SCIENCE

FRIDAY, SEPTEMBER 3, 1897.

CONTENTS:

MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE TORONTO MEETING OF THE BRITISH ASSOCIATION.

THE British Association decided to meet in Montreal in 1884, with some hesitation, but after the great success of that meeting an invitation presented at Oxford in 1894, urging the Association to meet at Toronto in 1897, was accepted by the general committee with unanimity. Elaborate arrangements were made by the Dominion, by the City of Toronto and by the University, for the reception of the Association, and steamship, railway and cable companies united to offer unusual facilities to visitors. The chairman of the local committee, Professor Macallum, was especially self sacrificing in devoting himself for more than a year to the work of arrangement. A visit of the leaders of British science to Canada is an event of no common importance for the Dominion, and the enthusiasm was this year intensified by a United States tariff law and a British Jubilee.

The members and associates in attendance at Toronto numbered somewhat over 1,300, about 400 fewer than at the Montreal meeting. SCIENCE has already published an article by Professor Macallum giving a list of the more distinguished British and Continental men of science who expected to attend, and with a few exceptions, such as Lord Rayleigh, they were present. Men of science from the United States were well represented. The attendance from Great Britain, the Continent, Canada and the United States can best be indicated by giving the officers and committees of the various sections, which were as follows:

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

President: Prof. A. R. Forsyth, D. Sc., F.R. S.

Vice-Presidents: Prof. W. E. Ayrton, F. R. S.; Prof. G. C. Foster, F. R. S.; Prof. Henrici, F. R. S.; Dr. G. W. Hill; Prof. A. Johnson, Lord Kelvin, F. R. S.; Prof. O. J. Lodge, F. R. S.; President Loudon; Prof. A. A. Michelson; Prof. S. Newcomb.

Secretaries: Prof. W. H. Heaton, M. A.; (*Recorder*); J. C. Glashan; J. L. Howard, D. Sc.; Prof. J. C. McLennan, B. A.; Prof. J. G. McGregor, D. Sc.

Committee: Prof. W. G. Adams, F. R. S.; Prof. A. Baker; Prof. G. F. Barker; Prof. Carl Barus; Prof. F. Bedell; Prof. W. W. Beman; Dr. J. T. Bottomley, F. R. S.; Prof. C. V. Boys, F. R. S.; Prof. Braun; Prof. O. Bolza; Prof. Eddy; Prof. H. L. Callendar, F. R. S.; Prof. Carhart; Prof. Cross; Prof. A. T. DeLeury; Prof. Ewing, F. R. S.; Prof. Fitzgerald, F. R. S.; Prof. T. Gray; Prof. Greenhill, F. R. S.; Dr. Harris Hancock; Prof. T. Holgate; Prof. W. H. H. Hudson; J. Hopkinson; Prof. J. V. Jones, F. R. S.; Prof. Hale; Prof. W. J. Loudon; Dr. D. MacAlister; Prof. A. Macfarlane; Major McMahon, F. R. S.; Dr. E. McClintock; Prof. McKay; Dr. M. Maclean; Prof. H. McLeod, F. R. S.; Prof. H. Maschke; Prof. E. Merritt; Prof. W. H. Metzler; Dr. Morley; Prof. Nichols; Prof. S. Newcomb; Prof. Newson; J. A. Paterson; Prof. J. Perry, F. R. S.; W. A. Price; Prof. Rücker, F. R. S.; Prof. C. Runge; Dr. Van Rijckevorsel; Prof. A. W. Scott; R. F. Stupart; Prof. S. P. Thompson, F. R. S.; A. E. Western; E. T. Whittaker; Prof. Woodward; Prof. Ziwet.

SECTION B.—CHEMISTRY.

President: Prof. W. Ramsay, F. R. S.

Vice-Presidents: Prof. G. F. Barker; Prof. F. W. Clarke; Prof. H. B. Dixon, F. R. S.; W. R. Dunstan, F. R. S.; Prof. B. J. Harrington; Prof. E. W. Morley; Prof. W. H. Pike; Prof. I. Remsen; Prof. W. C. Roberts-Austen, F. R. S.

