDP CENTER ESTABLISHED BY FIRST SERVICE CORPORATION

The First Service Corporation, Minneapolis, Minn. has established an electronic data processing center to handle certain accounting functions for a majority of the out-of-town banks affiliated with the First Bank Stock Corporation. FSC offers technical banking services to seventy-one banks in Montana, North and South Dakota, Minnesota, and Wisconsin.

The Corporation's center contains a combination of data transmission via special telephone lines and a computer system located at the processing center. It was provided by IBM Corp. and the Bell Telephone Company. The transmission system, known as the IBM 1001, is the largest of its type in operation anywhere and the first in the nation in the banking business.

NEW CONOCO COMPUTER AND PROCESS CENTER

A modern, central computer department and process center of the Continental Oil Company houses a new IBM 7090 computing system supported by two smaller IBM 1401 computers. The Ponca City, Oklahoma center contains 32,000 square feet of floor space and houses approximately 200 employees.

A service organization, the process center is responsible for the design and economic evaluation of new refining and petrochemical plants, as well as modifications to existing facilities. It also does work for the company's manufacturing, petrochemical and international departments.

COMPUTER SCIENCES LABORATORY FOR EDUCATION AND RESEARCH

The Computer Sciences Laboratory at the University of Southern California, Los Angeles, Calif., will permit on-campus training of students in EDP and its capabilities. One eight-hour shift of computer time, 5 days a week, will be used by USC professors and graduate students in business, engineering, medicine, and the sciences, for scientific research projects.

The Remington Rand UNIVAC Division of Sperry Rand Corp., Minneapolis-Honeywell, and the University of Southern California participate jointly at the computer laboratory. Univac has its Western Regional Training Center at the facility. An exchange of lecturers between the companies and the University is planned; a library of computer knowledge has been established.

CENTER FOR INFORMATION SCIENCES ESTABLISHED AT LEHIGH UNIVERSITY

The Center for the Information Sciences, an interdisciplinary project, has been established at Lehigh University, Bethlehem, Pa.

The Center is a division of the University Library, and is under the direction of Robert S. Taylor, Associate Librarian. It is to serve three purposes: (1) to pursue research in the Information Sciences; (2) to offer instruction in the field at the graduate level; and (3) to develop and operate selected substantive information centers.

Present research capabilities in the field of information sciences include such areas as: semantic and logical syntax of natural and artificial languages; theory of information storage and retrieval; computability of syntactic analysis; programming for linear deduction in logic. An LGP-30 digital computer and conventional punched card equipment are available on the Lehigh campus. By cooperative arrangement with nearby industrial concerns, other computer equipment can also be made available.

TYPESETTER TAPE CONVERSION SERVICE

A new service for the conversion of automatic typesetter punched paper tapes into magnetic tapes for use on IBM, Burroughs, Remington Rand, or RCA computers is now available at the Electronic Engineering Company's Tape Conversion Center at Santa Ana, Calif.

The new conversion service allows typographers with automatic punched paper tape typesetting equipment to produce compact magnetic tapes for use on computers. This magnetic tape can then be used by computer-controlled libraries and electronic information retrieval systems.

NEW CONTRACTS

CDC SYSTEM FOR AEC LAB

Control Data Corp., Minneapolis, Minn., has received a $5,574,000 order from the U.S. Atomic Energy Commission to furnish and install a high-speed computer system at the Lawrence Radiation Laboratory, Livermore, Calif.

The system, called the Control Data 6600, is to be installed and ready for acceptance testing by Feb. 29, 1964. Under the terms of the contract, the company will furnish interim computer capacity on the Control Data 3600 computer system until the new system is accepted.

The Control Data 6600 computer includes a single central processor with a high-speed arithmetic and logical unit, a central memory of 61,440 words, peripheral processor, associated console and input-output equipment.

HONEYWELL AWARDED $2 MILLION CONTRACT FOR THREE COMPUTERS BY NASA

The National Aeronautics and Space Administration has awarded a $2 million contract to Honeywell Electronic Data Processing, Wellesley Hills 81, Mass., for delivery of three electronic computers for use in connection with Project Apollo. The contract calls for the computing systems to be operative by October 1, 1962, in the Data Computing Center located at Slidell, La., near NASA's Michoud facility.

The Honeywell computers (a Honeywell 800 and two Honeywell 400's) will be used for manufacturing and inventory control applications related to production of the advanced Saturn boosters that will launch Apollo spacecraft into a moon orbit, as well as the giant Nova boosters that will be used for direct ascent to the moon.

LLOYDS BANK, LTD. ORDERS B270 MICR/EDP SYSTEM

Lloyds Bank, Ltd., of London, is the first of the "Big Five" of English banking to implement magnetic ink character recognition in its EDP program, with its order for a Burroughs B270 MICR/EDP system.

The London bank was the first in Great Britain to order MICR check sorting equipment after the E-13B common machine language was adopted by London clearing bankers in 1960. Its Burroughs sorter-reader will become a part of a B270 system which includes a solid state central processor, card reader, and high-speed multiple tape lister. The amounts of checks will be magnetically encoded with Burroughs P703 amount and account number printers.

PILOT TRAFFIC DETECTION SYSTEM

A contract to design and install a Pilot Traffic Detection System for the Congress Street Expressway in Chicago has been awarded to the General Railway Signal Company, Rochester, N.Y., by the Illinois Department of Public Works. The system will cover a five-mile congested westbound section of the expressway between Cicero and First Avenues.

Three types of ultrasonic vehicle detectors will be used in the test section. Traffic on each lane at seven locations will be measured by ultrasonic detectors mounted on bridges and structures. The presence of vehicles determined by ultrasonic sensors on the entrance and exit ramps will be mounted on street light poles at the side of the ramps. As vehicles pass through the narrow beam of ultrasonic energy, the detectors will determine the lane occupancy, vehicle count and volume. Doppler detectors, mounted on bridges, will measure the speed of vehicles at four sampling points.

Leased telephone lines will connect the detectors to a master traffic computer located at the Project Control Center about a mile from the test section. The master computer will consist of 21 volume-lane occupancy computers, 4 volume-speed computers, 8 analog output level monitors and the associated power supplies. Traffic conditions in the test section will be displayed on a 14 foot illuminated display map mounted on top of the master computer.

Analysis of data taken with the system will aid in understanding the behavior of traffic on expressway facilities. The goal is to determine what traffic control measures might be applied effectively to avoid unnecessary traffic tie-ups.

COLLINS RADIO CO. AWARDED $2 MILLION CONTRACT

International Electric Corp. of Paramus, N.J., has awarded a letter contract for $2 million for data transmission equipment to the Collins Radio Co. of Dallas, Texas.

The equipment will be installed as part of the Strategic Air Command world-wide data transmission, processing and display system, known as Project 465L. The order calls for a total of 320 digital data modems.

NEW CONTRACTS FOR NAVCOR

Navigation Computer Corporation, Valley Forge Industrial Park, Norristown, Pa., has received new contracts totalling about $80,000 for two digital systems.

The first contract, from the Naval Air Turbine Testing Station in Trenton, N.J., is for a high-speed printer for use with a Bendix G-15 computer. It prints 600 lines per minute, with 72 characters per line.

The second contract, from the Aberdeen Proving Ground, Aberdeen, Md., is for a device to prepare velocity data from a doppler radar for computer analysis.

AUTOMATIC DATA SYSTEM CONTRACT FOR MINUTEMAN PROGRAM

The Systron Division of Systron-Donner Corp., Concord, Calif., has received a $142,800 contract from the Wasatch Division of Thiokol Chemical Corp. for a large automatic data system.

The Systron data system, Model 166-1, is designed for use in the new Thiokol Vibration Facility at Brigham City, Utah. It will be used for vibration testing in the environmental test program of the first stage booster of the Air Force's Minuteman ICBM. It is expected to be a powerful tool in vibration testing.

The 166-1 System is a combination digital-analog computer. It accepts up to 80 analog inputs representing acceleration, strain, load, temperature and displacement. Any one or all of these variables can be selected and their corresponding parameters -- amplitude, phase, distortion and ratio -- can be automatically recorded on x-y plotters

as a function of time, transducer location, or frequency.

INFORMATION-SYSTEMS ENGINEERING FIRM RECEIVES CONTRACT FROM AIR FORCE

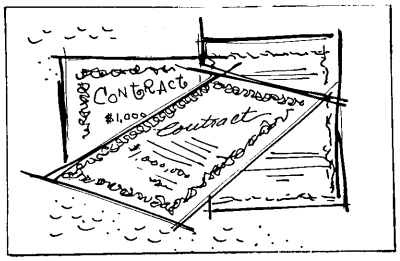
Documentation Inc., Washington, D.C., has been awarded a contract for $72,636 by the Air Force Systems Command, Rome Air Development Center, Griffiss Air Force Base, N.Y., to study the application of storage and retrieval techniques on indexer consistency.

The study is aimed at determining the degree of uniformity in definitions and subject heading of technical information used by scientists and technicians.

GPL RECEIVES OPTICAL CORRELATION CONTRACT

A research and development contract to examine the feasibility of applying optical correlation principles to automatically reduce aerial photographs to topographic maps was awarded the GPL Division, General Precision, Inc., Pleasantville, N.Y., by the U.S. Army Engineer Geodesy Intelligence and Mapping Research and Development Agency (GIMRADA), Fort Belvoir, Va.

Such work must presently be painstakingly accomplished by highly trained personnel who visually compare the photographs, or by equipment using electronic scanning principles.



BUSINESS NEWS

C-E-I-R WINS ON APPEAL IN SUIT AGAINST FORMER EMPLOYEES

C-E-I-R, Inc. has won an appeal in the Maryland Court of Appeals reversing a Montgomery County Court ruling which dismissed C-E-I-R's suit against a group of former employees who had formed a rival business organization.

The new firm, known as Computer Dynamics, proposed to compete with C-E-I-R to obtain a contract to perform computer-related services for the National Social Security Agency's claim section. Officers of the new firm, while employed by C-E-I-R, had been assigned to work on a 90-day study contract, upon completion of which, the Bureau intended to contract for assistance in the installation of the recommended system. The Appeals Court found that the experience and information gained in performing the study contract placed C-E-I-R's employees in a unique position to compete against the corporation by establishing their own organization, while still employed by C-E-I-R, and to bid against their employer for the subsequent contract.

The Appeals Court said that the former employees should be barred from making such a bid and testimony should be taken in the lower court on the amount of damages due to C-E-I-R.

RCA SALES SET SIX MONTH RECORD

Sales of Radio Corp. of America set a record high in the first six months of this year from the corresponding period last year.

David Sarnoff, chairman, said sales jumped to $853.9 million from $721.8 million a year earlier.

However, RCA's EDP Division is not as yet adding black figures to the account book. RCA reported "increased profitability in all major divisions, except electronic data processing, where increased sales and rental income are bringing the corporation closer to the goal of profitable operations."

BURROUGHS SHOWS 12% REVENUE GAIN -- PLANS ACQUISITION OF DATA DISPLAY FIRM

Burroughs Corp. reported a first half 12% increase in revenue from a year earlier. The firm said revenue rose to $207,031,000 from $184,856,000.

Ray R. Eppert, president, said new orders received in the first half were 12% higher than a year earlier.

Burroughs and Datronics Engineers, Inc. said they were negotiating for the acquisition by Burroughs of the capital stock of Strand Engineering Co., Ann Arbor, Mich.

Strand, a subsidiary of Datronics, specializes in data display. Terms were not disclosed. Datronics is based in Washington, D.C.

PREPARATION OF NEW COMPUTER LINE DEPRESSES SPERRY RAND PROFIT

Sperry Rand Corp. earnings fell in the four months ending June 30 to $3,467,169 from $4,296,313 a year earlier.

Sales, however, climbed to $280,816,331 from $265,823,716.

