

ROYAL SOCIETY OF CANADA

ANNUAL MEETING

THE 1948 meeting of the Royal Society of Canada was held at Vancouver (June 14–16) and Victoria (June 17) in British Columbia. This was the first time in its sixty-six years of existence that the Society has met west of Winnipeg, and for a while it seemed that the serious floods of the Thompson and Fraser Rivers would force the cancellation of the sessions here reported.

A general meeting of the Society, at which new fellows were introduced, was held on the morning of June 14. Those elected to the Scientific Sections of the Society were as follows: Section 3 (chemical, mathematical, and physical sciences), John David Babbitt, Adrien Cambon, Frank Thomas Davies, Richard Norman Jones, Robert Lloyd McIntosh and George Michael Volkoff; Section 4 (geological sciences), John Fletcher Caley, Edward Darwin Kindle and John Tuzo Wilson; Section 5 (biological sciences), James Kenneth Wallace Ferguson, F. E. J. Fry, Nathaniel Hew Grace, Rene Pomerleau, Frederick Smith and Omund McKillop Solandt.

On the evening of the same day the Flavelle Medal was presented to Margaret Newton, who was for a long time associated with the Dominion Rust Research Laboratories at Winnipeg, and whose work on the fungi attacking wheat has been of such importance in Canada. The Lorne Pierce Medal was awarded to Gabrielle Roy, author of "Bonheur d'Occasion", and the Tyrrell Medal to Canon Groulx. The president of the Society, Dean W. P. Thompson, of the University of Saskatchewan, then delivered his presidential address on "Mutations". This proved to be a masterly treatment of a difficult subject, made intelligible to a general audience. The final meetings were held in Victoria on June 17.

Officers for the session 1948–9 were elected as follows: *president*, Dr. Gustave Lanctot; *vice-president*, Dr. J. A. Pearce; *honorary secretaries*, Dr. F. J. Alcock and Dr. Seraphin Marion; *honorary treasurer*, Dr. L. E. Howlett; *honorary editor*, Dr. G. W. Brown.

Section 3: *President*, Dr. J. S. Foster; *vice-president*, Dr. C. S. Beals; *secretary*, Dr. H. G. Thode.

Section 4: *President*, Dr. Victor Dolmage; *vice-president*, Dr. T. L. Tanton; *secretary*, Dr. George Hanson.

Section 5: *president*, Dr. A. H. Hutchinson; *vice-president*, Dr. T. W. M. Cameron; *secretary*, Dr. R. D. Gibbs.

In Section 3 the presidential address, delivered by Dr. E. W. R. Steacie, was on "Photosensitization", an illuminating review of processes involved in photochemical reactions. Two symposia, of interest to the whole section, were held, at the first of which, on "Chemical Kinetics", four papers were presented: "Reactions of Atomic Sodium", by Dr. D. J. LeRoy; "Halogen-Sensitized Photoreactions", by J. W. T. Spinks; "The Thermal Decomposition of Complex Molecules", by C. C. Coffin; and "The Radiation Chemistry of Aqueous Solutions", by F. H. Krenz. LeRoy studied the subsequent reactions of the free radicals invariably produced in the primary reaction between atomic sodium and various halides. Particular attention was given to the free vinyl radicals produced in the reaction of atomic sodium with vinyl chloride and vinyl bromide. When using hydrogen

as a carrier for atomic sodium, spurious results may sometimes arise. Reactions due to atomic hydrogen were possible in such a system as one containing sodium hydride, hydrogen and ethane. Spinks, using spectroscopic evidence which indicated whether absorption of light by the halogen results in the formation of atoms or excited molecules, together with kinetic studies, described the mechanisms of a number of photochemical reactions sensitized by chlorine, bromine and iodine. Coffin discussed the effect of molecular structure on the activation energies, frequency factors, etc., of certain decompositions, particularly those of methylidene diacetate, peraldehyde and their homologues decomposing in the gaseous state at temperatures low enough to ensure the absence of free radical complications. F. H. Krenz described work to determine the 'indirect effect' on biological systems of the hydrogen atoms and hydroxyl radicals produced in aqueous solutions subjected to radiation. The effect was studied through the properties of irradiated water. Evidence was obtained for the production of long-lived activity in irradiated water, which may be due to electronically excited 'polymers' of water, and which may account for the efficiency of the 'indirect effect'.

