branch from the fifth in the orbit, but this could not be found in the present specimen. The three divisions of the fifth cranial nerve were distinct, but the ophthalmic and supra maxillary left the skull by a common foramen. The vagus gave off branches answering to the spinal accessory, and also a large lateral nerve which ran back along the body, giving off no branches until it reached the great lateral muscles of the tail, and in that differing from the corresponding nerve of fishes. The spinal nerves resembled in most points those of man very closely, the brachial and crural plexuses were, however, much more simple, which Prof. Humphry thinks is associated with a less perfect specialisation of the action of the limb muscles; and below knee and elbow the course of the nerve trunks in the fore and hind limbs was almost identical.—The next paper is by Prof. Flower, "On the composition of the Carpus of the Dog." The os centrale had previously never been recognised in Carnivora, and both Cuvier and Owen regarded it, in those animals in which it is present, as a dismemberment of some element of the carpus; Gegenbaur, however, regarded it as itself a true carpal element, though never able to discover the state of things in those cases in which it was absent. However, in the skeleton of a dog six weeks old, Prof. Flower finds that the so-called scapholunar bone consists of three distinct pieces, viz., a distinct scaphoid and lunar, and a third piece evidently answering to the os centrale; thus confirming the view that the latter is a true primitive carpal element.—Dr. Messenger Bradley gives an account of the brain of an idiot, who during life could taste and hear well, and could repeat a few words in a parrot-like manner, but was congenitally blind, and never recognised any one, or, although not paralysed, made any attempt at locomotion. His bones were extremely fragile, fracturing invariably if he jerked a limb against the bed. The brain when removed weighed twenty-eight ounces: most of the fissures and lobes of the cerebrum were present, but (notwithstanding the small size of the hemispheres) were relatively small. The island of Reil was small and very simple. The corpora quadrigemina were very small, which is interesting, taken in connection with his blindness. The cerebellum was relatively large, the vermiform process was imperfect, the pyramid and short commissure entirely absent, and the left hemisphere considerably lighter than the right. The bones throughout the body when examined microscopically were found permeated with oil drops and granular matter, but when these were washed away normal bone structure could be made out, except an unusually large size of the Haversian canals.—Prof. Young contributes some facts in the anatomy of the shoulder girdle of birds, showing that the only movement of the humerus in flight which is anatomically possible, is that in a figure of eight.—A short description by Mr. Watson, of the digestive, circulatory, and respiratory organs of the Indian elephant, follows.—The action of the chlorides of platinum, iridium, and palladium when introduced into the blood of dogs is the subject of an interesting paper by Dr. Blake, of San Francisco.—Prof. Turner describes the variations of nerves in the human body which he has lately met with, and then follows a paper by Prof. Struthers on the Great Fin Whale, the most interesting points being a careful account of the muscles of the fore-limb, helping to clear up some points as to the homologies of the bones; and the discovery, for the first time in this species, of a bony rudiment of the femur, though Prof. Flower had previously noticed a cartilaginous one.—Mr. Garrod gives some observations made on himself showing that the exposure of the nude body to a temperature below 70° F. causes a rise in the internal temperature of the body; which is greater the lower the temperature of the surrounding air down to 45°, the lowest point at which observations have been made. This he attributes to a contraction of the cutaneous vessels driving the blood inwards, and also lessening the conducting power of the skin. Exposure to a temperature of 70° causes no rise.—A detailed description of the anatomy of the Malayan Tapir, by Dr. Murie, and of the muscles and nerves of the chimpanzee and anubis, by Mr. Champneys, do not admit of a short abstract being given of either of them.—The Report of the Progress of Physiology, by Drs. Brunton and Ferrier, is very full, and contains short accounts of many matters of great interest. The anatomy report is postponed.

