

distance of the centres of the Sun and of Venus during the transits of that planet.—M. P. J. Van Beneden describes a new Sirenian from the Rupelian stage. The remains of this animal were obtained at Elsloo, near Maestricht, and consist of a portion of the cranium, one dorsal vertebra, and a series of seven caudal vertebrae. These are described and figured by M. Van Beneden under the name of *Crassitherium robustum*; he regards it as more nearly allied to the *Stelleræ* than to the Manatees and Dugongs. M. Van Beneden also notices the occurrence at Basel near Rupelmonde of a nearly complete skeleton of a Sirenian in brick-clay, and remarks upon the constant association of remains of *Squalodon* with those of Sirenians wherever the latter have been found in Europe. He also notices some points in the osteology of living Sirenia.—M. E. Van Beneden gives us a note on the preservation of the lower animals, in which he recommends the employment of solutions of osmic acid and picric acid for the preservation of the more delicate forms of animal life, such as the Medusæ, Ctenophora, &c. According to him these processes are most successful.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December 21.—“Contributions to the History of Orcin.—No II. Chlorine and Bromine-substitution Compounds of the Orcins.” By John Stenhouse, F.R.S.
“Note on Fucusol.” By John Stenhouse, F.R.S.

Mathematical Society, December 14.—Dr. Spottiswoode, president, F.R.S., in the chair. Mr. K. Freeman, of St. John's College, Cambridge, was elected an ordinary member, and the following gentlemen foreign members of the Society:—Dr. Clebsch, M. Hermite, Prof. Cremona, Dr. Hesse, and Prof. Betti. Dr. Sylvester explained the methods he had employed in his paper, “On the theorem that an arithmetical progression which contains more than one contains an infinite number of prime numbers.” The communication was limited to the case of arithmetical progressions proceeding according to the common difference, 4 or 6. The method employed appears to differ fundamentally from Dirichlet's method (Berlin Transactions, 1837). [In the account of Dr. Sylvester's previous communication to the Mathematical Society, given in NATURE, Nov. 23, p. 75, at line 18 from the commencement of the paragraph, for *intention* read *induction*, and at line 20 from the foot of the page, for the words *the magnitude read the order of the magnitude*.] Prof. Cayley and H. J. S. Smith took part in a discussion on the subject.—Prof. Clifford next spoke with reference to a paper, he is preparing for the society.—Prof. Cayley then drew attention to the question of the determination of the surfaces capable of division into infinitesimal squares by means of their curves of curvature. It was shown by M. Bertrand that in a triple system of orthotomic isothermal surfaces each surface possesses the property in question, of divisibility into squares by means of its curves of curvature. But in such a triple system each surface of the system is necessarily a quadric. There is nothing to show that the property is confined to quadric surfaces, and the question of the determination of the surfaces possessing the property appears to be one of considerable difficulty, and which has not hitherto been examined.—Mr. S. Roberts exhibited a thread model of a homographic transformation of the developable surface which circumscribes a system of compound quadrics. The surface is generated by planes touching an ellipse at a constant inclination, and its equation is obtained by writing $y^2 z^2$ for r^2 in $\phi(x^2, y^2, r^2) = 0$ representing the plane parallel of an ellipse.

Anthropological Institute, December 18.—Dr. Charnock, president, in the chair. Lord Dunraven, Dr. John Best, and Mr. J. Kempe were elected members. A paper was read by Mr. Joseph Kaines on the “Anthropology of Auguste Comte.” The sources of the paper were to be found in chapters on “Biology” and “Fetichism” of M. Comte's *Philosophie Positive* and in the *Politique Positive*. The paper itself aimed to show that the differences between man and the rest of the animal kingdom were not so great as they were usually represented, nor in fact were they so numerous in their resemblances. Treating man as the head of the zoological series, it argued that his dominion over animals was from primitive times (and is now) a moral dominion rather than intellectual, and it concluded, that in so far as external nature was used by man for

moral ends, it was rightly used, and that the intellect found its true work in directing his affective nature to moral purposes and relationships.