At the second symposium, on "Nuclear Physics", papers were presented as follows: "Experiments with Neutrons", by Dr. B. W. Sargent; "The $4n+1$ Radioactive Series", by E. P. Hineks; "Variations in Isotope Content of Light Elements", by H. G. Thode; "Progress Reports on McGill Cyclotron Project", by J. S. Foster; "Nuclear Physics Programme of the University of British Columbia", by G. M. Shrum. Sargent discussed determinations of the half-life of photoneutrons, measured after shutting down a low-powered atomic pile, following different lengths of activation. Instrumentation had to be improved to allow for the large range of intensity encountered. Thode described experiments using a mass spectrometer to measure the isotopic constitution of boron obtained from various mineral deposits in the earth's crust. This investigation involved the use of boron trifluoride gas prepared from boric acid. Both BF_2^+ and B^+ ions were considered in the determination of the boron-11/boron-10 ratios. Automatic recording equipment gave the relative values of these ratios for the different samples with a precision of ± 0.1 per cent and an absolute accuracy of ± 0.5 per cent or better. The ratio was found to vary from 4.27 to 4.42, depending on the source of the boron. Corresponding variations in the chemical atomic weights have been calculated using the latest mass data for the isotopes. For the remainder of the programme Section 3 was divided into subsections, and seven papers were given in the subsection on chemistry, twenty-eight papers in general physics and mathematics, and fifteen in astrophysics and geophysics.

In Section 4 the presidential address, delivered by Dr. F. J. Alcock, was on "Problems of New Brunswick Geology". The rocks of New Brunswick range in age from Precambrian to Triassic. Deformation and intrusion took place in the Precambrian, the Devonian and the Carboniferous ages; and the Triassic rocks have been extensively faulted. Volcanism was recurrent. Detailed study in local areas

has established the main facts of the geological story of the Province, but there are many places where the absence of fossils, the metamorphosed character of the rocks and the predominance of volcanic members present problems of correlation. The paper gives the conclusions reached by the author as a result of field work carried out in that region over the last quarter of a century, and is a most useful summary for all who are interested in the Appalachian geology of eastern Canada.

Thirteen papers were presented, and a lively discussion on the origin of granites followed the presentation of a paper entitled "Back to Logan" by H. C. Cooke, in which he briefly reviewed the development of theories of granitization and concluded, in harmony with an early interpretation by Sir William E. Logan, that many bodies in granite in Canada have been thus formed. Problems in the interpretation of age relationships of granites were dealt with in "Extent of Proterozoic Granite Intrusions in the Western Part of the Canadian Shield", by J. F. Henderson, and "The Relation of the Granite and the Seine Series at East Shoal Lake, Ontario", by E. L. Bruce and J. S. Ross. "Recent Data on the Nature and Origin of some Iron Deposits in the Canadian Shield", by E. S. Moore, gave information about Algoma and Labrador, where exploration for iron ore is in progress. "An Occurrence of Boron Minerals at Silver Harbor, Ontario", by T. L. Tanton and Eugene Poitevin, described a vein in which danburite has been found for the first time in Canada. "Radioactive Nodules in Sediments of the Sibley Series, Nipigon, Ontario", by T. L. Tanton, reported the results of a recent study of nodules in the red beds of the Sibley series, which were observed to be lithologically similar to uranium-bearing nodules in the Permian red beds of Devon, England. "Eoepionidella", by R. T. D. Wickenden, described a new genus of foraminifera. A paper of general interest to the members of the Section was "The Geological History of Greater Vancouver", by M. Y. Williams.

