

re electronic computation project at Inst. for Adv. Study
(Excerpt from letter/dated January 16, 1946 addressed to Dr. Weaver by
Professor S. H. Caldwell of the Massachusetts Institute of Technology.)

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These remarks, however, do not give you a picture of the present M.I.T. program. It has changed notably as a result of war-time experience.

We now contemplate a balanced program based on the cooperative action of the Department of Mathematics, the new Research Laboratory of Electronics, and the Center of Analysis in the Department of Electrical Engineering. Within this arrangement, the Center of Analysis acts as the ultimate consumer, and is responsible for the specification, overall engineering, and the operation of our advanced computation machinery. The Department of Mathematics is in the midst of a program to improve its position in applied mathematics, and we intend to make use of our computation machinery toward that end. There is a strong feeling that mathematics is entering a period of great new accomplishment by way of the mass production of numerical solutions, and that we are potentially situated to operate among the leaders in that advance. The Center of Analysis and the Mathematics Department have joined forces for that purpose.

filed separately
I am attaching a descriptive pamphlet on the new Research Laboratory of Electronics which tells the story of its organization and objectives. This description does not, however, present an adequate account of our plans relative to electronic computation.

Before the war our developments in this field were entirely within the Center of Analysis. Now we are in position to exploit the fact that M.I.T. has found many of the best men in the Radiation Laboratory eager to stay here. From these men, and particularly those most skilled in electronics, we have been able to select an exceptionally able group to form the nucleus of the Electronics Laboratory staff.

With such an asset available it would be sheer nonsense to form another group within the Center of Analysis in order to resume electronic computation developments. Accordingly Dr. Stratton and I have agreed that the basic electronic developments will be the responsibility of his group and that we in the Center of Analysis will retain the responsibility for furnishing development specifications to his laboratory, for carrying out all non-electronic component developments, and later for engineering and building the component groups which become the final machine.

In the meantime the Center of Analysis must perform its basic function of providing a strong computation service. Our differential analyzer capacity is under severe strain and must be enlarged. We hope to be able to do that out of operating income. We are operating and have every prospect for continuing to operate a large group of I.B.M. machines on scientific computations. This is a poor substitute for an electronic machine, but at least we are not sitting on our hands and waiting for something better.

There is also in the Center of Analysis a group of computation experts, recruited from the Harvard Observatory, from our own Mathematics Department and from miscellaneous sources. They carry out a great deal of

computation directly, using desk machines, and they also contribute studies of computation methods and procedures which are part of our basic knowhow.

We recognize an urgent need for some type of high-speed digital computer for use now. We have given serious thought and attention to the suggestion you made in regard to joining forces with Harvard through the use of the Aiken machine. May I report to you in confidence that we have concluded both from personal contacts and from reports of individuals at Harvard, that we could not work in harmony with the Aiken personality (I.B.M. has broken diplomatic relations with him and Harvard notified him last fall that he would have to move somewhere else - if he could find a place). This is all unfortunate because I feel that the Aiken machine can accomplish much useful work before it becomes fully obsolete, but the possible gain relative to alternative procedures is not enough to warrant the risk of warfare within our staff.

As an alternative, I believe the progress of Applied Mathematics and the solution of many pressing problems could be greatly expedited by the placement of a maximum type of B.T.L. relay computer within the Center of Analysis. I advocate this not to replace but to supplement the development of the electronic computer. I believe the really high-production, trouble-free, electronic computer will be ready in eight to ten years. If we start now we can have five to six years or more of relay machine operation behind us by then, and that represents a lot of work done and an invaluable reservoir of experience to bring the electronic machine into its most efficient operation.

For the electronic machine itself, we would like to proceed now with a program in the Center of Analysis and in the Research Laboratory of Electronics to extend for about two years and costing about \$100,000. This program would do the following:

- (a) Develop reliable and well-engineered designs of those components for which the general characteristics are known;
- (b) Study the related problems of switching, control, and recording and carry out research and development to provide equipment to perform these functions reliably and at speeds comparable with computation speeds;
- (c) Study the overall content and structure of the final machine in detail, and provide a prospectus of its form, size, ability and cost, so that any decision regarding support of the ultimate construction program can be made on the basis of a substantial quantity of detailed information.

The above program will require the efforts of a large and varied staff. We have the key men required for the theoretical, developmental, and engineering aspects of the problem, all under one roof, and organized under an exceptionally powerful cooperative arrangement.

These latter considerations do not bear, of course, directly on the von Neumann proposal. The subject matter is included in this form in response to your request for information on the situation at M.I.T.