Dr. Zirkel was elected president of the Committee of Petrography.

Papers:—*Sacco*, attempt at a general classification of rocks; *Salomon*, attempts at a nomenclature of the metamorphic rocks; *Weinschenk*, on dynamo-metamorphism and piézo-crystallisation; on the formation of graphite; *Hague*, on the Tertiary volcanoes of the Absaroka Range; *Sabatini*, the present state of our knowledge of the volcanoes of Central Italy.

Section IV. (Applied Geology and Hydrology). President: M. Schmeisser.

Papers:—*Mourlon*, the new methods of Belgian geology; *Gosselet*, mineralisation of deep-seated waters; *Van der Veur*, on the enlargement of the kingdom of the Netherlands by the draining of the Zuyder Zee; *L. Fabre*, the plateaux of the Hautes-Pyrenees and the dunes of Gascony; *Van den Broeck*, the applications of geology; *Kunz*, progress of the production of precious stones in the United States; *Léon Janet*, utilisation and protection of sources of drinking water; *De Launay*, the teaching of practical geology; *A. de Richard*, origin of petroleum.

General meetings. Presentation of works:—*E. de Margerie* and *L. Raveneau*, cartography at the Universal Exhibition of 1900; *Louis Raveneau*, ninth annual geographical bibliography of the annals of geography, 1899. Presentation of the reports and proposals of general interest adopted by the Council; the Assembly adopted successively:—

(1) Report of the Committee of Geological Nomenclature, presented by M. Tschernyschew, with the benefit of the remarks made at the meeting of the Section.

(2) Report of the Committee of the Geological Map of Europe, by M. Capellini.

(3) Report of the Committee of Petrography, by Dr. Zirkel.

(4) Report of the Glacier Committee, by M. Richter.

(5) Proposal by Sir A. Geikie on international co-operation in geological investigations.

(6) Proposition by M. Œhlert on the reproduction of types.

M. Tietze proposed to the meeting, on the part of the Austro-Hungarian Government, to organise in three years a new Session of the International Geological Congress at Vienna. He informed them of the advanced state of the preparatory work for such a congress, and enumerated the many excursions which would be arranged for the members of the Congress.

The invitation of the Austro-Hungarian Government was unanimously accepted, and M. Tietze thanked the Congress for the warm reception given to his proposal.

Papers:—*Matthew*, on the most ancient Palæozoic fauna; *Walcott*, the pre-Cambrian fossiliferous formations; *Cayeux*, on the radiolaria and sponges of the pre-Cambrian rocks of Brittany; *Pavlow*, the Portlandian rocks of Russia compared with those of the Boulonnais; on some means which would contribute to the determination of the genetic classification of fossils; *Van den Broeck*, on the age of the deposits of the Iguanodons of Bernissart; *Guébhard*, disturbances and fractures of the folds in the Alps of France; *Stanislas-Meunier*, structure of the diluvium of the Seine; *Hull*, sub-oceanic terraces and valleys of the rivers of the western coast of Europe; *Hudleston*, the eastern shores of the Atlantic; *E. Martel*, on the recent discovery of large caverns and fissures.

During the Congress receptions were offered to its members, first by the Geological Society of France, at their new rooms in the Hôtel des Sociétés Savantes. The president of this society, M. A. de Lapparent, of the Institute, inaugurated this reception by an address, which was warmly applauded. M. and Mdme. Albert Gaudry invited the members of the Congress to their house to a most brilliant soirée. Prince Roland Bonaparte received at his hotel the united members of the Geological and Anthropological Congresses, who were also received together by the Municipal Council at the Hôtel de Ville of Paris.

The Committee of Organisation offered a most brilliant banquet at the Hôtel du Palais d'Orsay; the addresses of M. Albert Gaudry, Sir Archibald Geikie, and MM. Tietze, Credner and de Lapparent were warmly applauded. Finally, cards for a reception at the Elysée, and tickets for the National Theatre, were placed at the disposal of the president by the Minister of Public Instruction and the Fine Arts, for distribution among the foreign members. Visits were arranged by the aid of the Committee, to the International Exhibition, the National collections of geology and mineralogy, to the Museum of Natural History, to the Sorbonne, and to the School of Mines.

The excursions of the Congress were well attended. The programme submitted to the geologists of the whole world was of the most tempting description. A pocket-guide, prepared by the united efforts of the French geologists, gave in several numbers a complete account of the geology of France.

In order to allow every one to take part in the greatest number of excursions, they were divided into three periods: before, during, and after the Congress.

