

gram does receive the attention of good young physicists. Interest is guided as much by matters of inspiration as by those of financial reward.

It should be added that the Bureau has not yet acquired any of the special positions provided by Public Law 313, which allows salaries as high as \$19 000. The Secretary has agreed, however, to support the request for a number of positions of this type. One can hope that they will be approved in the near future for they

will go a long way toward making a position at the Bureau even more promising to the physicist who looks to the Bureau for a lifetime career. Far too many of the new employees regard the Bureau as a temporary employer which will provide them with an opportunity to establish a reputation under conditions in which they can work most freely for a period of time.

F. Seitz

for the Advisory Committee for Physics

REPORT

NBS Technical Advisory Committee for Mathematics

THE National Bureau of Standards Technical Advisory Committee for Mathematics* has reviewed the work of the Applied Mathematics Division of the Bureau (Division 11) and finds that in spite of the difficulty this division is having in maintaining its present staff and acquiring new staff, it is providing very excellent mathematical, computational, and statistical services to other agencies of the government as well as to other Bureau divisions. The four sections of Division 11, Numerical Analysis Section (11.01), the Computation Laboratory (11.02), the Statistical Engineering Laboratory (11.03), and the Mathematical Physics Section (11.04), have interesting, useful, and imaginative research and training programs which make them effective organizations for the discharge of their responsibilities.

NUMERICAL Analysis (Section 11.01) has continued its outstanding work in modern numerical analysis and the use of computing machines in pursuing research problems in mathematics. In addition it has inaugurated a training program in numerical analysis for senior university staff.

The purpose of this program is to give regular university staff, heretofore specializing in fields different from numerical analysis, a training in that field which will enable them to direct the operation of a university computing center and to organize training and research in numerical analysis on their return to their own institutions. Thirteen people began work on this program on February 11, 1957, and will continue to be in residence at the Bureau of Standards until June 7, 1957. The funds for stipends to the participants and other expenses in connection with this training program were supplied by the National Science Foundation.

Trainees will be taught programming for SEAC and will be given a very intensive course of lectures on classical numerical analysis, linear equations and matrix

inversion; quadrature and ordinary differential equations; characteristic values of matrices, partial differential equations, integral equations, and linear programming and nonlinear equations. In addition, lectures will be given covering a variety of other topics, including recursive functions and Turing machines, statistical calculations, discrete variable problems, and some experimental mathematical calculations.

The lecturers include, in addition to members of the staff of the Applied Mathematics Division of the Bureau, mathematicians of note presently engaged in research on one or more of the topics listed above.

This training program should greatly stimulate teaching and research in numerical analysis in universities. It complements the work being done at some universities and does not conflict with it since the universities are in the main concerned with the training of students and this program has as its trainees established mathematicians.

COMPUTATION Laboratory (Section 11.02), like other sections of the division, is having difficulty in maintaining its staff. If this situation is viewed as an educational service to the community in that it furnishes to industry and to other agencies of the government young people with good training in computing procedures, the Bureau may well take pride in the role it is playing.

However, the problem is a difficult one, particularly as the section experiences a need for the expansion of its staff to provide for the increased work it must undertake with the delivery of the IBM 704 and the obligation to provide some programming help to DOFL.

The Handbook of Mathematical Tables is progressing well. The section is to be particularly commended for drawing into the work experts in the special phases of mathematics that are represented either by securing the temporary services of these experts at the Bureau, or by contracting out the preparation of specific parts of the book.

* The members of the Technical Advisory Committee for Mathematics are David Blackwell, E. U. Condon, Mark Kac, Philip M. Morse, Mina Rees, and A. H. Taub, chairman.

STATISTICAL Engineering Laboratory (Section 11.03) has as a major activity consulting with scientists in other divisions of the Bureau on statistical aspects of their problems, including design of experiment and analysis of results. It is performing this function well, and its services are in great demand. The SEL continues to be a center of basic research in experimental design; ten research papers in experimental design are in process of publication in various technical journals. The reliability study recently undertaken by SEL has made a good beginning and promises to produce valuable results.