"The expense associated with the completion of development, preparation for production, and systems programing of the company's new line of data-processing equipment was a major factor in the reduction in earnings for the quarter," Harry F. Vickers, president, said. However, he said prospects for the new machines are "encouraging".

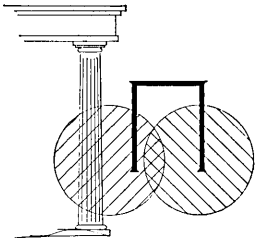
Sperry Rand's Univac division hasn't been profitable, and at the annual meeting in August, Mr. Vickers said he couldn't estimate when the division will be in the black.

Sperry Rand also makes military electronics equipment, typewriters and other office machines and furniture; farm machinery; electric razors, and other products.

TRW SALES RISE SHARPLY

Thompson Ramo Wooldridge, Inc. has reported its sales of $231.6 million in the first six months were 15% ahead of the same period last year and the highest for any half-year in the company's history.

All product divisions of the company were said to have contributed to the gain in sales. Sales of the missiles and space unit, Space Technology Laboratories, Inc., gained 38% from a year earlier. Electronic products and services volume rose 44% in the same period.



S and W FINE FOODS, INC.

"ONE OF THE NATION'S LEADING QUALITY FOOD PACKERS AND DISTRIBUTORS."

"Why we chose the NCR Computer." —S and W Fine Foods, Inc., *San Francisco*

"With the many items in our product line, we have urgent need for a data processing system which permits fast random access to data stored in our billing, accounts receivable, and inventory files. After a thorough investigation, we chose the NCR 315 Computer which features CRAM . . . Card Random Access Memory . . . as the one best suited to our particular data processing requirements.

"CRAM will enable us to store all the required billing, accounts receivable, and inventory data on-line with the computer. Then as sales data is introduced, the computer will make all the necessary billing extensions, post the accounts receivable, and reduce the separate inventories—all on an extremely fast random access basis.

"Being in a business where QUALITY is of paramount importance, we were very impressed with the quality built into the machines which make up the NCR 315 System. Similarly, we were impressed with the quality built into NCR's software—in both the standard programs and backup support offered.

"In summary, we are certain the NCR 315 CRAM Computer System will be a highly profitable investment."

J. Karagelos

Controller
S and W Fine Foods, Inc.

NCR PROVIDES TOTAL SYSTEMS—FROM ORIGINAL ENTRY TO FINAL REPORT—
THROUGH ACCOUNTING MACHINES, CASH REGISTERS OR ADDING MACHINES, AND DATA PROCESSING
The National Cash Register Co.•1,133 offices in 120 countries•78 years of helping business save money

NCR

COMPUTERS IN SOVIET ECONOMIC PLANNING

Patrick J. McGovern
Assistant Editor
Computers and Automation

Computers are playing an expanding role in the development and refinement of the economic plans of the Soviet Union. The degree of success of the Soviet's economic competition with the West could depend on how effectively they use computers in analyzing the capabilities and weaknesses of their economic resources.

"Mikhail, the State Planning Committee has just issued a change in the construction priority list of the transportation network. They want the railroad connection between Oleminsk and Inya completed in nine months rather than two years."

"Fine, Aloysha, transmit that new deadline to the Computer Center at the State Economic Council and have them up it into the transportation sector of the economic resources matrix. Have them send us promptly the computer output list of production and distribution control directives."

And a few hours later: "Mikhail, here is the output from the SPC computer."

"Let's see, ten thousand tons of iron ore from the mines at Mayza should be shipped to the steel plant at Yakutsk in addition to present shipments. Shipments are to be reduced by an equal amount to the truck factory at Yakutsk. The dam construction team at Dikemda will divert four thousand men to the RR project—the dam completion date is set back two months. Required construction equipment will be taken from the dam project. Wood is to be drawn from existing stockpiles at Amga, Arku, and Markha. . . .

"We'll wire these instructions to the regional control directorates immediately."

The above dialogue, while fancy at present, is indicative of the proposed use of computers in the control of economic development in the Soviet Union. Since economic competition is the crucial conflict in the continued struggle between the United States and the Soviet Union, the results of such applications of electronic computers are of great interest and importance to the Free World.

Separate Economic Mechanisms

Each economy has its own mechanism for determining the answers to the questions: What to produce? What production processes to use? How produced goods should be distributed among the members of society? How much of the national wealth should be currently consumed, used for increasing productive capacity, or stockpiled? The free-enterprise economy answers these questions through a system of markets and prices; the collectivist economy, such as in the Soviet Union, fixes the answers through a national plan, and implements them by means of elaborate administrative controls. In fact, the Soviet economy is distinctive in its fusion of economic and political leadership, its nationalization of the material means of production, and the planning, coordination, and control of economic activities through a unitary plan for the economy as a whole.

It is in this last activity where linear programming, dynamic programming, input-output analysis, and other mathematical techniques employing electronic computers offer a potent analytic tool to the Soviet leaders. The Soviets view their economic plans as a program of action that coordinates information, forecasts, and directives concerning productive output and capital formation for a stated period. They express key outputs, employment targets, and consumption objectives in physical terms using a system of input-output and consumption balances. Producers' and consumers goods are accounted for in monetary terms, for production generates income which is either exchanged for goods and services, or saved.

The Soviets employ both long-term expansion or capital formation plans, and yearly working plans. These plans are first differentiated, and then coordinated, with respect to objective, time span, and the organizational set-up of the entire economy. Many readers will detect the similarity, in many respects, with planning procedures in any big business in the U. S.

Soviet Plan Formulation

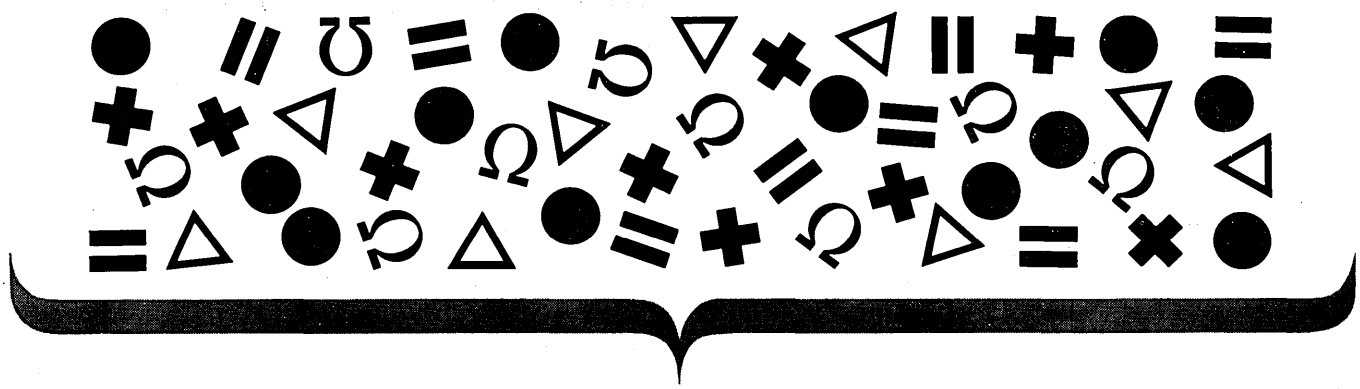
The starting point for all Soviet economic plans is the formulation of political directives by the Communist Party of the Soviet Union. The political directives describe the prospective changes desired in the output and expansion of the Soviet economy. These are based on the previous performance of the economy and its various branches—the so-called achievement balance—which is prepared by the Central Statistical Administration. A scale of priorities expresses the preferences of the policy makers within the limits of the economy's estimated potential.

Once the directives are formulated, it is the task of the State Planning Committee to translate them into coordinated plans for concrete projects. The successive planning drafts prepared by the SPC include data in both physical and value terms. They specify the output quotas of industrial production and of key commodities, the rates of development for the various economic sectors, the volume of investments, and the volume of consumption.

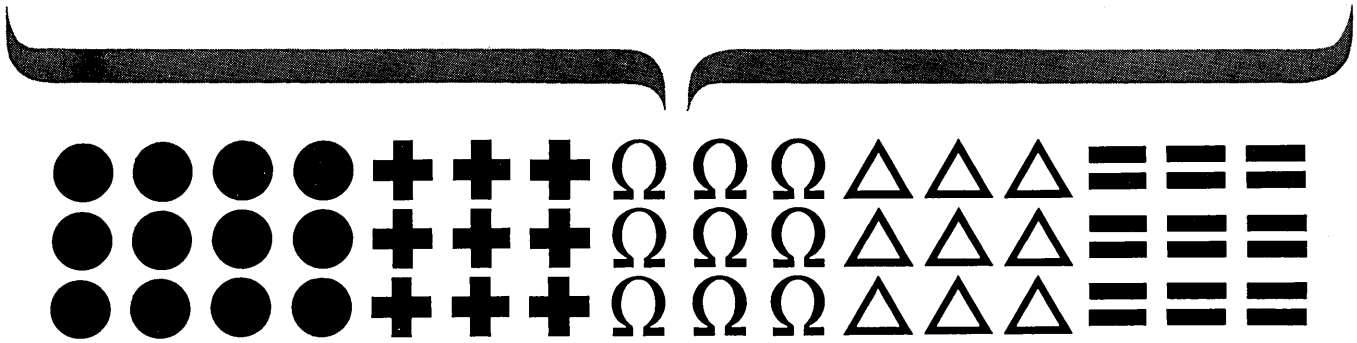
Use of Computer in Economic Matrix

One of the first uses of computers in economic planning in the Soviet Union was undertaken at the In-

SYRACUSE INTERVIEWS FOR
COMPUTATION OPPORTUNITIES
AT AEROSPACE CORPORATION



The rapidly increasing workload in the recently activated computation center at Aerospace Corporation has resulted in the need for additional top level staff members. □ Established six months ago, the center is already well equipped, having two IBM 7090's, five 1401's and considerable related equipment. □ This facility in El Segundo near Los Angeles provides the computation capability necessary to support the Aerospace Corporation mission of systems research, planning, and engineering, technical direction, and operational design and development on a wide variety of ballistic missile, space and re-entry programs. □ Urgent requirements exist for highly qualified engineers, physicists and mathematicians in the following areas: COMPUTER PROGRAMMERS / Emphasis will be placed on scientific programming in one or more of these areas: orbital mechanics and trajectory analysis, aerodynamics, thermodynamics, missile dynamics, control systems and structures, simulation of guidance systems and computers. Degrees in Engineering, Physics, or Mathematics with programming experience for the IBM 7090 are desirable for these applications. Other areas include management data processing, computation systems programming, compiler and monitor design and development. NUMERICAL ANALYSTS / Individuals with advanced degrees in Mathematics are desired for both basic research and application to machine computation of new numerical methods for the solution of non-linear equations, two-point boundary value problems, partial difference equations, and matrix eigenvalue problems. APPLIED MATHEMATICIANS / Advanced degrees in Mathematics or Mathematical Physics are desirable in conjunction with some industrial experience. The tasks here are the formulation and analysis of physical problems and mathematical models originating in missile and space technology. Specific areas are astrodynamics, elasticity, thermodynamics, fluid flow, and control theory. Qualified applicants are invited to contact Aerospace Corporation, an equal opportunity employer. Syracuse interviews for those attending the Association for Computing Machinery Conference are being conducted by technical staff members on September 4, 5, 6 and 7. To arrange an appointment call Mr. Irving Meisner at HA 2-1167. Or, if more convenient, write to Mr. Meisner at 1776 Massachusetts Avenue, Lexington, Massachusetts.



AEROSPACE CORPORATION

Organized in the public interest and dedicated to providing objective leadership in the advancement and application of space science and technology for the United States Government.

stitute of Electronic Control Machines in 1959. The branches of production were analyzed in a matrix structure. The horizontal rows represented how much of the output of a given branch went into the production of goods produced by other branches. The vertical columns gave the products of different branches of industry which are utilized in a given branch. This matrix permitted the determination of the material and labor outlay that was needed to produce a particular quantity of a product. For instance, if the quantity of railroad cars has to be increased, this causes an increase not only in the quantity of steel used directly in their manufacture, but also in the amount of metal used in the machines required for their manufacture, additional amounts of electric power, etc.

