

duced by high-frequency currents in cylindrical wires. His most important discovery, however, was that of the distortionless circuit, a discovery which led to most important practical developments in long-distance telephony both in land and in submarine cables.

References were made to the discovery of X-rays, of radio-telegraphy, and of the atomic nature of electricity.

The Institution of Electrical Engineers has been fortunate in having so many eminent men of science as Presidents in its early days. Lord Kelvin was President three times, and John Hopkinson was President twice. Amongst others we may mention Sir William Crookes, Sir Joseph Swan, and D. E.

Hughes. The wonderful physical insight of Sir William Crookes is only now being fully recognised. Many years ago he had visions of electrons and even considered the possibility of isotopes.

The Institution was founded in order to promote the general advancement of electrical and telegraphic science. In its Journal many important scientific and mathematical papers have been published. In conjunction with the Physical Society of London it has published, at considerable expense, *Science Abstracts* for the past 24 years. Its activities are ever widening and we congratulate it on its well-merited success.

### The American Association at Toronto.

THE second Toronto meeting of the American Association for the Advancement of Science and of the associated scientific societies, which was held during the last week of 1921, at the invitation of the University of Toronto and of the Royal Canadian Institute, was the seventy-fourth meeting of the association. It was successful in every way, and must go on record as the most satisfactory meeting thus far held, apart from the greater four-yearly meetings. Fourteen sections of the association were represented and twenty-six associated societies. About nine hundred addresses and papers were presented, and the official registration showed an attendance of 1832 persons. The sessions were held in the buildings of the University, which are excellently adapted for such purposes, while the majority of those in attendance were very conveniently housed in the University dormitories. These arrangements proved to be unusually convenient and satisfactory.

On the afternoon of Monday, December 26, the day before the official opening, the secretaries of the sections met with the general secretary and the permanent secretary to discuss some general problems of the association. On Tuesday afternoon Dr. F. R. Moulton, professor of astronomy in the University of Chicago, showed some very fine motion pictures on scientific subjects, illustrating the use of motion pictures in education.

The meeting was formally opened on the evening of Tuesday, December 27, under the able presidency of Dr. E. H. Moore, professor of mathematics in the University of Chicago. The president was introduced by the retiring president, Dr. L. O. Howard, chief of the Bureau of Entomology of the United States Department of Agriculture, who was permanent secretary of the association for many years. Sir Robert Falconer, president of the University, delivered an admirable address of welcome, emphasising the close and friendly relations that have so long obtained between Canada and the United States. This was followed by the address of the retiring president. In the first part of his address, among other interesting things, Dr. Howard directed attention to the fact that the average age of the presidents of the British and of the American Associations since 1895 is about the same, sixty-one years and eleven months for the British and sixty-one years and five months for the American. The second part of Dr. Howard's address dealt with the topic "The War against the Insects." It was pointed out that unceasing warfare must be waged by mankind against the almost countless and omnipresent forms of insect-life, which threaten the very existence of the human race. A report of the latter part of the address appeared in *NATURE* of January 19, p. 79. The opening sessions were followed by a reception in the

room behind Convocation Hall, where members and their friends had an opportunity to meet one another and to examine the fine series of exhibits of scientific apparatus and products brought together by the local sub-committee on exhibits, of which Prof. E. F. Burton was chairman.

The Wednesday evening session in Convocation Hall was of a twofold character. Dr. W. Bateson, director of the John Innes Horticultural Institution, Merton Park, Surrey, who was present at Toronto by joint invitation of the American Association and the American Society of Zoologists, delivered a stimulating address on "Evolutionary Faith and Modern Doubts." He clearly emphasised the point that students of evolution harbour no doubts as to the fact of evolution, but the exact mode of evolution remains still an unsolved problem. He dwelt on the important progress recently made in America in relation to inheritance and the problems of genetics, especially with reference to chromosomes.

At the close of this address the session was transformed into a convocation of the University of Toronto, Sir Robert Falconer presiding, and the degree of Doctor of Science *honoris causa* was conferred on Dr. Bateson, Dr. Howard, and Dr. Moore. A reception followed the convocation.

Sir Adam Beck, chairman of the Hydro-Electric Power Commission of Ontario, addressed a general session on Thursday afternoon under the auspices of Section M (Engineering). His subject was "Hydro-Electric Developments in Ontario," and he showed a series of moving pictures illustrating the various hydro-electric projects in Ontario.

The Thursday evening conversation in Hart House was one of the greatest social functions ever held in Toronto, and was unique in the history of the association. For three hours the two thousand guests of the University and the Royal Canadian Institute enjoyed the entertainment facilities of the magnificent students' social centre in Queen's Park.

The weather throughout the meeting was fine, though cold enough to be stimulating, and with an almost unclouded sky. The necessity for using artificial ice for winter sports in Toronto furnished an agreeable surprise to those who had anticipated arctic cold.

The Toronto meeting was especially international in character. It emphasised the point that the American Association is an international organisation. Although the majority of its members are now residents of the United States, it was clearly seen at Toronto how much the future of the association depends upon Canadians. The meeting was an occasion for a pronounced increase in the Canadian membership, and it is hoped that the time will soon come when Canadian men of science will all regard the association as theirs. A wonderfully fine

spirit of international good-fellowship and understanding prevailed throughout the meeting.

