A short discussion followed the reading of the paper. The only important point brought forward, however, was a statement by Mr. Hugh Bell that, at Clarence, they had been carrying on a process almost identical with that described by the author. Had he, the speaker, been aware that the plan was in use elsewhere, and had he known a paper was to be read on the subject, he would have come provided with certain figures bearing on the matter.

The meeting then broke up after the usual votes of thanks had been duly passed.

The autumn meeting of the Institute is this year to be held in America. The meeting will be held in New York, and we hear rumours of vast preparations that are being made by the hospitable metallurgists and engineers of the United States to welcome their British *confrères*. Members are left to make their own way to New York, but upon landing they become the guests of the American Institute of Mining Engineers. From an outline programme we have seen, it would appear that the only limit to the excursion will be the time at the disposal of members, which, those who know American hospitality best will agree, is sure to be exhausted long before the good-nature of their hosts.

We should have stated before that Mr. W. D. Allen, of Sheffield, this year has been awarded the Bessemer Gold Medal. Mr. Allen was associated with Sir Henry Bessemer in the manufacture of Bessemer steel from the very first. Indeed, he may be said to have been present at the birth of the invention, and was fully acquainted with the whole process before a single patent was taken out.

A MONUMENT TO A FAMOUS JAPANESE CARTOGRAPHER AND SURVEYOR.

THE *Japan Weekly Mail* contains a report of the unveiling of a monument in Tokio on December 14, 1889, to the memory of Ino Chukei, a Japanese cartographer and surveyor of the early part of the present century. The ceremony was performed by Prince Kitashirakawa, President of the Tokio Geographical Society. The name of Ino Chukei was first made familiar to the Western world by Dr. Naumann, the organizer, and for many years the head of the Geological Survey Bureau of Japan. More lately, Dr. Knott wrote two short biographies of Ino, the one published in the Transactions of the Asiatic Society of Japan (vol. xvi., 1888), and the other as an appendix to the memoir on the recent Magnetic Survey of Japan, published in the Journal of the College of Science, Imperial University (vol. xi., 1888). Ino was by profession originally a brewer, and did not begin his scientific life till he was past fifty. The story of the enthusiastic septuagenarian travelling over the length and breadth of Japan with his quadrant, his azimuth circle, his compass, and his clock is almost a romance. His latitude measurements are still of importance to the cartographer, and his map of Japan has formed the basis of every map since constructed. He finished his grand survey in 1818, after 17 years of travelling and observing. And now, nearly seventy years after his death, a lasting memorial has been raised at Shiba, in Tokio. The ceremony of unveiling the monument began at 2 p.m. on December 14, in the presence of a large company. Amongst those present were Prince Kitashirakawa, Viscount Sano, Viscount Enomoto, Admirals Akamatsu, Nakamuta, and Yanagi, Mr. Hanabusa (Councillor), Mr. Arai, Director of the Meteorological Office, Mr. Watanabe, President of the Imperial University, many of the University Professors, and others. The Chinese Representative, the German Minister, M. Dautremer, of the French Legation, and Profs. Burton, Divers, and Knott, may be named as the diplomatic and scientific representatives of foreign nations. The Naval Band was in attendance, and filled the intervals between the different parts of the celebration with selections of music. Four Shinto priests first went through a religious ceremony, which consisted chiefly of purificatory rites, and an invocation to the spirit of Ino. Mr. Watanabe then read a report, giving a history of the movement, which originated seven years ago with the members of the Tokio Geographical Society, and culminated in the ceremony of the day. The original desire had been to put up the monument on the site of the spot where Ino made the first observations in his grand survey—that is, the point through which the zero meridian was taken. This was at Shinagawa. But it had been found more convenient to raise the memorial at Shiba, within sight of this first station. The monument, designed by Prof. Tatsuna, of the Imperial University, and cast in bronze at the Kawaguchi Foundry, had cost nearly 3800 dollars. The whole of the expenses had amounted to about 4000 dollars, which had been met by voluntary subscriptions from the members of the Geographical Society and many others who desired to contribute their mite. The monument, a graceful obelisk of a dull green tint, was unveiled by Prince Kitashirakawa, a translation of whose speech runs thus:—"What an achievement in cartography was that of learned Ino Chukei! During the eras of *Kansei* and *Bunsei* (1790 to 1820), when Japan, at peace within her own borders, isolated from intercourse with the outer world, divided into a number of mutually-secluded fiefs, and, undisturbed by the cares of coast defence, was content with her own littleness, Ino, his fiftieth year already passed, commenced the study of geodesy, and, equipped with instruments of his own manufacture, devoted eighteen years of toil and suffering to the survey of the empire, bequeathing to posterity the memory of a truly great work. From the point of view of strategical advantage, from the point of view of the progress of civilization, from a domestic as well as from a foreign point of view, Ino undoubtedly was a credit to his country. His name is on the lips of the whole nation. The Emperor himself has bestowed posthumous rank on him and presents on his descendants. Japanese and foreigners have contributed to erect to his memory a monument of dimensions unparalleled in Japan. And it is a privilege conferred on me in this enlightened era that, as President of the Tokio Geographical Society, I am permitted to speak of his achievements and to unveil his monument. I rejoice greatly to take part in this imposing ceremony, and I am persuaded that the spirit of Ino in heaven will share the satisfaction which his posterity must feel on such an occasion. Reverentially, on behalf of this Society, I unveil the monument. May the fame of the illustrious dead grow with the growth of our country's civilization."