SOCIETIES AND ACADEMIES

LONDON

Geological Society, January 24.—Mr. Joseph Prestwich, F.R.S., president, in the chair.—The following communications were read:—(1) "On the Foraminifera of the Family Rotalinæ (Carpenter) found in the Cretaceous Formations, with Notes on their Tertiary and Recent Representatives," by Prof. T. Rupert Jones, and Mr. W. K. Parker, F.R.S. The authors enumerated the Rotalinæ which have been found in the Cretaceous rocks of Europe, and showed by tabular synopses the range of the species and notable varieties in the different formations of the Cretaceous system. For the comparison of the Tertiary Rotalinæ with those of the Cretaceous period the following Tertiary formations were selected:—the Kessenberg beds in the Northern Alps, the Paris Tertiaries, the London Clay, the Tertiary beds of the Vienna Basin, and the English and Antwerp Crags. The authors also enumerated the recent Foraminifera of the Atlantic Ocean. The authors stated that of *Planorbulina* several species and important varieties of the compact, conical form occur throughout the Cretaceous series, and that those of the Nautiloid group are still more abundant. The plano-convex forms are represented throughout the series by *P.* (*Truncatulina*) *lobatula*; but the flat concentric growths had not yet come in. *Planorbulina* extends down to the Lias and Trias. *Pulvinulina repanda* is feebly represented in the uppermost Chalk, but forms of the "*Menardii*" group abound throughout the series. Species of the "*elegans*" group are peculiarly characteristic of the Gault, and some of the "*Schreibersii*" group are scattered throughout. These two groups extend far back in the Secondary period. The typical *Rotalia Beccarii* is not a Cretaceous form, but the nearly allied *R. umbilicata* is common. *Tinoporus* and *Patellina* occur at several stages; *Calcarina* only in the Upper Chalk. The above-mentioned types are for the most part still living, but the "*auricula*" group of *Pulvinulina* is wanting in the Cretaceous series, as also are *Spirillina* and *Cymbalopora*, except that the latter occurs in the Maestricht Chalk. *Discorbina* and *Calcarina* make their first appearance in the uppermost Chalk. The chief distinction between the Cretaceous and the existing Rotalinæ was said to consist in the progressively increasing number of modifications. The authors concluded by disputing the propriety of regarding the Atlantic ooze as homologous with the Chalk. The president suggested the possibility of some of the minute Foraminifera being transported fossils derived from earlier beds than those in which they are now found. Dr. Carpenter observed that the mode of examination to be adopted with Foraminifera was different in character from that which was applicable to higher organisms. The range in variation was so great that an imperfect examination of Nummulites had sufficed to make M. d'Archiac reduce the number of species by one half; and all the speaker's subsequent studies had impressed upon him the variety in form and in sculpturing of surface on individuals of the same species. When out of some thousands of specimens of *Operculina*, say, a dozen pronounced forms had been selected, such as by themselves seemed well marked and distinct, it might turn out that after all there was but one species present with intermediate varieties connecting all these different forms. He thought the same held good with Rotalinæ, and that there were osculant forms which might connect, not only the species, but even the genera into which they had been subdivided. This fact had an important bearing on their genetic succession, especially as it appeared that some of the best-marked types were due to the conditions under which they lived. The temperature in tropical seas differed in accordance with the depth so much, that when 2,000 fathoms were reached a degree of cold was attained such as was to be found in high latitudes; and in consequence the deep-sea forms in tropical latitudes assumed the dwarfed character of those in shallower seas and nearer the pole. He suggested caution in drawing inferences from forms so subject to modification, both spontaneous and due to the depth of the sea, especially as connected with abundance of food. Prof. Ramsay remarked that geologists would be pleased to find Foraminifera exhibiting, like other organisms, changes in some degree connected with the lapse of time. These low forms, however, could hardly afford criteria for judging of the age of geological formations, while at the same time such ample means were afforded by the higher organisms for coming to a conclusion. He cited, for instance, the Cephalopoda, as proving how different were the more important forms of marine life in Cretaceous times from those of the present day. He thought that no one who had thoroughly studied the forms of ancient life would be led to ignore the differences they presented, as a whole, from those now existing.—Prof. Jones, in reply, observed that the question of whether the Foraminifera in a given bed were derived or not was to be solved partly by their condition and partly by their relative proportions, but that in most

