ANNUAL REPORT

of the Advisory Panel to the Applied Mathematics Division of NBS

The following report on the work of the Applied Mathematics Division of the National Bureau of Standards has been prepared by one of several advisory panels assembled by the National Academy of Sciences—National Research Council, and is based on discussions at the group's meeting earlier this year, supplemented by visits to NBS made by individual panel members.

THE Applied Mathematics Division has done without the services of some of its key people during all or part of the past year. Some of these were on leave and are expected to return. Unfortunately, the death of Dr. Milton Abramowitz takes from the Bureau a most valuable member of the Division. In spite of this, the Division continues to provide excellent mathematical, computational, and statistical services to other agencies of the government and to other Bureau divisions. In addition, the Division is serving the scientific community of the nation with its preparation of the *Mathematical Tables Handbook* and its training program in numerical analysis. Further, the members of the Division are carrying out significant research programs in addition to their service duties. The activities of the various sections of the Division are described below.

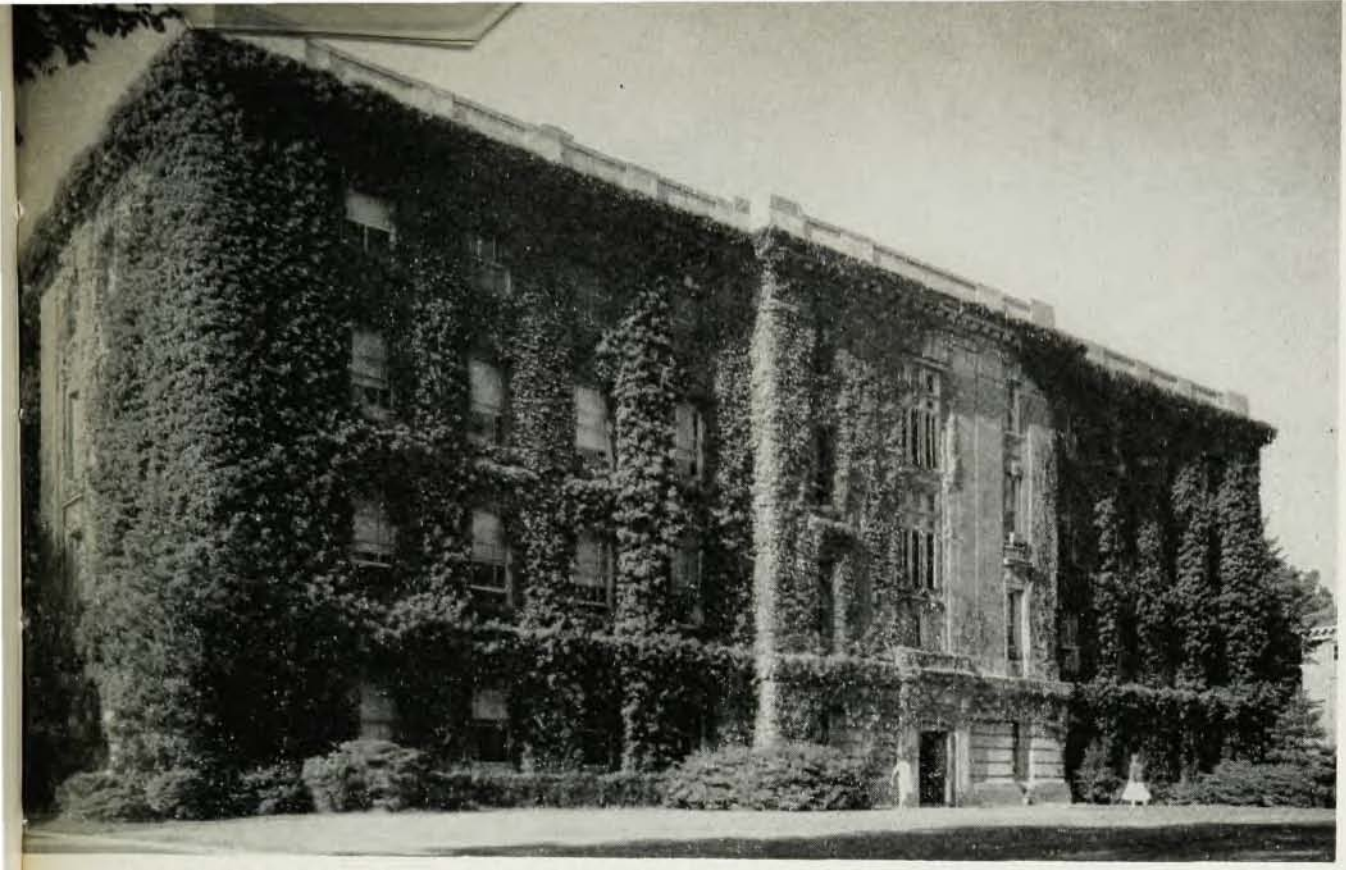
The Numerical Analysis Section (11.01) has conducted its second training program in numerical analysis, commencing February 1, 1959. Although the number of visitors from a distance is not large (9)—these are ordinarily supported in part by the National Science Foundation as well as their own institutions—a number of them are quite able; in addition, the regular attendance of about 25 commuters from the neighborhood of Washington seems sufficient in quality and quantity to justify the program, and perhaps its repetition two years hence.

