occurred at Ischia on July 28, 1883, by Prof. A. Serpieri.—On numbers irreducible by complex numbers, by Prof. C. Formenti.—On some forms of right lines produced by two reciprocal stars, by Prof. F. Aschieri.—Meteorological observations made at the Brera Observatory, Milan, during the months of October and November, 1883.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, February 14.—"On a New Reflecting Galvanometer of Great Sensibility, and on New Forms of Astatic Galvanometers." By Thomas Gray, B.Sc., F.R.S.E., and Andrew Gray, M.A., F.R.S.E. Communicated by Sir William Thomson, F.R.S.

The paper describes first a very sensitive galvanometer, of novel construction, which the authors have had made, with aid from the Government Research Fund, for their experiments on the electric resistance of glass and allied substances. It consists of two pairs of coils with hollow cores, arranged so that the axes of each pair are parallel and in a vertical plane, which act on a needle-system, consisting of two horse-shoe magnets of thin steel wire connected by a very light frame of aluminium, and hung with their planes vertical, so that a horse-shoe corresponds to each pair of coils and has its poles within the hollow cores. In the instrument constructed each pair of coils is carried by a vertical brass plate, and these two plates are set so as to make an angle with one another of about 106°. A line drawn from the suspension thread (a single fibre of silk) to a point near a pole of either of the needles, when the needles are at the same distance within both pairs of coils, is nearly at right angles to the axis of the coil, and the motion of the needle for small deflections is nearly along the axis. The needles enter the coils from the same side, and the current is usually sent through the coils, so that one pair cause their horse-shoe to move outwards and the other pair their horse-shoe to move inwards, thus turning the needle-system round the suspension fibre. A mirror fixed to the aluminium connecting-bar gives a measure of the deflection in the ordinary manner. This system of needles, when rightly adjusted, is practically astatic in a magnetic field of uniform intensity.

A magnet (or system of magnets) is generally arranged to give a differential field at the upper and lower ends of the needles, which are usually placed with unlike poles turned in similar directions; but any magnetic system may be employed to give directive force in the proper manner and degree for a particular purpose or arrangement.

Another form of the instrument is described in which the coils are all in one plane, and the connecting aluminium bar carrying the horse-shoe needles passes through the plate in which the coils are set from one side to the other, so that one horse-shoe enters its pair of coils from one side, and the other horse-shoe from the other side. When the needle-system is deflected thus, both needles are pushed out of the coils or both pulled in.

By the method of arranging the needles and coils adopted in these instruments the current is made, when the hollow cores are made small, to act very advantageously on the needles, and hence in great measure their high sensibility. By attaching to the suspended system a small needle to give directive force in a uniform field, the great magnetic moment and leverage of the horse-shoes may be taken advantage of.

The paper then describes a new and very compact form of distributing plate, by means of which a multiple coil galvanometer, or one in which the coil is wound in sections, may be connected in any desired manner to vary its resistance or its sensibility.

Finally, two forms of instrument are described, in which two perfectly vertical and straight needles connected together rigidly by bars of aluminium are used to give a perfectly astatic system, not disturbed by the magnetising or demagnetising action of neighbouring magnets, a result the authors think practically unattainable in any arrangement of horizontal needles. Two vertical needles, with their upper ends in the position occupied by the upper needle of a so-called astatic galvanometer, and their lower ends in the position of the lower needle, experience, if their like poles are turned in dissimilar directions, a similar electromagnetic action to that in the horizontal needles; and the authors propose when convenient to use such an arrangement instead of the ordinary needle system.

Also a pair of vertical needles may be used instead of the horse-shoe needles described above, the coils being so placed as to act advantageously, and give a convenient arrangement of the parts of the instrument.

Geological Society, February 15.—Annual General Meeting.—J. W. Hulke, F.R.S., president, in the chair.—The Secretaries read the Reports of the Council and of the Library and Museum Committee for the year 1883. In the former the Council congratulated the Fellows upon an improvement in the state of the Society's affairs since the date of their last Report, the income of the Society having been greater, and its expenditure less, in 1883 than in 1882, while, although the removal from the list of the names of twelve Fellows whose addresses were unknown, and whose election dated back before the incorporation of the Society in 1826, had produced an apparent loss of three Fellows during the year, the Society might really be regarded as having received an increase of nine Fellows. The increase in the number of contributing Fellows was twenty-two. The Council's Report further announced the awards of the various Medals and of the proceeds of the Donation Funds in the gift of the Society.