MATHEMATICAL Physics (Section 11.04) carries on fundamental research on problems of its own, and has the function of providing high-level specialist consulting services to other parts of the Bureau in the field of mathematical physics. The committee finds that a good program of work is going forward within the limitations of the small staff available.

The idea of having a central consulting group on difficult problems of mathematical physics to serve the rest of the Bureau is sound and commendable. But it can only function effectively if its staff includes creative scientists of the highest caliber. By its nature the work cannot be carried on effectively by persons in the lower ranks. It follows necessarily that this section must develop in a way that its staff will have considerably higher than average grade ratings as compared with the rest of the Bureau or other comparable scientific laboratories.

The development thus far has been mostly in the direction of fundamental work on theoretical mechanics. In the years to come corresponding staff strengthening should occur to permit the rendering of effective consulting service in thermodynamics, statistical mechanics, chemical physics, electrodynamics, and so on.

During the past year important contributions were made by the section in exact nonlinear water wave theory, theoretical elasticity, the theory of elastic surface waves, the theory of diffraction and reflection of electromagnetic waves, and the study of the Fourier transformations for distribution functions occurring in applied statistics.

The strength of the section in carrying on this program of highly original work has been greatly enhanced because the Bureau has been following a wise and highly praiseworthy policy of having on its staff a succession of some of the most renowned mathematical physicists in the world for varying periods as visitors. These have included Stomeley of Cambridge, England; Synge of Dublin, Eire; Schultz-Grunow of Aachen, West Germany; Burgers of Delft, Holland; and Walz of Göttingen, West Germany.

The field of mathematical physics is one that gains in creative productivity in unusual degree from stimulating contacts with great men in the field from other lands. The Bureau is indeed to be congratulated, in the

opinion of the committee, on having developed such a first-rate stimulating atmosphere that men of such high distinction find it worth while to spend some time there as visiting research workers, and to give the Bureau the benefit of sharing their latest research ideas. This phase of the program represents a very genuine step forward which deserves every encouragement.

Since further recruiting will be required to maintain the research of this section at its present level of excellence, and to extend their consulting service to other divisions of the Bureau, it may be useful to review the philosophy behind the establishment of Section 11.04, to see how important its maintenance might be. Many divisions of the Bureau deal with various aspects of classical (nonatomic) physics and, in order to improve their measurement techniques and broaden their service coverage, they require detailed theoretical computations in the fields of classical physics. Many of these computations are difficult enough to be classed as important research projects in theoretical physics, requiring theoretical physicists of exceptional ability to solve them successfully.

One way to get such problems solved is for each division of the Bureau to hire theoretical specialists in their own field, but this has several disadvantages. The number of challenging problems arising in any one division may not be sufficient to attract the services of a first-class man and the general attitude of the division may be such as to discourage theoretical research in new directions. Moreover the specialist, being isolated in one division, may find it difficult to obtain the advice and encouragement from other theoretical workers, in other specialties, which often can make the difference between failure and success in some difficult problem.

Section 11.04 represents an alternate way of providing such specialized consulting services. The theoretical physicists are kept as a group, supporting each other in their work and able to divert manpower, as needed, to various important problems as they arise in the various divisions. This arrangement utilizes scarce manpower more efficiently and makes it easier to attract good men, but it places a considerable responsibility on the head of the Section to keep in touch with the various divisions of the Bureau so that the Section can be of real help to them (even, at times, to the extent of persuading the divisions to get interested in an area which they had neglected before).

If the Bureau is convinced that the maintenance of Section 11.04 is the correct way to provide consulting services for the divisions on difficult theoretical problems, it must be prepared to make special efforts to recruit the experienced personnel needed by the section. A section with these responsibilities, staffed by mediocre people, would defeat its purpose. If such recruiting involves the hiring of specialists from Europe, special arrangements should be made to make this possible.

A. H. Taub
for the Advisory Committee for Mathematics