Secretaries: Prof. W. H. Ellis; Arthur Harden (*Recorder*); Charles A. Kohn; Prof. R. F. Ruttan.

Committee: Prof. W. W. Andrews; Prof. H. E. Armstrong, F. R. S.; Prof. B. Brauner; Prof. R. A. Fessenden; Prof. C. Le Neve Foster, F. R. S.; Prof. P. C. Freer; Prof. W. L. Goodwin; A. Vernon Harcourt, F. R. S.; O. S. James; F. B. Kenrick; Prof. A. R. Leeds; Prof. Loeb; Prof. H. McLeod, F. R. S.; Prof. Meldola, F. R. S., Prof. Meslans; W. L. Miller; Prof. J. U. Nef; Prof. W. A. Noyes; H. Ramage; W. W. Randall; Prof. T. W. Richards; F. T. Shutt; F. J. Smale; Prof. A. Smith; A. Stansfield; W. M. Watts; Prof. W. C. Williams; Prof. H. W. Wylie.

SECTION C.—GEOLOGY.

President: Dr. G. M. Dawson, C. M. G., F. R. S.

Vice-Presidents: Dr. W. T. Blanford, F. R. S.; Prof. C. LeNeve Foster, D. Sc., F. R. S.; Prof. G. K. Gilbert; Prof. H. Alleyne Nicholson, F. R. S.

Secretaries: Prof. A. P. Coleman, M. A., Ph. D.; G. W. Lamplugh; Prof. H. A. Miers, F. R. S. (*Recorder*).

Committee: Prof. F. D. Adams; Dr. H. M. Ami; The Rt. Hon. James Bryce, M. P.; Prof. T. C. Chamberlin; Dr. F. W. Clarke; Dr. W. H. Dall; Sir J. Evans, K. C. B., D. C. L., F. R. S.; Dr. H. O. Forbes; W. F. Ferrier, B. A. Sc.; Prof. J. B. Harrington; J. Hopkinson; Prof. L. C. Miall, F. R. S.; Prof. John Milne, F. R. S.; J. L. Myres; Prof. Albrecht Penck; Prof. E. B. Poulton, F. R. S.; Dr. A. R. C. Selwyn, C. M. G., F. R. S.; Prof. J. C. Smock; Dr. J. W. Spencer; A. C. Seward, M. A.; B. B. Walker; J. W. Woodall.

SECTION D.—ZOOLOGY.

President: Prof. L. C. Miall, F. R. S.

Vice-Presidents: Prof. W. A. Herdman, D. Sc., F. R. S.; Prof. R. Meldola, F. R. S.; Prof. E. B. Poulton, D. C. L., F. R. S.; Prof. R. Ramsay Wright.

Secretaries: Walter Garstang, M. A.; Prof. E. E. Prince, B. A.; W. E. Hoyle, M. A. (*Recorder*).

Committee: Senator G. W. Allan; Prof. Mark Baldwin; Dr. T. Bethune; Dr. Anton Dohrn; Dr. Eigenmann; Dr. Theodore Gill; Prof. Gustave Gilson; Dr. L. O. Howard; Prof. Malcolm Laurie; Prof. J. P. McMurrich; Prof. C. S. Minot; Prof. C. Lloyd Morgan; Prof. E. S. Morse; Prof. H. F. Osborn; J. F. Whiteaves.

SECTION E.—GEOGRAPHY.

President: J. Scott Keltie, LL. D.

Vice-Presidents: Dr. Burwash; E. G. Ravenstein; Prof. A. Penck; F. C. Selous; Coutts Trotter.

Secretaries: Colonel F. Bailey; Dr. H. R. Mill (*Recorder*); Captain Deville; J. B. Tyrrell.

Committee: Marcus Baker; W. M. Beaufort; Dr. W. T. Blanford, F. R. S.; Rt. Hon. James Bryce; Prof. W. M. Davis; Prof. R. E. Dodge; Dr. H. O. Forbes; General A. W. Greely; Otto J. Klotz; Prince Krapotkin; Prof. John Milne, F. R. S.; Prof. Willis L. Moore; E. Delmar Morgan; Sir G. S. Robertson, K. C. S. I.; A. Laurence Rotch; Sir John Swinburne, Bart; J. White.