In presenting the Wollaston Gold Medal to Prof. A. Gaudry, F.M.G.S., the President addressed him as follows:—"Prof. A. Gaudry,—The Council of the Geological Society has awarded you the Wollaston Medal in recognition of the value of your palæontological researches and the important scientific generalisations you have deduced from long and laborious observations. The numerous papers on topographical geology and on palæontology you have contributed during the past thirty years, your important 'Recherches Scientifiques en Orient entreprises par les ordres du Gouvernement pendant les années 1853-1854,' your 'Animaux fossiles et géologie de l'Attique,' and, lastly, your work 'Les Enchaînements du monde animal dans les temps géologiques,' have made your name so familiar, wherever our branch of natural science is cultivated, that in receiving you we feel we are not receiving a stranger, but a scientific brother, and one who, by his labours and singleness of aim, has achieved a position as a palæontologist such as few can hope to attain. Personally it affords me great and sincere pleasure that it has fallen to my lot to hand you this medal, which, by the consent of all, has never been more worthily bestowed."

The President then presented the balance of the proceeds of the Wollaston Donation Fund to Mr. E. Tulley Newton, F.G.S., and addressed him as follows:—"Mr. Newton,—The Council has voted you the balance of the proceeds of the Wollaston Donation Fund, in recognition of the value of your researches amongst the Pleistocene Mammalia of Great Britain, and to assist you in the prosecution of further investigations. Your memoirs published by the Geological Survey of England and Wales, 'On the Vertebrata of the Forest-bed Series of Norfolk and Suffolk,' and on 'The Chimæroid Fishes of the Cretaceous Rocks,' and your papers published in our *Journal* are considered by the Council to evince great merit; they regard them as a bright earnest of future work which they hope may be promoted by this award."

In presenting the Murchison Medal to Dr. Henry Woodward, F.R.S., the President said: "Dr. Henry Woodward,—The Council has awarded you the Murchison Medal and a grant of ten guineas in recognition of your valuable researches into the structure and classification of the fossil Crustacea, especially of the Merostomata and Trilobita, and your services to the progress of geology in Great Britain by your conduct of the *Geological Magazine* for nearly twenty years. Your monograph on the 'Merostomata,' published by the Palæontographical Society, and your 'Catalogue of British Fossil Crustacea, with their synonyms and the range in time of each genus and order,' will long continue to be works of reference indispensable to every student of these interesting life-forms. But valuable as are these written records, they discover but a small part of the services you have rendered in the advancement of our science. How much more you have done by the assistance you have so freely given to all who have sought your help at the Museum in deciphering some difficult matters in palæontology will never be fully known."

The President then handed the balance of the proceeds of the Murchison Geological Fund to Mr. R. Etheridge, F.R.S., for transmission to Mr. Martin Simpson, of Whitby, and addressed him as follows: "Mr. Etheridge,—The balance of the proceeds of the Murchison Donation Fund has been awarded by the Council to Mr. M. Simpson, Curator of the Whitby Museum. He has devoted much attention to the fossils of that district, and he is the author of two books descriptive of them. The Council

hopes that this cheque may be of assistance to him in continuing the useful extra-official work he has long been carrying on in that locality."

The President next handed the Lyell Medal to Prof. W. H. Flower, F.R.S.. for transmission to Dr. Joseph Leidy, F.M.G.S., and addressed him as follows :—"Prof. Flower,—The Council has bestowed on Dr. J. Leidy the Lyell Medal, with a sum of 25*l.*, in recognition of his valuable contributions to palæontology, especially as regards his investigations on the Fossil Mammalia of Nebraska and the Sauria of the United States of America. These vast and, in comparison with our own country, but little explored territories have for some years past yielded a harvest of fossil vertebrate remains of exceeding richness, of which we have no example here. How well this harvest is being garnered by our Transatlantic *confrères* the flood of memoirs published by them during the last quarter of a century bears witness. Amongst these scientific labourers in the palæontological harvest-field, Dr. J. Leidy has held a foremost place. Careful in observing, accurate in recording, cautious in inferring, his work has the high merit which trustworthiness always imparts. The well-nigh astounding number of papers written by him between 1845 and 1873, amounting to 187, his Reports on the 'Extinct Vertebrate Fauna of the Western Territories,' his 'Synopsis of the Extinct Mammalia of North America,' and his 'Cretaceous Reptiles of the United States,' testify to the fertility of his pen."

In presenting to Prof. C. Lapworth, F.G.S., the balance of the Lyell Geological Fund, the President said: "Prof. Lapworth,—The Council has awarded to you the balance of the proceeds of the Lyell Donation Fund in recognition of the value of your researches into the palæontology and physical structure of the older rocks of Great Britain, carried on frequently under unfavourable circumstances and to the injury of your health, and to aid you in similar investigations. Your papers on 'The Girvan Succession,' 'The Moffat Series,' published in our *Journal*, and 'The Graptolites,' and 'The Secret of the Highlands,' contributed to the *Geological Magazine*, were the outcome of an extremely laborious and detailed exploration of the districts to which they refer—an exploration in conducting which you spared no pains and shrank from no hardships. No one who desires to know the structure of these districts can safely omit a careful study of these very instructive papers."