(1) Excursions before the Congress: Ardennes, conducted by M. Gosselet; Gironde, by M. Fallot; Touraine, by M. G. Dollfus; Pyrenees (crystalline rocks), by M. Lacroix; Aquitania (Charente et Dordogne), by M. Glangeaud; Turonian of Touraine and Cenomanian of Le Mans, by M. de Grossouvre; Mayenne, by M. D. P. Œhlert; Brittany, by M. Barrois.

(2) Excursions during the Congress: Tertiary basin of Paris, MM. Munier-Chalmas, Léon Janet, Stanislas-Meunier and G. Dollfus.

(3) Excursions after the Congress: Boulonnais and Normandy, MM. Gosselet, Munier-Chalmas, Pellat, Rigaux, Bigot, Cayeux; Central Rocks, MM. Michel-Lévy, Marcellin Boule, Fabre; Coal-basin of Central France, MM. Fayol, Grand'Eury; Tertiary basins of the Rhone; Secondary and Tertiary rocks of the Lower Alps, MM. Deperet, Haug; Alps of Dauphiny, MM. Marcel Bertrand, Kilian, Lory, Paquier, Sayn, Léenhardt, Termier; Picardy, MM. Gosselet, Cayeux, Ladrière; Range of the Black Mountains, M. Bergeron; Pyrenees (sedimentary deposits), M. L. Carez; Lower Provence, MM. Marcel Bertrand, Vasseur, Zürcher.

These excursions, beginning on August 3, ended on October 2, and have had therefore a duration of three months.

The next meeting of the International Geological Congress will be held at Vienna in 1903. L. GENTIL.

FORTHCOMING BOOKS OF SCIENCE.

MR. F. ALCAN (Paris) announces:—"De l'Infection en chirurgie d'armée. Evolution des Blessures de Guerre," by Dr. Nimier; and a new edition of volume i. of "Manuel d'Histologie Pathologique," by Profs. Cornil and Ranvier.

The Australian Book Company (of West Smithfield) announce:—"The Geology of Sydney and the Blue Mountains; A Popular Introduction to the Study of Australian Geology," by Rev. J. Milne Curran.

The announcements of Messrs. Baillière, Tindall and Cox include:—"The Hair in Health and Disease," by Dr. David Walsh; "Infantile Syphilis," by Dr. G. Carpenter; "Microscopy of the Starches," by Prof. Hugh Galt; "Standards of Foods and Drugs," by C. G. Moor; and new editions of Rose and Carless's "Manual of Surgery," Stewart's "Manual of Physiology," Walsh's "Röntgen Rays in Medical Work," Himes's "Guide to Public Health Acts," Hutchinson's "Aids to Ophthalmic Surgery and Medicine," Sparke's "Artiolic Anatomy of Man," Dennis's "Second-Grade Perspective."

Mr. Batsford promises:—"Waterworks Distribution," by J. A. McPherson, and "Sanitary Engineering," by Colonel Moore.

Messrs. Bemrose and Sons, Ltd., call attention to:—"Decimal Calculator and Multiplier," by C. Barker; and a new edition of "The Scientific Angler," by D. Foster.

Messrs. A. and C. Black will publish:—"The Human Ear: its Identification and Physiognomy," by Miriam A. Ellis; "Introduction to the Study of Physics," by A. F. Walden and J. J. Manley; vol. i. "General Physical Measurements—a Textbook of Zoology," by Dr. Otto Schmeil, translated R. Rosenstock; part iii. "Invertebrates."

Messrs. W. Blackwood and Son's list includes:—"Khurasan and Sistan," by Lieut.-Colonel C. E. Yate, illustrated; "The Sovereignty of the Sea," by Dr. T. Wemyss Fulton, illustrated; "A Manual of Classical Geography," by John L. Myres; "Physical Maps for the Use of History Students, (Greece, British Isles)" by Bernhard V. Darbishire; "Exercises in Geometry," by J. A. Third.

In the Cambridge University Press's list we notice:—"Scientific Papers," by Lord Rayleigh, F.R.S., vol. ii.; "Scientific Papers," by the late Dr. John Hopkinson, F.R.S., 2 vols.; "Scientific Papers," by Prof. Osborne Reynolds, F.R.S., vol. ii.; "The Scientific Papers of John Couch Adams," vol. ii., edited by Prof. W. G. Adams and R. A.