Linnean Society, December 21.—Mr. G. Bentham, F.R.S., president, in the chair. “On the Anatomy of the American King-Crab (*Limulus polyphemus*, Latr.),” by Prof. Owen, F.R.S. The author, referring to anatomies of existing species of animals elucidating the type of structure of large extinct groups—as that of *Apteryx* in reference to the *Dinornithide*; of *Protopterus* in relation to the notochordal, protocercal Cyclogonoids of palæozoic beds; of *Nautilus* as the representative of the constructors of extinct chambered and siphonated shells; of *Orbicula*, *Discina*, and *Terebratulajin* like relation to extinct *Brachiopoda*—stated that, in reference to the Trilobite Crustacea, he had once doubted whether *Serolis* or *Limulus* would reflect most light on the internal structure of those ancient forms of the class. But, in the 14th lecture of the Hunterian Course of 1843, published in April of that year, appreciating the importance of the character by which the Xiphosures and Trilobites agreed in differing from *Malacostraca*, viz., in the numerical formula of segments, he decided to take *Limulus* in hand. Isopodal tendencies in Trilobites indicated, however, their more generalised character, and continued palæontological research led to the postponement of the original purpose, until the subsequent discoveries of a palæozoic group of Crustacea, due mainly to the labours of Salter, Huxley, and Woodward, decided the author no longer to delay the present communication, in view of its more special bearings upon the *Merostomata* of the last-named carcinologist. Of the external characters of *Limulus* but little was left to describe. The author accepted the evidence of the homologies of the three divisions of the body adduced by Dana, Spence Bate, and Woodward as outweighing that which influences V. der Hoeven. The “cephalothorax” of the latter author was the “cephalon,” the second division was, not the “abdomen,” but the “thorax,” of the later carcinologists. The determination by the latter of the articulated appendages of the foremost division of the body of *Limulus* was also adopted. But as that division includes not only the brain, organs of sense, mouth, and manducatory instruments, but also the stomach, liver, major part of the heart, and genital organs, together with a long tract of the ventral ganglionic neural chords or centres, the author proposed to speak of it as the “cephaletron,” the succeeding division as the “thoracetron,” for the spine-shaped part he adopted Spence Bate's term of “pleon.” In the description of the cephalotron, its modifications enabling it to act effectively as a burrowing digger or spade were dwelt upon, and the modifications of the hind border which articulates with the thoracetron were pointed out, showing that whilst by coalescence it was part of the foremost division in all its formal characters, more especially its upper pair of entapophysial pits and under pair of coalesced lamelliform appendages, it belonged to the series of lamelligerous segments constituting the thoracetron. The author then proceeded to give a detailed account of the muscular system of *Limulus*, and concluded this third section of the paper, by condensing notes made by Mr. Lloyd, of the Crystal Palace Aquarium, on the movements of living *Limuli* in captivity, and those made by Mr. Lockyer in New Jersey on the *Limulus polyphemus* in its native seas. The reading of this memoir will be continued at a subsequent meeting of the Linnean Society.

MANCHESTER

Literary and Philosophical Society, November 28.—Dr. J. P. Joule, F.R.S., vice-president, in the chair. “Encke's Comet and the Supposed Resisting Medium,” by Professor W. Stanley Jevons. The observed regular diminution of period of Encke's comet is still, I believe, an unexplained phenomenon for which it is necessary to invent a special hypothesis, a *Deus ex machina*, in the shape of an imaginary resisting medium. I cannot be sure that the suggestion I am about to make has not already been made, but I have never happened to meet with it; and therefore I venture to point out how it seems likely that the retardation of the comet may be reconciled with known physical laws. It is asserted by Mr. R. A. Proctor, Prof. Osborne Reynolds, and possibly others, that comets owe many of their peculiar phenomena to electric action. I need not enter upon any conjectures as to the exact nature of the electric disturbance, and I do not adopt any one theory of cometary constitution more than another. I merely point out that if the approach of a comet to the sun causes the development of electricity arising from the comet's motion, a certain resistance is at once accounted for.