The President then handed to Prof. Bonney, F.R.S., for transmission to Dr. J. Croll, a portion of the proceeds of the Barlow-Jameson Fund, and said: "Prof. Bonney,—The Council, in recognition of the value of Dr. James Croll's researches into the 'Later Physical History of the Earth,' and to aid him in further researches of a like kind, has awarded to him the sum of 20*l.* from the proceeds of the Barlow-Jameson Fund. Mr. Croll's work on 'Climate and Time in their Geological Relations,' and his numerous separate papers on various cognate subjects, including the 'Eccentricity of the Earth's Orbit,' 'Date of the Glacial Period,' the 'Influence of the Gulf Stream,' the 'Motion of Glaciers,' 'Ocean Currents,' and the 'Transport of Boulders,' by their suggestiveness have deservedly attracted much attention. In forwarding to Dr. Croll this award, the Council desires you to express the hope that it may assist him in continuing these lines of research."

In handing to Prof. Seeley, F.R.S., a second portion of the proceeds of the Barlow Jameson Fund for transmission to Prof. Leo Lesquereux, F.C.G.S., the President spoke as follows: "Prof. Seeley,—The Council has awarded to Prof. Leo Lesquereux the sum of 20*l.* from the proceeds of the Barlow-Jameson Fund, in recognition of the value of his researches into the palæobotany of North America, and to aid him in further investigations of a similar kind. Prof. Lesquereux's 'Contributions to the Fossil Cretaceous and Tertiary Flora of the Western Territories,' published in the 'Reports of the United States Geological Survey,' are works which, for their matter, typography, and illustrations, leave nothing to desire. In transmitting this award to Prof. Lesquereux, you will convey to him the hopes of the Council that it may assist him in prosecuting further investigations in the difficult branch of research in which he has already accomplished so much."

The President then read his Anniversary Address, in which, after giving obituary notices of some of the Members lost by the Society in 1883, he passed in review the principal work done by the Society since the last Anniversary Meeting, and finally referred more in detail to some important results obtained elsewhere in connection with the comparative osteology of the Vertebrata, dwelling particularly upon the question of the existence in the lower jaw of an unpaired bone occupying, or anterior to, the symphysis—the "os présymphysien" of M. Dollo, the "mento-Meckelian" of Cope, the "inferior intermaxillary element" of W. K. Parker,—and upon certain cranial and pelvic characters of the Dinosauria.

The ballot for the Council and Officers was taken, and the following were duly elected for the ensuing year :—President: Prof. T. G. Bonney, F.R.S. Vice-Presidents: W. Carruthers, F.R.S., John Evans, F.R.S., J. A. Phillips, F.R.S., Prof. J. Prestwich, F.R.S. Secretaries: W. T. Blanford, F.R.S., Prof. J. W. Judd, F.R.S. Foreign Secretary: Warington W. Smyth, F.R.S. Treasurer: Prof. T. Wiltshire, F.L.S. Council: H. Bauerman, W. T. Blanford, F.R.S., Prof. T. G. Bonney, F.R.S., W. Carruthers, F.R.S., John Evans, F.R.S., Col. H. H. Godwin-Austen, F.R.S., Henry Hicks, Rev. Edwin Hill, M.A., G. J. Hinde, Ph.D., J. Hopkinson, Prof. T. M'Kenny Hughes, M.A., J. W. Hulke, F.R.S., J. Gwyn Jeffreys, F.R.S., Prof. T. Rupert Jones, F.R.S., Prof. J. W. Judd, F.R.S., J. A. Phillips, F.R.S., Prof. J. Prestwich, F.R.S., F. W. Rudler, Warington W. Smyth, F.R.S., J. J. H. Teall, M.A., W. Topley, Prof. T. Wiltshire, F.L.S., Henry Woodward, F.R.S.

Chemical Society, February 21.—Dr. W. H. Perkin, president, in the chair.—The following gentlemen were elected Fellows of the Society :—L. Archbutt, J. H. Burland, D. Bain, W. H. Barr, R. A. Bush, P. S. Chantrell, A. F. Damon, H. C. Draper, T. R. Duggan, V. Edwards, W. T. H. Elsley, G. W. Gibson, F. W. Harris, T. Hilditch, R. E. Moyle, P. Morton, W. J. Orsman, F. R. Power, A. E. Simpson, C. W. Sutton, H. G. Shaw, E. F. Smith, F. W. Tompson, A. Tarn, and E. W. Voelcker.—The following papers were read :—On the composition of the ash of wheat grain and straw grown at Rothamsted in different seasons and by different manures, by Sir J. B. Lawes and Dr. J. H. Gilbert. This is an extremely lengthy paper giving the details of 253 analyses of ashes from produce whose history as to growth, soil, season, and manuring is known. The experiments are given in three series. The first gives the results obtained during sixteen consecutive seasons under three characteristically different conditions as to manuring, and thus illustrates the influence of the fluctuation of season from year to year. The second represents nine different conditions as to manuring obtained in four seasons—two favourable, two unfavourable—and so shows the influence of characteristic seasons under a great variety of manuring conditions. The third series represents the proportionally mixed produce for the ten years 1852–61, and again for the succeeding ten years, 1862–71, from ten differently manured plots, and thus brings out the influence of continuous exhaustion or supply of certain constituents. The general results are that the influence of the season on the composition of the ash is very much more marked than the influence of the manure, and that the composition of normally-ripened grain is very uniform and in fact only varies in any marked degree according to manure, when there is a very abnormal deficiency of one or more constituents; the amounts of mineral constituents in the straw have a very obvious connection with the supply or exhaustion of these constituents in the soil.—On the analysis of Shotley Bridge Spa water, by H. Peile. This is a chalybeate water containing 0·0155 grm. Fe_2O_3 per litre as ferrous bicarbonate, 1·73 grm. sodium chloride, calcium salts, some lithium chloride, magnesium bromide and iodide, &c.