After some minutes' interval, Viscount Sano advanced to the foot of the steps that lead up to the pedestal, and introduced to the audience the great-great-grandson of Ino, who bowed and expressed the gratitude of the family for the honour done to their ancestor. Viscount Sano then gave a short biographical sketch of Ino, and an account of his great labours, for which he had earned the never-dying gratitude of his countrymen. This ended the ceremony. Later on, in the rooms of the Geographical Society, a select party assembled to inspect the rude instruments with which Ino carried out his observations. The obelisk is very graceful in form, and beautiful in its setting. As already mentioned, the colour is pleasing, and the inscription is artistic as only an ideographic inscription can be. The monument is 34 feet high, the obelisk itself being 27 feet. A flight of steps ascends to a square platform of masonry in the centre of which the pedestal rests. A railing, the bars of which are curved and puckered up so as to represent sea and clouds according to a common Japanese convention, runs round the outer edge of the platform and down the sides of the steps, allowing free ingress and egress to the pedestal and obelisk. The obelisk faces nearly south, and in its back is a door by which access can be gained to the interior. It is intended to place inside the instruments already spoken of, which were used in Ino's survey.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 1.—"The Development of the Sympathetic Nervous System in Mammals." By A. M. Paterson, M.D.

At the present time two opposite views exist among embryologists regarding the development of the sympathetic system. In both, the segmental formation of the sympathetic cord is upheld. According to the view of Remak and others, it is mesodermal, and formed *in situ*. According to the other view, it is ectodermal. Balfour and Onodi, who have maintained the latter view, differ, however, as to the fundamental origin of the sympathetic system—Balfour regarding each sympathetic ganglion as an offshoot from the spinal nerve, while Onodi considers it as a direct proliferation from the spinal ganglion.

For the present research, mammalian embryos were exclusively employed. The stage in development was first considered in

which the sympathetic system was plainly visible; and from this point the earlier and later steps in the process were traced.

The first event to occur is the formation of the main sympathetic cord, which arises in the mesoblast on either side of the aorta, as a solid, unsegmented rod of fusiform cells produced by the differentiation of cells *in situ*, and not at first connected with the spinal nerves. In front, it ends abruptly at the level of the first vertebral segment; behind the suprarenal body (to which it sends a considerable cellular bundle) it becomes indistinct, terminating at the level of the hind limbs.

This cellular column is, secondly, connected to the spinal nerves by the formation of the white *rami communicantes*. This is effected by the gradual growth of the inferior primary divisions of the nerves, and their final division into *somatic* and *splanchnic* branches. The splanchnic branch extends into the splanchnic area, where it meets and joins the cellular sympathetic cord. In the anterior part of the thorax it appears to end wholly in the cord; in the posterior thoracic and lumbar regions it divides into two parts, of which one joins the cord, the other passes beyond it. In both cases the fibres joining the cord are directly connected with the component cells. Behind the loins the splanchnic branches cease, and in the neck they do not join the sympathetic cord.

The formation of ganglia in the main sympathetic cord occurs subsequently, and is due to (1) the function of the splanchnic branches, the accession of a large number of nerve-fibres at the point of entrance, and the consequent persistence of the component cells (which are joined by these nerves) as ganglion cells; and (2) the anatomical relations of the cord to the bony segments, vessels, &c., over which it passes, and which indent it at certain points. This view is supported by the evidence obtained from dissections of human embryos in the 3rd, 4th, 5th, and 6th months, where the cord forms a band, constricted irregularly at considerable intervals, and from the adult structure, where the "segmentation" of the sympathetic cord is apparent rather than real.