Computer Handles Inter-Branch Balance

This type of inter-branch balance in terms of value and physical units was also recently used in economic planning by the State Economic Council. Its computer compiled a 84 x 84 matrix of the value balance on the "Strela" computer in two hours. The matrix of the physical inter-branch was 157 x 157. It took the computer 4 hours and 50 minutes to compile it.

At the present time the SEC computer center is collaborating with a number of organizations and research institutes on an inter-branch balance for 1962 covering a wide range of goods (350 items and branches). In accordance with the results of this work, a proposal is expected to be presented to make the computer analysis of the inter-branch balances a permanent part of Soviet national economic planning.

The SEC computer center is also currently working with the Council for the Study of Productive Forces and other agencies on the problem of establishing by means of computers the most rational long-term distribution of the various branches of industry, taking into account production costs, transportation, and other factors. This work is being conducted for the cement, coal, and pipe industries, and for industries producing certain types of rolled goods.

Other Computer Applications

Another program has been worked out for long range demographic calculations. For this purpose the Ural-II electronic computer makes a detailed calculation of population increases per year, and its effect on various stages of long-term economic development.

The SEC computer center has also worked out a program, and experimentally calculated the optimum exploitation of equipment in machinery producing industries. It provided the possibility of optimizing the assortment and quantity of the output of particular economic branches by employing available equipment effectively (with a minimum of both redundant equipment, and scarce equipment).

These latter calculations take about an hour on the Ural-II computer. An attempt by the State Planning Commission personnel to perform this calculation manually took a great deal of time, and as a subsequent check with the computer revealed, was performed inaccurately.[1]

The computer center, jointly with the Economic Research Institute, has worked out and tested the possibility of effectively automating calculations connected with material and technical supply of information affecting the distribution of rolled steel iron. The computer center is also being used to plan the output of items distributed by the USSR State Planning Committee's Main Administration of Special Industries.

Regional Computer Centers

Some of the economic planning committees of the independent republics have formed their own computer center. For example, the computer center of Byelorussian Economic Planning Committee has tackled such problems as: the drawing up of optimum schemes for the transportation of bulk cargoes; elaboration of an optimal system of material and technical supply with respect to the basic types of products; introduction into planning practice of reported and planned inter-branch balances; the working out of certain aspects of the geographical distribution of production.

The results turned out by the Byelorussian computer center pointed out some of the inefficiencies that had existed in Soviet job planning previously. The computer-generated plans for the shipment of timber cargoes showed an average 13% annual saving. The computer plan for the shipping of freshly cut softwood saved over 30% of the annual cost of this transportation. It has been estimated that the economy of Byelorussia has obtained an annual saving of more than 10 to 15 million rubles (one ruble = $1.25) from computer analysis of transport routes alone.[2]

The computer center of the Ukrainian Academy of Sciences has solved about one hundred problems in optimal planning of road and rail haulage. Each month the computer compiles truck routes for delivering reinforced concrete blocks to construction sites in the Moscow Region. In the first month of this program, the mileage of no-load runs was reduced by 100,000 kilometers.

In a similar example, the plan for hauling ground away from construction sites in ten days in August, 1961, was compiled by the Ukrainian computer center. It proved a 43% more economical operation in its plan than the one devised by the job supervisor.[3]

Computer Building Emphasized

These widespread uses of computers are emphasized by the concentrated effort being made by the Soviets in the development and construction of electronic computers. The control figures for the Seven-Year Plan adopted by the 21st Congress of the Communist Party in 1958 stated that the amount of money to be spent on the development and construction of computing machines is planned to grow from 150 million rubles in 1958 to 400-420 million rubles in 1965, an increase of 4.5-4.7 times. This growth figure is nearly twice the increase estimated for any other type of machinery.[4]

Obstacles to Computer Use

The extensive introduction of electronic computers into Soviet economic planning still faces two major hurdles. One is the problem of reliable statistics, and

the other is internal resistance from old-line economists.

As several economists have recently acknowledged, there is a lack of accurate, properly classified and sorted information on the production and consumption factors that are needed in order to operate effectively with a quantitative economic plan. The information reported to the Central Statistical Administration is often scanty, and delayed, due to reluctance on the part of regional committees to reveal their difficulties in meeting their previous quotas.

The entrenched opponents to the use of mathematical models and computers in Soviet Planning are many. Their opposition is based on:

—their belief that the traditional planning methods leave the door open for marginal adjustments to objectives, and yet they do not require the maintenance of full consistency between selected output targets;

—an ingrained reluctance to accept complicated mathematics in economics;

—a primary interest in the fulfillment of their goals in a ranked order of priority. They are reluctant to accept what they fear is an operational scheme which may imply random cutbacks in supplies and output, while an open-ended planning system allows low priorities to be sacrificed first;

—the conviction that economic performance is a highly flexible matter depending on the pressures during the period of plan implementation.

Developments Carefully Watched

However, as the noted Russian economist A. N. Kosygin has recently pointed out, "In economics and in planning based on scientific economic research we [the Soviets] must shift more boldly and widely to the use of modern electronic computers and mathematical models."

There seems to be little doubt that this will indeed happen in the near future. It is a development that will add a new dimension of precision to Soviet economic planning and to their statistics. The latter has often been viewed lightly in the past by Western observers because of their unreliability, and a belief that they are used more frequently for propaganda than for planning. The use of computers in these areas should be watched carefully in the future not only by computer experts, but also by diplomats, economists, and defense strategists.

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[1] Kovalev, N., Introduction of Mathematical Methods and Computers in Planning Practice, *Planovoe Khoziaistvo*, 1961, No. 8.

[2] Malinin, S., M. Polonskii and V. Aizenshtat, Problems in Applying Mathematical Methods and Electronic Computers in Planning, *Voprosy Ekonomiki*, 1961, No. 9.

[3] Glushov, V., and A. Dorodnitsin, Computers in the National Economy (tr.), *Izvestia*, Dec. 26, 1961.

[4] Control Figures for the Economic Development of the U.S.S.R. 1959-1965, Foreign Languages Publishing House, Moscow, 1958, p. 43.

(English translations of ref. 1 and 2 can be found in *Problems of Economics*, May, 1962, International Arts and Science Press, New York.)

Helping Hand for Automation

"Another nice feature . . . it's self adjusting!"

READERS' AND EDITOR'S FORUM

(Continued from Page 7)

To some it may be a consolation to know that the Russians are apparently aching from the same affliction.

In a recent article published in the Soviet journal "Gosplanizdat," N. Kovalev, the chief of the computer center at the USSR State Economic Council complains that the "extensive introduction of mathematical models and electronic computers in national planning requires the training . . . of specialists on electronic computers. Very few such specialists are being trained at present. In 1961 no more than 10% to 15% of the minimum number of mathematicians and computer operators needed to ensure normal operation of the newly-produced electronic computers were graduated.

"There is an obvious miscalculation in the plan for the training of young computer specialists: there exists a disproportion between output of electronic computers and the training of personnel to operate them. A broad training program for programmers should be organized. Programmers can be trained fairly quickly, but at present, unfortunately, they are trained in much fewer numbers than needed."

THE DATE OF EASTER DETERMINED BY COMPUTER

Richard K. Allen
Montpelier, Vt.

The definition of the date of Easter which is usually offered is that it shall occur on the first Sunday after the first full moon ofter spring begins. This is the rule laid down at the Council of Nicaea in 325 A.D. It normally gives the correct result, but 1962 is an exception. Reference to an almanac will show that this year the moon was a full five hours and twenty-six minutes after the vernal equinox. The Nicaean rule would say that March 25, 1962, should have been Easter. But it wasn't. Why?

When the calendar was reformed by decree of Pope Gregory in 1582 the determination of Easter was completely divorced from astronomical considerations. Tables were set forth which defined Easter, and these usually cause it to fall in accordance with the Nicaean rule.

The crucifixion occurred on the Friday after the Passover, and the first Easter was on the following Sunday. In ancient times the Passover fell on the fourteenth day of the month of Nisan. This month began at such a time that the full moon in the month would follow the vernal equinox. Since a Jewish month begins at the time of the new moon it follows that the Passover came at the time of the full moon. It will be seen that the problem is to find the time of the full moon. The solution will be available if we know the age of the moon on January 1. This is known as the epact, the number of days from the preceding new moon until January 1 (i.e., the age in days of the calendar moon at the beginning of the year).

The average time from new moon to new moon, the length of a lunar month, is 29 days, 12 hours, 44 minutes, 3 seconds. Twelve lunar months approximate 354 days, which is about 11 days short of a calendar year. It follows that the age of the moon will be 11 days greater a year from today than it is today. Nineteen years of 365¼ days will differ from 235 lunar months by only 1/16 of a day. If for the moment we disregard this difference the times of new moons will repeat every 19 years. By beginning with zero, successively adding 11, deducting 30 whenever the sum equals or exceeds 30 we get the sequence:

0 11 22 3 14 25 6 17 28 9 20 1 12 23 4 15 26 7 18

This is the series of epacts which would have applied prior to 1583. The difference of 1/16 of a day already mentioned will accumulate to one day in 310 years. In about 300 years the moon will be new one day sooner and the epacts must be increased by one. This is done in the sequence 1800, 2100, 2400, 2700, 3000, 3300, 3600, 3900, 4300, 4600, . . .

Table 1 — EPACT

Calendar Period	Remainder after Division by 19: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	0
0-1582	0	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18
1583-1699	1	12	23	4	15	26	7	18	29	10	21	2	13	24	5	16	27	8	19
1700-1899	0	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18
1900-2199	29	10	21	2	13	24	5	16	27	8	19	0	11	22	3	14	26	6	17
2200-2299	28	9	20	1	12	23	4	15	26	7	18	29	10	21	2	13	24	5	16
2300-2399	27	8	19	0	11	22	3	14	25	6	17	28	9	20	1	12	23	4	15
2400-2499	same as 2200-2299																		
2500-2599	same as 2300-2399																		
2600-2899	26	7	18	29	10	21	2	13	24	5	16	27	8	19	0	11	22	3	14
2900-3099	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29	10	21	2	13
3100-3399	24	5	16	27	8	19	0	11	22	3	14	26	6	17	28	9	20	1	12
3400-3499	23	4	15	26	7	18	29	10	21	2	13	24	5	16	27	8	19	0	11
3500-3599	22	3	14	25	6	17	28	9	20	1	12	23	4	15	26	7	18	29	10
3600-3699	same as 3400-3499																		
3700-3799	same as 3500-3599																		
3800-3999	21	2	13	24	5	16	27	8	19	0	11	22	3	14	26	6	17	28	9