cases sufficient data existed on which to found a judgment. He agreed with Dr. Carpenter as to the existence of extreme modifications, and it had been his object to ignore such as seem due to ordinary and local causes, and to group the forms in accordance with certain characteristics. Whether the classification was right or wrong, it was necessary, for the sake of increasing knowledge, that fossils of this kind should be arranged in groups; and whether these were to be regarded as truly generic was a minor consideration. In forming their types and subtypes the authors had carefully avoided minor differences; but they still thought that the modifications which were capable of being substantiated were significant of a great lapse of time. A variation once established never returned completely to the original type. In *Globigerina*, he stated that there were in Cretaceous times 8 forms, in Tertiary 12, at the present time 14; and these modifications he regarded as equivalent to the specific changes in higher animals.—(2.) "On the Infralias in Yorkshire," by the Rev. J. F. Blake. The Infralias, *i.e.*, the zones of *Ammonites planorbis* and *Am. angulatus*, have been recorded hitherto only from Redcar, to the beds at which place the author referred; but the chief object of the paper was to describe some sections at Cliff, near Market Weighton, where these and lower beds are well exposed, and have yielded a numerous suite of fossils. He considered, however, that these beds did not belong to the typical Yorkshire area, but were the thin end of the series which stretches across England. He supposed there had been a barrier in Carboniferous times, which had separated the coal-fields of Yorkshire and Durham, prevented the continuity of the Permian beds, and curved round the secondary rocks to the north of it, to form the real Yorkshire basin, while these beds at Cliff were immediately to the south of it. The sections described were six in number, the first pit yielding the great majority of the fossils, and the third showing best the succession of the beds. The fossils could be mostly identified with known forms, and showed a striking similarity to the Hettangian fauna. In all the clays of the Infralias Foraminifera were numerous and varied. The section in pit No. 3 showed, commencing at the top:—1. Stone bed with *Am. angulatus* (the fossiliferous bed of pit No. 1). 2. Thick clays, with bands of stone characterised by *Am. Johnstoni*. 3. One band of clay with *Am. planorbis*. 4. Thin-bedded stones and clays, some of them oyster-bands. 5. Clays without Foraminifera, and with impressions of *Anatina* (White Lias). The *Avicula contorta* series is not reached, nor are there any signs of the bone-bed, as the junction with the Keuper marls, which are found three miles off, is not seen. The paper was followed by references to the fossils mentioned, including the description of those that are considered new. Prof. Duncan remarked that English geologists had been backward in receiving the term Infralias, which he had suggested with respect to the Sutton Down beds some years ago, and the propriety of which was shown by the term having been applied to the same beds by French geologists at a still earlier period. As to the White Lias, he regarded it as a mere local deposit, not to be found out of England. He traced the existence of the Infralias from Luxembourg through France into South Wales, where corals were abundant. In Yorkshire, though one fine coral had been found, the Ammonites seemed to point to a difference in condition. Mr. Hughes remarked that the lithological character of the beds, as described by the author, did not agree with that of the Infralias in the S.W. of England or the N. of Italy, and that the palæontological evidence which had been laid before the Society did not confirm the view that they were Infralias, the author having especially noticed the absence of *Avicula contorta* where he expected that it should occur. Also, by reference to the author's section, Mr. Hughes pointed out that below what he described as Infralias he drew other beds which were not Trias, the author having explained that some beds which had been called Trias were only stained beds of Liassic age.—The Rev. J. F. Blake, in reply, acknowledged the difference between the Yorkshire section and those of the neighbourhood of Bath, but insisted on the similarity of the fossils.