Sampson; "Lectures on the Lunar Theory," by John Couch Adams, from his collected Papers, edited by R. A. Sampson; "A Treatise on Spherical Astronomy," by Prof. Sir Robert S. Ball, F.R.S.; "A Treatise on Geometrical Optics," by R. A. Herman; "Advanced Exercises in Practical Physics," by Prof. Arthur Schuster, F.R.S., and Dr. Charles Lees; "The Prevention of Valvular Disease of the Heart," by Dr. Richard Caton; "Zoological Results based on material from New Britain, New Guinea, Loyalty Islands, and Elsewhere," collected during the years 1895, 1896 and 1897, by Dr. Arthur Willey. Part v., an account of the Entozoa, by A. E. Shipley; of the Nemertina, by R. C. Punnett; the development of the Robber Crab (*Birgus*), by L. A. Borradaile; new genera and species of Entromostraca, by the Rev. T. R. R. Stebbing, F.R.S.; anatomy of *Neohelia porcellana* (Moseley), by Edith M. Pratt, illustrated. "Fauna Hawaiiensis," or the Zoology of the Sandwich Islands: being results of the explorations instituted by the Joint Committee appointed by the Royal Society of London for promoting Natural Knowledge and the British Association for the Advancement of Science, and carried on with the assistance of those bodies and of the trustees of the Bernice Pauahi Bishop Museum, edited by Dr. David Sharp, F.R.S., vol. ii., part v. Arachnida, by Mons. Eugène Simon; Crustacea, Isopoda, by M. Adrien Dollfus; Amphipoda, by Rev. T. R. R. Stebbing, F.R.S.; (Cambridge Natural Science Manuals—Biological Series).—"Zoology," by Prof. E. W. MacBride and A. E. Shipley; "Fossil Plants; a Manual for Students of Botany and Geology," by A. C. Seward, F.R.S. In 2 vols. Vol. ii. (Physical Series)—"Electricity and Magnetism," by R. T. Glazebrook, F.R.S. (The Cambridge Series for Schools and Training Colleges)—"The Teacher's Manual of School Hygiene," by E. W. Hope and Edgar Browne; "An Introduction to Logic," by W. E. Johnson; "Euclid: Books I.-III., with Simple Exercises," by R. T. Wright; "An Introduction to Physiography," by W. N. Shaw, F.R.S.; "A New Primer of Astronomy," by Prof. Sir Robert S. Ball, F.R.S.; "A New Primer of Mechanics," by Prof. L. R. Wilberforce; "A New Primer of Physics," by the same author; "A New Primer of Physiology," by Dr. Alex. Hill; "A Brief History of Geographical Discovery since 1400," by Dr. F. H. H. Guillemard. (Pitt Press Mathematical Series)—"The Elements of Hydrostatics," by Prof. S. L. Loney.

Mesrs. Carré and Naud (Paris) announce:—"Les Terres rares," by A. Job; "Les Nouveaux gaz," by Raveau; "Les sucres et leurs principaux dérivés," by Prof. L. Maquenne; "Essais du Commerce et de l'Industrie," by Cuniasse et Zwilling; "Chimie des matières colorantes," by Rudolf Nietzki, translated by C. Favre and Vaucher; "La Chimie photographique," by Namias Rodolf, translated by Jaquez; "La Vinification dans les pays chauds," by Dugast; "La Pratique industrielle des courants alternatifs," by Chevrier; "Microbiologie de la distillerie (Ferments, Microbes)," by Levy.

Messrs. Cassell and Co., Ltd., give notice of:—"Our Bird Friends," by R. Kearton, illustrated; "Cyclopædia of Mechanics," edited by P. N. Hasluck; "Practical Gas-Fitting and Practical Draughtsmen's Work," edited by P. N. Hasluck; "A Practical Method of Teaching Geography," by J. H. Overton, part ii.

Messrs. Chapman and Hall, Ltd., announce a new edition of "What is Heat? a Peep into Nature's most Hidden Secrets," by Frederick Hovenden, illustrated.

The list of Messrs. J. and A. Churchill includes:—"A Treatise on Physics," by Prof. A. Gray, F.R.S., in three parts, illustrated; and new editions of Notter, Firth and Horrocks's "Hygiene," and "Carpenter's Microscope and its Revelations," edited by Rev. Dr. W. H. Dallinger, F.R.S., illustrated.

Messrs. T. and T. Clark (Edinburgh) will publish:—"The Herschells," by James Sime.