Zoological Society, February 19.—Mr. Osbert Salvin, F.R.S., president, in the chair.—Mr. Sclater laid on the table and made some remarks on a copy of the lately issued "Guide to the Calcutta Zoological Gardens."—Mr. W. T. Blanford, F.R.S., made some observations on the collection of drawings of Himalayan birds lately presented to the Society's library by Brian H. Hodgson, F.Z.S.—Prof. F. Jeffrey Bell read the second part of his contribution to the systematic arrangement of the Asteroidea. In the present communication the author treated of the species of the genus *Oreaster*.—A communication was read from M. Fernand Lataste, C.M.Z.S., containing the description of a new species of Gerbille from Arabia. This new species was founded on specimens living in the Society's Gardens, which had been hitherto referred to *Gerbillus erythrurus*, Gray. M. Lataste considered the species to be undescribed, and proposed to call it *Meriones longifrons*.—A communication was read from Mr. J. Wood-Mason, F.Z.S., in which he gave a description of a new species of the Neuropterous genus *Corydalis*. The first example of this insect (a female) was

captured by Lieut. Col. H. H. Godwin-Austen, F.R.S., on the Naga Hills, north-east frontier of India; but male specimens had since been obtained. The author proposed to call this species *Corydalis asiatica*.—A communication was read from Dr. J. Gwyn Jeffreys, F.R.S., on the Mollusca procured during the *Lightning* and *Porcupine* Expeditions 1868–70, forming the seventh part of his series of papers on this subject. The present part comprised the genera from *Rissoa* to *Acirsa*, with seventy-four species, of which fourteen were new to science, as was also one new genus.

Physical Society, February 23.—Prof. F. Guthrie, president, in the chair.—New Members :—Mr. E. F. J. Love, Mr. James Grundy, Rev. F. J. Smith, Mr. F. R. Bawley.—Prof. Silvanus P. Thompson read a paper on a new method of making resistance coils. This consisted in cutting off a piece of the wire of which the coil is to be made, long enough to give a resistance some 2 per cent. higher. From the formula—

$$\text{Shunt} = \frac{R\,r}{R - r}$$

(where R is the rough resistance, and r the final resistance), the value of a wire wherewith to shunt the first piece in order to give the resistance required is found. A length of wire giving this resistance (or, rather, about 2 per cent. more) is then cut off and soldered as a shunt to the first piece. Practice shows that this method is very quick and accurate. It is useful for shunts under 10 ohms. Prof. Thompson also described a new form of "meter bridge" devised by him. The wire is 2 m. long, and there are two wires, one of a resistance about ¼ ohm., the other 8·21 ohms. Contact is made by one or other by a sliding contact with vernier attached. This arrangement is more convenient than the single wire meter bridge, and allows of higher resistances being measured. A special switch board with an arrangement of mercury cups avoids the necessity of transposing the coils in Foster's method, this being effected by shifting the contact links in the mercury cups.—Mr. R. T. Glazebrook, F.R.S., explained a cam or axle key devised by Mr. Shaw to effect the contacts necessary to transpose the coils by a single movement. He pointed out that a certain pressure was necessary to make good contact with mercury. The ordinary way of making coils was to double the wire, cut the bight, bare the ends there, and solder a piece of copper across them, which could be shifted until the resistance was got. Prof. G. C. Foster said that the copper links in mercury cups should rest on the copper.—Prof. Foster read a paper by himself and Mr. Pryson on the difference of potential required to give sparks in air. Let V = this difference of potential, l = length of spark in centimetres, their experiments gave (approximately) $V = 102\,l + 7{\cdot}07$. Tables and curves of the sparking distances, potentials, and electric forces in the experiments were given. The results were got with brass balls 1·35 centimetres in diameter, a frictional machine, and a Foster absolute electrometer. When $l = {\cdot}142$, the electric force giving a spark was 154·76; $l = {\cdot}284$, the electric force was 133·35, or less than at a shorter distance; $l = 497$, the electric force was 131·66; $l = {\cdot}9$, the electric force was 138·57; that is, it began to rise again.—Prof. G. Forbes made a communication on a magnetised chronometer watch. The watch slowed several minutes a day. He found the rate to vary with the position of the watch with respect to the cardinal points and also in a vertical plane. The bar of the balance was magnetised and some screw nails. He traced the variation of rate to magnetisation of the spring, the bar, and screws. The fact that it varied with position suggested that a magnetised ship's chronometer might be made which would integrate the course and give a mean course. Messrs. E. Dent and Co. had fitted a gold spring and a platinum iridium balance to the chronometer, and rendered it non-magnetisable.