SECTION F.—ECONOMICS AND STATISTICS.

President: Prof. E. C. K. Gonner, M. A.

Vice-Presidents: Prof. W. Clark, M. A., LL. D.; Prof. J. Mavor; The Hon. Sir C. W. Freemantle, K. C. B.

Secretaries: E. Cannan, M. A.; Prof. A. Shortt, M. A.; Henry Higgs, LL. B. (*Recorder*).

Committee: Archibald Blue; The Rt. Hon. James Bryce, M. P.; R. E. Ely; Sir Malcolm Fraser; Prof.

N. P. Gilman; Prof. A. T. Hadley; J. A. McLean; W. H. Moore; Prof. Simon Newcomb; Prof. Goldwin Smith; B. E. Walker; S. M. Wickett.

SECTION G.—MECHANICAL SCIENCE.

President: G. F. Deacon, M. Inst. C. E.

Vice-Presidents: Prof. W. E. Ayrton, F. R. S.; Prof. H.T. Bovey, M. A.; Prof. John Galbraith, M.A.; Prof. G. Lanza; Prof. W. C. Unwin, F. R. S.

Secretaries: Prof. T. Hudson Beare, F.R.S.E. (*Recorder*); Prof. Dupuis; W. A. Price, M.A.; Prof. Callendar, M.A., F.R.S.

Committee: J. G. W. Aldridge; Prof. Baily; J. T. Bottomley; Bryan Donkin; Prof. R. C. Carpenter; E. K. Clark; J. Coates; Prof. Ewing, F.R.S.; Prof. Vernon Harcourt; C. Hawksley; W. T. Jenning; Lord Kelvin, G.C.V.O., F.R.S.; H. S. Maxim; Prof. Perry, F.R.S.; Prof. S. P. Thompson, F.R.S; W. G. Walker; Major-General Webber, C.B., R.E.

SECTION H.—ANTHROPOLOGY.

President: Prof. Sir W. Turner, M.D., LL.D., F.R.S.

Vice-Presidents: E.W. Brabrook, C.B., Pres. Anthr. Inst.; Prof. A. Macalister, M.D., F.R.S.; R. Munro, M.D., F.R.S.E.; Dr. W J McGee; Prof. F. W. Putnam, D.Sc.

Secretaries: A. F. Chamberlain, Ph.D.; H. O. Forbes, LL.D.; Prof. A. C. Haddon, D.Sc.; J. L. Myres, M.A., F.S.A. (*Recorder*).

Committee: David Boyle; Dr. G. M. Dawson, C.M.G.; F. T. Elworthy; A. F. Hunter; Prof. E. S. Morse; E. Sidney Hartland, F.S.A.; Prof. Lightner Witmer, Ph.D.

SECTION I.—PHYSIOLOGY.

President: Prof. Michael Foster, M.A., LL.D., Sec. R.S.

Vice-Presidents: Lord Lister, P.R.S.; Dr. J. S. Billings; Prof. H. P. Bowditch, M.D.; W. H. Gaskell, M.D., F.R.S.; Prof. A. B. Macallum, M.B., Ph.D.; Prof. W. Osler, M.D.; Prof. C. Richet, M.D.; Prof. A. D. Waller, M.D., F.R.S.

Secretaries: Prof. Rubert Boyce, M.B. (*Recorder*); Prof. C. S. Sherrington, M.D., F.R.S.; A. Kirschmann, Ph.D.; L. E. Shore, M.D.

Committee: Prof. Cushny; Prof. E. M. Crookshank; Prof. W. D. Halliburton; Prof. Carl Huber; Dr. K. Huerthle; Dr. D. McAlister; Dr. J. H. Kellogg; Prof. F. S. Lee; Prof. J. Loeb; Prof. W. P. Lombard; Prof. Wesley Mills; J. J. Mackenzie; Dr. Noel Paton; Prof. W. T. Porter; Prof. Waymouth Reid; Prof. Anderson Stuart; Prof. G. N. Stewart; Prof. W. H. Thompson.