Table 2 -- DATE OF EASTER

Epact	Day Index: 0	1	2	3	4	5	6
0	Apr. 18	Apr. 17	Apr. 16	Apr. 15	Apr. 14	Apr. 20	Apr. 19
1	Apr. 18	Apr. 17	Apr. 16	Apr. 15	Apr. 14	Apr. 13	Apr. 19
2	Apr. 18	Apr. 17	Apr. 16	Apr. 15	Apr. 14	Apr. 13	Apr. 12
3	Apr. 11	Apr. 17	Apr. 16	Apr. 15	Apr. 14	Apr. 13	Apr. 12
4	Apr. 11	Apr. 10	Apr. 16	Apr. 15	Apr. 14	Apr. 13	Apr. 12
5	Apr. 11	Apr. 10	Apr. 9	Apr. 15	Apr. 14	Apr. 13	Apr. 12
6	Apr. 11	Apr. 10	Apr. 9	Apr. 8	Apr. 14	Apr. 13	Apr. 12
7	Apr. 11	Apr. 10	Apr. 9	Apr. 8	Apr. 7	Apr. 13	Apr. 12
8	Apr. 11	Apr. 10	Apr. 9	Apr. 8	Apr. 7	Apr. 6	Apr. 12
9	Apr. 11	Apr. 10	Apr. 9	Apr. 8	Apr. 7	Apr. 6	Apr. 5
10	Apr. 4	Apr. 10	Apr. 9	Apr. 8	Apr. 7	Apr. 6	Apr. 5
11	Apr. 4	Apr. 3	Apr. 9	Apr. 8	Apr. 7	Apr. 6	Apr. 5
12	Apr. 4	Apr. 3	Apr. 2	Apr. 8	Apr. 7	Apr. 6	Apr. 5
13	Apr. 4	Apr. 3	Apr. 2	Apr. 1	Apr. 7	Apr. 6	Apr. 5
14	Apr. 4	Apr. 3	Apr. 2	Apr. 1	Mar. 31	Apr. 6	Apr. 5
15	Apr. 4	Apr. 3	Apr. 2	Apr. 1	Mar. 31	Mar. 30	Apr. 5
16	Apr. 4	Apr. 3	Apr. 2	Apr. 1	Mar. 31	Mar. 30	Mar. 29
17	Mar. 28	Apr. 3	Apr. 2	Apr. 1	Mar. 31	Mar. 30	Mar. 29
18	Mar. 28	Mar. 27	Apr. 2	Apr. 1	Mar. 31	Mar. 30	Mar. 29
19	Mar. 28	Mar. 27	Mar. 26	Apr. 1	Mar. 31	Mar. 30	Mar. 29
20	Mar. 28	Mar. 27	Mar. 26	Mar. 25	Mar. 31	Mar. 30	Mar. 29
21	Mar. 28	Mar. 27	Mar. 26	Mar. 25	Mar. 24	Mar. 30	Mar. 29
22	Mar. 28	Mar. 27	Mar. 26	Mar. 25	Mar. 24	Mar. 23	Mar. 29
23	Mar. 28	Mar. 27	Mar. 26	Mar. 25	Mar. 24	Mar. 23	Mar. 22
24	Apr. 25	Apr. 24	Apr. 23	Apr. 22	Apr. 21	Apr. 20	Apr. 19
25	Apr. 25	Apr. 24	Apr. 23	Apr. 22	Apr. 21	Apr. 20	Apr. 19
26	Apr. 18	Apr. 24	Apr. 23	Apr. 22	Apr. 21	Apr. 20	Apr. 19
27	Apr. 18	Apr. 17	Apr. 23	Apr. 22	Apr. 21	Apr. 20	Apr. 19
28	Apr. 18	Apr. 17	Apr. 16	Apr. 22	Apr. 21	Apr. 20	Apr. 19
29	Apr. 18	Apr. 17	Apr. 16	Apr. 15	Apr. 21	Apr. 20	Apr. 19

The solar year is not 365¼ days, but is 365 days, 5 hours, 48 minutes, 46 seconds. To allow for this difference the Pope ruled that leap day should be omitted in the years 1700, 1800, 1900, 2100, 2200, 2300, 2500, . . . Thus the moon will be one day younger because of this change. The epacts must be reduced by 1 at these years. Sometimes the increases and de-

creases offset each other. The net effect is that the epact must be increased in 2400 and 3600 and decreased in the years 1700, 1900, 2200, 2300, 2500, 2600, 2900, etc. To allow for errors which had accumulated from the time of Nicaea up to 1582, ten days were omitted from October, 1582, and the epacts increased by 1.

At this point we have a method of finding the time of the full moon. The next question is to determine what is the date of Sunday. Essentially this is done by counting the number of days which have elapsed from some starting point, dividing the result by 7, and noting the remainder, the "day index." Now a year of 365 days exceeds 52 weeks by 1 day. Hence we have this method: To the number of the year (count of the days beyond even weeks) and one-quarter of the number of years (leap-days), discard fractions, and subtract the number of days omitted by the Gregorian reformation (13 in the 20th and 21st centuries). Divide the result by 7.

It is now possible to assign a date to Easter for each combination of epact and day index. The tables which govern the date of Easter consist of epacts for the century involved and the actual days which correspond to epacts and day indexes.

There are 30 epacts. When the tables were made up two different days were assigned the same epact because there were only 29 days in the lunar month in question. Consequently it would be possible to have Easter fall on the same date within the same sequence of 19 years. This was thought to be undesirable and to avoid this, a refinement was made stating that if both 24 and 25 fall in the same series of epacts 25 is arbitrarily changed to 26.

To the year add one, and divide the result by 19. From the remainder it is possible to read the epact. The day index has already been described. In a computer store the tables and the epacts corresponding to the various centuries. Reference to the different sets of epacts can be changed by index registers. Another index register is used as a counter for the years.

It is now a simple matter to write a program which will compute the date of Easter from any starting point, such as 1583, extending as far into the future as it is desired to go. The Remington Rand Univac STEP computer at the National Life Insurance Company in Montpelier, Vermont, has calculated the dates of Easter up to 3999. The computation was stopped at that time because there is some doubt whether or not the year 4000 will be a leap year. There is an average annual error of 26 seconds in our present calendar. This will accumulate to one day in 3300 years, and some authorities advocate that leap day be omitted in the years 4000, 8000, 12000, . . . as a further correction.

Easter may fall on any day from March 22 to April 25. Some samples of the results obtained from the computer are:

March 22, 1818	April 7, 1776	April 18, 3999
March 22, 2285	April 18, 2500	April 8, 3962
April 25, 1943	April 13, 3000	April 18, 2962
April 25, 2038	April 8, 3500	

PAPERS FOR THE JOINT AUTOMATIC CONTROL CONFERENCE, JUNE, 1963

The Fourth Joint Automatic Control Conference will be held at the University of Minnesota in Minneapolis on June 19-21, 1963. Prospective authors are invited to submit abstracts (100 words) by September 30 and manuscripts by November 15, 1962.

Papers are invited on control theory, applications, and components. Particular efforts are being made to include a broad range of application papers, and one or more applications symposia are being developed. Components papers, also, are especially invited.

The sponsoring societies of the JACC are the American Institute of Chemical Engineers (which has prime responsibility in 1963), the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the Institute of Radio Engineers, and the Instrument Society of America. Abstracts and papers may be submitted through the member society headquarters with the designation "for 1963 JACC" or to the Program Chairman, Professor Otis L. Updike, Department of Chemical Engineering, University of Virginia, Charlottesville, Virginia.

Papers prepared for the Congress of the International Federation for Automatic Control in Basle may be presented also at the JACC, and will be preprinted in abstract only, to conform with IFAC requirements.

EXAM TO BE OFFERED FOR THE CERTIFICATE IN DATA PROCESSING

On December 8, 1962, the Data Processing Management Association (formerly NMAA) will offer the examination for the Certificate in Data Processing at 45 University Test Centers throughout the United States and Canada. The examination, to be revised regularly by the DPMA Examination Advisory Committee, will be held annually thereafter. This is the first time the examination is being offered on a nationwide basis.

The test covers a range of subjects considered useful in the field of data processing, including statistics, accounting, mathematics, and knowledge of various types of automatic data processing systems and methods. A working knowledge of data processing equipment capabilities and limitations is expected. The Certificate is *not* awarded on the basis of programming knowledge or ability, although a familiarity with electronic computer concepts and basic programming principles are considered essential requisites for passing the test.

Applicants for the Certificate Examination need not be members of DPMA. It is open to anyone who (1) completes the prescribed course of study, (2) has at least three years of direct work experience in the field of automatic data processing, and (3) has high character qualifications. (Specific academic requirements may be waived at present.)

For further information, application forms, and the list of test centers for the December 8th examination, write to the Data Processing Management Association, International Headquarters, 524 Busse Highway, Park Ridge, Ill.

BOOKS AND OTHER PUBLICATIONS

Moses M. Berlin
Allston, Mass.

We publish here citations and brief reviews of books and other publications which have a significant relation to computers, data processing, and automation, and which have come to our attention. We shall be glad to report other information in future lists if a review copy is sent to us. The plan of each entry is: author or editor / title / publisher or issuer / date, publication process, number of pages, price or its equivalent / comments. If you write to a publisher or issuer, we would appreciate your mentioning **Computers and Automation.**

Current Bibliography on Analog and Digital Computers and their Applications, no. 54, 8th vol. (1961), 2nd quarter / Franz Steiner Verlag GmbH, (62) Wiesbaden, Postfach 743, Germany / 1961, printed, 58 pp, annual subscription: DM-96.

This edition (list 54) cites over 600 books, articles and patents from nearly 150 sources. The information is subdivided into four primary groups and 120 sections. German and English keywords (and also numerical codes) characterize the contents of each reference. The reference is cited in the language in which it was published, usually German, English, or French. The four main divisions are: General and Associated Items, Engineering and Design of Digital Computers and Digital Data Processors, Analog Computers and Simulators, and Applications of Digital Computers and Digital Data Processors.

Morley, Derek Wragge / Automatic Data Processing / published by Her Majesty's Stationery Office, London, England; available from British Information Services, 45 Rockefeller Plaza, New York 20, N. Y. / 1961, printed, 78 pp, $1.15.

The need to process rapidly large quantities of data, and how this need can be met, are discussed. Chapters include: Introduction, Automatic Data Processing, Internal Memories, Instructing the Computer, Inserting and Extracting Data, Development of Automatic Data Processing in the United Kingdom, and Examples of Data Processing. Systems currently in use in Great Britain are described as examples of successful applications of data processing. Two appendices list automatic data processing systems available in the United Kingdom, and computer facilities where machine time is rented.

Dwight, Herbert Bristol / Tables of Integrals and other Mathematical Data, Fourth Edition / The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. / 1961, photo offset, 339 pp, $3.50.

This edition incorporates a group of integrals that result in elliptic integrals and includes numerous changes from earlier editions. The thirteen sections give 898 equations, functions and formulas. Some of the headings are: Algebraic Functions, Probability Integrals, Hyperbolic Functions, Surface Zonal Harmonics, and Differential Equations. An appendix, "Tables of Numerical Values," includes the Gamma Function, Trigonometric Functions, Numerical Constants and the Greek Alphabet. References and index.

Greenwood, J. Arthur, and H. O. Hartley / Guide to Tables in Mathematical Statistics / Princeton University Press, Princeton, N. J. / 1962, offset, 1076 pp, $8.50.

Here is a catalogue of many tables in the field of mathematical statistics and some tables relating to mathematical statistics. In addition to giving the sources for the tables, this guide describes the functions tabulated, gives the characteristics of the principal tables, and lists annotated tables of contents of sixteen collections of statistical tables. The guide's sixteen categories include: "The Normal Distribution," "Correlation, Serial Correlation and Covariance," "Non-Parametric Tests," "Variate Transformations," and "Sundry Mathematical Tables." Two appendices include a "Supplement to the Descriptive Catalogue" and the tables of contents. Author and subject indices.

Henrici, Peter / Discrete Variable Methods in Ordinary Differential Equations / John Wiley & Sons, Inc., 440 Park Ave. South, New York 16, N. Y. / 1962, printed, 407 pp, $11.50.

This book is an outgrowth of a course "Numerical Methods in Differential Equations" which the author has taught repeatedly to mathematicians, engineers, and physicists. He is Professor of Mathematics at the University of California, Los Angeles. Each discussion of theory in the book is accompanied by examples of applications. The text is divided into three parts: "One-Step Methods for Initial Value Problems," "Multi-step Methods for Initial Value Problems," and "Boundary Value Problems." Each chapter includes problems. Bibliography and index.

Stolurow, Lawrence M. / Teaching by Machine, OE-34010, Cooperative Research Monograph no. 6 / Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. / 1961, printed, 176 pp, 65c.

