upwards and to a less distance. As I walked home along elevated country roads, the effect produced by a dark sky on one side with a bright sky on the other, as if lighted up by an invisible full moon, was very beautiful. E. H.

Sheffield, February 1

THE aurora borealis which occurred last night was first visible here at 6 p.m. As is usual, the glow extended in an arc about 15° above the horizon, and was of a faint greenish colour.

From it arose frequent streamers of the same colour, having a slow westerly motion: these streamers attained to various heights, one at 6.55 reaching almost to the zenith; their colour, of various intensities, was as a rule greenish, but at times the streamers were of a reddish tint, more remarkably that one which occurred at 5.55, above referred to. At 6.50 the low arc changed its character, becoming irregular, finally assumed the form of a double arc, of which the centres of curvature were north-east and north-west of the place of observation.

At irregular intervals, during the whole of the first half hour, after the first appearance of the aurora, a flickering arc of light would ascend from the lower arc, up to an elevation, in many cases, of about 80° At 7 p.m. the aurora decreased in intensity, and at about nine o'clock had disappeared.

Cirencester, February 1 G. W. PREVOST

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—The term's work has been delayed a little by the severity of the weather. Many of the colleges were but half filled on the regular day of meeting.

At the University Museum the following courses will be given during the term:—Prof. Henry Smith lectures on Pure Geometry, and Prof. Barth. Price on Geometrical and Physical Optics. Prof. Clifton will lecture on Terrestrial Magnetism at the Clarendon Laboratory. In this department Messrs. Stocker and V. Jones will lecture on Mechanics, and will give practical instruction in Physics. In the Chemical Department Dr. Odling will continue his course on Organic Chemistry. Mr. Fisher will lecture on Elementary Inorganic, and Dr. Watts on Elememtary Organic, Chemistry. The laboratories will be open under the direction of Messrs. Fisher, Watts, and M. Robb. Dr. F. D. Brown will lecture (for the Professor) on Chemical Affinity. In the Physiological Department, in the absence of Dr. Rolleston through illness, there will be practical instruction given by Messrs. Robertson, Hatchett Jackson, and Thomas. Mr. Jackson will lecture on Circulation and Respiration; Mr. Thomas on Comparative Embryology; Mr. Robertson will form a class for Practical Microscopy; and Mr. Lewis Morgan will form a class for Human Anatomy.

The following afternoon lectures will be given in the Museum: Prof. Prestwich will lecture on the Palæozoic Strata, and Prof. Westwood will give an informal lecture on the Arthropoda. In the University Observatory Prof. Pritchard gives two courses, one on the Lunar and Planetary Theories, the other on General Elementary Astronomy, once a week in the evening.

At the Botanical Garden Prof. Lawson gives a course of elementary botany.

At the Colleges which possess laboratories the following courses will be given:—At Christchurch Mr. Baynes will lecture on Thermodynamics; Mr. Dixon, owing to the illness of Mr. Vernon Harcourt, will continue his course on Inorganic Chemistry. At Balliol Mr. Dixon will lecture on Elementary Electricity and Magnetism; at Exeter Mr. Lewis Morgan will lecture on Histology; at Magdalen Mr. Yale will give a series of practical demonstrations on the Physiology of Circulation and Respiration.

In the School of Natural Science Prof. W. A. Tilden has been nominated as Examiner in Chemistry; Dr. S. J. Sharkey, of Jesus College, has been nominated Examiner in Biology; and Mr. J. W. Russel, of Merton College, has been nominated Examiner in Physics.

An examination for a Fellowship in biological subjects will be held in March at University College. The examination will comprise papers of questions, and practical work in zoology, physiology, and botany, and will begin on Thursday, March 3, at 9 a.m. Intending candidates are desired to send in their names to the Master (if possible) before February 11, with a list of the subjects they offer for examination. They are also invited to mention any original work on which they have been engaged, and to send copies of any original articles or books on biological subjects of which they are the authors. Candidates are desired to call on the Dean with the usual testimonials and certificates on Wednesday, March 2, between 5 and 6 p.m.

