

President, I. Fankuchen, Polytechnic Institute of Brooklyn; *Vice-president*, R. W. G. Wyckoff, National Institute of Health; *Secretary*, H. T. Evans, jun., Philips Laboratories, Inc., Irvington-on-Hudson, N.Y.; and *Treasurer*, J. Karle, Naval Research Laboratories. Thus at the beginning of this year the American Crystallographic Association was firmly established. The charter membership now stands at 495, and plans have been made for the first meeting to be held this month at Pennsylvania State College. Two meetings will be held yearly, and the publications and activities of the two former Societies will be continued and expanded.

MECHANISM OF COMBUSTION IN GASES

AN international conference on the kinetics and mechanism of burning and combustion reactions in the gaseous phase was held in Paris during April 26–May 1, 1948, in the Reunion Hall at the French Institute of Petroleum. The conference was organised by the National Centre of Scientific Research with the material assistance of the Rockefeller Foundation. Academic representatives of Belgium, France, Great Britain, Holland and the United States were present, and a detailed account of papers presented and discussions relevant thereto is to be found in three consecutive issues of the *Revue de l'Institut Français du Pétrole et Annales des Combustibles Liquides* (4, No. 7, 275; No. 8, 363; and No. 9, 439; 1949).

Within the terms of reference of this conference, a wide choice of subjects was presented by thirty-five delegates to between sixty and eighty members. It included, as recorded in No. 7 of the *Revue*, flame-speeds at atmospheric pressure and the influence of catalysts; researches on the source of issue of hydrocarbon 'bandes de flammes'; slow oxidation of hydrocarbons; the role of formaldehyde in the oxidation of hydrocarbons such as methane and ethylene; the slow oxidation of di-isopropyl-ether over the temperature-range 360°–460° C.; oxidation and pyrolysis—the effect of small quantities of oxygen on the pyrolysis of organic vapours with special reference to acetaldehyde; the influence of the nature and size of the walls on the birth and the breaking of reaction chains, and the action of small quantities of several vapours, gases and solid substances; propagation of flame in ethylene–air mixtures; flame-movement mechanism in gaseous mixtures and the phenomenon of projection of active centres; what happens on ignition of a bubble of hot gas.

No. 8 of the *Revue* covers papers on the mechanism of initiation of chains in the thermal reaction between hydrogen and oxygen; the theory of burning, extinction and stabilization of flames; processes of combustion in two stages of the higher hydrocarbons and their derivatives; the emission and absorption spectra of the hydroxyl radical in various flames at low pressure; mechanism of combustion of a pure cyanogen flame and its decrease in radiation when hydrogen, chlorine or nitrous oxide is present; an account of research into the mechanism of combustion of methane; vapour tension and heat of sublimation of carbon.

Included in No. 9 are studies in the kinetics and inhibition of burning methane; the active combustion

of methane; the temperatures of spontaneous burning of air–diethyl acetate mixtures; the influence of the state and of the evolution of walls on burning temperatures with air–hexane mixtures; kinetic study of diethyl–acetal–air flames and air–*n*-hexane; the technique of using a mass spectrometer to detect reaction intermediates in the decomposition and combustion of simple hydrocarbons. A method is described for measuring efficiencies of fast reactions of atomic hydrogen with olefins. It is also shown that reactivity of any particular bond in a hydrocarbon may be affected by neighbouring groups in the molecule. Concluding papers discuss influence of walls and gas diluents on the sphere of inflammability of hydrogen; the use of free valence number in studies of chemical reactivity; the influence of a special change of size of the open end of a cylindrical tube on flame propagation in gaseous mixtures; certain hypotheses adopted in calculating speeds of deflagration from measurements in a spherical bomb, and finally the influence of turbulence on the mechanism of combustion reactions in the gaseous phase. Altogether, this is a most comprehensive exposition of an extremely complex subject.

H. B. MILNER

NATIONAL RESEARCH COUNCIL OF CANADA REVIEW FOR 1948

THE review of the National Research Council of Canada for the year ended December 31, 1948*, describes the work of the Council in rather greater detail than is done in the annual report and, besides a directory of staff and list of research grants, includes a more up-to-date account of the activities of the year. The staff employed by the Council numbered more than 2,700, and, of the thousand skilled workers employed on the Atomic Energy Project at Chalk River, half were men of science. Progress at Chalk River in operations and in scientific output continued; the experimental NRX reactor (heavy-water pile) gave the highest neutron flux density of any research pile then in existence, and, in addition, opportunities for fundamental investigations permitted irradiation of nearly six hundred samples for the production of radioactive isotopes. The Isotopes Branch distributed forty different isotopes to twenty-two institutions. The Chemical Engineering Research Branch was enlarged, and a new laboratory was being constructed for the separation of isotopes. As a result of co-operation, many centres in Canada started working on the use of radioactive isotopes as tracers in agricultural, biological, medical, chemical, physical and metallurgical research.

A more reasonable balance was established between applied and fundamental research in the Division of Applied Biology. Work continued on refrigerated storage of meat, processing of liquid and dried eggs, and dairy products, in which it was found that the baking properties of sugar-egg powders improve as the size of the atomizer nozzle is reduced, within practical limits. Considerable progress was made in the adaptation to Canadian requirements of the Fritz continuous butter machine. Interesting results were obtained with dried whey as a component in sponge

* National Research Council of Canada. Review, 1949. (N.R.C. No. 1997.) Pp. 252. (Ottawa: National Research Council of Canada, 1949.) 75 cents.

cakes, and good results were obtained on two shipments of frozen fish, using new freezing-mixtures in railway refrigerator cars. Progress was made in the production of glycerol by fermentation of beet molasses, and papers of the glassine or parchment type were obtained from several cereal straws. Construction of the Prairie Regional Laboratory advanced during 1948, and three laboratories began operating, for bacteriology, mycology and fermentation chemistry; a fourth laboratory, for antibiotics and enzyme chemistry, was due to be staffed.

