will not be set on Vegetable Palæontology or the Geographical Distribution of Plants.

In Zoology and Comparative Anatomy minor details will not be included in the questions relating to classification. Geographical distribution of animals is held to be a part of Zoology, and Comparative Anatomy includes the structure of extinct as well as of recent forms.

Human Anatomy will include the mechanism of the human body, the comparison of its parts with those of lower animals, its development, &c. ; but the questions will be of a simple and elementary character.

In Physiology the questions will be of a comparatively elementary character.

A practical examination will be held in each of the above subjects.

SCIENTIFIC SERIALS

Verhandlungen der Schweizerischen Naturforschenden Gesellschaft in Zürich, August 7–9, 1883.—We note here the opening address by Prof. Cramer, on unicellular fungi.

Verhandlungen der Naturhistorischen Vereines der preussischen Rheinlande, Westfalens, und der Reg-Bezirks Osnabrück, 42nd year, first half, 1885.—The greensand of Aacken and its molluscan fauna, by J. Böhm.—The forest vegetation of the outer Northwestern Himalaya, by D. Brandis.—On Devonian Aviculaceæ, by O. Follmann.—The biology of water plants, by H. Schenck.

Nouveaux Mémoires de la Societé Helvetique des Sciences Naturelles, vol. xxix. part 1, 1884 —Geological sections of the Tunnels of Doubs, by M. Mathay.—On the nisal flora of Switzerland, by M. Heer. Fossil woods from Greenland, by M. Beust.

SOCIETIES AND ACADEMIES

LONDON

Mathematical Society, November 12.—J. W. L. Glaisher, F.R.S., President, in the chair.—Mr. L. J. Rogers, Balliol College, Oxford, was elected a member.—The following gentlemen were elected to form the Council for the ensuing Session :—President : J. W. L. Glaisher, F.R.S. ; Vice-Presidents : Dr. O. M. Henrici, F.R.S., Prof. Sylvester, F.R.S., J. J. Walker, F.R.S. ; Treasurer : A. B. Kempe, F.R.S. ; Secretaries : M. Jenkins, R. Tucker ; other Members of the Council : Prof. Cayley, F.R.S., Sir J. Cockle, Knt., F.R.S., E. B. Elliott, A. G. Greenhill, J. Hammond, H. Hart, C. Leudesdorf, Capt. P. A. Macmahon, R.A., Samuel Roberts, F.R.S.—The following communications were made :—On waves propagated along the plane surface of an elastic solid, by Lord Rayleigh, F.R.S.—On the application of Clifford's graphs to ordinary binary quantics, by A. B. Kempe, F.R.S. (Messrs. Hammond and Macmahon put questions to the author).—On Clifford's theory of graphs, by A. Buchheim.—On unicursal curves, by R. A. Roberts.—On some consequences of the transformation formula $y = \sin(L + A + B + C + \ldots)$, by J. Griffiths.