Sixteen well-attended dinners were held during the meeting by the various groups of scientific workers. The programmes of the sections and of the societies associated with them were generally extensive, and all were interesting and important. Many vice-presidential and presidential addresses were given and many symposia held. Special mention should be made here of the fine programme of Section M (Engineering) and of the symposium on an international auxiliary language, which was arranged for Toronto under the auspices of Section K (Social and Economic Sciences). The engineering programme was unusually excellent in many ways. Arrangements for this were due to the very efficient work of Mr. J. B. Tyrrell, of Toronto, vice-president of Section M. The Society for the Promotion of Engineering Education met with Section M.

The social and economic sciences (Section K) had no separate programme, but through the enthusiastic and efficient work of Dr. F. G. Cottrell, of the U.S. National Research Council, a symposium on an international auxiliary language was arranged. This was held at a joint session on Friday afternoon of Sections K and Q (Education). The symposium was preceded by the address of the retiring vice-president of Section K, Dr. F. L. Hoffman, of the Prudential Life Insurance Co. of America, on "The Organisation of Knowledge."

A programme of great general and cultural interest was presented by the Committee on the History of Science in a session held on Thursday morning. Among others, Dr. J. P. McMurrich—afterwards elected president of the association for 1922—gave a paper on the artistic anatomical work of Leonardo da Vinci.

The extraordinary success of the meeting was due mainly to the tireless and varied activities of the members of the local committee under the chairmanship of Prof. J. C. Fields, who foresaw all needed arrangements and added many pleasant and convenient details. Especially was praise given to the very artistic official badge, which will serve as a worthy commemoration of one of the most satisfactory meetings of the association. The very onerous and pressing work of caring for the publication of the general programme was undertaken by Dr. J. P. McMurrich, who handled this very difficult and confusing complex of details with very great skill. The University of Toronto Press gave very efficient service in this connection.

Publicity was unusually well handled. The recently

organised Science Service co-operated with the association in arousing public interest in the meeting through the daily press. Dr. E. E. Slosson, editor of Science Service, and Mr. Watson Davis were present throughout the meeting on behalf of Science Service. Besides the valuable publicity work of Science Service, which is under the control of the American Association, the U.S. National Academy, and the U.S. National Research Council, and which operates for the sole purpose of disseminating scientific knowledge through the newspapers, just as valuable and efficient publicity work was accomplished by the local Subcommittee on Publicity, of which Prof. A. G. Huntsman was chairman.

At the council meeting of the association the sum of 4000 dollars was allocated in grants for research, according to the recommendations of the committee on grants. Prof. B. K. Emerson, of Amherst, Mass., and Prof. E. A. Smith, of the University of Alabama, were elected to emeritus life-membership on account of the Jane M. Smith Endowment Fund. On a vote by the council the president appointed the following committee to consider the subject of reciprocity between the United States and Canada so far as this concerns scientific work:—E. L. Nichols (chairman), F. D. Adams, T. C. Chamberlin, J. C. Fields, and J. C. Merriam. It was decided that the next annual meeting of the association should be held at Boston, Mass., on December 26–30, 1922, and the 1923–24 meeting at Cincinnati, Ohio, in December 1923.

Dr. J. P. McMurrich, professor of anatomy in the University of Toronto, was elected president of the association. The following vice-presidents of the several sections were elected:—A (Mathematics), G. A. Miller, University of Illinois; B (Physics), Frederick A. Saunders, Harvard University; C (Chemistry), W. Lash Miller, University of Toronto; D (Astronomy), Otto Klotz, Dominion Observatory, Ottawa, Ontario; E (Geology and Geography), Charles P. Berkey, Columbia University; F (Zoological Sciences), Maynard M. Metcalf, Oberlin College; G (Botany), Francis E. Lloyd, McGill University; I (Psychology), Raymond Dodge, Wesleyan University; K (Social and Economic Sciences), Henry S. Graves, Washington, D.C.; L (Historical and Philological Sciences), William A. Lacy, Northwestern University; M (Engineering), George F. Swain, Harvard University; N (Medical Sciences), Francis W. Peabody, Harvard Medical School; and O (Agriculture), R. W. Thatcher, University of Minnesota.

BURTON E. LIVINGSTON.

### The Use of Light as an Aid to Aerial Navigation.

AT the meeting of the Illuminating Engineering Society on January 31, Lt.-Col. L. F. Blandy, who is associated with the Air Ministry, delivered a paper on "The Use of Light as an Aid to Aerial Navigation." Gen. Sir Frederick Sykes, Controller-General of Civil Aviation, presided. In the introductory portion of the paper the author described the lighting of the passengers' accommodation and crew's quarters, etc., on a modern airship, the light being derived from electric lamps fed from a generator driven by the engine. Small candle-power lamps are used for illuminating the dials of instruments, etc., on some machines. The external lighting of aircraft has been closely studied by the International Air Convention, which has defined precisely the equipment of a forward white light of 8-km. range, a red light of at least 5-km. range on the left hand, and a green light of similar range on the right. Special arrangements must be made to prevent the green light being

seen from the left side or the red light from the right. A white rear light is also provided.

In navigating the air, principles similar to those in use at sea are thus being adopted for external lights, but owing to the motions of aircraft and their high speed the arrangement of navigation lamps demands special care. The relative speed of approaching machines may attain 200 m.p.h., *i.e.* 3.3 miles per minute. From the time of sighting headlights to the moment of collision the time available may be only 90 seconds, and it looks as though the range of navigation lights may have to be increased. Lights used by aircraft to facilitate landing may be either chemical or electric. Gas-filled electric lamps of 1000–2000 c.p. have been developed for this purpose, and appear to have some advantages over flares, notably as regards ease of control and extinction at will. Aerodrome lighting includes lights used to define the positions of buildings and other obstruc-