The cervical portion of the embryonic sympathetic cord separates at the origin of the vertebral artery into two unequal parts. The smaller forms a fibro-cellular cord, and accompanies that artery as the vertebral plexus; the larger portion becomes constricted off from the main sympathetic cord by the formation of a fibro-cellular commissure, and forms the "superior cervical ganglion." When the middle cervical ganglion is present, it may be looked upon as a mass of the original cells of the sympathetic cord which have been included in the growth of the commissure.

Posteriorly the sympathetic cord gradually extends from the level of the hind limbs, until in older embryos it can be traced for a considerable distance along the middle sacral artery. It is not joined by splanchnic branches behind the loins.

The peripheral branches from the sympathetic cord arise as cellular outgrowths which accompany the parts of the splanchnic branches which do not join the sympathetic cord into the splanchnic area. They form considerable nerves, which follow the main vessels, and produce parts of the splanchnic nerves, the solar plexuses, &c., as well as the medullary portion of the suprarenal body. The gray *rami communicantes* appear to arise in the same way, and to belong to the same category.

The main conclusions derived from the above investigations are that in its development the sympathetic cord in mammals is mesoblastic, formed *in situ*, and primarily unsegmented, and unconnected with the spinal nervous system.

Linnean Society, May 1.—Mr. J. G. Baker, F.R.S., Vice-President, in the chair.—Mr. Miller Christy exhibited and made remarks on specimens of the so-called Bardfield oxlip, which he had found growing abundantly not only in the neighbourhood of Bardfield, Essex, but over a considerable area to the north and west of it.—Mr. Buffham exhibited under the microscope specimens of *Myristrichia claviformis* with plurolocular sporangia, and conjugation of *Rhabdomena arctuatum*, found upon *Zostera marina*.—The Rev. Prof. Henslow exhibited a collection of edible Mollusca which he had recently brought from Malta, and described the native methods of collecting and cooking them.—Prof. Stewart exhibited some spirit specimens of a lizard, in which the pineal eye was clearly apparent.—Mr. Sherring exhibited a series of excellent photographs which he had taken near Falmouth, and which showed the effects of climatic influence on the growth of several subtropical and rare plants cultivated in the open air.—A paper was then read by Prof. W. Fream, on a quantitative examination of water-meadow herbage.—This was followed by a paper from Mr. R. I. Pocock, on some Old World species of scorpions.

Zoological Society, May 6.—Prof. W. H. Flower, F.R.S., President, in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of April 1890; and called special attention to two examples of Simony's Lizard (*Lacerta simonyi*) from the rock of Zalmo, Canaries, obtained by Canon Tristram, F.R.S., and presented to the Society by Lord Lilford.—Mr. Sclater exhibited and made remarks upon the stuffed head of an Antelope, shot by Commander R. A. J. Montgomerie, R.N., of H.M.S. *Boadicea*, in June 1890, near Malimdi, on the East African coast, north of Zanzibar. Mr. Sclater referred this head to what is commonly called the Korrigum Antelope (*Damalis senegalensis*).—Prof. Howes made remarks on a dissection of the cephalic skeleton of *Hatteria*, and pointed out some features of special interest exhibited by this specimen. These were the presence of a pro-atlas and the existence of vomerine teeth, as in *Palæohatteria*.—Two letters were read from Dr. Emin Pasha, dated Bagamoyo, March 1890, and announced that he had forwarded certain zoological specimens for the Society's acceptance.—Mr. H. Seebohm exhibited and made remarks on a specimen of the Eastern Turtle (*Turtur orientalis*), killed near Scarborough, in Yorkshire.—Prof. F. Jeffrey Bell read the first of a series of contributions to our knowledge of the Antipatharian Corals. The present communication contained the description of a particularly fine example of the Black Coral of the Mediterranean, and an account of a very remarkable Antipathid from the neighbourhood of the island of Mauritius.—A communication was read from Mr. E. N. Buxton, containing notes on the Wild Sheep and Mountain Antelope of the Algerian Atlas, taken during a recent excursion into that country. These notes were illustrated by the exhibition of fine mounted specimens of the heads of these animals.—Mr. R. Lydekker read a note on a remarkable specimen of an antler of a large Deer from Asia Minor, which he was inclined to refer to an abnormal form of the Red Deer (*Cervus elaphus*).—Mr. F. E. Beddard read a paper on the minute structure of the eye in some shallow-water and deep-sea species of the Isopod genus *Arcturus*. He pointed out that in all the deep-sea forms there was some change in the visual elements which indicated degeneration.—Mr. E. T. Newton gave an account of the bones of some small birds obtained by Prof. Nation from beneath the nitrate beds of Peru. These bones seemed to occur in considerable abundance, and nearly all appeared to belong to one small species of Petrel, which it was thought most nearly resembled *Cymochorea leucorrhoa* or *C. markhami*, the latter of these being now found living on the coast of Chili.—A communication was read from Dr. Mivart, F.R.S., containing notes on some singular Canine dental abnormalities.—Mr. H. Elwes read descriptions of some new Indian Moths.