Linnean Society, February 1.—Dr. J. D. Hooker, F.R.S., vice-president, in the chair. "On the Classification and Distribution of Compositæ," by G. Bentham, F.R.S., president. The order Compositæ, or Synantheræ, is remarkable, not only from its enormous size, but from its extremely natural and well-marked characters, there being not a single instance in which it is doubtful whether a plant should be referred to this order or not. All the essential characters of the androecium, pistil, structure of the fruit, structure of the seed, and inflorescence are absolutely constant throughout the 10,000 species comprised within it. This very fact, however, renders its sub-division into tribes and genera a matter of extreme difficulty, the systematist being compelled to adopt characters as generic, which, in other orders, would hardly be considered as even specific. After briefly reviewing the labours of Linnæus, Jussieu, Cassini, Don, Lessing, Schultz Bipontinus, De Candolle, Asa Gray, Hildebrand, Delpino, and other botanists who have paid special attention to this subject, the author spoke of the special opportunities he had had in the preparation of the "Genera Plantarum," in conjunction with Dr. Hooker, for examining himself nearly the whole of the genera comprised within the limits of the order, and then proceeded to the consideration of the value of the several characters available for the distinction of genera and tribes: 1. Sexual differences in the florets contained in the capitulum, which may either have both the male and the female organs perfect, or the female organs sterile in the central florets, or the male organs or both sets abortive or wanting in the marginal florets. These distinctions formed the basis of Linnæus's order, but have been considered of less and less importance by subsequent writers. The author finds them sometimes constant in large genera or subtribes, sometimes variable in closely-allied species. 2. Di- and tri-morphism, very rare in Compositæ, except as connected with sexual differences. 3. Differences in the pistil. The ovary and ovule are uniform throughout the order, and the style nearly so when it acts only as the female organ; but the modifications of its extremity, in so far as they are destined to sweep the pollen out of the anther tube, supply some of the most important differential characters for genera, and even for tribes. These characters, first brought forward by Cassini, formed the basis of Lessing's and De Candolle's classifications, but have in many instances been too implicitly relied upon. 4. Differences in the fruit and its pappus. The structure of the fruit and seed is uniform in the order, but the outer shape of the achene and its ribs, angles, or wings have been made much use of, especially by Schultz Bipontinus, and the pappus presents such infinite variations so easily observed that it has been applied to the distinction of innumerable genera often very artificial. 5. Differences in the androecium. The male organs are as uniform in their structure, number, insertion, and relative position as other essential parts of the flower, but appendages often observed at the base of the anthers, usually called tails, having no apparent function to perform, are, however, so constant in their presence or absence, as to supply most valuable tribual characters. 6. Differences in the corolla, which, though uniform as to essential points in its structure and position, shows modifications of the limb or lamina, which are of great importance as distinctive characters: (1) the pentamerous ligula of Cichoraceæ truncate at the end with five short equal teeth; (2) the regular tubular corolla, either slender and equal to the end, or expanded upwards into an equally toothed or lobed limb; (3) the bilabiate corolla, in which the two inner lobes forming the inner lip are usually shorter or smaller or more deeply divided than the three outer; and (4) the trimerous ligulate corolla forming the ray of most heterogamous capitula, in which the two inner lobes are deficient or rarely represented by minute slender teeth. 7. Differences in the calyx. This organ is so reduced as to supply no characters except such as are derived from the ribs and pappus of the ripe fruit, and are considered under that head. 8. Differences in the ultimate inflorescence and bracts, *i.e.*, in the capitulum, its involucre, receptacle, and paleæ, the modifications of which acquire a great degree of constancy and consequent importance in the distinction of genera or even of tribes, as might be expected from the increased functions imposed upon them by the abortion of the calyx. 9. Differences in foliage. There is no type of foliage in Compositæ which may not be found in several other orders, although the leaves are never compound with articulate leaflets, but the opposition or alternation of the leaves are of great assistance as characters of some of the tribes, differences in habit, stature, and general inflorescence, rarely giving absolute characters excepting where numerous capitula are crowded on a common receptacle into a kind of compound capitulum. 10. Differences in geographical distribution, which, if considered in as far as it may be attributed to origin independently of climatological considerations and modern colonisations, may be of great use in determining natural genera. In the portion of the paper now laid before the society and read in abstract the author enters into considerable detail with regard to the above several series of available characters, and concludes with a summary of the thirteen tribes which he has adopted for the "Genera Plantarum,"

reserving for a future meeting the second part relating to the geographical distribution of the order.