SECTION K.—BOTANY.

President: Prof. Marshall Ward, Sc.D., F.R.S.

Vice-Presidents: Prof. D. P. Penhallow, M.A.; Prof. Farlow, M.D., LL.D.; Prof. F. O. Bower, Sc.D., F.R.S.

Secretaries: E. C. Jeffrey, B.A.; Prof. Bretland Farmer, M.A.; A. C. Seward, M.A.; Prof. F. E. Weiss, B.Sc. (*Recorder*).

Committee: Prof. Arthur; Prof. Atkinson; Prof. Barnes; Prof. Bessey; Prof. Britton; Prof. Campbell; Prof. Coulter; Dr. Fletcher; Dr. Galloway; Prof. Reynolds Green; Prof. Greene; Arthur Lister; Prof. MacDougal; Prof. Magnus; Dr. Saunders; Harold Wager; H. J. Webber.

Nearly all these scientific leaders and many others were present at Toronto when the Association was received by the civic authorities, at four o'clock on the afternoon of Wednesday, August 18th. Addresses of welcome were made by Lord Aberdeen, the Governor-General, and by the Mayor of the city. Replies were made by the retiring President of the Association, Lord Lister, by the incoming President, Sir John Evans and by Lord Kelvin. The Premier of the Province and the Minister of Education also made remarks. In the evening Lord Lister resigned the presidency to Sir John Evans, who gave the address already published in SCIENCE (page 269). Remarks thanking the President for his address were made by Lord Aberdeen, Lord Kelvin and Mayor Shaw.

Other general meetings of the Association were held to listen to the evening addresses by Professor W. C. Roberts-Austen and by Professor J. Milne. Professor Austen, on August 20th, lectured on 'Canada's Metals'. He reviewed the discovery and prospects of Canadian gold fields, illustrating the subject by a series of photographs, and called special attention to the nickel deposits of the Dominion. Illustrations were also shown of the speaker's interesting experiments on the splash of metals, and a demonstration was given showing on the screen the action of the electric furnace. Professor Milne, on Monday evening, lectured on a subject in which he is the leading authority, 'Earthquakes and Vol-

canoes.' He discussed especially the causes leading to the display of seismic and volcanic activity and the benefits to be derived from studying the phenomena. Dr. H. O. Forbes gave, on Saturday evening, the usual lecture to artisans, taking as his subject 'Borneo.' Meetings were also held for the conferring of degrees on several of the prominent members both by Toronto University and by Trinity College.

The arrangements for social intercourse and entertainment were numerous and attractive. A reception was given by the Governor-General and the Countess of Aberdeen on Thursday evening; there was a conversatzione in the University building on Tuesday evening and a banquet in honor of Lord Kelvin, Lord Lister and Sir John Evans on Wednesday evening. There were garden parties daily in the afternoons and many luncheons and dinners. Excursions were made on Saturday to Niagara Falls and in other directions, and for the Thursday following the meeting excursions were arranged to Montreal, Ottawa and elsewhere. Finally elaborate excursions were planned under the most favorable conditions to the maritime provinces and to Manitoba and the Pacific coast.

The business of the Association is transacted by the General Committee, chiefly on advice of the Council. This year part of the arrangements, including the election of officers for next year, were deferred until an autumn meeting in Great Britain. Professor Roberts-Austen was made General Secretary in succession to Mr. Vernon Harcourt, and in the room of the five members of the Council who retired there were elected F. Darwin, Esq., Sir C. W. Freemantle, Professor W. D. Halliburton, Professor S. P. Thompson and Sir W. H. White. Dr. F. Kohlrausch, Berlin; Dr. Van Rejckevorsel, Rotterdam, and Professor E. Zacharias, Hamburg, were made corresponding members.

The report of the Council adopted by the General Committee contained reports of two important committees appointed at the Liverpool meeting. The committee appointed to bring before the government the question of the establishment of a national physical laboratory has been in so far successful that the Treasury is taking the matter into consideration and has appointed a committee to report on such a laboratory.