Chemical Society, May 1.—Dr. W. J. Russell, F.R.S., President, in the chair.—The following papers were read:—An investigation of the conditions under which hydrogen peroxide is formed from ether, by Prof. W. R. Dunstan and Mr. T. S. Dymond. The authors have investigated the conditions under which hydrogen peroxide is formed from ether (compare Richardson, Chem. Soc. Proc., 1889, 134), and found that ordinary ether, prepared from methylated spirit, yields hydrogen peroxide when exposed for several months to sunlight or the electric light. Contrary, however, to the usual statements, pure ether (either wet or dry) and ordinary ether which has been purified by treatment with dilute chromic acid do not give a trace of hydrogen peroxide when exposed to light under similar conditions. An experiment shows that neither water nor dilute sulphuric acid form hydrogen peroxide when exposed to light in contact with air; the authors refer the production of the peroxide from ether to the presence of a minute quantity of some impurity in the ether employed. Hydrogen peroxide is formed when ozone acts on ether in the presence of water, and is also produced under certain conditions during the slow combustion of ether in contact with water.—Paradesylphenol, by Dr. F. R. Japp, F.R.S., and Mr. G. H. Wadsworth.—Note on Benedikt's acetyl values, by Dr. J. Lewkowitsch.

Mathematical Society, May 8.—J. J. Walker, F.R.S., President, in the chair.—The President announced that a member of the Society, Lieut.-Colonel J. R. Campbell, had asked to be allowed to give a donation of £500 to the Society, the sum to be invested, or otherwise made use of, for the good of the Society, in any way the Council should judge best. On the

motion of the Treasurer, (A. B. Kempe, F.R.S.), seconded by S. Roberts, F.R.S., the following resolution was carried unanimously: That the cordial thanks of the London Mathematical Society be given to Lieut.-Colonel Campbell for his generous gift of £500 to the general fund of the Society.—The following communications were made:—On the function which denotes the excess of the divisors of a number which $\equiv 1$, mod. 3, over those of a number which $\equiv 2$, mod. 3, by Dr. Glaisher, F.R.S.—A table of complex multiplication moduli, by Prof. Greenhill, F.R.S..—On bicircular quartics, by R. Lachlan.—On the genesis of binodal quartic curves from conics, by H. M. Jeffery, F.R.S.—On the arithmetical theory of the form $x^3 + ny^3 + n^2z^3 - 3nxyz$, by Prof. G. B. Mathews.

PARIS.

