

ANNUAL REPORT

NBS Technical Advisory Committee for Mathematics

The following report was submitted earlier this year to the director of the National Bureau of Standards in accordance with the recommendations of the ad hoc committee ("the Kelly Committee"), which was formed in 1953 to evaluate the Bureau's functions and operations.

THE National Bureau of Standards Technical Advisory Committee for Mathematics* is pleased to report that the program of the Applied Mathematics Division is progressing well and that this division continues to provide excellent mathematical, computational, and statistical services to other agencies of the government, as well as other Bureau divisions. Members of the division are carrying out significant research and training programs in addition to their service duties.

The Applied Mathematics Division has a serious problem in recruiting personnel. There is a serious shortage of people trained in applied mathematics in this country, and the rules of the Department of Commerce concerning the hiring of noncitizens make it difficult to take advantage of the possibility of obtaining the services of foreign scientists if and when they become available.

NUMERICAL Analysis (Section 11.01) has prepared a number of chapters for the Handbook of Tables carried out under the direction of the late Dr. M. Abramowitz, head of Section 11.02. Members of this section have done research in various branches of mathematics and have conducted numerical experiments on the SRAC and IBM 704 computers.

One noteworthy experiment involved the evaluation of matrix inversion programs. The programs of a number of computing organizations were used to invert a set of matrices which were felt to be a representative set of those that occur in practice. The methods were

ordered in goodness in accordance with various measures of the "errors" involved. The error estimates given by von Neumann and Goldstine in their classic paper, "The Numerical Inverting of Matrices of High Order", were found to be accurate and to apply to those codes which used floating point arithmetic in spite of the fact that they were derived assuming fixed point arithmetic operations.

Section 11.01 is planning another training program so that regular university staff, not trained in numerical analysis, may become acquainted with that field and with the problems arising in the operation of a university computing center. A successful program of this type was conducted from February 11, 1957, to June 7, 1957. The new program is being planned to start in February, 1959, and end in June, 1959. Funds to support this program are being solicited from the National Science Foundation. It is hoped that it will be possible to make an early announcement of the training program and that applications for trainee positions can be solicited in good time.

COMPUTATION Laboratory (Section 11.02) is fruitfully engaged in operating the IBM 704 installation for divisions of the Bureau and other Government agencies. In spite of the prevalence of computing services in and outside of Government, the Computation Laboratory's services are very much in demand and there seems to be no difficulty in selling machine time and coding services. This speaks very well for the quality of the services rendered by Section 11.02.

*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.

Operations research engineers

Hughes Research and Development Laboratories has several openings in tactical and operations analysis. New weapons systems which are being developed must be studied with the purpose of optimizing their tactical employment. Other proposed systems are evaluated in terms of their tactical feasibility.

The development of suitable mathematical models to reduce the physical situations to meaningful, yet tractable,

problems and their analysis requires an imaginative and versatile approach.

The participation in studies of the most advanced weapons system concepts offers a challenging opportunity.

Scientists with M.S. or Ph.D. degrees in Engineering, Physics, or Mathematics and preferably with experience in Military Operations Research are invited to write to: Dr. Allen Puckett, Associate Director, Systems Development Laboratories.

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SOVIET PHYSICS TRANSLATIONS

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Soviet Physics—Technical Physics

A translation of the "Journal of Technical Physics" of the Academy of Sciences of the U.S.S.R. The translation began with the 1956 issues. Twelve issues per year, approximately 3,000 Russian pages. Annually \$75.00 domestic, \$79.00 foreign. Libraries * \$35.00 domestic, \$39.00 foreign. Back numbers, all issues \$8.00.

Soviet Physics—Acoustics

A translation of the "Journal of Acoustics" of the Academy of Sciences of the U.S.S.R. The translation began with the 1955 issues. Four issues per year, approximately 400 Russian pages. Annually \$12.00 domestic, \$14.00 foreign. (No library discounts.) Back numbers, all issues \$4.00.

Soviet Physics—"Doklady"

A translation of all of the "Physics Sections" of the Proceedings of the Academy of Sciences of the U.S.S.R. The translation began with the 1956 issues. Six issues per year, approximately 1,500 Russian pages. Annually \$35.00 domestic, \$39.00 foreign. Libraries * \$15.00 domestic, \$18.00 foreign. Back numbers for Volumes 1 and 2, \$5.00 per issue; Volume 3 and subsequent, \$7.00 per issue.

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A translation of the "Journal of Experimental and Theoretical Physics" of the Academy of Sciences of the U.S.S.R. The translation began with the 1955 issue. Twelve issues per year, approximately 4,000 Russian pages. Annually \$75.00 domestic, \$79.00 foreign. Libraries * \$35.00 domestic, \$39.00 foreign. Back numbers, all issues, \$8.00.

Soviet Physics—"Crystallography"

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Soviet Astronomy—AJ

A translation of the "Astronomical Journal" of the Academy of Sciences of the U.S.S.R. The translation began with the 1957 issues. Six issues per year, approximately 1,100 Russian pages. Annually \$25.00 domestic, \$27.00 foreign. Libraries * \$10.00 domestic, \$12.00 foreign. Back numbers, all issues \$5.00.

* For libraries of non-profit academic institutions.

The expanded program of the American Institute of Physics comprises translation of six leading Soviet physics journals, as listed above. These translations, by competent, qualified scientists, provide all research laboratories and libraries with accurate and up-to-date information of the results of research in the U.S.S.R.

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This section is making very good progress on the Handbook of Mathematical Tables. It is presently estimated that the Handbook will consist of about 1000 pages, divided into 27 chapters. Each chapter will contain formulas of importance connected with the function being discussed and tabulated, as well as information as to how the tables can be used and extended.

THE approximately 12 scientist years of work in the Statistical Engineering Laboratory (Section 11.03) during 1957 were divided about as follows:

Within NBS consulting	5.4
NBS supported research and professional activities	3.1
Non-NBS (contract) work	3.5

The non-NBS work is of a type which the SEL is uniquely (among Government agencies) qualified to perform, and the results have been excellent. The Post Office project has apparently gone well in spite of the press of other work this section had. About nine research papers were completed during 1957. Professional activities include Eisenhart's serving as an editor of *JASA* and Mrs. Rosenblatt's teaching a course at the Bureau.

Some of the members of SEL feel that they are undertaking too many activities. For example, while no consulting problem is ever refused, because of the lack of time, the members of SEL usually stop with answering the immediate question raised instead of pursuing the matter further as they would like to do in many cases.

Because the section is understaffed, it has not been able to seek out statistical problems in other divisions of the Bureau; it has had to divert attention from the reliability study; and has not been able to do consulting on problems in stochastic processes. Given the present staff, the division of activities seems reasonable and well carried out.

MATHEMATICAL Physics (Section 11.04) has continued the excellent work discussed in last year's Report; it has been able to start work in only a few new fields. The most important new field is that of magnetohydrodynamics, a good choice both because of its growing importance and also because its cultivation requires skill in analysis and access to high-speed computers, both of which the division has.

The work in hydraulics and fluid dynamics, in general, continues at about the same pace as last year; likewise with the useful and important work in theoretical elasticity. Detailed consulting work for other divisions of the Bureau has continued to about the same extent as before.

Some calculations of satellite problems have been carried out, for example, the effect of the earth's magnetic field in a spinning satellite. Calculations are nearly complete on the behavior of steam-filled bubbles in water and other two-phase hydrodynamic problems.

A. H. Taub
for the Advisory Committee for Mathematics