The committee appointed to urge upon the government the importance of establishing a Bureau of Ethnology for Greater Britain, consisting of the President and General Officers, with Sir John Evans, Sir John Lubbock, Mr. C. H. Read and Professor Tylor, made the following report:

A central establishment in England, to which would come information with regard to the habits, beliefs and methods of government of the primitive peoples now existing would be of great service to science and of no inconsiderable utility to the government.

1. The efforts of the various societies which have, during the last twenty years, devoted themselves to collecting and publishing ethnological information have necessarily produced somewhat unequal, and therefore unsatisfactory, results. Such societies had, of course, to depend upon the reports of explorers, who usually travelled for another purpose than that in which the societies were interested; and such reports were naturally unsystematic, the observers being mostly untrained in the science. Again, whole regions would be unrepresented in the transactions of the societies, perhaps from the absence of the usual attractions of travellers, *e.g.*, big game or mineral riches. This has been to some extent corrected, at least as to the systematic nature of the reports, by the publication of 'Anthropological Notes and Queries,' by the Anthropological Institute, with the help of the British Association.

If it be admitted that the study of the human race is an important branch of science, no further argument is needed to commend the gathering of facts with regard to the conditions under which aboriginal races now live, and if this work is worth doing, it should be done without delay. With the exception, perhaps, of the negro, it would seem that none of the lower races are capable of living side by side with whites. The usual result of such contact is demoralization, physical decline and steady diminution of numbers;

in the case of the Tasmanians, entire disappearance. Such will probably soon be the fate of the Maories, the Andamanese, the North American Indians and the blacks of Australia. While these exist it is possible to preserve their traditions and folk-lore and to record their habits of life, their arts and the like, and such direct evidence is necessarily more valuable than accounts filtered through the recollection of the most intelligent white man.

It is scarcely necessary to enlarge upon this point, as no one will seriously question the value to science of such information. But it does seem necessary to urge that no time be lost.

2. As to the benefit, to the government, of these inquiries, the history of our relations with native tribes in India and the colonies is rich in examples. No one who has read of the ways of the African can doubt that a thorough study of his character, his beliefs and superstitions is a necessity for those who have to deal with him. And what is true of the natives of Africa is also true, in a greater or less degree, of all uncivilized races. Their ideas of common things and common acts are so radically different from those of civilized man that it is impossible for him to understand them without a special training.

Even in dealing with the highly civilized natives of India it is most necessary that an inquirer should be familiar with their religion and with the racial prejudices which the natives of India possess in common with other civilized nations.

A training in knowledge of native habits is now gone through by our officers, traders and missionaries on the spot; and by experience—sometimes dearly bought—they, after many failures, learn how to deal with the natives. By the establishment of such a bureau as is here advocated much might be done to train our officers before they go out, as is now done by the Dutch government, who have a handbook and a regular course of instruction as to life, laws, religion, etc., of the inhabitants of the Dutch Indies. The experience thus gained would then mature rapidly, and they would become valuable servants to the state more quickly.

The collecting of the necessary information for the Bureau could be done with but little expense and with a very small staff only, if the scheme were recognized and forwarded by the government. If instructions were issued, for instance, by the Colonial Office, the Foreign Office, the Admiralty, and the Intelligence Branch of the War Office, to the officers acting under each of these departments, not only that they were at liberty to conduct these inquiries, but that credit would be given to them officially for good work in this direction, there is little doubt that many observers qualified by their previous training would at once put themselves and their leisure at the disposal of the Bureau.

The Bureau itself, the central office, would be of necessity in London—in no other place could it properly serve its purpose—and preferably for the sake of economy and official control, it should be under the administration of some existing government office. But the various interests involved make it somewhat difficult to recommend where it should be placed. The Colonial Office would obviously present some advantages. The British Museum has been suggested, with good reason, and there appears to be no insuperable difficulty if the Trustees are willing to undertake the responsibility of controlling such a department.