CAMBRIDGE.—The senior wrangler in this year's Mathematical Tripos is Mr. Andrew Russell Forsyth, of Trinity College, born in Glasgow in 1858, and educated at Liverpool College. The next two are Mr. Robert Samuel Heath and Mr. Ernest Steinthal, both also of Trinity.

In connection with the list published in these columns in December, of those who had obtained first class honours in the Natural Sciences Tripos, the following statistics may be of interest:—In the year in which the Tripos was instituted (1851), 6 names appeared in the list; the same number in 1861; in 1871, 14; in 1878, 22; and in 1880, 31 passed the examination, obtaining honours. In 1869, 7 men passed the Special Examination in Natural Science for the ordinary B.A. degree; the number increased to 25 in the Easter examination of 1870; in 1878 it slightly diminished to 22; and in 1880, 16 passed the examination in December. So far as these results go, it would appear that an increasing number of those students who declare for natural science at Cambridge aim at thoroughness in their work, and are not content with that superficial smattering of book knowledge which is considered sufficient in the examination for the Pass degree.

M. FERRY, the French Minister of Public Instruction, has given an important character to the next meeting of the schoolmasters of France. Each of the 40,000 teachers of the 40,000 parishes (communes) is to meet with his fellow-teachers at the proper district towns. There are about 2000 of each of these little assemblies, each of which is to elect a delegate who will go to the chief town of the Department, and all these cantonal delegates are to appoint a department of delegates, who will go to Paris with a memoir written for communication and discussion before the pedagogical congress. All these memoirs are to deal with questions proposed by the Government.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, January 27.—"*Polacanthus Foxii*, a large undescribed Dinosaur from the Wealden Formation in the Isle of Wight." By J. W. Hulke, F.R.S. (Abstract.)

A description of the remains of a large dinosaur, discovered in 1865 by the Rev. W. Fox, in a bed of shaly clay between Barnes and Cowleaze Chines, in the Isle of Wight. Head, neck, shoulder-girdle, and fore-ribs were missing, but the rest of the skeleton was almost entire. Some of the præsacral vertebræ recovered show a double costal articulation. In the trunk and loins the centrum is cylindroid, relatively long and slender, with plano-concave, or gently biconcave ends. Several lumbar centra are anchylosed together, and the hindmost to the sacrum. The sacrum comprises five relatively stout and short anchylosed centra of a depressed cordiform cross-sectional figure. The post-sacral vertebræ have a stout short centrum.

The limb bones are short, their shafts slender, and their articular ends very expanded. The femur has a third trochanter, and the distal end of the tibia has the characteristic dinosaurian figure.

The back and flanks were stoutly mailed with simple, keeled, and spined scutes, and the tail was also sheathed in armour.

The animal indicated by these remains was of low stature, great strength, and probably slow habits. It is manifestly a dinosaur, and is considered to be very nearly related to Hylæosaurus.

Linnean Society, January 20.—The Rev. J. M. Crombie, F.L.S., in the chair.—The proposed alterations in the bye-laws were again successively read, voted for, and confirmed, excepting sect. 2, chap. viii. which was not confirmed.—Portfolios of British sea-weeds and zoophytes, prepared by Mr. W. Smith of Falmouth, were exhibited by the Rev. J. Gould.—A squirrel's nest was also shown and commented on by Mr. Chas. Berjeau.—A new form of microscopical cabinet designed by Mr. W. Hillhouse of Cambridge was explained by him, its compactness and portability rendering it advantageous to teachers.—Mr. Thos. Christy exhibited some horn-shaped galls growing on a branch of *Pistacia atlantica*, and somewhat similar in appearance to those known in India under the name of "Kalera-singhi" galls. From the galls a substance exuded not unlike Chian turpentine; Mr. Christy also drew attention to the fruit of the

