

diations for insect detection and control was reviewed by F. R. Lawson, who also reported on research conducted by him and his associates of the U.S. Department of Agriculture. The highlight of this report was the success achieved in reducing populations of the tobacco hornworm by large-scale trapping experiments in which several hundred black light traps were used over an area of more than 100 square miles (260 km²). Another observation reported by Lawson which may have great significance was the marked increase in catch of male hornworm moths in light traps when unmated female hornworm moths were caged in close proximity to the light traps. Electromagnetic radiations in the infrared and far red regions of the spectrum may provide

the chief means of communication between insects of a given species in connection with reproduction, according to a theory advanced by P. C. Callahan (U.S. Department of Agriculture). He also expressed the view, with supporting data, that radiations given off by host plants or animals may represent the means whereby certain insects locate their host plants or animals. The theories advanced by Callahan should stimulate research on the influence of electromagnetic radiations on insect responses and behavior.

The symposium on pest control by chemical, biological, genetic, and physical means was broad in scope. Twenty-four topics were presented. These topics encompassed the research efforts now under way to develop al-

most every conceivable approach to the control of pests. The material presented clearly showed the desire of scientists with many agencies to obtain new information which will serve as a basis for maintaining and improving on the great advances that have already been made in meeting pest problems and at the same time assuring the achievement of this objective without undue risks to man and his environment. There is reason for optimism that significant progress can be expected in the practical development of various alternate ways to control pests. In all probability many major pest problems will also be met more effectively and safely in the future by properly integrating different systems of pest control.

E. F. KNIPLING, *Chairman*

Reports of Sections and Societies

General Sessions

Possible Meteoric or Lunar Influences on Meteorological Phenomena

The interdisciplinary symposium on possible meteoric or lunar influences on meteorological phenomena (sponsored not only by the Physics (B) and Astronomy (D) Sections of the AAAS but also by the American Geophysical Union, the American Meteorological Society and the American Astronomical Society) advanced convincing evidence that (i) active freezing nuclei, with important meteorological consequences, are present in the lower atmosphere in spectacularly varying quantities, and they descend to the lower atmosphere from space or at least from an abundant reservoir at heights above 25 km, and (ii) lunar tide-producing forces manifest themselves as small but statistically significant changes in heavy rainfall frequencies at widely separated terrestrial stations.

E. Keith Bigg described experiments

to ascertain the origin and properties of freezing nuclei important in many cloud physical processes. The original "Bowen hypothesis" on the influence of meteoric dust on rainfall called for 10- μ particles capable of falling from high to low levels of the atmosphere in about 30 days. Bigg's work on actual particle collection reveals, instead, particles largely of submicron size which vary abruptly in concentration by factors of as much as 1000 times. The "ice nucleus storms" show no simple or consistent relation to local dust sources or small-scale surface weather conditions, nor are there decreases in numbers of freezing nuclei evident at greater heights. In fact, there is some evidence for substantial increases in volumetric concentrations above 27 km, and thus above the "ammonium sulfate layers" of Junge where freezing nuclei appear likely to be coated over with the soluble sulfate, and rapidly destroyed in freezing effect unless they can be transported rapidly downward.

Recent Australian experiments seem to suggest that just such rapid vertical

transport may indeed be responsible for the large pulses of freezing nuclei often found at lower levels.

Glenn W. Brier presented results of work done in collaboration with Donald A. Bradley and Max A. Woodbury which convincingly demonstrates a small but real influence of lunar tides on the frequency of occurrence of heavy rainfall. Using data from 1871 to the present, these painstakingly careful studies seem, on very conservative statistical grounds, to confirm the reality of an effect tending to produce greater frequency of heavy rainfall a few days after new moon and full moon in the lunar month—for all months and locations. Brier cautioned, however, that the effects involved represent only small perturbations on the average variability of rainfall. Thus, no matter how well established, they cannot at present add more than a minor additional factor to the prediction, for any given day, of the prospect of rainfall or for the magnitude of the expected fall. They are, however, of great significance to the understanding of the mechanism of large scale meteorological phenomena.

WALTER ORR ROBERTS,
Program Chairman

Symposium on Medical Geology and Geography

Seldom can five people with such different backgrounds enjoy exchanging their experiences and points of

view as much as did the five persons who took part in the AAAS Symposium on Medical Geology and Geography in Montreal (28 December 1964). Most of the panelists had never met one another until the day of the meeting. Nevertheless, there was virtual agreement on many points.