The staff would not be numerous. A Director accustomed to deal with ethnological matter would necessarily direct the conduct of the inquiries, and until the material assumed large proportions two or three clerks would probably suffice. If the value of the results were considered to justify it, the increase of the area of operations over the world would probably call for additional assistance after the Bureau had been at work for a few years.

The Bureau of Ethnology in the United States aims chiefly at publishing its reports, but its area is limited to America. The scope of the present proposal is so much wider that the Committee think it better not to deal with the question of publication at present.

If this report be adopted by the Council it will be necessary to approach the government and impress upon them the importance of having such an organization for carrying out these recommendations. For this purpose a deputation should be appointed, and it would be well to invite the Council of the Anthropological Institute to appoint two members."

The Council resolved that the Trustees of the British Museum be requested to consider whether they could allow the proposed Bureau to be established in connection with the Museum; and if they are unable to sanction this proposal, that the authorities of the Imperial Institute be requested to undertake its establishment. The matter is now under the consideration of the Trustees of the British Museum.

The Report of the Corresponding Societies Committee for the past year, together with the list of the corresponding societies and the titles of the more important papers, and especially those referring to local

scientific investigations, published by those societies during the year ending June 1, 1897, was received.

One of the most important functions of the Association is represented by the work of its committees. In addition to the three reports to the Council many very valuable reports were presented at Toronto before the sections, which will be noticed in special articles on the work of the sections to be published in subsequent issues of SCIENCE.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

*LONG RANGE TEMPERATURE AND PRESSURE VARIABLES IN PHYSICS.**

METHODS OF PYROMETRY.

THE endeavor to provide suitable apparatus for high temperature measurement is one of long standing. The student of the subject is fairly overwhelmed with the variety of devices which have been proposed. There are few phenomena in physics which have not in some way or other been impressed into pyrometric service, often indeed by methods of exquisite physical torture. I cannot, of course, even advert to many of these this afternoon, as my purpose will have to be restricted to such devices as have usefully survived. Thus a whole group of 'intrinsic thermoscopes,' as Lord Kelvin calls them — apparatus in which some property of the substance is singled out for measurement—will be overlooked. Pyrometry will some day receive substantial aid from the phenomena of solid thermal expansion, dear to the hearts of old Wedgewood, of Professor Daniells, of the citoyen Guyton-Morveau, and recently to Professors Nichols, Joly and others; but even the 'meldometer,' which has received Ramsay's encouragement and recent heroic attempts to measure the expansion of platinum, have not yet entered the arena to stay.* The same may be said of vapor pressure, ebullition and certain dissociations, of which the former is entirely too liberal in dispensing pressure, and the latter too negligent in readjusting it. Little has been done with heat conduction regarded as subservient to the measurement of high temperatures; little with color and the spectrum, even though Draper and Langley in this country and many others abroad have paid tribute; little with polarization. The wave-length of sound has told Cagniard Latour and our own A. M. Mayer much about high temperature, but it did not tell them enough.

Throughout the history of pyrometry, *fusion* seems to have come forward for journeyman duty. What is more convenient than to find whether the degree of red heat is too low or too high from the fusion of prepared alloys. As far back as 1828 Prinsep, aware of the golden opportunity, with his golden air thermometer determined the melting point of some equally precious alloys of gold, silver and platinum, and determined them very well. Other alloys were afterwards substituted and graded mixtures made of quartz, chalk, kaolin and feldspar for the purpose. Efforts to obtain more accurate values are due to Becquerel; but the absolute values most widely used until quite recently, namely, the melting points of silver (958°), gold (1035°), copper (1054°), palladium (1500°), platinum (1775°), iridium (1950°), are due to the researches of Violle.

Interest in high temperature fusions has of recent date rather increased than abated. The demand for more accurate data has been met by the Reichsanstalt, and we have now a set of values for silver, copper, gold, nickel, palladium and platinum in terms of

* Address by Professor Carl Barus, Vice-President and Chairman of Section B (Physics).

* Noteworthy attempts to replace mercury by a liquid potassio-sodium alloy in glass thermometers are among the novelties.