and moral attitudes, the opportunities, the open sesame that permitted them to go out into the great world and exert their effective and beneficent influences.

Neither is there need for saying to this audience that the desirable cultivation of the fields of knowledge represented in the research activities of universities and governments has been but little more than begun. Our great commercial organizations recognize this fact in the existence of their research departments. They know that the discovery of fundamental knowledge and the application of the finest methods of scientific research are the essential and powerful aids to industrial progress. These commercial organizations control and apportion the appropriations in support of their several departments of activity and endeavor with rare acumen and judgment, and we shall not learn that any of those organizations, successful in large degree, will reduce their financial support of research for the year beginning on July 1, 1933, in percentages exceeding those relating to their administrative divisions. Their boards of trustees are too wise for that. I do not know of any good reason why research activities conducted in universities and under governments should not be supported in accordance with the same policy. We know that such research activities have earned and paid priceless dividends through the years, the decades and the centuries of the past, and I do not have the slightest lack of confidence in the correctness of the thesis that further research activities, continued through the years, the decades and the centuries ahead, will be equally fruitful in results that the human race should have and will use to its tremendous advantage.

A HISTORY OF THE NATIONAL RESEARCH COUNCIL 1919--1933

IV. DIVISION OF CHEMISTRY AND CHEMICAL TECHNOLOGY[1]

By Professor CHARLES A. KRAUS
CHAIRMAN

THE Division of Chemistry and Chemical Technology is a representative organization of American chemists. Its membership in the main consists of representatives from the different societies of American chemists and members-at-large nominated by the division itself. In addition, it acts through numerous committees, the membership of which is unrestricted. The division is, therefore, under the control of American chemists acting through representatives chosen by their own organizations.

Its chairmanship has been held by the following persons since the organization of the division in 1918:

1918 —John Johnston
1919–1920—W. D. Bancroft
1920–1922—F. C. Cottrell
1922–1923—E. W. Washburn
1923–1924—J. Enrique Zanetti
1924–1925—James F. Norris
1925–1927—William J. Hale
1927–1928—Frank C. Whitmore
1928–1929—George A. Hulett
1929–1930—James E. Mills
1930–1931—Harry A. Curtis
1931–1932—Henry K. Benson
1932–1933—Charles A. Kraus

The division acts as agent in cooperation with other similar national agencies on all problems of international concern. It recommends the appointment of delegates to the International Union of Chemistry, votes on matters requiring decision *ad interim*, receives and distributes reports of committees of the union, and assists in organizing American committees supplementary to committees of the union. In a field such as chemistry there are many questions that can be settled only by international agreement. The division, owing to its wide affiliations, is in a position to give expression to the opinions of American chemists.

Following the war, there was great need for reliable values of physical and chemical constants. Indeed, a thoroughly satisfactory tabulation of such constants had not theretofore been made. At the request of the International Research Council, the Division of Chemistry and Chemical Technology, acting conjointly with the Division of Physical Sciences, undertook the stupendous task of publishing "International Critical Tables of Physical and Chemical Constants." The publication of these tables entailed the critical examination of the vast amount of data collected in the literature up to that time. The division organized an editorial staff, including ten foreign representatives; and arranged for the detailed analysis of all available data by collaborating experts in the various fields. The first volume of the Tables appeared in 1926 and the seventh volume in 1930. These seven volumes totaled 3,404 pages.

[1] This is the fourth of a series of ten articles prepared to describe briefly the nature of the activities with which the National Research Council has been engaged during the past fourteen years.

One of the defects of practically all existing tables of constants has been the lack of satisfactory indexes. The division accordingly undertook to provide an index to the Critical Tables. This index, comprising some 330 pages, will appear from the press in April of the present year.

The "Survey of American Chemistry" was brought out in 1926, in order to provide a general view of the state of research progress in America. This survey developed into an annual publication, the seventh volume of which is now in press. Chapters dealing with various fields of chemistry are contributed by authors who themselves are active in those fields. Originally all fields were reviewed each year, but with the last volume of the Survey it was decided to review some fields only every second or third year. To any one who is interested in following the development of research in chemistry generally throughout the country, the Survey has proved very helpful.

The division has been of assistance in providing avenues for publication of important results in many different ways. Various chairmen of the division have contributed monographs on timely subjects, journal publications have been assisted, and reports of numerous committees have been made available. The division was helpful in establishing *The Chemical Review,* a bi-monthly journal, and there might also be named the Chemical Monograph Series, which now comprises some 50 volumes.

The division, through various committees, has administered research funds provided for special investigations. Among these may be mentioned the investigation carried out at the Bureau of Standards on the preservation and permanence of records. As the result of this investigation it has been found that the life of all record papers is greatly influenced by conditions such as light, humidity and atmospheric impurities. Corrective measures have been suggested and libraries are already making use of the results of this investigation. This work has also done much to stimulate further investigation of problems relating to the permanence of record papers. Important investigations were also carried out under the auspices of the Committee on Chemical Research on Medicinal Substances, with funds provided for the purpose from various sources. The division also cooperated with the Central Petroleum Committee in organizing petroleum research under a grant of $500,000, which was administered by the Petroleum Institute.

Much of the work of the division is carried out through its committees, the membership of which includes not only members of the division but also chemists throughout the country.

The Committee on the Chemistry of Colloids was organized in 1919 and has ever since been active in promoting colloid research. This committee was instrumental in arranging for the publication of several books and of numerous monographs, the earliest of which were published in mimeographed form by the National Research Council. In 1923 the committee was instrumental in organizing the First Colloid Symposium. This symposium has since been continued each year in cooperation with the Colloid Division of the American Chemical Society. The papers read at these symposia have been published in monograph form.