This monograph, based on research being conducted at the University of Illinois, discusses problems in education and how teaching machines may solve some of them. The author, a professor of psychology, includes eight chapters on the problems and proposed mechanical solutions. Among the titles: "Current Instructional Problems," "A Systems Approach to Instruction," "Teaching Machines," "The Learner," and "Implications for Education." Five tables are given in an appendix. References.

Rosenblatt, Frank / Principles of Neurodynamics: Perceptrons and the Theory of Brain Mechanisms / Spartan Books, 6411 Chillum Place, N.W. Washington 12, D. C. / 1962, offset ("utilizing the composition of the original technical report"), 640 pp, $6.50.

The principles and accomplishments of the theory of perceptrons and the motivation of the perceptron program are discussed. The author investigates the "physical structures and neurodynamic principles which underlie 'natural intelligence,'" he develops his presentation under the consistent theoretical position that perceptrons are simplifications of the central nervous system. The book's four parts, which include numerous chapters, are: Development of Basic Concepts, Three-Layer Series-Coupled Perceptrons, Multi-Layer and Cross-Coupled Perceptrons, and Back-Coupled Perceptrons and Problems for Future Study. Three appendices include symbology and notation, theorems, basic equations and standard diagnostic experiments. References. No index.

Miller, G. A., H. F. Blichfeldt, and L. E. Dickson / Theory and Applications of Finite Groups / Dover Publications, Inc., 180 Varick St., New York 14, N. Y. / 1961, (originally printed 1916), printed, 390 pp, $2.00

Each of the authors discusses in detail the area of the subject in which he is a specialist: Miller, substitution and abstract groups; Blichfeldt, finite groups of linear homogeneous transformations; Dickson, applications of finite groups. The three parts of the book include twenty chapters covering: Fundamental Definitions and Theorems of Abstract Groups, Isomorphisms, Abelian Groups, Groups Whose Orders Are Powers of Prime Numbers, etc. The final chapter discusses the Monodromie group.

Ceccato, Silvio, Editor / Linguistic Analysis and Programming for Mechanical Translation (Mechanical Translation and Thought) / Gordon and Breach Science Publishers, Inc., 150 Fifth Ave., New York 11, N. Y. / 1962, printed, 246 pp, $7.50

This book presents a report of a research program carried out for the European Office of the Air Research and Development Command of the U. S. Air Force by members of the Center for Cybernetic and Linguistic Research of the University of Milan, Italy. The report gives many generalities, fine-spun theories, and classifications, but contains little specific information on the subject of machine translation; apparently, no computer was used in the research. Included are some papers which report on hypothetical techniques for Russian-to-English translation. Among the book's sections: "Operational Linguistics and Translation," "List of Classifications," "Illustration of the Classifications for Developmental Situations," and "Some Notes Concerning Ambiguous Russian Verbs." Two appendices include flow diagrams of translation operations and processes. Index.

Frielink, A. B. / Auditing Automatic Data Processing: A Survey of Papers on the Subject / Elsevier Publishing Co., Spuistraat 110-2, Amsterdam-C, Netherlands / 1962, printed, 70 pp, cost: D.fl. 7.50

A selection of opinions on the application of computers to business data processing is here presented. The author digests many opinions and reports on them in various groups, without stressing any single source. The material is presented under eight headings including: "Auditing and Accounting Techniques; General," "Influence of Automation on Internal Control," and "The Auditor's Own Work." A brief evaluation of the digested papers is given. A bibliography, including some biographical notes on the authors, and an index are given. The

author is a member of the Netherlands Institute of Accountants and has worked with the Netherlands A. D. P. Research Centre.

Greenspan, Donald / Introduction to Partial Differential Equations / McGraw-Hill Book Co., Inc., 330 West 42 St., New York 36, N. Y. / 1961, printed, 195 pp, $7.50

This text presents rigorously partial differential equations for seniors and beginning graduate students; and requires a knowledge of advanced calculus. The first of eight chapters discusses "Basic Concepts," furnishing information about sets, real functions and ordinary differential equations. The remaining chapters are: "Fourier Series," "Second-order Partial Differential Equations," "The Wave Equation," "The Potential Equation," "The Heat Equation," "Approximate Solution of Partial Differential Equations," and "Survey of Other Topics," including lattice points, the Dirichlet problem, and approximate methods for the Cauchy problems I and II. Bibliography and index.

Kopstein, Felix F., and Isabel J. Shillestad / A Survey of Auto-Instructional Devices, ASD Technical Report 61-414 / Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. / 1961, printed, 122 pp, cost ?

An excellent survey of devices which are "self-instructional (in) character" and in which "automation is invariably present" is given. Such devices have been termed, "teaching machines," "automated trainers," and "programmed learning devices"; the survey describes a large and varied number of them giving many pictures. The first section defines auto-instruction and sets forth the benefits, limitations and prospects for the future of the field. The second section catalogs instructional devices which were available as of April, 1961. An appendix lists twenty-two patented teaching devices, giving the inventor and patent date. Bibliography.

Speiser, A. P. / Digitale Rechenanlagen / Springer-Verlag, Heidelberger Platz 3, West Berlin, W. Germany / 1962, printed, 432 pp, DM 69

This German language text discusses the digital computer with an emphasis on design and the logical procedures which are implemented in designing a computer. The first of nine chapters introduces the subject, including a section on Boolean algebra and one on programming. Other chapters discuss electronic equipment, comparing the merits of diodes, transistors, parametrons and other devices. The computer's methods for accomplishing arithmetic and the practicality of various number bases are discussed. The author is a manager of the Zurich affiliate of IBM Corp. The book includes a bibliography and an index.

Markov, A. A. / Theory of Algorithms / Program for Scientific Translations, 14 Shammai St., Jerusalem, Israel / 1961, printed, 374 pp, $11.00

This English translation from the Russian discusses the concept of the algorithm, citing algorithms in various branches of mathematics. The author then develops a foundation for the establishment of a theory of algorithms, and applies the theory to proving the undecidability of a series of algorithmic problems. The six chapters are: "Letters, Alphabets, Words," "The Notion of Algorithm," "Construction of Normal Algorithms," "The Universal Algorithm," "Fundamental Theorems on the Impossibility of Algorithms," and "The Unsolvability of Some Mass Problems." The translators point out that certain Russian idioms are retained even though their connotations differ from American ones. An example is the word "mass" in chapter six's title; the English word would most often be "general." A brief conclusion and a bibliography are given.

Ackoff, Russell L., Shiv K. Gupta, and J. Sayer Minas / Scientific Method: Optimizing Applied Research Decisions / John Wiley & Sons, Inc., 440 Park Ave. South, New York 16, N. Y. / 1962, printed, 464 pp, $10.25

This book discusses many aspects of scientific investigation and presents techniques for arriving at rational decisions without recourse to hunches and intuition. The author hopes to "improve the skill of the scientist in the conduct of inquiry." To that end, fifteen chapters discuss, among other topics, "The Nature of Science and Methodology," "Formulating the Problem," "Testing Hypotheses." "Experimental Optimization," "Implementation and Organization of Research," and "The Ideals of Science and Society: An Epilogue." Two appendices include details of mathematical derivations cited in the text. Author and subject indexes.

Problematical Recreations, Third in a series / Litton Industries, 336 North Foothill Rd., Beverly Hills, Calif. / 1961, printed, 38 pp, free on request

A third collection of thirty-one humorously illustrated mathematically searching puzzles is here presented, for the interest of the mathematically inclined. Solutions are given.

Evans, George W., II, and Clay L. Perry / Programming and Coding for Automatic Digital Computers / McGraw-Hill Book Co., Inc., 330 West 42 St., New York 36, N. Y. / 1961, printed, 249 pp, $9.50

The techniques of programming and coding for internally programmed digital computers are presented. From basic principles, the logical sequence of preparing inputs is described. In eleven chapters the authors discuss basic concepts, representation of data, subroutines, optimum coding, numerical analysis, automatic programming, etc. Two appendices discuss computer command lists for three- and two-address computers. Index.

Evans, D. S. / Digital Data: Their Derivation and Reduction for Analysis and Process Control / Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. / 1961, printed, 82 pp, $2.95

The "scope of the book is limited to" shaft-driven digital devices. The five chapters are: "Incremental Scales," "Digital Counting Devices," "Direct Reading from Coded Scales," "Ancillary Equipment," and "System Arrangements and Applications." The British author is a member of the Institute of Electrical Engineers. Bibliography and index.

Careers in Mathematics / National Council of Teachers of Mathematics, 1201 Sixteenth St. N.W., Washington 6, D. C. / 1961, printed, 28 pp, free on request

The student who is interested in a mathematical career will find this pamphlet a source of information about the opportunities that exist, and will exist, in the near future. Brief biographies are given of eight prominent contemporary American mathematicians who are teachers, computer analysts, industrial advisers or government researchers. Careers in six fields are described. Salary information is included. No contents. No index.

MANUSCRIPTS

WE ARE interested in articles, papers, reference information, and discussion relating to computers and automation. To be considered for any particular issue, the manuscript should be in our hands by the first of the preceding month.

ARTICLES: We desire to publish articles that are factual, useful, understandable, and interesting to many kinds of people engaged in one part or another of the field of computers and automation. In this audience are many people who have expert knowledge of some part of the field, but who are laymen in other parts of it.

Consequently, a writer should seek to explain his subject, and show its context and significance. He should define unfamiliar terms, or use them in a way that makes their meaning unmistakable. He should identify unfamiliar persons with a few words. He should use examples, details, comparisons, analogies, etc., whenever they may help readers to understand a difficult point. He should give data supporting his argument and evidence for his assertions.

We look particularly for articles that explore ideas in the field of computers and automation, and their applications and implications. An article may certainly be controversial if the subject is discussed reasonably. Ordinarily, the length should be 1000 to 3000 words. A suggestion for an article should be submitted to us before too much work is done.

TECHNICAL PAPERS: Many of the foregoing requirements for articles do not necessarily apply to technical papers. Undefined technical terms, unfamiliar assumptions, mathematics, circuit diagrams, etc., may be entirely appropriate. Topics interesting probably to only a few people are acceptable.

REFERENCE INFORMATION: We desire to print or reprint reference information: lists, rosters, abstracts, bibliographies, etc., of use to computer people. We are interested in making arrangements for systematic publication from time to time of such information, with other people besides our own staff. Anyone who would like to take the responsibility for a type of reference information should write us.

NEWS AND DISCUSSION: We desire to print news, brief discussions, arguments, announcements, letters, etc., anything, in fact, if it is likely to be of substantial interest to computer people.

PAYMENTS: In many cases, we make small token payments for articles, if the author wishes to be paid. The rate is ordinarily ½¢ a word, the maximum is $15, and both depend on length in words, whether printed before, etc.

All suggestions, manuscripts, and inquiries about editorial material should be addressed to: *The Editor*, COMPUTERS *and* AUTOMATION, *815 Washington Street, Newtonville 60, Mass.*

Andrews, Alan / Electronics Math Simplified / Howard W. Sams & Co., Inc., 1720 East 38 St., Indianapolis 6, Indiana / 1961, printed, 224 pp, $4.95

This book is written for "the engineer student or technician who requires a knowledge of mathematics as it relates to electronics." The twenty chapters are designed to illustrate practical applications of mathematical theory to electronics. The text includes numerous examples which are solved explicitly. Among the titles of the chapters are: "Basic Algebra," "Ohm's Law," "Inductance," "Resonance," "Tubes and Amplifiers," "Modulation," and "Binary Numbers." Tables of the natural trigonometric functions and common logarithms; answers to problems given in each chapter; index.

Attwood, C. / Six-Figure Tables / Ottenheimer Publishers, Inc., Baltimore 15, Md. / 1961, printed, 192 pp, $1.00

A vest-pocket (5½" by 3") size set of mathematical tables is presented. Trigonometrical, logarithmic, antilogarithmic and logarithmic trigonometrical tables are included. A section of standard and often-used formulas are given.