Section 5 had a very crowded programme with more than fifty papers listed, and for some sessions the Section split into separate botany, zoology and medical sciences subsections. The address of the president, Dr. E. Gordon Young, of Dalhousie University, was entitled "Canadian Dietary Patterns, 1937-1947", and constituted a survey of work on diets in Canada, particularly with reference to the war years. One session was devoted to a symposium on atomic energy in relation to biology. Contributors to this were an introduction by G. M. Shrum; "Problems of Handling and Measuring Stable Isotopes", by H. G. Thode; "Measurement and Handling of Radioactive Isotopes", by A. J. Ciprianni; "Precautions for Workers Using Radioactive Isotopes", by G. H. Guest; "Botanical Problems", by J. W. T. Spinks; and "Radiation Genetics", by C. E. Ford.

It was natural that sessions held in British Columbia would include several papers on salmon and other fish. "Mortality in Pink Salmon" was discussed by A. L. Pritchard; "Fecundity and Mortality in Pacific Salmon" and "Migrations and Spawning of Sockeye Smolt" by R. E. Foerster; and "Movement of Fundy (Atlantic) Salmon" by A. G. Huntsman. Papers dealing with the butter sole and the lemon sole were read by J. L. Keith Stuart Ketchen, and A. L. Tester spoke on "Catch Limitations for Regulation of the B.C. Herring Industry".

SOLUBILITY OF INDUSTRIAL SILICEOUS DUSTS

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THE theory that tissue damage in silicosis is caused by silicic acid formed by solvent action of the plasma on inhaled particles stimulated the study of the solubility of airborne siliceous dusts and of the materials which give rise to them. The investigation of the solubility of mineral silicates is complicated by their peculiar properties. When a powdered siliceous mineral is shaken with water, the solution may contain particles which range from large colloidal particles to simple ions; and different workers have determined the solute gravimetrically after filtration¹, gravimetrically after ultracentrifuging² or colorimetrically as the silicomolybdate complex which is formed both with simple and with more complex colloidal silicic acids. King and McGeorge³ consider that the colorimetric method is most likely to give figures representing physiologically active 'soluble silica'.

A mineral suspension does not reach equilibrium with the liquid phase within a reasonably short time, and a comparison of the solubilities of two substances must normally be made by comparing the quantities of solute after a fixed time. The apparent solubility depends on the temperature, the particle size of the dust and on the ratio of dust to solvent⁴. Since the extraction of dust particles in the lung by constantly changing lymph is so complex a process that any true imitation is impossible, investigators have attempted to compare solubilities under simplified fixed conditions, and with simpler solvents. For example, Briscoe and others⁴ investigated the effect of water, Whitehouse⁵ used 1 per cent sodium carbonate solution, Emmons and Wilcox⁶ used plasma, while King and McGeorge³ used ascitic fluid, similar to plasma but with less protein.

Experiments already reported⁴ have shown that airborne industrial flint dusts have a relatively high silica-solubility in water at 100° C., and this solubility increases greatly as the particle-size is reduced. Under the same conditions industrial cement dusts show a much smaller solubility which varies but little with particle-size. Since flint produces silicotic lesions and cement does not, these results were accepted as supporting the general theory that dangerous dusts have a higher solubility than those which have no pathological action. Further investigation has shown that the solubility values are widely influenced by a number of additional factors. For example, the proportion of silica which dissolves

Table 1. Solubility of flint dusts in water at 100° C.

Composition of dust	Dust : water ratio		Raw flint	Calcined flint
	1 : 100	1 : 1000		
SiO ₂	—	—	76.0	79.1
CaO	—	—	12.7	6.5
Composition of solute				
SiO ₂	1 : 100	1 : 1000	3.9	1.2
(mgm. from 1 gm. dust)			8	24
CaO	1 : 1000		12	64
(mgm. from 1 gm. dust)				