Academy of Sciences, May 6.—M. Hermite, President, in the chair.—Heats of combustion of the principal nitrogen compounds contained in living bodies, and their *rôle* in the production of animal heat, by MM. Berthelot and André. The data and results are given for sixteen nitrogenous bodies. The average heat of combustion is 9400 cal. for fatty bodies, 5700 cal. for albumenoids, and 4200 cal. for carbohydrates, taking 1 gram of each substance. The conclusion is drawn that a weakening of the organism with diminution of power of consumption of the food digested shows itself first by general deposition of the most difficultly eliminated substances, fatty matters, then by failure to get rid of nitrogenous bodies, and finally by incapacity to consume the carbohydrates.—Some remarks on the subject of spherical functions, by M. E. Beltrami.—Remarks on the loss of virulence in cultures of *Bacillus anthracis*, and on the insufficiency of inoculation as a means of estimating it, by M. S. Arloing. It is known that in a culture of the *Bacillus anthracis* left to itself the virulence after a time disappears. The author gives details of the phenomenon and some results of an examination of various cultures.—MM. Bertrand, Tisserand, and Poincaré reported on a memoir by M. Cellérier entitled "On Variations of Eccentricities and Inclinations." The memoir deals with equations of movement, planetary perturbations, the development of the perturbing function, the study of secular variations, and the differential equations which define them.—On fields of magnetic rotation, by M. W. de Fonvielle.—On algebraical integrals of differential equations of the first order, by M. Painlevé.—Solar phenomena observed during 1889, by M. Tacchini. The distribution in latitude of protuberances, faculæ, spots, and eruptions is given.—On the polarization of electrodes, by M. Lucien Poincaré. The author shows that in the case of melted salts the maximum polarization decreases with the temperature, and becomes *nil* at the temperature of decomposition of the salt, the change is gradual with silver poles, but with gold electrodes there is a sudden fall at the point of decomposition of the electrolyte. Admitting that the maximum of polarization is equal or superior to the equivalent of the energy expended in the electrolytic action, the results point to the theory that an elevation of temperature tends to dissociate a salt by the separation of the two ions of which it is composed, just as occurs, according to M. Arrhenius, in a weak solution.—On the preparation and properties of tetrafluoride of carbon, by M. H. Moissan.—On the reduction of nitric acid to ammonia and a method of estimation of this acid, by M. E. Boyer. The author indicates the exact conditions under which nitric acid may be entirely reduced to ammonia when acted upon by hydrogen liberated in the solution by the action of Zn upon hydrochloric acid, and gives analyses which show that his method yields trustworthy quantitative results.—On the molecular refracting power of salts in solution, by M. E. Doumer. It is shown that the law of molecular refraction is best exemplified when one considers the solutions in a state of dilution such that the density of the salt in the solution, taken in relation to the density of hydrogen, may be equal to the molecular weight of the salt.—The action of oxygenated water upon the oxygen compounds of manganese; Part 2, action upon permanganic acid and the permanganates, by M. A. Gorgeu.—On the amethylcamphophenolsulphonate and a derived tetranitrated yellow colouring-matter, by M. P. Cazeneuve.—Note on tridymite and christobalite, by M. Er. Mallard.—On the zeolites of gneiss from Cambo (Basses Pyrénées), by M. A. Lacroix. It is noted that the zeolites are remarkable for their abundance and the beauty of their crystals. They occur in two distinct beds: (1) in acid gneisses, (2) in basic gneisses. Descriptions of the crystals are given.—On a new method for the analysis of straw, by M. Alexandre Hébert.—On the *rôle* of green manures as nitrogenous dressing, by M. A. Muntz. The author concludes from the results of some experiments that the efficacy of green manures as nitrogenous dressing depends especially on the facility with which the fresh vegetable matters allow the nitrification of the proteids and on the favourable influence which they exercise on the physical properties of soils.—Experiments relative to the transmissibility of hæmoglobinuria to animals, by M. V. Babes.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

A Class-Book of Geography: W. B. Irvine (Relfe).—A Hand-book of European Birds: J. Backhouse (Gurney and Jackson).—Larva Collecting and Breeding: Rev. J. S. St. John (Wesley).—A Course of Lectures on the Growth and Means of Training the Mental Faculty: Dr. F. Warner (Camb. University Press).—Pure Logic, and other Minor Works: W. S. Jevons (Macmillan).—Terminologia Medica Polyglotta: T. Maxwell (Churchill).—A Guide to the Exhibition Galleries of the Department of Geology and Palæontology in the British Museum (Natural History), Parts 1 and 2 (London).—Geologisk kart over de Skandinaviske Lande og Finland: H. Reusch (Kristiania).—The Elements of Machine Design; Part 1, new edition: W. C. Unwin (Longmans).—Annual Report of the Department of Mines, N.S.W., for the year 1888 (Sydney, Potter).—Seventh Annual Report of the U.S. Geological Survey 1885-86: J. W. Powell (Washington).—The Chemistry of Paints and Painting: A. H. Church (Seeley).—A Smaller Commercial Geography: G. G. Chisholm (Longmans).—Les Aguas Minerales de Chile: Dr. L. Darapsky (Valparaiso, Helfmann).—Notes upon a Proposed Photographic Survey of Warwickshire: W. J. Harrison (Birmingham).—Fjeld og Jordarter i de Skandinaviske Lande og Finland: H. Reusch (Kristiania).—Report of Mr. Tebbutt's Observatory, 1889: J. Tebbutt (Sydney).—Notes on Electric Lighting: Rev. G. Molloy (Dublin, Gill).—Imperial College of Agriculture and Dendrology, Tokyo, Japan, Bulletin No. 7: Y. Kozai (Tokyo).

CONTENTS.