Brown, B. M. / The Mathematical Theory of Linear Systems / John Wiley & Sons, Inc., 440 Park Ave. South, New York 16, N. Y. / 1961, printed, 267 pp, $8.00

The "principles of control engineering" are here discussed in detail, with the emphasis on theory rather than on applications. The book's sixteen chapters include: "Linear Differential Equations with Constant Coefficients," "Fourier Series and Integrals," "Stability," "Design of Optimum Systems," "The General Linear Operator," and "Interpolation Systems." Thirteen appendices provide information about complex numbers, partial fractions, Stieltjes integrals, statistics and probability and matrices. Answers to exercises given in the text. Index.

Mittman, Benjamin, and Andrew Ungar, Editors / Computer Applications: Proceedings of the 1960 Computer Applications Symposium / The MacMillan Co., 60 Fifth Ave., New York 11, N. Y. / 1961, printed, 193 pp, $5.75

Fourteen of the papers delivered and two of the panel discussions conducted at the symposium sponsored by the Armour Research Foundation at the Illinois Institute of Technology, are here published. Under the heading, Business and Management Applications, are included in the following papers: "Prediction of Program Running Time as an Aid in Computer Evaluation," "The Computer in the Library," "An Electronic Computer in Economic Research," and the discussion on business applications. Part two, Engineering and Scientific Applications, includes: "Computer Design of Optical Lens," "Loglan and the Machine," "Data Communication Between Remote Machines," and a panel discussion on engineering applications.

Steinbuch, Karl / Automat und Mensch / Springer-Verlag, Abteilung VI, Berlin-Wilmersdorf, Heidelberger Platz 3, West Berlin, Germany / 1961, printed, 253 pp, DM 28.50

This German book discusses machine intelligence in comparison with human intelligence, pointing out similarities in the thought processes of the human being and the logical deductive processes of machines. In twenty chapters the author covers learning machines, special-purpose machines, reflexes, logic, motives, etc. Bibliography and index.

Foltz, Charles I. / The World of Teaching Machines: Programmed Learning and Self-Instructional Devices / Electronic Teaching Laboratories, 5034 Wisconsin Ave. N.W., Washington 16, D. C. / 1961, printed, 118 pp, $4.95

Initially, this book places the field of teaching machines in proper focus: serious, but mostly unrelated research which has produced numerous and diverse devices. The techniques of such devices are explained, and two chapters discuss advantages and problems. A glossary of terms is given. Three appendices include, "Sources of Programs," "Current Variables of Self-Instructional Devices," "Sources of Self-Instructional Devices" and "Current Research Projects."

Schwartz, Jacob T. / Introduction to Matrices and Vectors / McGraw-Hill Book Co., Inc., 330 West 42 St., New York 36, N. Y. / 1961, printed, 163 pp, $5.50

The concrete, computational, and elementary aspects of the subject are emphasized in this useful book, which is aimed at the uninitiated. The author, Professor of Mathematics, New York University, includes in eight chapters: "Definition, Equality, and Addition of Matrices," "Multiplication of Matrices," "Division of Matrices" "Vectors and Linear Equations," "Infinite Series of Matrices," etc. Index.

Fedoseyev, V. A. / Automatic Coding Systems for Computers, 6121131 / Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. / 1961, mimeographed, 53 pp, $1.50

Originally published in Russian, this technical and theoretical paper discusses techniques which lead to automatic coding systems for high speed digital computers. Section I covers the problems which automatic coding systems pose; the remaining two sections discuss the features, applications and shortcomings of two automatic systems. The English translation is clear and idiomatic.

An Experimental Communication Center for Scientific and Technical Information, AD 255 656 / Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. / 1961, printed, 19 pp, 50¢

This report discusses a proposal to establish a center where scientists could communicate with one another, providing "the flow of information between originator and user." The proposal has been prepared at the Lincoln Laboratory of M. I. T. It includes a data processing system which would process and file scientific documents and information, and provide rapid retrieval.

Computer Basics, five volumes / Howard W. Sams & Co., Inc., 1720 East 38 St., Indianapolis 6, Indiana / 1961, printed, 1256 pp, $19.95.

This comprehensive study of analog and digital computers covers theory, design, operation and maintenance. The work was developed as a course for U. S. Navy personnel over a two year period, at a cost of more than $250,000. The material in each volume begins with basic principles and includes recent developments. The volumes are: I. Introduction to Analog Computers, including among its eleven chapters, "Characteristics of Analog Computers," "Calculus for Analog Computation," and "Applying Analog Techniques." II. Analog Computers—Mathematics and Circuitry, seven chapters. III. Digital Computers—Mathematics and Circuitry, eight chapters, including: "Characteristics of the Digital Computer," "Advanced Digital Mechanics," and "Gating and Logic Circuits." IV. Digital Computers—Storage and Logic Circuitry, seven chapters including, "Magnetic Memory Theory," "Computer Coding," and "Arithmetic Operations." V. Computers—Organization, Programming and Maintenance. Its nine chapters

WHO'S WHO IN THE COMPUTER FIELD — CUMULATIVE EDITION, 1962

Computers and Automation will publish this fall a cumulative edition of "Who's Who in the Computer Field."

If you are interested in computers, please fill in the following Who's Who entry form (which may be copied on any piece of paper) and send it to us for your free listing. If you have friends in the computer field, please call their attention to sending us their Who's Who entries. The cumulative edition will include only the entries of persons who send us their Who's Who information.

Name? (please print) .....

Your Address? .....

Your Organization? .....

Its Address? .....

Your Title? .....

Your Main Computer Interests?

( ) Applications
( ) Business
( ) Construction
( ) Design
( ) Electronics
( ) Logic
( ) Mathematics
( ) Programming
( ) Sales
( ) Other (specify):

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Year of birth? .....

College or last school? .....

Year entered the computer field? ....

Occupation? .....

Anything else? (publications, distinctions, etc.) .....

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When you have filled in this entry form please send it to: Who's Who Editor, **Computers and Automation,** 815 Washington Street, Newtonville 60, Mass.

include, "Input-Output Units," "Hybrid Computation," "Real-Time Computation," and "Typical Computer Installations." Each volume includes review questions and answers, and an index.

Hamming, Richard W. / Numerical Methods for Scientists and Engineers / McGraw-Hill Book Co., Inc., 330 West 42 St., New York 36, N. Y. / 1962, printed, 411 pp, $11.00.

This useful book explains the uses of numerical methods for solving problems on a digital computer. The author prepared the book during the year he taught a course on the subject at Stanford University. Part 1. "The Discrete Finite Difference Calculus," discusses techniques of numerical analysis. Its six chapters include: "The Difference Calculus," "Roundoff Noise," and "Finite Difference Equations." Part II. "Polynomial Approximation—Classical Numerical Analysis," includes "Introduction to Polynomial Approximations," "A Uniform Method for Finding Formulas," and "Indefinite Integrals." The third part, "Nonpolynomial Approximation," connects some aspects of computing with the subjects of electrical engineering, sampling theory and transfer functions. The final part, "Algorithms and Heuristics," includes "On Finding Zeros," "Some Examples of the Simulation of Situations and Processes," and "Random Numbers and Monte Carlo Methods." Chapter N + 1, "The Art of Computing for Scientists and Engineers" (reprinted in **Computers and Automation** for July, 1962) discusses how to approach and solve problems, with the motto, "The purpose of computing is insight, not numbers." References and index.

Merritt, Frederick S. / Mathematics Manual / McGraw-Hill Book Co., Inc., 330 West 42 St., New York 36, N. Y. / 1962, printed, 378 pp, $9.50.

This most useful book explains the formulas and principles (in handbook style with illustrations and without proofs) of the following subjects: algebra, plane and solid geometry, plane and spherical trigonometry, plane and spherical analytical geometry, differential and integral calculus, differential equations, series, matrices, determinants, vectors, tensors, complex variables, conformal mapping, permutations, combinations, probabilities and statistics. The author, Senior Editor of "Engineering News-Record," covers these subjects in a concise but clear style, and often transcends the customary boundaries of mathematics to discuss closely related topics and closely related ways of solving problems. Examples demonstrate the uses of the numerous formulae given. The book includes seventeen chapters, a bibliography and an index.

5th Annual Report for the Period Ending June 30, 1961 / Council on Library Resources, Inc., 1025 Connecticut Ave., N.W., Washington 6, D. C. / 1961, printed, 66 pp, limited distribution.

The Council's activities during the five years of its existence are reviewed. The purpose of the Council, to aid in the solution of library problems, has been pursued in diverse ways, with emphasis on the problems of research libraries. Funded by the Ford Foundation, the Council has undertaken studies to improve library access, storage techniques, administrative procedures, and standardization of operations. Electronic methods for accomplishing some of these tasks have been explored and implemented. The report discusses all these activities and describes some of the projects currently being undertaken.

Beckenbach, Edwin F., and Richard Bellman / Inequalities / Springer-Verlag, Heidelberger Platz 3, West Berlin, West Germany / 1961, printed, 198 pp, DM 48, 60.

This mathematical book discusses the applications of inequalities in ordinary and partial differential equations, as well as in game theory, digital computer work, and mathematical analysis. The five chapters, each including a bibliography, are: "The Fundamental Inequalities and Related Matters," "Positive Definite Matrices, Characteristic Roots, and Positive Matrices," "Moment Spaces and Resonance Theorems," "On the Positivity of Operators," and "Inequalities for Differential Operators." Name and subject indices. There are extensive bibliographical notes after each chapter.

The Collected Works of John von Neumann, vol. I / Pergamon Press Inc., 122 East 55 St., New York 22, N. Y. / 1962, printed, 654 pp, $14.00

This volume, the first of six edited by A. H. Taub, includes a reprinting of all the published articles by von Neumann on Logic, Theory of Sets, and Quantum Mechanics; and also some of his reports to government agencies and other organizations, and reviews of unpublished manuscripts. Of the twenty-seven articles, only the first, "The Mathematician," is in English; the others, in German, include: Mathematische Begründung der Quantenmechanik," "Zur Hilbertschen Beweistheorie," "Über Merkwürdige Diskrete Eigenwerte," and "Zur Allgemeinen Theorie des Masses." Bibliography.

The Collected Works of John von Neumann, vol. II / Pergamon Press, Inc., 122 East 55 St., New York 22, N. Y. / 1962, printed, 568 pp, $14.00

This second of six volumes edited by A. H. Taub includes a reprinting of all the published articles by von Neumann on Operators, Ergodic Theory, and Almost Periodic Functions in a Group; and also some of his reports to government and other organizations, and reviews of unpublished manuscripts. Of the twenty-seven papers, the following are in English: "Proof of the Quasi-Ergodic Hypothesis," "Physical Applications of the Ergodic Hypothesis," "Dynamical Systems of Continuous Spectra," "On an Algebraic Generalization of the Quantum Mechanical Formalism," "Almost Periodic Functions in a Group I," "The Dirac Equation in Projective Relativity," "On Complete Topological Spaces," and "Almost Periodic Functions in Group II." The remaining papers are in German. Bibliography.

Cherry, Colin, Editor / Information Theory / Butterworth, Inc., 7235 Wisconsin Ave., Washington 14, D. C. / 1961, printed, 488 pp, $16.00

The Proceedings of the Fourth London Symposium on Information Theory, held at the Royal Institution, London, England, August, 1960, are here published. Thirty-six papers (and discussion) were selected from those given and here published under the headings: Coding and Detection Theory and Statistical Theory, Telecommunication Systems, Human Reaction to Information, Sensory Information and Biological Models, Learning Mechanisms and other Artefacts, and Classification Theory, Syntactics and Semantics. Among the titles: "A Self-Optimizing System of Coding," "Communication in Digital Systems," "Hesitation and Information in Speech," "Some Mathematical Models of Learning," "The Description of Finite Sequential Processes," and "The Informational Analysis of Questions and Commands."