In the list of Messrs. Archibald Constable and Co., Ltd., we notice "Through Siberia," by J. Stadling, edited by Dr. F. H. H. Guillemard, illustrated; "Across and About the Black Republic of Hayti," by Hesketh Prichard; "Travels in the East of Nicholas II., 1890-1," written by Prince E. Ookhtomsky, and translated by Robert Goodlet, edited by Sir George Birdwood, vol. ii.; "Motor Vehicles and Motors," by W. W. Beaumont, illustrated; "Modern Astronomy," by Prof. H. H. Turner, F.R.S., illustrated: "Practical Electro-Chemistry," by B. Blount, illustrated.

Messrs. Dent and Co. announce:—"Birds that come to our Houses and Gardens," by the Rev. H. D. Astley, illustrated; White's "Natural History of Selborne"; "Modern Chemistry," 2 vols., by Prof. Ramsay, F.R.S.; "Plants, their Structure and Life," by Dr. Dennert; "Primitive Man," by Dr. Homes; "First Aid to the Injured," by Dr. Drinkwater.

Messrs. Duckworth and Co. call attention to:—"Problems of Evolution," by F. W. Headley.

Mr. Wilhelm Engelmann (Leipzig) announces:—"Pompeji in Leben und Kunst," von A. Mau; "Die Rohstoffe des Pflanzenreichs. Versuch einer technischen Rohstofflehre. 2. Gänzlich umgearbeitete und erweiterte Auflage," I. Band, von J. Wiesner (Wien); "Monographien afrikanischer Pflanzenfamilien und -Gattungen," herausgegeben von A. Engler. V. R. Schumann, *Sterculiaceae africanae*; A. de Bary's "Vorlesungen über Bakterien." Dritte Auflage, durchgesehen und teilweise neu bearbeitet von W. Migula; "Hoffmann v. Fallersleben, Unsere volkstündichen Lieder." Vierte Auflage, herausgegeben und neu bearbeitet von Karl Hermann Prahl; "Die Assanierung von Paris" (Assanierung der Städte in Einzeldarstellungen, I. Band, Heft 1), von Dr. Th. Weyl; "Physikalisch-chemische Propaedeutik, unter besonderer Berücksichtigung der medizinischen Wissenschaften und mit historischen und biographischen Angaben," I. Band, von Prof. H. Griesbach.

Messrs. R. A. Everett and Co. give notice of:—"The Veterinary Manual for Horse Owners," by Frank T. Barton, illustrated; "The Stable Key, or Stud and Stable Studies," by Captain W. A. Kerr, V.C., illustrated.

The announcements of Messrs. C. Griffin and Co., Ltd., include:—"Central Electrical Stations," by C. H. Wordingham, illustrated; "The Metallurgy of Steel," by F. W. Harbord, illustrated; "A Dictionary of Dyestuffs," by C. Rawson, W. M. Gardner and W. F. Laycock; "A Dictionary of Textile Fibres," by W. J. Hannan, illustrated; "Pernicious Anæmia," by Dr. William Hunter; "The Construction and Maintenance of Vessels built of Steel," by T. Walton, illustrated; and new editions of "A Short Manual of Inorganic Chemistry," by Dr. A. Dupré, F.R.S., and Dr. Wilson Hake; "Tables and Data for the use of Analysts, Chemical Manufacturers and Scientific Chemists," by Prof. J. Castell Evans; and "Ore and Stone Mining," by Prof. C. Le Neve Foster, F.R S., illustrated.

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Mr. W. Heinemann's list includes:—"The Regions of the World, 1900," a series of twelve volumes descriptive of the physical environment of the nations, with maps by J. G. Bartholomew, edited by H. J. Mackinder, illustrated; vol. i. "Britain and the British Seas," by the editor; vol. ii. "Western Europe and the Mediterranean," by Élisée Reclus; vol. iii. "Central Europe," by Dr. Joseph Partsch; vol. iv. "Scandinavia and the Arctic Region," by Sir Clements R. Markham; vol. v. "the Russian Empire," by Prince Kropotkin; vol. vi. "The Near East," by D. G. Hogarth; vol. vii. "Africa," by Dr. J. Scott Keltie; vol. viii. "India," by Col. Sir T. Holdich; vol. ix. "The Far East," by Archibald Little; vol. x. "North America," by Prof. Israel C. Russell; vol. xi. "South America," by Dr. John C. Branner; vol. xii. "Australasia and Antarctica," by Dr. H. O. Forbes; "The Life of William Cotton Oswell," by his son, W. E. Oswell, illustrated; "The First Ascent of Mount Kenya," by H. J. Mackinder, illustrated; "Mount Orin and Beyond," by Archibald Little: "Nature's Garden: An Aid to Knowledge of Wild Flowers and their Insect Visitors," by Neltje Blanchan, illustrated; "Pompei: The City, its Life and Art," by Pierre Gusman. Translated by Florence Simmonds and M. Jourdain, illustrated.