Especially noteworthy in this Section are the investigations of functional analysis in its relation to numerical analysis. This has been the topic of a seminar for the staff, conducted by W. C. Rheinboldt, W. Gautschi, and J. Arms, and also the underlying topic for various research projects. Other interesting results have been obtained by N. Bazley on eigenvalues, E. Haynsworth on stochastic matrices, M. Golomb and H. F. Weinberger on optimal approximations, M. Newman on modular forms, K. Goldberg on distribution of primes, and A. Ostrowski on Sylvester's law of inertia.

The Computation Laboratory (Section 11.02) has been headed by Dr. Cannon since the untimely death of Dr. Abramowitz last summer. Dr. Cannon has been assisted by Irene Stegun, in charge of computing, and J. H. Wegstein, in charge of data processing and advanced programming.

In terms of man-hours, service computing has been the major activity in Miss Stegun's group. Of more general interest, however, is the *Handbook of Mathematical Tables* now nearing successful completion. This project which was begun under Dr. Abramowitz has been supported by the National Science Foundation and has been supervised by a special committee of the National Academy of Sciences. It should result in an addition to the list of published tables which will be of use to most engineers and scientists. It is hoped

The members of the Advisory Panel for the NBS Applied Mathematics Division are David Blackwell, Alston S. Householder, Mark Kac, Philip M. Morse, J. L. Walsh, and A. H. Taub, chairman. O. F. Schuette is executive secretary of the various NAS-NRC Advisory Panels to NBS.



South Building, National Bureau of Standards, where the Applied Mathematics Division is located.

that the *Handbook* can be made ready for the printer by September of this year. There are to be 29 chapters, of which 15 are in final form, 9 edited, and 5 being edited. These chapters include 500 pages of actual tables, of which 450 are done. A partial by-product of the over-all project is a collection of matrix identities and inequalities, being published separately.

Immediately following the release to the printer, work will begin on a revision of the *Handbook,* and algorisms will be collected for the computation of functions not tabulated.

The work in Mr. Wegstein's group included preliminary planning for the use of the computer PILOT, now under construction; plans for a tape-to-card converter as a link between laboratory recordings and the machine; and studies of forms of automatic programming.

The principal functions of the Statistical Engineering Laboratory (Section 11.03) are consulting with scientists in other Divisions of the Bureau (60%), research (20%), and consulting with other governmental agencies (20%). The Laboratory continues to be a leading center of research in the design of experiments, and to be an excellent training ground for future professors of statistics: e.g., Lieberman (Stanford), I. R. Savage (Minnesota) and, in September, Connor (Triangle Institute) and Severo (University of Buffalo). The consulting program would be strengthened by the addition of a specialist in stochastic processes.

The Mathematical Physics Section (11.04), at present directed by Dr. Pell as acting head, is continuing much of the work begun earlier in elasticity and hydrodynamics. Some interesting work has also been started on methods of calculation of satellite orbits, which has uncovered several promising lines for further work. There has been a small increase in the utilization of this Section by other Divisions of the Bureau but this desirable development has been severely limited by staff restrictions mentioned in our last year's report, which still continue.

Mention should also be made of the activity of the Division in the field of operations research. Although no Section has been formed for this activity, Dr. Alt has supervised several interesting studies in the field of governmental operations, including Post Office operations and some problems in the communication field. We feel that this activity in operations research is quite appropriate for the Division and that it should be fostered because of the great need for work in operations research on governmental problems. As with other beginnings in this field of work, the formation of a special Section on operational research does not yet seem to be called for. Initiation and planning of operations research studies can be done by Dr. Alt and his immediate aides and the detailed work for any task can be carried out by special groups recruited from the various present Sections of the Division, as has been done already. Later, if the work load increases sufficiently, action can be taken to form a special Section.

A. H. Taub
for the Advisory Panel to the Applied Mathematics Division