Calendar of Coming Events

(Continued from Page 16)

Oct. 15-18, 1962: Conference on Signal Recording on Moving Magnetic Media, The Hungarian Society for Optics, Acoustics and Cinetechnics, Budapest, Hungary; contact Optikai, Akusztikai, es Filmtechnikai Egyesulet, Szabadsag ter 17, Budapest V, Hungary

Oct. 15-18, 1962: Instrument Society of America's 17th Annual Instrument-Automation Conference and Exhibit, New York Coliseum and Hotel New Yorker, New York, N. Y.; contact D. R. Stern, Publicity Mgr., Instrument Society of America, Penn Sheraton Hotel, 530 Wm. Penn Pl., Pittsburgh 19, Pa.

Oct. 24-25, 1962: 1962 Computer Applications Symposium, sponsored by Armour Research Foundation of the Ill. Inst. of Technology, Morrison Hotel, Chicago, Ill.; contact Ed Hansen, Ill. Inst. of Technology, 35 W. 33 St., Chicago 16, Ill.

Oct. 24-26, 1962: Cooperating Users' Exchange Meeting, Los Angeles, Calif.; contact A. P. Jensen, Vice Pres., CUE, Georgia Inst. of Technology, Rich Electronic Computer Center, Atlanta 13, Ga.

Oct. 29-Nov. 2, 1962: 9th Institute on Electronics in Management, International Inn, Thomas Circle, Washington, D. C.; contact Dr. Lowell H. Hattery, Director, 9th Inst. on Electronics in Management, The American University, 1901 F St., N.W., Washington 6, D. C.

Oct. 30-31, 1962: Conference on Eng. Tech. in Missile & Spaceborne Computers, Disneyland Hotel, Anaheim, Calif.; contact William Gunning, EPSCO-West, 240 E. Palais Rd., Anaheim, Calif.

Nov., 1962: Sort Symposium, Princeton, N. J. (exact date and place to be announced); contact Martin A. Goetz, Sort Symposium, Applied Data Research, Inc., 759 State Rd., Princeton, N. J.

Nov. 4-7, 1962: 15th Annual Conf. on Elec. Tech. in Medicine and Biology, Conrad Hilton Hotel, Chicago, Ill.; contact Dr. J. E. Jacobs, 624 Lincoln Ave., Evanston, Ill.

Nov. 5-7, 1962: NEREM (Northeast Res. & Engineering Meeting), Commonwealth Armory, Somerset Hotel, Boston, Mass.; contact NEREM-IRE Boston Office, 313 Washington St., Newton, Mass.

Nov. 7-9, 1962: Data Processing Management Association South Central Div. Conference, Washington Youree Hotel, Shreveport, La.; contact J. D. Parker, Jr., Conference Chairman, P. O. Box 1724, Shreveport, La.

Nov. 29-30, 1962: Sort Symposium, Nassau Inn, Princeton, N. J.; contact Mrs. L. R. Becker, c/o Applied Data Research, Inc., 759 State Rd., Princeton, N. J.

Dec. 4-5, 1962: Eastern Joint Computer Conference, Bellevue-Stratford Hotel, Philadelphia, Pa.

Dec. 4-6, 1962: FJCC (Fall Joint Computer Conference), Sheraton Hotel, Philadelphia, Pa.; contact E. Gary Clark, Burroughs Research Center, Box 843, Paoli, Pa.

Dec. 6-7, 1962: PGVC (PG on Vehicular Communications) Conference, Disneyland Motel, Los Angeles, Calif.; contact W. J. Weisz, Motorola, Inc., Comm. Div., 4545 West Augusta Blvd., Chicago 51, Ill.

Dec. 12-14, 1962: American Documentation Institute Annual Meeting and Exhibit, Diplomat Hotel, Hollywood, Fla.; contact John L. Whitlock Associates, 253 Waples Mill Rd., Oakton, Va.

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 computer and associated equipment from the "Official Gazette of the U. S. 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.

May 1, 1962

3,032,265 / Thomas G. Leary, Santa Clara, Calif. / I.B.M. Corp., New York, N. Y., a corp. of New York / Error Free Data Input System.

3,032,266 / John F. Couleur, Fayettesville, N. Y. / General Electric Co., a corp. of New York / Decimal to Binary Conversion of Numbers less than unity.

3,032,745 / Howard Hamer, West Long Branch, N. J. / Electronic Associates, Inc., Long Branch, N. J. / Data Transmission System.

3,032,746 / William H. Kautz, Palo Alto, Calif. / General Electric Co., New York, N. Y., a corp. of New York / Buffer Storage System.

3,032,749 / Vernon L. Newhouse, Haddonfield, N. Y. / Radio Corp. of America, a corp. of Delaware / Memory Systems.

May 8, 1962

3,033,447 / Robert J. Buegler, Springdale, and Joseph F. McCarroll, Jr., South Norwalk, Conn. / Teleregister Corp., Stamford, Conn., a corp. of Delaware / Automatic Computer Program System.

3,033,449 / James L. Quinn, Chicago, and John E. Jones, Wilmette, Ill., Cummins-Chicago Corp., Chicago, Ill., a corp. of Illinois / Coded Information Reading Apparatus.

3,033,450 / Leonard C. Zitnick, Crystal Lake, Ill. / Pure Oil Co., Chicago, Ill., a corp. of Ohio / Check Digit Computing Apparatus.

3,033,455 / Huberto M. Sierra, San Jose, Calif. / I.B.M. Corp., New York, N. Y., a corp. of New York / Multiplier system.

3,033,456 / Charles Mark Kramskoy, Ealing, London, England / Electric & Musical Industries, Ltd., Hayes, England, a company of Gt. Britain / Apparatus for Multiplying Binary Numbers.

3,033,457 / Christopher Strachey, London, England / I.B.M. Corp., New York, N. Y., a corp. of New York / Multiplying-Dividing arrangements for Electronic Digital Computing Machines.

3,033,458 / Richard Herbert Booth, Beaconsfield, and Rolf Edmund Spencer, London, England / Electric & Musical Industries, Ltd., Hayes, England, a company of Great Britain / Data-Handling apparatus.

3,033,460 / Henry T. Marcy, Scarsdale, N. Y., I.B.M. Corp., New York, N. Y., a corp. of New York / Computer apparatus for problems wherein a number of variables are subject to a lesser number of restrictions.

3,034,102 / Philip N. Armstrong, Santa Monica, Calif., Mitchell P. Marcus, Johnson City, N. Y., and Raymond J. Nelson, Cleveland, Ohio / I.B.M. Corp., New York, N. Y., a corp. of New York / Data handling system.

3,034,103 / Francis O. Underwood, Vestal, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Data comparing and sorting apparatus.

3,034,104 / Mitchell P. Marcus, Johnson City, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Data switching apparatus.

3,034,106 / Victor H. Grinich, Palo Alto, Calif. / Fairchild Camera and Instrument Corp., Syosset, N. Y., a corp. of Delaware / Memory circuit.

3,034,107 / William S. Knowles, Malibu, Calif. / Ampex Corp., Culver City Calif., a corp of Calif. / Memory sensing circuit.

3,034,108 / David R. Bennion, Loma Mar, Calif. / Burroughs Corp., Detroit, Mich., a corp. of Michigan / Flux boost circuit for a magnetic core register.

3,034,111 / Albert S. Hoagland, Palo Alto, and Leonard D. Seader, Saratoga, Calif. / I.B.M. Corp., New York, N. Y., a a corp. of New York / Data storage system.

May 15, 1962

3,034,720 / Jordan M. Taylor, Poughkeepsie, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Serial operation of a parallel computer.

3,034,722 / John Bentley Stringer, Hanworth, England / National Research Development Corp., London, England, a corp. of Great Britain / Multipliers for electrical digital computing engines.

3,034,723 / Robert Dressler and Albert B. Jacobs, Elmont, N. Y. / Autometric Corp., New York, N. Y. / a corp. of Delaware.

3,035,252 / William A. Malthaner, New Providence, and John F. Muller, Montclair, N. J. / Bell Telephone Labs., Inc., New York, N. Y., a corp. of New York / Data handling equipment.

3,035,253 / George C. Devol, Greenwich, Conn./————/ Magnetic storage devices.

3,035,254 / Michael J. Moore, Montgomery County, Pa. / Burroughs Corp., Detroit, Mich., a corp. of Michigan / Binary magnetic counter with one core per stage.

3,035,255 / Robert A. Tuttle, Vestal, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Magnetic recording system.

3,035,257 / Ernest R. Kretzmer, New Providence, N. J. / Bell Telephone Labs., Inc., New York, N. Y., a corp. of New York / Cumulative code translator.

3,035,258 / Norman E. Chasek, Colts Neck, N. J. / Bell Telephone Labs., Inc., New York, N. Y., a corp. of New York / Pulse code modulation encoder.

May 22, 1962

3,035,770 / Myron J. Mendelson, Los Angeles, and Charles A. Krause, Gardena, Calif. / United Aircraft Corp., East Hartford, Conn., a corp. of Delaware / Digital Comparator for Binary-Coded Decimal System.

3,036,175 / Hubertus Bettin, Braunschweig, Germany / Loympia Werke A.G., Wilhelmshaven, Germany / Matrix arrangement for data processing machines.

3,036,221 / Johann O. Kleinschmidt, Korntal, Wurttemberg, Germany / International Standard Electric Corp., New York, N. Y., a corp. of Delaware / Bistable trigger circuit.

3,036,291 / Robert L. Whittle, Cedar Grove, N. J., Claude E. Jones, Atlanta, Ga., and Vladimir P. Honeiser, Paramus, and Howard S. Magetts, Lincoln Park, N. J. / International Telephone and Telegraph Corp., Nutley, New Jersey, a corp. of Maryland / Data processing system.

3,036,292 / William R. Beall, Glendale, Calif. / Clary Corp., San Gabriel, Calif., a corp. of Calif. / Read-out system.

May 29, 1962

3,036,770 / Donald A. Harrison, Poughkeepsie, N. Y., and James J. Selfridge, Pacific Palisades, Calif. / I.B.M. Corp., New York, N. Y., a corp. of New York / Error Detecting System for a Digital Computer.

3,036,771 / Edward S. Fabiszewski, Lexington, Mass. / Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., a corp. of Delaware / Weight count generating circuit for data processing systems.

3,036,772 / Earle W. Pughe, Jr., Natick, and Mark E. Connelly, Concord, Mass. / United States of America as represented by the Sec. of the Navy / Analog-Digital Simulator.

3,036,773 / Joseph L. Brown, Poughkeepsie, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Indirect addressing in an electronic data processing machine.

3,036,774 / Joris M. Brinkerhoff, Arlington, Mass. / Laboratory for Electronics, Inc., Boston, Mass., a corp. of Delaware / Computing apparatus.

3,036,775 / William L. McDermid, Peekskill, Harold E. Peterson, Chappaqua and Glenmore L. Shelton, Jr., Mahopac, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Function generators.

3,037,190 / Philip J. Herbst, Moorestown, N. J. / Radio Corp. of America, a corp. of Delaware / Information transmission system.

3,037,192 / Robert R. Everett, Reading, Mass. / Research Corp., New York, N. Y., a corp. of New York / Data processing system.

3,037,193 / Charles J. Barbagallo, Needham, Edward S. Fabiszewski, Lexington, and Louis G. Oliari, Brockton, Mass. / Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., a corp. of Delaware / Electrical apparatus for processing digital data.

3,037,194 / Gerhard Dirks, 44 Morfelder Landstrasse, Frankfurt am Main, Germany / Transfer of data.

3,037,195 / Ernest W. Bivans, West Newton, Mass. / Research Corp., New York, N. Y., a corp. of New York / Data filtering system.