Messrs. Hodder and Stoughton will issue in their "Self Educator" series:—"Botany," by R. S. Wishart; "Chemistry," by J. Knight.

Messrs. Hutchinson and Co. announce:—"The Living Races of Mankind," by Rev. H. N. Hutchinson, Prof. J. W. Gregory, and R. Lydekker, F.R.S., illustrated; "Disciples of Aesculapius, Biographies of Leaders of Medicine," by the late Sir Benjamin Ward Richardson, F.R.S., with a biography by his daughter, Mrs. George Martin, in 2 vols., with portraits and illustrations.

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In the list of Messrs. Sampson Low and Co., Ltd., we observe:—"Golden Tips, a Description of Ceylon and its Great Tea Industry," by H. W. Cave; "The Inhabitants of the Philippines," by Frederic H. Sawyer, illustrated; "Lepcha Land, or Six Weeks in the Sikhim Himalayas," by Florence Donaldson, illustrated; "Textile Machinery, Recent Improvements," by E. A. Posselt, part ii.; and a new edition of "On the Manufacture of Vinegar, Cider and Fruit Wines, &c.," by W. T. Brannt.

The science list of Messrs. Macmillan and Co., Ltd., is:—"Life and Letters of Thomas Henry Huxley, F.R.S.," by Leonard Huxley, with portraits and illustrations, in 2 vols.; "Studies Scientific and Social," by Dr. Alfred R. Wallace, F.R.S., in 2 vols., vol. i. Scientific, vol. ii. Social, illustrated; "The Cambridge Natural History," vol. viii. Amphibia and Reptiles, by Dr. H. Gadow, F.R.S., illustrated; "The Scientific Memoirs of Thomas Henry Huxley," edited by Sir M. Foster, K.C.B., F.R.S., and Prof. E. Ray Lankester, F.R.S., in 4 vols., vol. iii.; "Dictionary of Philosophy and Psychology," edited by Prof. J. Mark Baldwin, in 3 vols.; "Cyclopedia of Horticulture," vols. iii. and iv., edited by Prof. L. H. Bailey, illustrated; "Botany, a Text-Book for Schools," by Prof. L. H. Bailey, illustrated; "The Principles of Vegetable-Gardening," by Prof. L. H. Bailey, illustrated; "Principles of Stock-breeding, the Application of Biological Laws to the Breeding of Domestic Animals (including Poultry), whether for 'Fancy' or Profit," by Prof. W. H. Brewer; "First Experiments in Psychology, a Manual of Elementary Laboratory Practice," by Prof. Edward B. Titchener, in 2 vols., vol. i. Qualitative Experiments, vol. ii. Quantitative Experiments; "Foundations of Knowledge," by Prof. Alexander T. O. McCosh; "School Geography," by Prof. R. S. Tarr, vol. iii. Europe, &c.; "The Principles of Mechanics," by Prof. Frederick Slate; "Design and Construction of Electric Power Plants," by Bion J. Arnold; "Elementary Electricity and Magnetism," by Prof. D. C. Jackson and Prof. J. P. Jackson, illustrated; "An Introduction to Celestial Mechanics," by Prof. Forest Ray Moulton; Surgical Technique, being a Handbook of and Operating Guide to all Operations on the Head, Neck, and Trunk," by Prof. Fr. von Esmarch and Dr. E. Kowalzig, translated by Prof. Ludwig H. Grau, edited by Prof. Nicholas Senn, illustrated; and new editions of "West African Studies," by Mary H. Kingsley; "The Golden Bough, a Study in Magic and Religion," by Dr. J. G. Frazer, 3 vols.; and "Modern Perspective, a Treatise upon the Principles and Practice of Plane and Cylindrical Perspective," by Prof. William R. Ware, with a portfolio of plates.

Messrs. Methuen and Co. give notice of:—"The Science of Hygiene," by W. C. C. Pakes, illustrated; "The Principles of Magnetism and Electricity: an Elementary Text-book," by P. L. Gray, illustrated.