The Division of Building Research concentrated attention on questions of building practice in relation to house construction, including studies of the construction of houses built without basements but resting on flat concrete slabs and of cavity-wall construction. In the Division of Chemistry, photochemical and other kinetic investigations on acetone, acetaldehyde, ethylene oxide and hydrocarbons yielded information on the reactions of the free radicals involved, and radioactive carbon was used to label functional groups so as to follow their course in photochemical reactions. The compressibility of helium was measured with a high degree of accuracy in the range 0–600° C., and work continued on the infra-red absorption spectra of complex organic compounds, including deuterium-enriched compounds, and on the acid dyeing of wool. In addition to its service functions, the Applied Chemistry Branch carried out numerous investigations in such fields as textiles, rubber, protective coatings and organic synthesis, mainly directed towards the application of new scientific knowledge in chemical industry.

Basic investigations by the Division of Mechanical Engineering, the aeronautical laboratories of which provide research, development and testing facilities for the Canadian aviation industry and also function as the research organisation of the Royal Canadian Air Force, included further work on the control and stability of tailless aircraft, the behaviour of turbines under low-temperature conditions and the icing of turbines. The engine laboratory was in the process of being modified to accommodate jet and propeller-jet units, and the facilities of the model-testing basin were extended by the provision of self-propulsion equipment. Further work was done on the model of the Fraser River for the Department of Public Works, and problems in connexion with the use of fuels and lubricants at low temperatures continued to be a major activity. During the year 1949–50 one hundred and eleven projects were scheduled for support by grants-in-aid under the Division of Medical Research, including fundamental research on such subjects as physiology and biochemistry of muscular activity; cellular development; growth destruction and regeneration; the physiology and biochemistry of nervous and special sense activity; mechanisms of secretion; metabolic studies, including the role of vitamins; studies on blood constituents, including the cells; enzymes; lipids and clothing agents.

In the Division of Physics, progress was made in planning and building the laboratory for a spectroscopy group, and an investigation was started on the influence of the magnetic field of the earth on cosmic rays. A new type of accelerator which produces 4.5 MeV. electrons was substantially completed, some of the equipment for geophysical prospecting was modified for measuring the depth of glaciers, and the factors affecting the resolving power in a print were examined by a projection. A study was also being made of methods of applying Shoran radar technique in

measuring the distance between two fixed points on the ground with an accuracy sufficient for geodetic purposes, and in determining the position of an aircraft, engaged in taking photographs, at intervals along a flight line. A fully automatic ionospheric recorder was being developed for the study of radio-wave propagation, and a simplified, low-cost marine radar set developed for the use of Canadian shipping was in the process of being produced by a Canadian manufacturer. Trials were conducted to obtain a comparison on the three- and ten-centimetre bands of the interference to radar equipment caused by rain and snowstorms.

LIBRARY STATISTICS IN THE UNITED STATES

UNDER the title "Statistics of Libraries in Institutions of Higher Education, 1946–47", the Research and Statistical Service of the Office of Education has issued as Chapter 6 of the Biennial Survey of Education in the United States, 1946–48, a summary of the distribution and status of library service in higher educational institutions in the United States, and some interpretation of the detailed statistics tabulated*. The pamphlet was prepared by W. O. Mishoff and E. M. Foster, and is based on library reports from 1,345 institutions, or 79.1 per cent of such institutions in the United States, and including 680 of the 779 colleges and universities and 175 of the 265 professional and technological schools.

Analysing the returns, the report points out that colleges and universities added an average of 2.0 books per student to their stocks, professional and technological schools adding 1.8 books. Of 1,311 institutions reporting this item, the number that made additions during the year fell into the following ranges of number of volumes: less than 1,000, 591; 1,000–4,999, 594; 5,000–24,999, 107; and more than 25,000, 19 volumes. Moreover, while 26.5 per cent of the universities and colleges reporting added fewer than a thousand volumes, 1 per cent acquired fifty thousand or more volumes, and 0.6 per cent of the professional and technological schools added from ten to fifteen thousand volumes. Of the total holdings, colleges and universities accounted for 83.3 per cent and professional and technological schools for 6.7 per cent, eleven of the former owning one million or more volumes. Inter-library loans totalled 101,866 volumes, and 93,093 volumes were borrowed from other libraries by those of higher educational institutions.

Only 161 libraries were open for eighty hours or more per week; but 555 were open for 60–79 hours and 490 for 40–59 hours. The total operating expenditure exceeded 34.6 million dollars or almost double that of 1939–40, but expenditure per student only increased from 15.3 to 18 dollars; in colleges and universities it averaged 39.2 dollars, and in professional and technological schools 15.7 dollars per student. Of colleges and universities, nineteen spent 300,000 dollars on more library operations; but thirty-eight spent less than 3,000 dollars. Library services employed 8,511 full- and 2,106 part-time workers, and, while nine colleges or university libraries employed more than a hundred library workers, 121 employed only one.

* Federal Security Agency: Office of Education. Biennial Survey of Education in the United States, 1946–48. Chapter 6: Statistics of Libraries in Institutions of Higher Education, 1946–47. Prepared by Willard O. Mishoff and Emery M. Foster. Pp. v + 49. (Washington, D.C.: Government Printing Office, 1949.) 20 cents.