Royal Meteorological Society, February 20.—Mr. R. H. Scott, M.A., F.R.S., president, in the chair.—T. G. Benn, Capt. C. F. Cooke, Francis Galton, M.A., F.R.S., Prof. S. A. Hill, B.Sc., Capt. A. W. Jeffery, G. Paul, F.G.S., F.R.H.S., R. Veevers, H. T. Wakelam, and E. Wells were elected Fellows of the Society.—The following papers were read :—The great storm of January 26, 1884, by William Marriott, F.R.Met.Soc. This storm was remarkable for its violence and large area, as well as for the unprecedentedly low barometer reading at its centre. The author has prepared isobaric charts for each hour from noon on the 26th to 3 a.m. on the 27th, and by this means has tracked the storm across the British Isles. The centre of the depression appears to have first reached the north-wes coast of Ireland at noon, and passed in a north-easterly direction over the north of Ireland and across the middle of Scotland, reaching Aberdeen about midnight. Its rate of progress was therefore about thirty miles an hour. A violent gale was experienced all over the British Isles, the greatest hourly velocity of the wind being 68 miles at Valencia at 11 a.m., 70 miles at Holyhead at 2 p.m., 63 miles at Falmouth at 3 p.m., 69 miles at Armagh and 59 miles at Aberdeen at 5 p.m., 58 miles at Greenwich from 5 to 7 p.m., and 76 miles at Alnwick at midnight. Thunderstorms occurred on the south-eastern side of the depression, and travelled across the south of Ireland and England at the rate of about thirty miles an hour. The lowest readings of the barometer (reduced to sea-level) yet reported were 27·32 inches at Kilcreggan at 8.30 p.m., and 27·332 inches at Ochtertyre, near Crieff, at 9.45 p.m. In the southern part of England, directly after the minimum had occurred, there was a very sudden rise in the reading of the barometer, in some cases amounting to ·08 inch in five minutes. From an examination of previous records, it appears that there has never before been so low a barometer reading as 27·32 inches, so that this storm may be considered as one of the most remarkable that has occurred in the British Islands.—The height of the neutral plane of pressure and depth of monsoon currents in India, by Prof. E. D. Archibald, M.A., F.R.Met.Soc.—The sunrises and sunsets of November and December, 1883, and January, 1884, by the Hon. F. A. Rollo Russell, M.A., F.R.Met.Soc. The author gives a very interesting account of all the special features of the remarkable sunrises and sunsets which have been observed from November 8 to February 2. The following are stated to be the marks distinguishing the peculiar sky-haze from cirrus :—1. It is commonly much more evenly spread over the sky than cirrus. 2. It is visible (except when very dense or in the neighbourhood of the sun) only about the time of sunrise and sunset. During the day not the faintest trace obscures the clear azure, whereas cirrus becomes more distinct with more daylight. 3. When actually glowing with bright colour, it loses its wavy appearance. 4. It has no perceptible motion, unless perhaps when watched through a long period. 5. It does not interfere with the clear definition of the moon or brilliancy of the stars. 6. It lies, almost without exception, in long streaks, stretching from between south-south-west and west-south-west to between north-north-east and east-north-east. 7. Its radiant point lies, not on the horizon, but far below it. 8. If both cirrus and sky-haze be present, the sky-haze begins to shine with a red light soon after the cirrus has ceased to glow above the western horizon. When cirrus is present, however, there is in general a reaction of effects. 9. The sky-haze is destitute of the fibrous twists and angular branches of cirrus, and, since the sunlight leaves it in regular progression, it must be stratified at the same uniform level. 10. It has always been visible on every clear day for more than two months, and has been quite independent of wind and weather.

Entomological Society, February 6.—Mr. J. W. Dunning, president, in the chair.—The President nominated Sir S. S. Saunders and Messrs. F. P. Pascoe and R. Meldola as vice-presidents for the ensuing year. Two new members were elected. —Mr. P. Crowley exhibited specimens of *Castnia eudesmia*, with eggs, larval galleries, and pupæ.—Mr. W. F. Kirby exhibited a coloured photograph of an abnormal specimen of the genus *Samia*, which had been bred by M. Alfred Wailly.—Mr. H. T. Stainton remarked on the food of the larva of *Aglossa pinguinalis*.—The Secretary exhibited photographs of the female of *Hypocephalus armatus*, and read some notes on the subject by Dr. Sharp.—Mr. F. P. Pascoe exhibited a collection of *Curculionidæ* from New Guinea.—The President made some remarks on the attempt to introduce humble-bees into New Zealand. He also called attention to the disappearance of many common butterflies and moths from the neighbourhood of Huddersfield, upon which a discussion ensued, the opinion of most of the speakers being that butterflies were rapidly becoming much scarcer in England than they used to be.—The Secretary read a report from the Committee appointed to inquire into the alleged occurrence of *Phylloxera* in Victoria, confirming its presence in that colony.—Mr. J. W. Douglas communicated a description of a new species of *Orthezia* from Monte Cristo.—Sir S. S. Saunders communicated further notes on the caprification of domestic figs.