Helen Cannon showed that not only do soils vary widely in their trace element content, but also that different vegetables vary widely in their trace elements. The same vegetables grown in different parts of one country show significant differences in their mineral content. Anna H. Koffler pointed out that many "old wives'" or "witch doctors'" ideas cannot be ignored. Plants have been used for medicinal purposes for thousands of years. It has been argued that plants contain beneficial drugs. Now it seems, in the light of newer and better chemical techniques, that plants are good for us not only because they contain certain drugs but because they contain these drugs in association with trace elements. Arthur Furst presented evidence suggesting that metals, both essential and nonessential, may play an important role in the cancer processes. R. J. F. H. Pinsent reported that in Great Britain the prevalence of some diseases, notably some cancers, pernicious anaemia, and multiple sclerosis vary widely in different counties. The College of General Practitioners is planning a number of researches in which possible explanations for these variations will be investigated. Mineral imbalances in food and water are one possible explanation which will be considered. Harry V. Warren pointed out that the trace element content of rocks of similar age and type varies greatly. In epidemiological studies, involving trace elements, it proved wasteful in time and money to work with political boundaries. Geochemical and political boundaries seldom have anything in common.

HARRY V. WARREN,
University of British Columbia

Mathematics (A)

Larger than usual audiences attended the two programs of Section A at Montreal (29–30 December 1964).

R. W. Hamming's vice-presidential address on "Computing vs. mathematics" resulted in extensive discussion. His suggestion that numerical analysis differs in many ways from

traditional mathematics stimulated a general consideration of the current revolution in mathematics teaching.

The program of mathematics films attracted an overflow audience. Holbrook MacNeille, in commenting on the varied items, emphasized the experimental approach to the making of the films. He expressed the desire to break away from the direct lecture format if more effective techniques emerge from the current efforts. Techniques shown ranged from an hour-long lecture, including student reaction, by George Polya to films composed entirely by a computer.

WALLACE GIVENS, *Secretary*

Physics (B)

The following is an account of the closely allied programs of the Physics Section (B) and the Canadian Association of Physicists (B4).

Physics Section (B)

The overall program of the Physics Section (B) was a broad, diversified one; it included the allied fields of astronautics and meteorology. Both American and Canadian societies participated at Montreal (28–29 December 1964). This report, however, is restricted to the sessions on physics arranged by the section officers.

The vice-presidential address was given by Ralph A. Sawyer, who recently retired as dean of the Graduate School and vice president for Research of the University of Michigan and is now acting director of the American Institute of Physics. He examined the current crisis in physics education. This crisis starts at the high school level, where the enrollment in physics has stayed constant in absolute numbers while high school enrollments in general have increased many fold. Thus the percentage of students studying physics has declined from about 20 percent in 1900 to 4 percent in 1962. Physics enrollments in the colleges have followed a rather similar pattern in both the United States and Canada and fall far short of promising to meet future needs. Professional opportunities for physicists on the B.S. level have increased drastically since World War II, and the increase has been even greater for those with advanced degrees. The shrinking base of the physics manpower pyramid is re-

stricting the number of Ph.D.'s in physics that are granted, and the needs of the teaching profession and of industrial and government laboratories are going unfilled. This problem is now clearly recognized and is under serious study and attack by the American Institute of Physics, its member societies, and other interested groups. Action programs are underway in the areas of curriculum revision, development of new teaching apparatus, and solution of the staffing problem. Sawyer was optimistic that the impact of these programs will perhaps restore the present lag in physics education, all the way from high school through graduate school.

Following the vice-presidential address, a series of four papers on contemporary topics in physics gave a good sampling of activities in four of the universities of eastern Canada.

STANLEY S. BALLARD, *Secretary*

Canadian Association of Physicists (B4)

The first speaker of invited papers on contemporary physics in Canada was Serge Lapointe (Université de Montréal). He discussed the origin of slow-onset, recurrent magnetic storms. Using the magnetic records of the past 5 years, he was able to use the method of superposed epochs for 38 recorded events to show an association between these magnetic storms and certain radio noise centers on the sun. G. D. Scott (University of Toronto) described experiments on the density of packing of steel balls, and showed that some of the simpler properties of rare gases in liquid and solid forms can be closely reproduced, particularly the ratio of densities of the solid and liquid forms at the triple point. Albéric Boivin (Université Laval) described some new theoretical work on the structure of the electromagnetic field at the focus of a high-aperture, aplanatic lens system, with applications in laser research. He also described some experiments and associated theory on the subject of iterated diffraction by multiple apertures. Finally J. C. Hardy (McGill University) described recent experiments on delayed proton emission, a new form of radioactivity (and incidentally the third to be discovered at McGill out of the existing total of six kinds of radioactivity). These new nuclides extend from carbon-9 to titanium-41,

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Symposium on Medical Geology and Geography

Harry V. Warren

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