FUTURE RELEASE

PLEASE NOTE DATE

WAR DEPARTMENT
Bureau of Public Relations
Press BRANCH
Tel. - RE 6700
Brs. 3425 and 4860

FUTURE RELEASE

FOR RELEASE SATURDAY A.M. FEBRUARY 16, 1946

For Radio Broadcast after
7:00 P.M.,EST, February 15, 1946

HIGH-SPEED, GENERAL PURPOSE COMPUTING MACHINES NEEDED

It took an atomic bomb to make the average man conscious of how far the physical sciences have advanced. No longer is the physicist thought of as a long-haired, wild-eyed, impractical dreamer, whose work is of no immediate value. With the release of atomic energy, the public became conscious of the physicist's role in society, realizing, for instance, that most large commercial engineering organizations constantly encounter problems requiring the services of competent physicists. It is hoped that the announcement of the ENIAC will bring the same recognition for the mathematician.

Technological progess in our age is based on constant research in the physical sciences. Mathematics is the indispensable tool to this process of development. Even the most abstruse problems involving relations among several complex phenomena can be reduced by the skilled mathematician to the language of mathenatics, whose words are equations. These equations must be solved in a practical length of time in order for the results to be useful. The answer to the question of providing these solutions is obviosusly some type of calculating device. The average person is aware of the necessity of computing machines in modern business institutions--banks, life insurance companies, accounting firms, domestic-and-foreign trading houses. What he doesn't realize is that the multiplicity of calculations required in solving difficult problems in physics and engineering demands devices of far greater speed and versatility than those used in the ordinary commercial fields.

A striking example is to be found in the work of the great American mathematician and physicist, J. Willard Gibbs. The practical benefit of his discoveries in thermodynamics was denied to the world for many years because of the absence of adequate computing devices. It took many years of careful and laborious computing to produce the tables and other data required in designing and building, heating, refrigeration, air-conditioning and other modern heat-exchange equipment.

Here we see the need for a labor-saving device in the field of mathematics: On the one hand, the theory--the general laws of thermodymanics--which can be expressed on the form of mathematical equations; on the other hand, the practical use of these theoretical equations --a table or chart that will tell us conditions of heat or temperature, given certain other factors in a specific situation. Obviously, the need for such charts is clear--it would be extremely inefficient for an engineer to start from fundamental theories, each time he meets a new situation.

Fortunately for our modern mode of living many thermodynamic problems were possible of solution by ordinary mathematical means and in a "practical" length of time. The introduction of tile differential analyzer expanded the scope of physical problems which could be readily solved by mechanical means. This type of computing device which is sometimes referred to as a continuous variable machine will accept a fairly large class of total differential equations, The a. c. network analyzer further expanded the scope of problems which could be solved. However, the class of problems which can be solved by both these means is still very limited. Further, since these machines perform all operations of a computation in parallel, the size and complexity of the specific problem they can solve even in the class which they - will accept is limited by the number of arithmetic components they contain.

MORE

Physical problems that cannot be solved analytically (i.e., cannot be solved by formulas) are growing increasingly large in number. Such problems have been handled by computational methods or through the use of specific analogy machines. An illustration of the computational approach is the truly remarkable world of the English physicist, Douglas R. Hartree, on the structure of the atom. This work involved a series of calculations extending over a period of 15 years, by the methods available to Hartree. One is tempted to speculate on the historical implications of these brilliant investigations, had a truly high-speed computing device been available to this eminent mathematical physicist.

An example of the analogy technique is found in the use of wind tunnels. At present, the supersonic wind tunnel at the Ballistic Research Laboratory at Aberdeen is used about 30 per cent of the time as an analogy machine to solve aerodynamical problems. Industrial research organizations frequently make use of highly specific analogy machines to solve such problems as electric circuit theory eqautions or the partial differential equations that enter into electron-optics problems. Not only are such techniques lengthy and costly, but sufficient degrees of accuracy are not always obtained. It is clear that if one had a computing machine of sufficient flexibility, the necessity for such experiments would be obviated, provided that it was rapid enough to solve the problems in a period cf time no longer than that of experimentation.

In considering the undertaking of a problem mathematically susceptible of solution by conventional computing methods the practical aspects of time and manual labor cannot be overlooked. Leaders of our scientific world are aware of many problems which have "gone begging" for want of practical means of solution. To be sure, if the mathematician or physicist had several hundred trained computers working for 50 years on one problem, he might solve it, but by that time the need for its solution would probably have disappeared. Such problems, of course, are highly theoretical. But yesterday's laws of thermodynamics are today's gas turbines.

More important, however, are the engineering problems which are still being picked at with hammer and chisel, when it is a charge of mathematical TNT that is needed to smash the granite of conventional industrial design. An engineer designing compressor blades for a jet engine may have an idea for radical improvement in shape of the blade. But even if he were an advanced mathematician he would still lack the means of translating his mathematical formulation of the problem into practical design data. Consequently, his approach must be one of cut and try with the hope of eventually hitting upon an optimum design.

Such methods were satisfactory in the days of Edison and Marconi, but modern means of mass-production have outdated both the garret inventor and his methods. That present design methods are not entirely satisfactory is indicated by the fact that some of America's largest industrial organizations are deeply interested in the ENIAC.

In this day of accelerated technical development, the long slow process of experimentation by specific analogy is becoming increasingly unsatisfactory. To efficiently handle large classes of problems that can be mathematically formulated, automatically sequenced general purpose computing machines are needed. Such machines can solve problems which are otherwise unapproachable, either computationally or analytically. Machines of this type in existence prior to the ENIAC represented a great step forward, but were still severely limited in speed and versatility by their mechanical nature.

With the development of high speed general computing machines, progress in mathematical physics and engineering will be greatly accelerated. We have not brought steam turbines to their full development, when gas turbines are discovered; we work on gas turbines, and jet engines are invented; atomic-powered engines cast their shadows across our scientific vistas while jet propulsion is still experimental.

Thus we see the need not only for discrete or digital machines, but also for more rapid machines. The next step, in order to make operation of these devices more speedy, was to design an electronic digital calculating machine. The ENIAC is the first general purpose automatic electronic computing machine. Its speed is considerably greater than that of any non-electronic machine (see section on description of ENIAC), and its accuracy is superior to that of any non-digital machine, such as a differential analyzer.

END

DISTRIBUTION: Aa, Af, B, Da, Dd, Dm, N, Sc.

1-30-46