3,037,196 / Andrew E. Brennemann, Poughkeepsie, N. Y., / I.B.M. Corp., New York, N. Y., a corp. of New York / Logical circuit element.

3,037,197 / Newton F. Lockhart, Wappingers Falls, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Magnetic equals circuit.

3,037,198 / Hewitt D. Crane, Palo Alto, David R. Bennion, Loma Mar, and Fred C. Heinzmann, Palo Alto, Calif. / Burroughs Corp., Detroit, Mich., a corp. of Michigan / Multiple output magnetic core circuit.

3,037,199 / Paul M. Grant, Poughkeepsie, N. Y., / I.B.M. Corp., New York, N. Y., a corp. of New York / Thin film switching circuit.

3,037,200 / Robert N. Mellott, Los Angeles, Calif. / Thompson Ramo Wooldridge Inc., Cleveland, Ohio, a corp. of Ohio / Computer magnetic drum writing circuits.

June 5, 1962

3,038,085 / John T. Wallmark and Harwick Johnson, Princeton, N. J. / Radio Corporation of America, a corp. of Delaware / Shift-register utilizing unitary multielectrode semiconductor device.

3,038,119 / Lewis S. Billig, Wayland, and Benjamin T. Newman, Dedham, Mass. / General Electric Laboratories, Inc., Cambridge, Mass., a corp. of Mass. / Information signal intelligibility measuring apparatus.

3,038,145 / George J. Laurer, Johnson City, and Richard S. Washington, Binghamton, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Data transfer and control apparatus.

3,038,146 / Arnold Unger, Hasbrouck Heights, and Robert L. James, Bloomfield, N. J. / The Bendix Corp., a corp. of Delaware / Infinite memory and non-destructive readout integrating circuit.

3,038,147 / Edward J. Grenchus, Johnson City, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Data selecting apparatus.

3,038,148 / John B. Tait, Vestal, and Leo C. Kaye, Endwell, N. Y. / I.B.M. Corp., New York, a corp, of New York / Apparatus for increasing the storage capacity of a magnetic drum.

3,038,149 / Frederick B. Sylvander, Hackensack, N. J. / The Bendix Corp., a corp. of Delaware / Monitor circuit and arrangement for dual data transmission systems.

3,038,150 / Paul F. Bechberger, Tenafly, N. J. / The Bendix Corp., a corp. of Delaware / Monitor circuit for a data transmission system.

3,038,153 / Robert L. Metz, Milford, Conn. / United Aircraft Corp., East Hartford, Conn., a corp. of Delaware / Digital-analogue coincidence gate.

June 12, 1962

3,038,657 / Frederic A. Foss, Binghamton, N. Y. / I.B.M. Corporation, New York, N. Y., a corp. of New York / Electrical Switching Apparatus.

3,038,658 / Roy A. Hempel, Cleveland, Ohio / Robotomics Enterprises, Inc., Phoenix, Ariz. / Electronic Counter.

3,038,660 / Pierre Marcel Honnell, University City, and Robert Edwin Horn, St. Louis, Mo. / Washington University, St. Louis, Mo. / Electric Synthesizer of Mathematical Matrix Equations.

3,039,080 / Gordon van B. King, Convent, N. J. / Sperry Rand Corporation, New York, N. Y., a corp. of Delaware / Encoding Device.

3,039,082 / Richard W. Spencer, Philadelphia, Pa. / Sperry Rand Corp., New York, N. Y., a corp. of Delaware / Shifting Register.

3,039,083 / Robert C. Minnick, Arcadia, Calif., and John E. Mekota, Jr., Belmont, Mass. / Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., a corp. of Delaware / Multi-bit nondestructive memory readout apparatus.

3,039,085 / Ernest A. Keller, Wilmette, Ill. / ISI, Inc., Skokie, Ill., a corp, of Illinois / Magnetic Core Annunciator System.


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June 19, 1962

3,039,679 / Jay C. Shaver, Atlanta, Ga. / Commercial Controls Corp., Rochester, New York, a corp. of Delaware / Information Translation System.

3,039,683 / Frederick Harry Bray and David Gerald Bryan, London, England / International Standard Electric Corp., New York, N. Y. / Electrical Calculating Circuits.

3,039,688 / Walter J. Moe, St. Paul, and Byron D. Smith, Minneapolis, Minn., and Clair E. Miller, San Rafael, Calif., and Seymour R. Cray, Minneapolis, Minn. / Sperry Rand Corporation, New York, N. Y., a corp. of Delaware / Digital incremental computer.

3,039,689 / Esmond Philip Goodwin Wright and Joseph Rice, London, Eng. / International Standard Electric Corp., New York, N. Y. / Electrical Notation Converting Circuits.

3,039,690 / Ronald Percy Bawden Yandell, Streatham, London, England / International Computers and Tabulators Limited, London, England, a British company / Computing machines.

3,039,691 / Howard M. Fleming, Jr., Basking Ridge, N. J., Irving Gardoff, Schenectady, N. Y., and Richard La Manna, Whippany, and Murray Weinberg, Elizabeth, N. J. / Monroe Calculating Machine Company, Orange, N. J., a corp. of Delaware / Binary Integer Divider.

3,039,692 / William H. Lohneiss and Rubin Boxer, Santa Barbara, Calif. / Servomechanisms, Inc., Hawthorne, Calif., a corp. of New York / Computer circuit.

3,040,190 / Fred K. Buelow, Poughkeepsie, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / High speed, sensitive binary trigger utilizing two series connected negative resistance diodes with variable bias feedback.

3,040,192 / Edwin J. Slobodzinski, Hopewell Junction, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Logic exclusive-or, and shift register circuits utilizing directly connected cascade transistors in "tree" configuration.

3,040,194 / Clarence S. Jones, Los Altos, and Frank P. Lewandowski, Mountain View, Calif. / General Precision, Inc., a corp. of Delaware / Bistable circuit utilizing PNPN diode in series with transistor.

3,040,198 / Gerald A. Maley, Poughkeepsie, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Binary trigger having two phase output utilizing AND-invert logic stages.

3,040,299 / James S. Crosby, Jr., and Francis Stern-Montagny, Poughkeepsie, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Data storage system.

3,040,300 / Edward J. Rabenda, Poughkeepsie, and Maurice A. Every, Wappingers Falls, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Data selector.

3,040,302 / Marc Jean Dumaire, Suresnes, France / Societe d'Electronique et d'Automatisme, Courbevoie, Seine, France / Saturable Magnetic core circuits for handling binary coded information.

3,404,303 / John Bernard James, Stevenage, England / International Computers and Tabulators, Limited, London, England / Data storage apparatus.

3,040,304 / Arthur Edward Brewster, London, England / International Standard Electric Corp., New York, N. Y. / Magnetic information storage arrangements.

3,040,305 / Umberto F. Gianola, Florham Park, N. J. / Bell Telephone Labs., Inc., New York, N. Y., a corp. of New York / Magnetic memory circuits.

June 26, 1962

3,040,984 / Bonnar Cox and Jacob Goldberg, Palo Alto, Calif. / General Electric Company, New York, N. Y., a corp. of New York / Data-checking system.

3,040,986 / Ladimer J. Andrews, Gardena, Walter G. Edwards, Manhattan Beach, and James F. Hudson, Hermosa Beach, Calif. / The National Cash Register Company, Dayton, Ohio, a corp. of Maryland / Magnetic core logical circuitry.

3,040,987 / Edward S. Fabiszewski, Lexington, and Louis G. Oliari, Brockton, Mass. / Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., a corp. of Delaware / Magnetic core computing circuit.

3,041,466 / Seymour R. Cray, Minneapolis, and Arnold P. Hendrickson, Richfield, Minn. / Sperry Rand Corporation, New York, N. Y., a corp. of Delaware / Magnetic core circuits.

3,041,474 / William N. Carroll, Wappingers Falls, N. Y. / I.B.M. Corp., New York, N. Y., a corp. of New York / Data storage circuitry.

3,041,476 / Bernhard Dollman Parker, London, England / The Decca Record Company Limited, London, England, a British company / Registers for binary digital information.

3,041,581 / Joseph Wylen, Broomall, Pa. / Burroughs Corp., Detroit, Mich., a corp. of Michigan / Binary data transfer device.

3,041,582 / Seymour R. Cray, Minneapolis, Minn. / Sperry Rand Corp., New York, N. Y., a corp. of Delaware / Magnetic Core circuits.

3,041,584 / Andre Michel Richard, Paris, France / Societe d'Electronique et d'Automatisme, Courbevoie, France / Magnetic Core devices for handling binary informations.

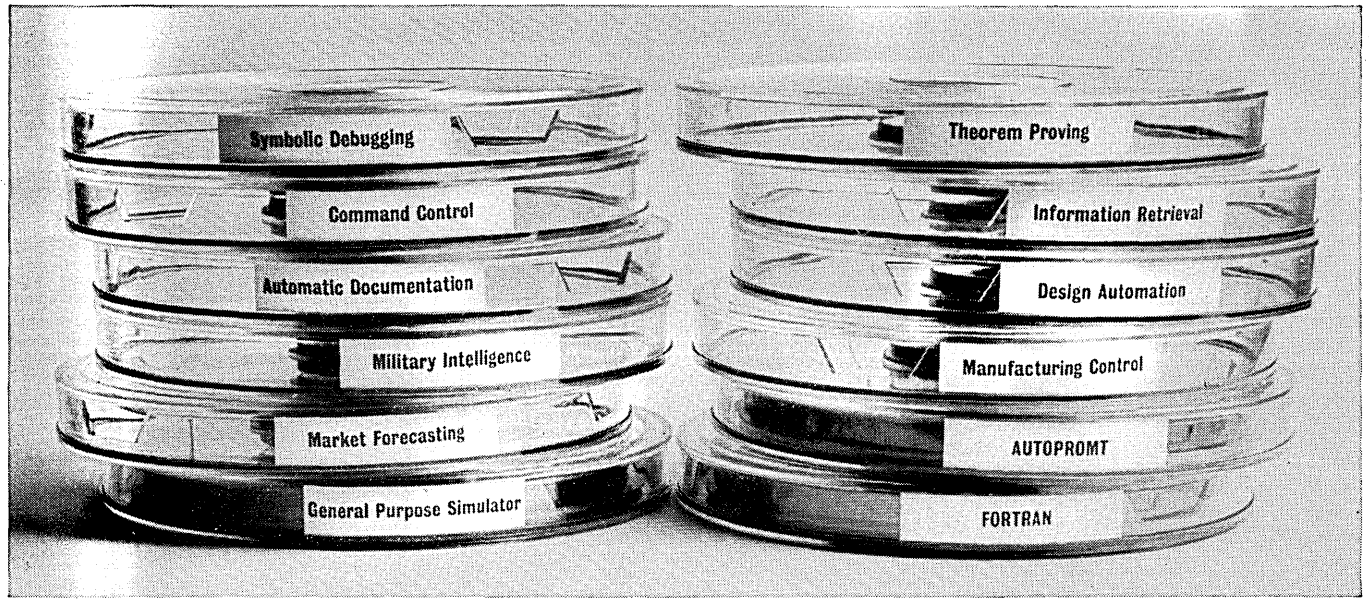
3,041,586 / Bernard T. Wilson, Los Angeles, and Frank A. Bridges, Redondo Beach, Calif. / The National Cash Register Co., Dayton, Ohio, a corp. of Maryland / Memory reading channel selector.

ADVERTISING INDEX

Following is the index of advertisements. Each item contains: Name and address of the advertiser / page number where the advertisement appears / name of agency if any.

IBM extends the range of programming

Are you interested in exploring the capabilities of the computer?



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Programming facilities are located in San Jose, Calif.; Washington, D. C., area; Lexington, Kentucky; Rochester, Minnesota; Omaha, Nebraska; and New York, Endicott, Kingston, Owego, Poughkeepsie and Yorktown Heights, New York. IBM is an Equal Opportunity Employer.

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