Wherever there is an electric current, some heat will be produced and sooner or later radiated into space, so that the comet in each revolution will lose a small portion of its total energy. In the experiments of Arago, Joule, and Foucault, the conversion of mechanical energy into heat by the motion of a metallic body in the neighbourhood of a magnet was made perfectly manifest. If then there is any magnetic relation whatever between the sun and the comet, the latter will certainly experience resistance. The question is thus resolved into one concerning the probability that a comet would experience electric disturbance in approaching the sun. On this point we have the evidence now existing that there is a close magnetic relation between the sun and planets. If, as is generally believed, the sun-spot periods depend on the motion of the planets, a small fraction of the planetary energy must be expended. I find, indeed, that a very brief remark to this effect was given in the memoir of the original discoverers of the relation, namely, Messrs. Warren De La Rue, Balfour Stewart, and B. Loewy. At p. 45 of their Researches on Solar Physics they add a small note to the following effect: "It is, however, a possible inquiry whether these phenomena do not imply a certain loss of motion in the influencing planets." As I conceive, no doubt can exist that periodic disturbances depending upon the motions of bodies must cause a certain dissipation of their energy; for if stationary the constant radiation of the sun could not produce any periodic changes, unless the sun were itself variable. Is there not then a reasonable probability that the light of the aurora represents an almost infinitesimal fraction of the earth's energy, and that in like manner the light of Encke's comet represents a far larger fraction of its energy? It is also worthy of notice that the tail of a comet is usually developed most largely at those parts of its orbit where the rate of approach or recess is most rapid, and where the electric disturbance would be correspondingly intense. I do not, of course, deny that the resisting medium may nevertheless exist, or may by other observations or experiments be made manifest. But I hold that so long as other physical causes can be pointed out which might produce the same effect, it is quite unphilosophical to resort to a special hypothesis. Encke's comet ought not to be quoted as evidence of the existence of such a medium until electric disturbance is shown by calculation to be insufficient to account for the observed diminution of period.

LIVERPOOL

Geological Society, November 14.—Dr. Ricketts, president, in the chair. Mr. T. Mellard Reade, C.E., on the "Geology and Physics of the Post-Glacial Period, as shown in the Deposits and Organic Remains in Lancashire and Cheshire." The paper was largely illustrated by maps and sections. The author's views are summarised in the following conclusions:—1. That since the glacial period there are distinct evidences in Lancashire and Cheshire of three periods of depression or downward movement, and two periods of elevation or upward movement. There may also have been a period of elevation and a land surface previous to any of these movements, but posterior to the true glacial times. 2. That the first period of depression, which was the greatest, submerged the land to a minimum of 1,500 feet below its present level—in Wales at least—and was doubtless general. The post-glacial shells of Moel Tryfan and those by the Ribble, indicating ancient beaches, belong to this period. During this time, and the re-emergence of the land, what the author termed the "washed drift sand" was eliminated from, sorted, and reformed out of, the boulder drift, and scattered over the country, but has since been much denuded by atmospheric and aqueous or sub-aërial influences above the 25 feet contour, and by sub-aërial and submarine denudation below that line. 3. A re-emergence of the land took place, and a land-pause favourable to growth occurred, during which time the "inferior peat and forest beds," or sub-terrene land surfaces, were formed. At the period of pause the land would be higher than now, but the vertical extent of this movement the author purposed investigating hereafter. 4. A second period of subsidence again followed, and a pause occurred at or about the 25 feet contour line. "The Formby and Leasowe marine beds" were now laid down. 5. A second or latest vertical upward movement followed, elevating the Formby and Leasowe marine beds, upon which now grew the forest trees, the remains of which assist to form the "superior peat bed" extending along the coast margin from the river Douglas to Bootle in Lancashire, and from the Mersey to the Dee in Cheshire, and remains of which are found as high up the river Mersey as Garston and Warrington. 6. The third or latest downward movement now took place, and during this time the

river bed at Crossens was silted up, as also the Garston Creek. The drainage was obstructed, and the beds of marine silt intercalated in the peat. The tidal silt overlying the superior peat bed by the Douglas, the Alt, and the Birket, the silt which overlies the peat bed of Old Wallasey Pool, and that in which the vertebrae of a whale, now in Brown's Museum, were discovered at the North Docks, and all the deposits to which the author confined the term recent, belong to this period, in a pause of which we are now living. 7. That the whole of these movements were uniform over a far more extensive area than the author has investigated, he has not the shadow of a doubt. That post-glacial movements were slow is almost universally admitted, and from these the inference is obvious that the time which they measure compared with the historical period is so vast that it is difficult to form an adequate conception of it.