Chemical Society, February 1.—Dr. Frankland, F.R.S., president, in the chair.—When the ordinary business of the Society had been transacted, a note "On the crystalline principle of Barbadoes aloes" was read by the author, Dr. W. A. Tilden, in which he described anew derivative of aloïn. This is chloraloïn, which crystallises from boiling-water in yellow silky needles, bearing considerable resemblance to the corresponding bromime compound bromaloïn.—Dr. C. R. A. Wright then read an elaborate paper "On the relations between the atomic hypothesis and the condensed symbolic expression of chemical facts and changes known as dissected (structural) formulæ," in the first part of which he showed the possibility of expressing chemical facts without reference to the atomic theory; and in the second examined how far these facts could be accounted for by the atomic hypothesis. A long and very interesting discussion ensued, in which some of the speakers advocated the employment of the atomic theory to a greater or less extent, as promoting the progress of chemical science, whilst others desired its abolition.

PARIS

Academy of Sciences, January 29.—A note by M. J. Boussinesq on the integration of the equation with partial derivatives of the isostatic cylinders produced in a homogeneous and ductile solid, was presented by M. de Saint-Venant.—M. A. Ledieu read a note containing objections to the marine gyroscope proposed by M. E. Dubois at the meeting of January 22.—M. J. A. Serret presented a memoir on the pendulum of Léon Foucault.—M. Jamin presented a note by MM. A. Cornu and E. Mercadier on melodic musical intervals, confirmatory of their previous results.—A note by M. J. Violle on the induction currents produced in the polar masses of Foucault's apparatus was read.—M. Daubrée presented a note by M. Peslin on the bands of the solar spectrum, in which the author indicates a very simple relation between the most important bands.—M. Delaunay communicated a note by M. Fron on the prevision of certain earthquakes.—A further note by Father Secchi, on the temperature of the sun, was read, in which the author still maintains his opinion as to the enormous temperature of that body.—A note by M. E. Liais on absolute meridian observations in the low latitudes of the southern hemisphere was read, with especial reference to the observatory of Rio de Janeiro. Upon this paper MM. Le Verrier and Laugier made some remarks.—M. S. Meunier communicated a paper on the methods which concur in demonstrating the stratigraphy of Meteorites.—M. Delaunay made some remarks upon the note presented to the last meeting of the Academy by M. Renou with regard to the Meteorological Manual of the Paris Observatory for 1872, and presented to the Academy the first number of a monthly Meteorological Bulletin published by the Observatory.—M. P. Thenard presented some observations upon the preservation of wines by heating, in connection with a recent note by M. Balard. He claimed the discovery of the action of heat upon wines for MM. Appert and de Verguette.—M. Chevreul read a note upon the investigations upon dyeing carried out by M. Paul Havrez; MM. Monteféore-Levi and Kunzel presented a reply to a claim of priority made by MM. de Ruolz and Fontenay with respect to the discovery of phosphorus bronze and its employment in the manufacture of ordnance; M. Wurtz presented a note by M. L. C. Coppet on the supersaturation of the solution of chloride of sodium; and M. C. Bernard communicated a note on the analysis of the gases of the blood by MM. A. Estor and C. Saint-Pierre.—The lively discussion commenced two or three meetings ago on fermentation and heterogeny was reopened by a long paper on fermentations by M. E. Fremy, and continued by MM. Balard and Wurtz.—M. C. Martins read an important paper on the normal position of the hand in man and in the vertebrate series.