Mr. Murray's announcements include:—"A Treatise on Medical Jurisprudence," by Dr. G. Vivian Poore; "The Life of Gilbert White," based on letters, journals, and other documents in the possession of the family and not hitherto published, by his great grand-nephew, Rashleigh Holt-White. 2 vols., illustrated; "The Birds of Siberia," by the late Henry Seebohm, with the author's latest corrections, edited by Dr. F. H. H. Guillemard, illustrated; "The Life of Sir John Fowler, Bart., K.C.M.G.," a record of engineering work, 1834–1898, by Thomas Mackay, illustrated; "The Natural History of Religion," based on the Gifford lectures delivered in Aberdeen in 1889-90 and 1890 91, by Prof. E. B. Tylor, F.R.S., illustrated; 'A Handy Book of Horticulture," by F. C. Hayes, illustrated; "Heredity," by Prof. J. Arthur Thomson, illustrated; a popular edition of "The Origin of Species by means of Natural Selection," by Charles Darwin, F.R.S., with a photogravure portrait of the author; and a new edition of "Scrambles Amongst the Alps in the Years 1860–69," including the history of the first ascent of the Matterhorn, by Edward Whymper, illustrated.

Messrs. George Newnes, Ltd., promise:—"The Story of Thought and Feeling" (an elementary book on Psychology), by F. Ryland; "The Story of Animal Life," by B. Lindsay; "In Nature's Workshop," by Grant Allen, illustrated.

Mr. J. C. Nimmo's list comprises:—"Babylonians and Assyrians, Excavations and Account of Decipherment of Inscriptions," by Prof. A. V. Hilprecht; "Syria and Palestine, Important Discoveries in Recent Years"; "Reminiscences of a Falconer," by Major C. H. Fisher; and new editions of "British Game Birds and Wild Fowl," by Dr. Beverley R. Morris; "Fern Growing, Fifty Years' Experience in Crossing and Cultivation, with a list of the most important varieties and a History of the Discovery of Multiple Parentage," by E. J. Lowe, F.R.S.; Rev. F. O. Morris's "A History of British Birds," 6 vols.; "A Natural History of the Nests and Eggs of British Birds"; "A History of British Butterflies"; "A Natural History of British Moths"; and "A Handbook of British Birds," by J. E. Harting.

Mr. D. Nutt's list contains:—"Mythology and Folktales, their Relation and Interpretation," by E. Sidney Hartland.

The announcements of the Oxford University Press include:—"The Structure and Life-History of the Harlequin Fly," by Prof. L. C. Miall, F.R.S., and A. R. Hammond; "A Text-book of Arithmetic," by Richard Hargreaves; "The 'Junior' Euclid," by S. W. Finn, Books III. and IV.

Mr. Y. J. Pentland announces:—"Text-book of Physiology," edited by Prof. Schäfer, F.R.S.; vol. ii. "Text-book of Medicine," edited by Dr. G. A. Gibson; "Text-book of Pharmacology and Therapeutics," edited by Dr. W. Hale White; and "Diseases of the Throat, Nose and Ear," by Dr. P. McBride.

Messrs. G. P. Putnam's Sons promise:—"Care of the Consumptive," by Dr. Charles Fox Gardiner; "Thomas Henry Huxley, a Sketch of his Life and Work," by P. Chalmers Mitchell, with portraits; "Medical and Surgical Nursing," edited by Dr. H. J. O'Brien; and a new edition of "Materia Medica for Nurses," by L. L. Dock.

The list of the Religious Tract Society includes:—"The Royal Observatory, Greenwich, a Glance at its History and Work," by E. Walter Maunder.

Mr. Grant Richards promises:—"Flame, Electricity, and the Camera," by George Iles, illustrated.

Messrs. Sands and Co. will add to their Library for Young Naturalists, edited by F. G. Aflalo, "The Animals of Africa," by H. A. Bryden, illustrated; "Types of British Plants," by C. S. Colman, illustrated.

Messrs. Walter Scott, Ltd., will add to their "Contemporary Science" Series:—"The Mediterranean Race," by Prof. Sergi, illustrated.

Messrs. Seeley and Co., Ltd., promise a new edition of "The Chemistry of Paints and Painting," by Prof. A. H. Church, F.R.S.

The list of the Society for Promoting Christian Knowledge contains:—"Among the Birds," by Florence Anna Fulcher; "Sounding the Ocean of Air," being six lectures delivered before the Lowell Institute of Boston in December, 1898, by A. Lawrence Rotch, illustrated.