The Committee on Contact Catalysis was organized in 1920. Its first report was published in the *Journal of Industrial and Engineering Chemistry* in 1921, and subsequent reports have been published each year in the *Journal of Physical Chemistry.*

The Committee on Photochemistry was organized in 1927, and has published reports in the *Journal of Physical Chemistry.* The Committee on the Construction and Equipment of Chemical Laboratories was organized in 1924. Its final report was published in book form by the Chemical Foundation in 1930. This committee has been reorganized and is continuing its work in collecting data relating to laboratory construction and equipment. The Committee on Explosives Investigation was very active and rendered much valuable service for some years following the war. Among its other activities, it carried on a study of the utilization of surplus military explosives, and prepared a descriptive list of hazardous chemicals and explosives. The Committee on Research Chemicals was active for a number of years following the war, collecting data on research chemicals available in this country. Lists of research chemicals were published in the Reprint and Circular Series of the National Research Council.

Other committees, such as the Committee on Pharmaceutical Research, on Methods of Organic Analysis, on Medicinal Substances and on Petroleum Chemistry, have been active in stimulating research. The Committee on Chemical Research on Medicinal Substances was formed in 1923. It continued until its functions were taken over by the Annual Survey of American Chemistry, after its members had published 144 papers and three United States patents. Research results valued at many millions of dollars have been credited to the activities of this committee. The Central Petroleum Committee was constituted in 1926 with the cooperation of the Divisions of Physical Sciences and Geology and Geography, to plan a research program on the chemistry, physics and geology of petroleum, in conjunction with the American Petroleum Institute. This program has contained 41 separate projects, some of which have been completed, while others are still active.

Each year as funds permitted the division has undertaken conferences for the initiation and coordination of chemical research. Such conferences have been held on the subjects of permanence of printed records, on the coordination of chemical literature, on biological nomenclature, and on farm waste and chemistry of soils. The results of these meetings have been intangible in part, but the mere bringing together of eminent men interested in a certain phase of chemistry is important.

The division has from time to time collected pertinent data relating to chemistry. Since 1922, the division has each year made a census of graduate students in chemistry throughout the country, and this census has been published in the journals. The division also conducted a study of conditions of chemical research in the Southern States. The report of this study was published by the Chemical Foundation. Other activities include cooperation between academic and industrial research, and a list of research problems in various fields of chemistry.

One of the important activities of the division has been the administration of the grants in aid of research. During the past four years 42 grants have been made to 37 individuals. Many papers have been published as a result of these grants and many capable research workers have been encouraged in their work. Particularly during the last few years, the grants-in-aid have proved invaluable to research workers who have found themselves handicapped through lack of funds.

Another important activity of the Research Council and of the Division has been in connection with the National Research Fellowships. Since their foundation, 257 fellowships in chemistry have been awarded to 150 individuals. While it is true that some will profit more than others from the opportunities afforded by these research fellowships, there can be no question that the National Research Fellowships have produced tangible results.

Through meetings of the division and of committees, and through other contacts afforded by the division, those interested in various fields of chemistry are brought together and contacts are established. It is from these contacts that we may expect some of the major benefits in the course of time.

SCIENTIFIC EVENTS

CHICAGO PROGRAM ON RADIATION AND PLANT LIFE

THE American Society of Plant Physiologists has joined with Sections G and O and their affiliated organizations in the programs of June 20 and 21. On the morning of June 22, however, a special symposium has been arranged for plant physiologists who are attending the meetings. The meeting will be held in the Civic Opera Building, Chicago, in the rooms of the Lighting Institute at 10:00 A. M. The meeting will be open to all visiting botanists and to professional growers of plants. The titles of the papers are as follows:

"Influence of Radiation on CO_2 Absorption by Plants": W. H. Hoover, Smithsonian Institution.

"The Interrelated Effects of Light and Temperature on Plant Growth": A. D. Davis, University of California.

"Growth as a Criterion for Physiologic Response to Radiations": E. S. Reynolds, Missouri Botanic Garden.

"Photoperiodism and its Practical Application to Greenhouse Crops": Alex Laurie, Ohio State University.

"Responses of Certain Plants to Artificial Radiation Factors Applied as Supplements to Daylight": R. B. Withrow, Purdue University.

"The Response of Greenhouse Plants to Electric Light Supplementing Daylight": Laurenz Greene, Purdue University.

"Experimental Work at Pennsylvania State College on Radiation as Applied to Plants": H. W. Popp, Pennsylvania State College.

"Chemical Responses of Certain Plants to Solar Ultra-violet Radiation": W. E. Tottingham, University of Wisconsin.

"Some Growth Responses of Plants to X-ray Treatments": C. A. Shull, University of Chicago.

The program will be continued in the afternoon, if necessary, followed by a round table discussion.

CHARLES A. SHULL

MATHEMATICS AT THE CHICAGO MEETING

THE preliminary program of the Chicago meeting of the American Association for the Advancement of Science and Associated Societies, printed in the issue of SCIENCE for May 19, contains information concerning the programs of the different sections, but it may be well to repeat here a summary of the plans of the mathematicians given in the announcement of the American Mathematical Association.

It reports that the American Association and associated societies will present unusually attractive programs in connection with the Century of Progress, the week of June 19 being devoted chiefly to pure science and the next week to applied science. There will be numerous addresses by prominent foreign scientific men who have been specially invited for