BOOKS RECEIVED

ENGLISH.—The Highlands of Central India: Capt. J. Forsyth (Longmans).—Rude Stone Monuments in all Countries: J. Fergusson (J. Murray).—Hints and Facts on the Origin of Man: P. Melia (Longmans).—A Dictionary of Chemistry, Supplement: H. Watts (Longmans).—Gandeamus: Humorous Poems translated from the German by C. G. Leland (Trübner).—Geometrical Conic Sections: J. S. Jackson (Macmillans).—Arithmetic in Theory and Practice: J. Brook Smith (Macmillans).—Worms, a Series of Lectures on Practical Helminthology: Dr. T. S. Cobbold (Churchill).

FOREIGN.—Medizinische Jahrbücher, 1871; Heft 4: S. Stricker.—Mittheilungen der Naturforschenden Gesellschaft in Berne, 1870.—Nouveaux Mémoires de la Société Helvétique des Sciences Naturelles en Berne, Vol. xxiv.—Beiträge zur Kritik der Darwinsche Lehre: Dr. E. Askenasy.

DIARY

THURSDAY, FEBRUAR Y 8.

ROYAL SOCIETY, at 8.30.—Experiments concerning the Evolution of Life from Lifeless Matter: W. N. Hartley.—Experiments on the Directive Power of Large Steel Magnets, of Bars of Magnetised Soft Iron, and of Galvanic Coils, in their Action on External Small Magnets; with Appendix, containing an Investigation of the Attraction of a Galvanic Coil on a Small Magnetic Mass: James Stuart, M.A.

SOCIETY OF ANTIQUARIES, 8.30.—On the Hunnebedden of Holland: A. W. Franks.—On an Inscribed Saxon Knife; J. Evans, F.R.S.—On a Sword Found in Spain: Col. Lane Fox.

MATHEMATICAL SOCIETY, at 8.—On the Factors of the Differences of Powers, with especial reference to a theorem of Fermat's: W. Barrett Davis.—On an Algebraical Form and the Geometry of its dual connection with a polygon, plane, or spherical: T. Cotterill.

FRIDAY, FEBRUARY 9.

ASTRONOMICAL SOCIETY, at 3.—Anniversary Meeting.

ROYAL INSTITUTION, at 3.—On Sleep: Prof. Humphry, F.R.S.

QUEKETT MICROSCOPICAL CLUB, at 8.

SATURDAY, FEBRUARY 10.

ROYAL INSTITUTION, at 3.—On the Theatre in Shakespeare's Time: Wm. B. Donne.

SUNDAY, FEBRUARY 11.

SUNDAY LECTURE SOCIETY, at 4.—On the Skeleton of the Higher Vertebrates: Dr. T. S. Cobbold, F.R.S.

MONDAY, FEBRUARY 12.

GEOGRAPHICAL SOCIETY, at 8.30.

LONDON INSTITUTION, at 4.—Elementary Chemistry: Prof. Odling, F.R.S.

TUESDAY, FEBRUARY 13.

ROYAL INSTITUTION, at 3.—On the Circulatory and Nervous Systems: Dr. W. Rutherford, F.R.S.E.

PHOTOGRAPHIC SOCIETY, at 8.—Anniversary Meeting.—On a Comparison of the Different Modes of Plate Cleaning: Dr Anthony. The Nièpce de St. Victor specimens will be shown.

WEDNESDAY, FEBRUARY 14.

SOCIETY OF ARTS, at 8.—On the Study of Economic Botany: J. Collins.

THURSDAY, FEBRUARY 15.

ROYAL INSTITUTION, at 3.—On the Chemistry of Alkalies and Alkali Manufacture; Prof. Odling, F.R.S.

ROYAL SOCIETY, at 8.30.

SOCIETY OF ANTIQUARIES, at 8.30.

LINNEAN SOCIETY, at 8.—On a Chinese Artichoke Gall: A. Müller, F.L.S.—On the Habits, Structure, &c., of the three-banded Armadillo: Dr. J. Murie, F.L.S.—Comparative Geographical Distribution of Butterflies and Birds: W. F. Kirby.

CHEMICAL SOCIETY, at 8.

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