Anthropological Institute, February 12.—Mr. John Evans, F.R.S., vice-president, in the chair.—The election of Mr. Joseph

Fothergill, F.R.G.S., was announced.—Mr. Park Harrison exhibited some remains found last year in Castlefield, Wheatley, by Mr. E. Gale, the occupier of the land. The skulls were of two types, and belonged to subjects who have been interred for the most part in a flexed or contracted position, but some at full length. The objects associated with the skulls were also diverse. Amongst those lent by Mr. Gale were an unusually long and narrow spear-head and the boss of a target with rivets ornamented with tinned studs, such as have been found elsewhere in Oxfordshire. Other objects excavated at the expense of the late eminent archæologist, Mr. J. H. Parker, and given by him to the Ashmolean Museum, which he had intended to send, were not exhibited, owing to his lamented death. Mr. Harrison thought the remains at Wheatley dated from the time of the extension of the kingdom of Mercia to the Thames. Dr. Garson is preparing a description of the cranial peculiarities of the skulls.—Mr. Worthington G. Smith exhibited two skulls of the Bronze Age from a tumulus at Whitby.—Mr. Henry Prigg exhibited two Palæolithic implements and a fragment of a human skull from Bury St. Edmund's.—Mr. R. Morton Middleton exhibited some human bones from Morton, near Stockton.—Mr. John T. Young read a paper on some Palæolithic fishing implements from the Stoke Newington and Clapton gravels. Mr. Young exhibited a large collection of flints of various sizes, which he considered had been manufactured for use as fish-hooks, gorges, and sinkers; some of them showed evident traces of human workmanship; and the paper gave rise to an animated discussion.—Miss A. W. Buckland read a paper on traces of commerce in prehistoric times, in which she urged that the similarity of three cups of gold discovered, one in Cornwall, another at Mycenæ, and the third in the Necropolis of old Tarquinii, might be taken as evidence of the existence of commercial relations between Etruria and Ancient Britain.—A paper was read on a human skull found near Southport, by Dr. G. B. Barron.

Institution of Civil Engineers, February 26.—Sir J. W. Bazalgette, C.B., president, in the chair.—The paper read was on hydraulic propulsion, by Mr. Sydney Walker Barnaby, Assoc.M.Inst.C.E.

EDINBURGH

Royal Physical Society, February 20.—Ramsay H. Traquair, M.D., F.R.S., president, in the chair.—The following communications were read:—On the geological structure and age of the Harz Mountains, by H. M. Cadell, B.Sc., of H.M. Geological Survey of Scotland, a continuation of his former paper. The rocks of the Palæozoic core of the region had been deposited in an area subject to occasional volcanic outbursts. There were many patches of diabase on the Lower Harz which were usually associated with rocks of Hercynian age, and were regarded by German geologists as portions of interbedded sheets. Mr. Cadell believed they were intrusive sheets and bosses of later date, and gave as his reasons that (1) the adjacent strata were metamorphosed by heat on all sides; (2) the diabase sometimes cut obliquely through the sedimentary strata; (3) there was no tuff associated with these diabases as there was with the true interbedded lavas of the Harz; (4) these diabases did not, like the contemporaneous volcanic rocks, occur as continuous sheets, but were found in isolated patches like the intrusive diabases of the Scottish Midlands. The Whintill of Northumberland was cited as an example of an intrusive sheet which, like some of those on the Harz, kept on nearly the same horizon for considerable distances, but was not on that account alone to be regarded as interbedded. The first great break in the deposition of the Harz rocks took place in the middle of the Carboniferous period at the time of the irruption of the Brocken granite. The metalliferous veins of Clausthal and St. Andreasberg were all in faults traversing the culm strata and the granite, but were truncated by the Zechstein, which rested unconformably on the flanks of the Harz, and were therefore of Permian age. The Harz was bare during the Coal-measure and Permian periods, as conglomerates of Harz fragments were found in these strata. During the Secondary period the whole region appeared to have remained submerged, but the huge fault which bounded the north side of the Harz and inverted the whole of the Secondary rocks showed that the final upheaval had begun at the close of the Cretaceous period.—Remarks on the genus *Megalichthys* (Ag.), with description of a new species, by R. H. Traquair, M.D., F.R.S. This specimen was found at Burdiehouse, and was believed to be a different species from the *Megalichthys* of the Coal-measures.—On the principles of classification, by Prof. J. Cossar Ewart, M.D.—On the occurrence of an adult specimen of Sabine's gull (*Larus sabinii*) in Scotland, with exhibition of specimen, by Mr. E. Bidwell. This was a male bird shot last autumn on a loch in Mull, and is said to be only the second specimen of the bird in a mature state known to have been found in Europe. Immature specimens of this rare bird have occasionally been met with on the west coast of Ireland, but its home is on the borders of the Arctic region. In connection with this, Mr. Harvie-Brown, F.Z.S., made some interesting remarks on the migration of birds.