NORWICH

Norfolk and Norwich Naturalists' Society, October 31.—Mr. J. E. Taylor read a paper on "The Origin of the Norfolk Broads and Meres." With regard to the former, Mr. Taylor propounded the theory that the depressions, so-called, were owing to the influence of ice in remote ages, and that the basins thus scooped out had been since filled up by the growth of peat and the soil brought down by floods. His views were supported by an elaborate essay upon the probable condition of the European continent at the close of the glacial epoch, and the alterations effected by "the last geological change in its physical scenery and geography," as illustrated by the deep lakes of "Switzerland, Scotland, Cumberland, &c., hollowed out of the solid rocks by glacier action." He specially referred also to the great similarity in the physical aspect of the Dutch coast as compared with the Broad district of our eastern counties. Broads, he remarked, were distinguished from meres by being always in connection with rivers, and having a chalky bottom, more or less filled in with deposits of mud. Meres, on the contrary, in their physical characters, presented an almost entire separation from rivers and streams, "and the fact that they usually lie in the upper boulder clay, and therefore at a considerably higher level than the broads. The water supply of meres was simply the storage of wet seasons." The number of broads on the Bure and its tributaries, amounting in all to twenty-two, as compared with but four on the Yare, he attributed to the former stream having an average breadth of 150 feet, and the latter of only 100 feet. The formation of Diss Mere he considered due to glacial action, "as the neighbourhood abounded in evidences of such phenomena."—Mr. J. H. Gurney, jun., exhibited a male specimen of White's Thrush (*Oreocinclla aurea*), killed on the 10th October last, by Mr. F. Barrett, in a marsh at Hickling, and exhibited by permission of the Rev. J. Micklethwaite, for whose collection it is being preserved by Mr. T. E. Gunn. Mr. Gurney pointed out the distinctions between the closely allied genera *Oreocinclla*, *Turdus*, and *Merula*, and made some remarks on *O. aurea* as a British species. It is, he said, the *Turdus Whitei* of Egton, and of Yarrell's "British Birds," so called after the well-known naturalist of Selbourne, and has been killed in six or seven instances in this country, the specimen exhibited being the first recognised as occurring in this country. It is found in China, and is said to have been met with in Siberia.—Mr. Barrett exhibited specimens of *Zygonia exulans*, a Swedish moth recently taken in Scotland.

DUBLIN

Royal Irish Academy, December 11.—Prof. Henry Hennessy, F.R.S., vice-president, in the chair. Prof. Robert S. Ball read two notes on applied mechanics. In the first note it was demonstrated that in whatever manner a figure moves in a plane, a number of points, lying on the circumference of a circle, are any instant in points of inflexion of the curves which they describe, and that the points of the circle are at points the tangent to which meets the curve in four consecutive points. These theorems embrace what are known in mechanics as the parallel motions. The second note contained an elegant geometrical construction by which the consecutive points of contact of two curves are determined.—The Secretary then read a paper by Mr. Hodder M. Westropp, in which the writer stated that he had abandoned his former theory that the Ogham inscriptions had a Danish origin, and now suggested that after all the learned interpretations that had been attempted of their meaning, they were nothing more than notches made to mark the number of cattle possessed by the owner of a plot of land at the annual division which took place under the ancient Brehon

laws of Ireland. It was simply a rudimentary scoring of numbers, such as had taken place amongst all nations in the earliest stages of civilisation. There was no substantial reason for attributing to the Irish, who, even at the time of Giraldus Cambrensis, had scarcely emerged from barbarism, the formation of an alphabet, and the attempts to decipher the inscriptions by attributing to them an alphabetic character were simply absurd. Dr. Ferguson, Q.C., said he was sure that if Mr. Westropp knew anything of the circumstances in which these inscriptions were found he would not have put forward such a theory. One of the very examples to which he referred in his paper proved the inaccuracy of his statement that these stones had not been found in connection with gravel. It was quite evident that in his illustrations he had worked from very imperfect copies, for his illustrations misrepresented the inscriptions. This was a case of a wild theory started without a fact being adduced in support of it.

Royal Geological and Zoological Societies of Ireland.—A joint meeting of these societies was held on Wednesday, the 13th of December, 1871, William Ogilby, M.A., F.G.S., in the chair. W. H. Baily, F.J.S., read some additional notes on the Fossil Flora of Ireland. The author first described a new fossil plant from shale in the carboniferous limestone of Whitestone Quarry, near Wexford, under the name of *Filicites plumiformis*. He then gave the results of his examination of the collections made from upper Old Red sandstone strata at Kiltorcan, Co. Kilkenny, which collections had excited considerable attention among the Continental and American botanists, and brought forward some strong facts to prove that the Irish palaeontologists had not misled Prof. Heer, as stated by Mr. Carruthers at a recent meeting of the London Geological Society.—Prof. Traquair read some notes on the genus *Phaneropterion*.