White Quibracho.—Notes on the Orchideæ formed the subject of an important contribution from Mr. G. Bentham. Orchids early attracted the attention of botanists, though their popularity as objects of cultivation is comparatively a recent phase due in a great measure to Loddige's celebrated collections and to the fashion set up by the Duke of Devonshire in his famous Chatsworth collection, a still further incentive being given by Chas. Darwin in his studies of their singular modifications of fertilising apparatus and its protecting perianth. In their classification Swartz's labours (1800), thereafter the Richards', Dupetit-Thouars, and others, have been superseded by the influx of strange forms then unknown. Rb. Brown first established the principles of their natural arrangement on a solid basis, and Lindley's grouping remains true till the present day. Blume's observations must always take a high rank, and good analytic generic characters and illustrations obtain in the works of Sir W. Hooker, Wight, Griffith, Fitzgerald, and others. The younger Reichenbach has devoted great attention to the group, but we still lack from him a synopsis of contrasted characters adaptive to limitation of tribes and genera. Dr. Pfester has of late studied their vegetative characters advantageously; while J. G. Beer proposes divisions founded on modifications of the labellum, unfortunately neglecting other structural peculiarities. In reviewing the Lindleyan system Mr. Bentham observes that the primary division based on the consistence of the pollen has not been replaced by any other equally good, although it is by no means absolute. He admits that the distinctions dependent upon the so-called *caudicles* and gland can scarcely be maintained, independent of the confusion occasioned by the term having been applied to three different parts of the pollinary system. The result of Mr. Bentham's extended examination of all growing and dried specimens procurable, and of the literature extant, is that he divides the order into five tribes and some twenty-seven sub-tribes, as indicated below, and he further gives lengthened explanations of these and of the more remarkable genera, &c. :—ORCHIDEÆ: *Tribe I. Epidendreæ*—Subtribes (1) Pleurothalleæ, (2) Microstyleæ, (3) Liparieæ, (4) Dendrobieæ, (5) Erieæ, (6) Bletieæ, (7) Coelogyneæ, (8) Stenoglossæ, (9) Loelieæ; *Tribe II. Vandeæ*—Sub-tribes (1) Eulophieæ, (2) Cymbidieæ, (3) Cyrtopodieæ, (4) Stanhopieæ, (5) Maxillarieæ, (6) Oncidieæ, (7) Sarcantheæ, (8) Notyleæ; *Tribe III. Neottieæ*—Sub-tribes (1) Vanilleæ, (2) Corymbieæ, (3) Spiranthеæ, (4) Diurideæ, (5) Arethuseæ, (6) Limodoreæ; *Tribe IV. Ophrydeæ*—Sub-tribes (1) Serapiadeæ, (2) Habenarieæ, (3) Diseæ, (4) Corycieæ; *Tribe V. Cypripedieæ*.—In a paper by Mr. Edw. J. Lowe on some hybrid British ferns, the author's experiments lead him to believe that *Polystichum aculeatum* and *P. angulare* are forms of one species, and *P. lonchitis*, *Lastrea recurva*, and *L. Alpina* are merely mountain forms of *P. angulare* and *L. dilatata* respectively. Spores of *Athyrium Filix fœmina* were mixed, viz., vars. *Victoriæ*, with *frizelliæ* and *proteum* and var. *Fieldiæ*, with *Pullerii* and var. *Howardiæ*, with *Du Boulæ*, whence sprung varieties of singular beauty and vigour.—A revision of the genus *Vibrissea* was a communication by Mr. W. Phillips, which was taken as read.