PARIS

Academy of Sciences, February 25.—M. Rolland in the chair.—Notice of the scientific labours of the late M. Th. du Moncel, by M. Edm. Becquerel.—A second communication on hydrophobia, by MM. Pasteur, Chamberland, and Roux. The results are reported of further experiments on dogs, rabbits, poultry, sheep, monkeys, and other animals who were inoculated with the virus, chiefly by trepanning. The object of the operation was to ascertain how far immunity could thus be secured against rabies communicated by mad dogs. As many as twenty-three dogs have by the process been rendered absolutely safe from the effects of the virus in whatever way and in whatever quantity administered. To make the whole species in this way free from the disorder would afford a practical solution of the question in a prophylactic sense, for human beings are never affected by rabies except from virus proceeding directly or indirectly from dogs.—On the equilibriums established between chlorhydric and fluorhydric acids, by MM. Berthelot and Guntz.—General considerations on the distribution of plants in Tunis, and on their chief botanical affinities, by M. E. Cosson.—On the quantities forming a group of nonions analogous to the quaternions of Hamilton, by M. Sylvester.—Note on the chief inventions of the Genevese watchmaker, G. A. Leschot, who died on Feb. 4, by M. D. Colladon. Leschot was the first to suggest the use of carbonado (fragments of Brazilian black diamonds) for piercing rocks and tunnelling.—Memoir on atmospheric movements above barometric depressions and risings; schemas deduced from the results of the work of Hildebrand-Hildebrandsson, entitled "On the distribution of the meteorological elements about the barometric minima and maxima," by M. A. Poincaré.—*Résumé* of the observations made at Cape Horn on atmospheric electricity, by M. Lephay.—Determination of the proportion of carbonic acid present in the air effected by the mission to Cape Horn, by MM. A. Müntz and E. Aubin. From these observations it appears that the quantity of carbonic acid present in the atmosphere at Cape Horn is only about 2·56 in 10,000 volumes of air, as compared with 2·84, the average in Europe.—Observations of the Pons-Brooks comet made at the Observatory of Marseilles, by M. Borrelly.—On the appendices to the nucleus of the Pons-Brooks comet, by M. P. Lamey.—On the red glows observed at sunset and sunrise during the mild winter of 1876–77, by M. P. Lamey.—On the rosy, crepuscular after-glows recently observed at Buenos Ayres, by M. Beuf.—On a sudden earthquake-wave observed on January 14, at Montevideo, by M. Beuf. At 7.30 a.m. the water suddenly fell several feet, and then rose in two successive waves about 1·5 m. above the ordinary sea-level. The disturbance seems to have been quite local, and was not felt at Buenos Ayres on the opposite side of the estuary.—On the calculation of the diurnal rotation of the solar spots, by M. Pansiot.—On the hyperfuchsian groups (mathematical analysis), by M. H. Poincaré.—On the propagation of a uniform shock communicated to a gas inclosed in a cylindrical tube, by MM. Sebert and Hugoniot.—On the lowering of the freezing-point of solutions of alkaline salts, by M. F. Raoult.—Heat of formation of the chloride and oxychlorides of antimony, by M. Guntz.—On the heat of formation of the oxybromides of mercury, by M. G. André.—Synthesis of the pyridic and piperidic bases, by M. A. Ladenburg.—On the addition of the chloride of iodine ICl to monochloruretted ethylene, $CH_2 = CHCl$, by M. L. Henry.—New reduction of the carbamate of ethyl, by M. G. Arth.—On ethyl and the methylacetylcyanacetate of ethyl, by M. A. Held.—On the action of bromuretted ethylene on benzine in the presence of chlorine of aluminium, by MM. Hanriot and Guilbert.—On the action of rennet on milk, by M. E. Duclaux.—Researches on the fermentation of farmyard manure, by M. U. Gayon.—Experimental researches on rabies, showing (1) that birds are liable

to be attacked; (2) that they recover spontaneously, by M. P. Gibier.—Note on the electric reaction of the sensory nerves of the skin in ataxic animals, by M. M. Mendelssohn.—On the treatment by electricity of the elephantiasis prevalent amongst the Arabs, by MM. Moncorvo and Silva Araujo.—On the poison of the toad and other batrachians, by M. G. Calmels.—On the sexual differences of the *Corbæus bifasciatus*, and on the pretended eggs of this coleopterous insect injurious to the evergreen oak, by M. A. Laboulbène.—On the coincidences observed between the solar phenomena witnessed in 1831 and 1883, by M. A. Witz.