Messrs. Swan Sonnenschein and Co., Ltd., call attention to:—Aristotle's "Psychology, including the Parva Naturalia," translated and edited with commentary and introduction by Prof. William A. Hammond; "A History of Contemporary Philosophy," by Dr. Max Heinze, translated by Prof. William Hammond; "Ethics," by Prof. W. Wundt, vol. iii.: The Principles of Morality and the Sphere of their Validity, translated by Prof. E. B. Titchener; "Physiological Psychology," by Prof. W. Wundt, translated by Prof. E. B. Titchener, 2 vols., illustrated; "Text-book of Palæontology for Zoological Students," by Theodore T. Groom, illustrated; "Text-book of Embryology: Invertebrates," by Dr. E. Korschelt and Dr. K. Heider, translated by Mrs. H. M. Bernard, and edited (with additions) by Martin J. Woodward, vol. iv., illustrated; "The Romance of the Earth," by Prof. A. W. Bickerton, illustrated; "Biological Types in the Vegetable Kingdom," by Wilfred Mark Webb; "Mammalia," by the Rev. H. A. Macpherson; "Birds' Eggs and Nests," by W. C. J. Ruskin Butterfield; "Inductive Geometry," by H. A. Nesbitt; and a new edition of "Handbook of Practical Botany, for the Botanical Laboratory and Private Student," by Prof. E. Strasburger, edited by Prof. W. Hillhouse, illustrated.

The following is the science list of the University Corre-

spondence College Press:—"Algebra, The Tutorial, Part I., Elementary Course," by Rupert Deakin; "Arithmetic, The Tutorial," by W. P. Workman; "Building Construction (Science and Art)," by Brysson Cunningham; "Machine Construction, First Stage (Science and Art)," by J. Handsley Dales; "Mathematics, First Stage (Science and Art)"; "Physiography, Section One (Science and Art)," by Fabian Rosenberg; "Practical Plane and Solid Geometry, First Stage (Science and Art)," by G. F. Burn.

Mr. T. Fisher Unwin will add to his "Masters of Medicine" Series, "Thomas Sydenham," by J. F. Payne, and "Andreas Vesalius," by C. L. Taylor.

Messrs. Frederick Warne and Co. will issue new editions of:—"The Cattle Doctor," by Geo. Armatage; "Wayside and Woodland Blossoms, First and Second Series," by Edward Step.

Messrs. Wells Gardner, Darton and Co.'s list includes a new edition of "Playing at Botany," by Phœbe Allen.

Messrs. Whittaker and Co.'s announcements are:—"Periodic Classification and the Problem of Chemical Evolution," by George Rudorf; "Inspection of Railway Material," by G. R. Bodmer; "Electric Wiring Tables," by W. Perren Maycock; "Telephone System of the British Post Office," by T. E. Herbert; and "Horseless Road Locomotion," by A. R. Sennett.

MATHEMATICS AT THE BRITISH ASSOCIATION.

THE mathematical communications to this year's meeting of the British Association were made on Monday, September 10, in one of the halls assigned to the Mathematical-Physical-Astronomical Section. Major P. A. MacMahon, F.R.S., took the chair.

The committee appointed in 1888 to calculate tables of certain mathematical functions opened the proceedings by presenting a report on their year's progress. The work on which they have for some time been engaged, namely, the preparation of a new "Canon Arithmeticus," is now almost completed. The calculations have been made by Lieut.-Colonel Allan Cunningham, who, in presenting the report, announced that the liberality of the British Association and of the Royal Society had enabled the committee to undertake the publication of the tables as a separate volume. Before the Association meets next year this will probably have been given to the world, and the committee, after an existence of thirteen years, will (unless some other work is found for it) cease to exist.

Another report was taken next—this time not of a committee, but of a single worker, Miss F. Hardcastle, of Cambridge, who was commissioned two years ago to prepare an account of "The present state of the theory of point-groups" for the Association. In the absence of Miss Hardcastle, one of the secretaries stated that a first instalment of the work is to be published in this year's annual report; this, however, will give only the general classification of the subject, and an account of those memoirs on the theory of elimination which are of importance in it. The greater part of Miss Hardcastle's report will not be ready until next year.