Geological Society, January 19.—Robert Etheridge, F.R.S., president, in the chair.—Jabez Church, M.Inst.C.E., George Augustus Freeman, B.Sc. Lond., Charles Horsley, C.E., Edwin Simpson-Baikie, F.L.S., and Charles John Wood, M.Inst.C.E., were elected Fellows of the Society. William Henry Goss was proposed as a Fellow of the Society.—The following communications were read:—Further notes on the family Diastoporidæ, Busk, by G. R. Vine, communicated by Prof. P. Martin Duncan, M.B. Lond., F.R.S. In continuing his review of the family of the Diastoporidæ, the author stated that upon the question of the classification of the Polyzoa he is inclined to accept the views recently published by the Rev. T. Hincks in preference to the earlier ones enunciated by Prof. Busk. He now described the forms found in the Lias and Oolite, including *Diastopora stromatoporides*, Vine (= *liassica*, Quenst.), *D. ventricosa*, Vine, *D. oolitica*, Vine, *D. cricopora*, Vine. The author then proceeded to argue against the inclusion of the foliaceous forms in the genus *Diastopora*, and concluded by giving a definition of the genus, as now limited by himself.—Further notes on the Carboniferous Fenestellidæ, by G. W. Shrubsole, F.G.S. The author pointed out the discrepancies in the descriptions given by Lonsdale, Phillips, McCoy, and King of the genus *Fenestella*, as represented in the Silurian, Devonian, Carboniferous, and Permian formations respectively. He then proposed a new definition of his own, and described the following species:—*F. plebeia*, McCoy, *F. membranacea*, Phil. *F. nodulosa*, Phil., *F. polyporata*, Phil., *F. crassa*, McCoy, *F. halkinensis*, sp. nov.; and in conclusion he pointed out that the few species to which he has reduced the Carboniferous Fenestellæ find their representatives in the North American continent, only one really new form, *F. Norwoodiana*, having been described there.

Physical Society, January 22.—Prof. W. G. Adams in the chair.—New Member, Mr. G. Palgrave Simpson, B.Sc.—Notes on the construction of the photophone, by Prof. Sylvanus Thompson, were read by Prof. Rheinold. Prof. Thompson was led by experiment to question whether Prof. Bell's form of photophone receiver was adapted to give the best results. Theoretically he finds with a given maximum of incident light distributed uniformly over the surface, the change of resistance in a selenium receiver will vary proportionally with its linear dimensions, provided its parts be arranged so that on whatever scale constructed the normal resistance shall remain the same. A cell n times greater linearly each way will produce n times the variation in resistance for the same total amount of light. This follows from Prof. W. G. Adams' law that the change in the resistance of selenium is directly as the square root of the illuminating power. The author also finds that if the thickness of the conducting disks in the enlarged cell be kept the same as before and their number increased n times, the change of resistance will be n^3 times as great as before. Selenium cells should therefore be as large as possible, and the light should be distributed over them uniformly, not focussed to a point. A conical mirror would therefore be better than a parabolic one to receive the beam. Such a reflector would be cheaper to construct, and there would be a minimum loss by reflection, as the light would fall perpendicularly on a cylindrical cell parallel to its axis. To give the best effect, its angular semi-aperture should be 45°, and this will bring the front end of the cell in the same plane as the mouth of the reflector. Prof. Thompson has also constructed an improved cell by winding parallel wires on a cylinder of slate grooved with a double-threaded screw, and filling the interval between them with selenium. This form gives superior effects to Prof. Bell's disk device. Mr. Shelford Bidwell said that long annealing improved the sensitiveness of selenium for photophone purposes. He got the best speech from cells of high total resistance, made with fine wire. The selenium should however have a low specific resistance. With the apparatus he showed at a recent meeting of the Society he could now transmit articles from NATURE and the *Nineteenth Century* so as to be heard, every word, by the listener. Prof. Guthrie suggested that amorphous phosphorus should be tried in place of selenium as a more permanent substance.—Mr. Glazebrook, of the Cavendish Laboratory, Cambridge, read a paper on the measurement of small resistances and the comparison of the capacities of two condensers. In measuring small resistances by the Wheatstone balance the results differed on varying the resistance in the battery wires. According to Prof. Chrystal this was due to a thermo-electric effect produced by the hand at the middle point of the divided platinum iridium wire when the contact is made with it. It could be avoided by making this contact first and then making the battery contact. Mr. Glazebrook investigated the effect mathematically and experimentally. He suggested that the resistance in the battery wire should be kept small in comparison with the other resistances, and then the effect was inappreciable. It could best be eliminated by taking two measurements with reversed currents and calculating out. The author next considered the effect of a small leakage in comparing condensers by the Wheatstone balance method. The sensibility of this method is increased by increasing the two resistances and the resistance of the galvanometer. Dr. Hopkinson stated that he had found a modification of this plan to be very promising. For the battery he uses an induction coil, and for the galvanometer a telephone. Thus a high electromotive force and sensibility was obtained.