BERLIN

Physiological Society, February 1.—Dr. W. Wolff had had occasion to make an intimate study of the electrical plates of the torpedo, in the course of which he came upon a series of facts which served to explain the still very diverse views of authors on the structure of the electrical organ, and so confirmed his conception of the subject. The electrical organ of the fish in question consists, as is well known, mostly of hexagonal columns extending from the dorsal usually to the ventral side, though occasionally not so far. They were embedded in sheaths of ligamentous texture, in which were found the nerves and vessels of the organ, and consisted of single plates of 0·012 millimetres thickness piled one above the other, without any intermediary substance; detached cells of connective tissue, each with two or three fine offshoots, were now and again found between the plates, which themselves, in the main consisting of elastic fibres, were easily capable of being coiled in at the edges. In the plates, between the fibres were found detached round granules of a diameter equal to the thickness of the plates. These granules were for the most part enveloped each in a transparent sheath. On the lower side of the plate were seen punctiform organs consisting of small, powerfully refracting granules of a semi-liquid gelatinous consistence. Hitherto they had been for the most part regarded as the terminal organs of the nerves, and in the descriptions given of them by different authors the most diverse structures were imputed to them. According to Dr. Wolff, however, these were all accidental productions. The granules had no relation whatever to the nerves, their only function being probably that of making the plates cohere. The nerves ran in the sheaths of connective tissue belonging to the columns, and there split up into bundles of primitive fibers bending each to a single plate, in order to spread out on its lower side, dividing, as they constantly did, in a dichotomous manner. Soon the medullary sheath terminated either at a dividing spot or in the course of a twig, and all that remained was but the axial cylinder with the Schwann sheath. The dichotomous partition having been pushed forward to the most delicate filaments capable of being recognised, the Schwann sheath passed over into the membrane of the plate, while the axial cylinder in all probability came suddenly to an end.—Prof. Kronecker handed in a treatise for the *Proceedings*, in which he rebutted as unjustifiable the claims of priority advanced by M. Arloing in Paris against Herren Kronecker and Meltzer in the matter of the stoppage of the movements of swallowing.—Dr. Mœli gave a report on changes occurring in the cortex of the cerebrum of guinea-pigs, which he had observed after cutting through the capsula interna of the thalamus. Conjectures he had made on the course of the fibres in the cerebrum led him to cut through the fibrous courses of the corona (*Stabkranz*) radiating from the thalamus and running to the cerebrum at a point as far as possible from the cerebral cortex, and after a considerable time to examine the changes that had been produced in the cortical tissue in consequence of this cutting. By this examination he found that a large part of the fine filaments of the cortical substance had degenerated and faded away. A part of the ganglia, on the other hand, had continued unchanged, while another part had been essentially altered. Altogether Dr. Mœli distinguished in the cortex four species of ganglia: (1) round, (2) fusiform, (3) pyramidal, and (4) small and round, with short appendages. The first two, slightly tinged with colouring matter, remained unchanged on the side operated on, and like those on the sound side. The pyramidal and caudated cells, on the other hand, which were strongly tinged with colouring matter, had shrunk on the side operated on, and were greatly altered from those on the sound side. From this Dr. Mœli concluded that there was a centripetal propagation of the degeneration from the cut fibres to their central ganglia.—Dr. J. Munk took a survey of the various views held on the resorption of fat, and called to mind that in former experiments he had demonstrated how sebacic acids might, in the process of nourishment, take the place of neutral fat, but that even in the chyle neutral fats were alone to be found. By many physiologists the absorption of neutral fats from the food was disputed, and it was sought to derive the whole deposition of fat from decomposed albumen. Dr. Munk considered the arguments adduced in support of this view as not pertinent, and had repeated the fundamental experiment, which consisted in the absorption of a heterogeneous, and therefore easily demonstrable, neutral fat. He gave a dog, which through a long course of starvation had lost almost all the fat of its body, a large quantity of rape seed, and only so much albumen as was just necessary for the preservation of its life. After having been kept on this artificial food for a length of time, the dog was killed, and the fat of the skin, together with that of the ventral cavity, was melted in one lot, and compared with the fat of a dog that had been normally fed. The very appearance of the two kinds of fat under the temperature of the sitting-room was greatly different. The fat of the dog fed on rape seed was clear and fluid, and had but a little sediment of a firmer fat, while the fat of the normally fed dog formed a soft opaque mass. Chemically analysed, the first yielded some 80 per cent. of sebacic acid, while the normal fat contained but 68 per cent. of sebacic acid. Finally, Dr. Munk was able to demonstrate the presence of erucic acid in the fat of the rape-seed fed dog, though in a somewhat impure state, a fact which conclusively proved the absorption of rape seed, and therefore of alimental fat. Dr. Munk stated that at the next meeting of the Society he would communicate further experiments regarding the formation and deposition of the fat in the animal body.—After their addresses Dr. Wolff and Dr. Mœli gave demonstrations in the demonstrating hall of the Physiological Institute.

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