The chair was then taken by Prof. Forsyth, while Major MacMahon read a paper on "A property of the characteristic symbolic determinant of any n quantics in n variables." Let

$$\begin{matrix} \xi_1 & \xi_2 & & \xi_n \\ a_{1x}, & a_{2x}, & \ldots & a_{nx} \end{matrix}$$

be (in symbolic notation) any n quantics in m variables, and let

$$a_{1x}\, a_{2x} \ldots a_{nx} = \ldots + C_{\xi_1 \xi_2 \ldots \xi_n}\, x_1^{\xi_1} x_2^{\xi_2} \ldots x_n^{\xi_n} + \ldots$$

Major MacMahon arrives at the remarkable result that

$$\Sigma\Sigma \ldots \Sigma C_{\xi_1 \xi_2 \ldots \xi_n}$$

(where the summation is extended over all positive integral values of $\xi_1, \xi_2, \ldots \xi_n$) has the value $\frac{(-1)^n}{f(1)}$, where $f(\theta)$ is the characteristic determinant of the umbræ $a_{11}, a_{12}, \ldots$

The next communication was made in French by Prof. Cyparissos Stephanos, of the University of Athens, "Sur les relations entre la géometrie projective et la mécanique." The fundamental thought of this paper may be explained as follows. Consider a system of forces in equilibrium. What geometrical transformations of space will transform this system into another system of forces also in equilibrium? Prof. Stephanos solves this problem, and finds that the only transformations which thus conserve equilibrium are those which, considered as performed on the Pluckerian co-ordinates of the forces, are linear and homogeneous. When the system of forces is coplanar, these transformations are homographies in the plane. This train of thought is of some importance in Graphical Statics.

Mr. H. S. Carslaw (Fellow of Emmanuel College, Cambridge) followed with a paper on "The use of multiple space in applied mathematics." The method of images, so powerful in electrostatical problems, can in its original form be applied only when the fundamental angles of the problem are submultiples of π. Prof. Sommerfeld pointed out a year or two ago that by introducing the idea of a branched space, analogous to the branched planes used in Riemann's Theory of Functions, the method of images can be freed from this limitation. Mr. Carslaw's work is an extension and development of this suggestion, which is applied by him to the solution of several of the standard problems of the potential theory.

Lieut.-Colonel Cunningham then gave some results obtained by himself and Mr. H. J. Woodall in the "Determination of successive high primes." As an example of a new process due to the authors, the factors of all numbers between 16 776 196, and 16 778 236 have been determined. 117 of the numbers in this series are found to be primes, a fact which led to some discussion on Riemann's work in the theory of prime numbers.

This was followed by a paper on "The construction of magic squares," by Dr. J. Willis, of Bradford, in which some new modes of formation were described and exemplified in diagrams. Major MacMahon then communicated two papers in succession. The first was entitled "The asyzygetic and perpetuant covariants of systems of binary quantics"; it was concerned with the extension, to a system containing any number of binary quantics, of the work which has already been done in connection with the semivariant forms of a single binary quantic.

In the second paper, "On the symbolism appropriate to the study of orthogonal and Boolian invariant systems which appertain to binary and other quantics," Major MacMahon explained a new and most remarkable method which he has discovered in the invariant theory, which promises to revolutionise the treatment of that subject. Previous writers have considered the invariant theory as consisting in the investigation of those forms associated with a quantic, which are invariant when the variables of the quantic are subjected to the general linear transformation. When the variables are subjected only to linear transformations of special types, such as the orthogonal and Boolian transformations, the family of invariant forms associated with a given quantic is, of course, much larger; but these special classes of transformations have hitherto been, comparatively speaking, ignored, as forming a tedious and outlying branch of the subject. Major MacMahon's discovery is a new symbolic method for obtaining the forms which are invariant for orthogonal and Boolian transformations, in the same way as Aronhold's symbolic method enables the investigator to obtain the forms which are invariant for the general linear transformation. Major MacMahon obtains six symbolic factors analogous to Aronhold's symbolic factors a_x and (ab), and the ordinary invariant-theory can be derived as a particular case of the new theory, by simply rejecting those forms which contain any one of a certain four of these factors.

A paper by Mr. A. B. Basset, F.R.S., in which the result that "a quintic curve cannot have more than 15 real points of inflexion"—an extension of a theorem of Zeuthen's on quartic curves—is obtained, was briefly communicated by the chairman; and a remarkably interesting session closed with two communications by Prof. J. D. Everett, F.R.S., "On Newton's contributions to central-difference interpolation," and "On a central-difference interpolation formula." In the former of these papers the author observed that certain formulæ in the calculus of finite differences, usually attributed to Stirling, were really known to Newton; in the second, a formula of interpolation was obtained which is less unsymmetrical than those generally given.

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