Anthropological Institute, January 11.—Edward B. Tylor, F.R.S., president, in the chair.—Mr. G. M. Atkinson exhibited some stone celts from British Guiana.—Mr. John Evans, F.R.S., gave a short account of the proceedings of the International Congress of Prehistoric Archæology and Anthropology held at Lisbon in September last, at which he had been present in the capacity of delegate from the Institute. One of the excursions was to Otta, to inspect the beds in which it was thought that traces of man living in Miocene times had been discovered. This discovery had been accepted by many members of the Congress, but Mr. Evans had not been satisfied as to the un-

doubtedly human origin of the single bulbs of percussion on the flints, nor as to their actually forming integral parts of the beds in or on which they were found, nor as to the geological antiquity of the beds themselves.—The President read a communication from Mr. F. F. Tuckett, on the subject of a supposed diminution in the size of heads during the last half century.—A paper by Mr. W. D. Gooch was read, on the Stone age in South Africa. The paper was illustrated by a large number of specimens collected by the author.

Royal Asiatic Society, January 24.—Sir H. C. Rawlinson, K.C.B., president, in the chair.—The following gentlemen were elected as Resident Members:—Colonel S. C. Law, E. H. Man, J. W. McCrindle; and Thomas T. Fergusson, Rev. Mr. Cain, Atinaram S. G. Jayakar of Maskat as Non-Resident.—A paper was read by Mr. Simpson, F.R.G.S., on the identification of Nagara-hara with reference to the travels of Hiouen-Tsang. Nagara-hara, he stated, was the name of the chief city of the Jelalabad Valley, as also of the Province, the extent of which, according to Hiouen-Tsang, was probably from Gundamack to the Khyber Pass. It was visited by Hiouen-Tsang and Fah-Hian, who describe some of the buildings in it, at the same time referring to its distance from Hidda (now Hada), and thus confirming the suggested identification. Mr. Simpson stated that when in the Jelalabad Valley with General Sir Samuel Browne's column in 1879, he made many explorations into the Buddhist remains there, discovering, *inter alia*, an isolated rock covered with ruins of Buddhist masonry, bearing the local name of Bala-Hirsar (*i.e.* "the Citadel"), the whole ground about it being strewed with stones and fragments of topes. Around it may also be seen a series of ridges, most likely the remains of the ancient defences of the town. Hiouen-Tsang states that it was four miles in circumference, and that it was six miles from Hidda, both of which measures agree exactly with those made by Mr. Simpson. M. Vivien de St. Martin, who very nearly worked out a correct map of this district in his "Mémoire sur la carte de l'Asie Centrale," was, Mr. Simpson states, misled by the map published in the "Ariana Antiqua."

Statistical Society, January 18.—Mr. James Heywood, F.R.S., in the chair.—The following papers were read:—On the method of statistical analysis, by Wynnard Hooper.—On the growth of the human body, by J. Towne Danson.