VIENNA

I. R. Geological Institution, November 21.—The Director, Fr. Ritt. v. Hauer, read the anniversary report on the progress made by the Institute. The surveyors were occupied in the course of the last year on two different regions; the military frontier, where the geological maps of the country between Brod in Slavonia, and the shore of the Adriatic were finished, and Tyrol, where parts of the crystalline central mountain region and of the northern limestone ranges were surveyed. At the request of private proprietors, the members of the Institute were occupied besides with particular inquiries as to the nature and extent of coal-seams, strata and veins of ores and other useful minerals in almost all parts of the empire, and a very accurate examination of the rocks which are to be perforated by the Arlberg Tunnel, between Tyrol and Varalberg, was made by M. H. Wolf. In the museum of the Institute the larger collections of minerals from the different mining districts of the empire were completely re-arranged, and a magnificent collection of fossil Mammalia, from the tertiary brown coal of Eibiswald in Styria, was exposed under glass. More than forty different persons have contributed by donations to the increase of the various collections. In the Chemical Laboratory more than 100 analyses and assays have been performed for about fifty parties. A new arrangement of the library was finished in the course of the year; with the end of 1870 it numbered 6,500 different works, with about 16,500 volumes; in the first ten months of 1871 the increase amounted to more than 12,000 volumes. The collection of Maps (besides those which were made by the Institute itself) consisted, at the end of 1870, of 2,850 sheets, and has since increased by nearly 300 sheets. The publications of the Institute were enlarged by a new periodical, the "Mineralogischen Mittheilungen," which is edited by Dr. G. Tschermak, the director of the Imperial Mineralogical Museum; they appear separately as well as in the form of a supplement to the "Jahrbuch." The publication of the memoirs ("Abhandlungen") of the Institute, which had been interrupted, was also recommenced this year by the publication of two memoirs: one by Dr. Neumayer, "On the Cephalopods of the Jurassic Beds of Balin, near Krakaw;" the other by Dr. Bunzel, "On the Vertebrata of the Cretaceous Formation of Grünbach in Austria." Of the general geological map of Austria, edited by Fr. v. Hauer, appeared sheet No 3 (the northern Carpathians), and the printing in colours of sheet No. 7 (the Hungarian plain) was finished. Dr. Neumayer noticed the discovery of the salt formation in the valley of Hall in Tyrol, at a point far below the salt mines now being worked. Here the mining work would meet with considerably less difficulty,

arising from the great height of the fold mine (5,000 feet above the level of the sea) the access to which in winter time is always dangerous, often even impossible.—M. Charl. v. Hauer read a note on a very successful boring for coal in the tertiary basin near Fohnsdorf in Styria. On the northern edge of this basin, many years since, a large seam of coal had been worked. The bore-hole had been opened in the midst of the basin, 300 fathoms from the nearest point of the mine. At the depth of 155 fathoms the coal was reached in two seams, having together a thickness of 5½ fathoms. This discovery is of great importance for the industry of Upper Styria.—Dr. E. Tietze "On the Eocene Formation south of Glina, in Croatia." It consists of three members; the lowest a fresh-water deposit, with Planorbis, and traces of coal; the middle, green sandstones alternating with marly beds, probably identical with the so-called Albarese or Galestro of the Appennine mountains; and the upper, formed of slaty sandstones with fucoids.

DIARY

THURSDAY, DECEMBER 28.

ROYAL INSTITUTION, at 3.—On Ice, Water, Vapour, and Air. No. I. Prof. John Tyndall, F.R.S.
LONDON INSTITUTION, at 4.—The Philosophy of Magic: 2. The Magic of the Theatre: J. C. Brough, F.C.S.

SATURDAY, DECEMBER 30.

ROYAL INSTITUTION, at 3.—On Ice, Water, Vapour, and Air. No. II. Prof. John Tyndall, F.R.S.

MONDAY, JANUARY 1.

ANTHROPOLOGICAL INSTITUTE, at 8.—On the Hereditary Transmission of Endowments: George Harris.—The Adamites: C. Staniland Wake.

TUESDAY, JANUARY 2.

ZOOLOGICAL SOCIETY, at 9.
SOCIETY OF BIBLICAL ARCHÆOLOGY, at 8.30.—Hebræo Ægyptiaca; or, Hebrew and Egyptian Analogies: M. Francois Chabas.—Some Observations upon the Inscription of Daly (Idalion): S. Birch, F.S.A.

WEDNESDAY, JANUARY 3.

MICROSCOPICAL SOCIETY, at 8.—Fossils of the Coal Measures; W. Carruthers, F.R.S.—Fermentation and its results: James Bell.

THURSDAY, JANUARY 4.

LONDON INSTITUTION, at 4.—The Philosophy of Magic. 3. The Magic of the Mediums: J. C. Brough, F.C.S.

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NOTICE

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