

strengths greater than 0.10, an equilibrium mixture contains a larger proportion of A_2 than of A . The half-life time under these conditions is probably in excess of 200 hr. In 0.05 M borate buffers at pH 8, the equilibrium mixture contains a slightly higher proportion of dissociated form; but little is yet known of the reaction-rates.

From data of the type of Fig. 1, the dissociation process already mentioned becomes understandable. Dilution with water causes a lowering in salt concentration and therefore a shift in equilibrium position towards the dissociated form; a lowering in pH makes this position attainable rapidly. As would be anticipated, a lowering in protein concentration only (by dilution with salt solution), followed by pH lowering, causes little dissociation.

More is known also of the association process. The small effect of ammonium chloride as compared with that of ammonium sulphate at comparable ionic strength indicates that the sulphate ion is the effective entity. Potassium and sodium chlorides give effects similar to ammonium chloride. Further work is in progress to test the action of other divalent anions, and it would appear that the effect of divalent phosphate (HPO_4^{2-}) is probably similar to that of the sulphate ion. The associating action of the sulphate ion is probably connected with its strong absorption by both A_2 and A molecules. Dialysis, extended over several days, fails to remove completely such ions, although electrophoretic results indicate their displacement by barbiturate ions.

However, another type of reaction by ammonium sulphate occurs at quite low salt concentrations (c. 1 per cent saturation). Thus at pH 8, in the usual phosphate buffer solutions, the equilibrium mixture of A_2 and A contains an appreciable proportion of the A form, as may be seen by examining a solution of A_2 after four or five days dialysis against 0.05 M phosphate buffer at pH 8. However, an undialysed solution in the same buffer of A_2 , obtained by ammonium sulphate precipitation and contaminated, therefore, by ammonium sulphate, contains no A form after several days. It is not yet known whether the trace of ammonium sulphate present causes an actual shift in equilibrium, or merely slows reaction-rates. The strong absorption of sulphate ions, and their retention even in the absence of such ions in the solvent, is probably responsible for the effect also.

A new type of associating agent, the sodium salt of the long-chain paraffin sulphates ($C_8, C_{10}, C_{12}, C_{14}$), has recently been discovered. These substances are effective at very low concentration, complete association occurring at a concentration which is lower the longer the paraffin chain. Thus with the C_8, C_{10} and C_{12} members respectively, complete association occurs at the following detergent concentrations: 0.046 M ; 0.012 M ; 0.0018 M .

Electrophoretic examination under these conditions demonstrates the formation of complexes between the protein and detergent ions, and it seems clear that the latter have the property of linking two A molecules. If sulphate ions are effective as a result of two negative charges, then detergent ions with only one negative charge must act partly by nature of their non-polar chains. The greater effectiveness of the longer chains at a given molar concentration would thus be expected.

Higher concentrations of detergents than those necessary for complete association lead to an apparent breakdown of the protein and probably the formation of additional complexes.

A detailed account of this work is in preparation, and will be published elsewhere.

¹ Johnson, *Trans. Faraday Soc.*, **42**, 28, 36 (1946).

² Tiselius and Gross, *Koll. Z.*, **68**, 11 (1934).

³ Svedberg and Pedersen, "The Ultracentrifuge", pp. 356 and 407 (Oxford, 1940).

⁴ Lundgren, *Nature*, **133**, 122 (1936); **143**, 896 (1939).

⁵ Brohult, *J. Phys. and Coll. Chem.*, **51**, 206 (1947).

⁶ Gutfreund and Ogston, *Biochem. J.*, **40**, 432 (1946).

AMERICAN CRYSTALLOGRAPHIC ASSOCIATION

ON January 1 two Societies, the American Society for X-Ray and Electron Diffraction and the Crystallographic Society of America, were officially ended, and a new one, the American Crystallographic Association, came into existence in their place. A few of the events leading up to this decisive step are as follows.

The Crystallographic Society of America (originally the Crystallographic Society) grew out of a series of informal meetings in Cambridge, Massachusetts, which were started in 1938 by crystallographers in the vicinity, chiefly from Harvard University and the Massachusetts Institute of Technology. The last meeting before the entry of the United States into the Second World War was held in April 1942, and, largely because of its local nature, the Society suspended its activities for the duration of war. In 1945, it was revived on a national basis and has held a spring meeting every year to date. Its membership grew to 236, and the Society has published one memoir. The American Society for X-Ray and Electron Diffraction grew out of a meeting of men of science in New York in 1940. It was officially organised on a national basis by a committee at Gibson Island in 1941. Two meetings have been held annually to date. The Society has grown to a membership of 520 and has published two monographs and a very useful six-monthly bibliography.

At the end of the War it became apparent to a few that it was unwise for two groups, with interests becoming increasingly identical, to divide their activities. The suggestion of a combined society was more and more discussed in the years following 1945; but it was not until two years ago that official action was taken. In August 1948 a joint committee of the two Societies was formed, which, in consultation with the Committee on Crystallography of the National Research Council, drew up a proposal which was circulated among all members. The two Societies each held a business meeting, and at both of these the final votes indicated an overwhelming trend in favour of the proposed new organisation. The final step was taken on August 18, 1949, when a postal ballot was taken from members on the question of forming a new society, the combined vote being for, 472, and against, 40. With this ballot was sent a proposed constitution and a questionnaire to serve as guide to future policies, and, on the basis of this questionnaire, the name was established as the American Crystallographic Association, with terms of reference "... to promote the study of the arrangement of atoms in matter, its causes, its nature and its consequences, and of the tools and methods used in such studies".

In December 1949 a postal ballot was held for the election of officers, with the following results:

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.