PARIS

Academy of Sciences, January 24.—M. Wurtz in the chair.—M. Berthelot presented a supplement to his recent work, containing various new measurements by himself and others.—The following papers were read:—On the periodic development of any function of the radii vectores of two planets, by M. Tisserand.—On the theory of heat, by M. Resal.—On a new disease caused by the saliva of a child that had died of hydrophobia, by MM. Pasteur, Chamberland, and Roux. Rabbits inoculated with the dilute saliva died within thirty-six hours; symptoms, loss of appetite, paralysis, asphyxia, congestion of trachea, with hæmorrhage, swellings in groin, axillæ, &c. Other rabbits inoculated with saliva or blood from the first soon died also. The disease is attributed to a small organism (found in the blood); it is of rod shape, constricted at the middle and surrounded by mucous matter. It is like the microbe of chicken cholera, but has no effect on fowls. By artificial cultivation it is changed in form somewhat. Guinea-pigs, though so like rabbits, seem hardly affected by inoculation. Dogs that were inoculated died in a few days, but without symptoms of rabies. The disease seems distinct from rabies, but the authors do not at this stage affirm its absolute independence.—Experiments proving that thiotetrapyridine and isodipyridine have not the poisonous power of nicotine, whence they are derived, by M. Vulpian.—The mechanical contact of gneiss and limestone in the Bernese Oberland, observed by M. Baltzer, by M. Studer. M. Baltzer was requested by the Swiss Geological Commission to study the superposition of gneiss on the Jurassic system in the region named. This he did in 1874-76, and his observations are given in the work now presented.—M. Heer was elected Correspondent in Botany in place of the late M. Schimper.—Elements and ephemerides of comet *f* 1880 (Pechüle), by M. Bigourdan.—Presentation of a photograph of the nebula of Orion, by Prof. Draper. The exposure was for fifty-one minutes.—On the divisions of certain homogeneous functions of the third order with two variables, by M. Pepin.—On the distinction of integrals of linear differential equations in sub-groups, by M. Casorati.—On the separation of the roots of equations, the first member of which is decomposable into real factors and satisfies a linear equation of the second order, by M. Laguerre.—On the development of elliptic integrals of the first and second species in entire recurrent series, by M. Farkas.—On the choice of unit of force in absolute electric measurements, by M. Lippmann. The electric standards and chief theoretical formulæ being independent of choice of the unit of force, the choice is not of very great importance, and a change of it is always easy. The dyne presents no essential advantage in some cases. For unification of measurement in electricity and the rest of physics electricians might take for fundamental units the second, metre, and gramme.—Laws of liberation of electricity by pressure in tourmaline, by MM. Jacques and Curie. The two ends of a tourmaline liberate equal quantities of contrary electricity. The quantity liberated by a certain increase of pressure is of contrary sign and equal to that produced by equal diminution of pressure. It is proportional to variation of pressure, and independent of the length of the tourmaline. For a given variation of pressure per unit of surface it is proportional to the surface.—On baryta used to obtain arsenic, with arsenious acid and sulphides of arsenic, by M. Brame.—Action of dry carbonic acid on quick lime, by M. Raoult. When CO_2 is sent into (say) 100 gr. quick lime in a glass vessel which has been heated to the point at which the glass begins to soften, the lime absorbs the gas very powerfully, and becomes incandescent, remaining so about fifteen minutes. A bibasic carbonate is produced. It is practically impossible to produce neutral carbonate of lime by direct synthesis. Lime that has once been heated over 1100° acts on dry carbonic acid at a much slower rate than before.—On the losses of nitrous compounds in manufacture of sulphuric acid, and a means of attenuating them, by MM. Lasne and Benker. The means referred to are a direct injection of sulphurous acid.—On the resistance to flexure of tempered glass, by M. de la Bastie. This is proved from experiments to be considerably superior to that of ordinary glass.—On cholestène (cholestérilène), by M. Walitzky.—On the preparation of crotonic aldehyde, by Mr. Newbury.—On the *Mus pilorides*, or musk-rat of the Antilles, considered as a type of a new sub-genus in the genus *Hesperomys*, by M. Trouessart.—Formation of the blastoderm in Araneides, by M. Sabatier.—Resection of two metres of the small intestine, followed by cure, by M. Koeberlé.—The wild vines of California, by M. de Savignon. There are five varieties of these, though all have hitherto been usually comprised under the name *Vitis Californica*.—On *Theligonum cynocrambe*, L., by M. Guilland.

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