Linnean Society, November 5.—Sir John Lubbock, Bart., President, in the chair.—Mr. T. Christy exhibited orchids of the genus *Catasetum*, showing that owing to the plants having been moved, the flower in both instances had become malformed.—Mr. E. A. Heath showed a golden eagle in its characteristic plumage of the second year.—Mr. J. Carter exhibited a collection of seeds, lately introduced, remarkable for their peculiarities as specimens under the microscope.—There was shown for the Baron von Mueller a collection of skeleton leaves of species of *Eucalyptus*, prepared by Mrs. Lewellin of Melbourne. These confirm Baron von Mueller's observations as to definite layers, and the relation of these to the skeletonising process. The leaves in decaying produce no bad odour. Von Mueller's observations do not support M. Rivière's statement that the bamboo is as good as eucalypts to subdue malaria ; the former dry up, but do not exhale volatile oil as do the latter, and the eucalypts moreover absorb moisture as quickly as Willows, Poplars, and Bamboos.—Dr. Ondaatje showed examples of walking-sticks from Ceylon palms, viz. the Kittool Palm (*Cayota urens*), the Areca and Cocoa-nut.—Mr. J. G. Baker made remarks on an exhibition by Mr. Thiselton Dyer of Darwin's potato (*Solanum maglia*), grown at Kew, the weight of twelve tubers being 28 oz. ; also the "papa de Oso," Bear's potato (*S. tuberosum*, var.), grown out of doors from tubers received from Dr. Ernst of Caracas, who obtained them from Merida, where they are found wild.—Then followed a paper, viz. contributions to the flora of the Peruvian Andes, with remarks on the history and origin of the Andean flora, by Mr. John Ball. In this paper the author says that his statements chiefly refer to the western slope of the Cordilleras. From the collections made and other data, so far, therefore, a this region of Peru is concerned, it may confidently be averre that the limit of Alpine vegetation has been placed by previous writers on the subject far too low. In the present instance there can be no serious error as to heights, seeing these are based on those of the railway engineers. The explanation of this relatively high extension of the temperate flora depends on the peculiar climatical conditions. Rain occurs but sparingly, the nights are cold, but frost scarcely known ; whereas in the plateau region eastward storms, heavy snow, and frosts are frequent The vegetation of the region visited Mr. Ball divides into a subtropical dry zone from coast to 8000 feet, a temperate zone reaching to 12,500 feet, and an Alpine zone upwards to 17,000 feet, above the sea-level. As regards the proportion in which the natural families of plants are represented in the Andean flora, the Compositæ amount to nearly one-fourth of the whole species, the grasses equal one-eighth, the Scrophularineæ supply five per cent., while Cruciferæ, Caryophylleæ, and Leguminosæ each are represented by about one-thirtieth of the whole. The Cyperaceæ are conspicuous by their absence ; a remarkable feature is the presence of four Crassulaceæ. If we take the proportions of the endemic genera and species as criteria, then, as far as materials admit, the Andean flora appears to be one of the most distinct existing in the world. Mr. Ball agrees with those who think it probable that the south polar lands constitute a great archipelago of islands. To this region in question he is inclined to refer the origin of the Antarctic types of the South American flora.—The first part of an exhaustive monograph on recent Brachiopoda, by the late Dr. Thos. Davidson, was read by the Secretary. In this part of his contribution the author reviews the labours of his predecessors in the field, with regard to the shell, to the anatomy of the adult, and to the embryology. As regards the perplexing question of affinities he remarks :—"Now, although I do not admit the Brachiopoda to be worms, they may, as well as the Mollusca and some other groups of invertebrates, have originally diverged from an ancestral vermiform stem, such as the remarkable worm-like mollusk *Neomenia* would denote." He lays stress on the brachiopodous individual being the product of a single ovum, and not giving rise to others by gemmation. He considers that the shell, the pallial lobes, the intestine, the nerves, and the atrial system, afford characters amply sufficient to define the class. The greatest depth at which a living species has been found alive has been 2990 fathoms. As to classification, he groups the recent species into two great divisions :—(1) Anthropomata (Owen) = Clistenterata (King), (2) Lypomata (Owen) = Tretenterata (King). The Anthropomata he groups in 3 families :—1st Fam. Terebratulaceæ, with 7 sub-families and 13 genera and sub-genera, 70 species, and 21 uncertain species. 2nd Fam. Thecideidæ, with 1 genus and 2 species. 3rd Fam. Rhynchonellidæ, 1 genus, 1 sub-genus, and 8 species. The Lypomata he also groups into 3 families, 5 genera and sub-genera, 23 species, and 7 uncertain species :—1st Fam. Craniidæ, with 1 genus and 4 species. 2nd Fam. Discinidæ, with 1 genus, 1 sub-genus, and 8 species. 3rd Fam. Lingulidæ, with 1 genus and 1 sub-genus, and 11 species. He does not concur with M. Delongchamps' scheme (1884) of classifying the Terebratulina, bringing forward Mr. Dall's observations on *Waldheimia floridana*, of delicate spiculæ in the floor of the great sinuses as telling evidence against the arrangement. Dr. Davidson then proceeds to treat of the various genera and species, adding remarks in detail on the Terebratulaceæ from his standpoint, and throughout gives copious descriptions and observations on each.

Royal Microscopical Society, October 14.—The Rev. Dr. Dallinger, F.R.S., President, in the chair.—Mr. Crisp exhibited D'Arsonval's water microscope, a suggestion for improving the means of focusing. The body-tube of this extraordinary instrument contained a glass cylinder which was connected by an india-rubber tube with a syringe. On turning the handle of the syringe water was forced into the cylinder, and the focus was altered according as more or less water was pumped in. Of course, an alteration of focus did result from the operation, but the arrangement destroyed the correction of the objective, and was

otherwise objectionable.—Mr. J. Mayall, jun., described Riddell's binocular microscope, which was exhibited by Mr. Crisp, and was of considerable interest, as having been the first binocular microscope with a single objective. He pointed out as a noteworthy feature that it was provided with a means of separating the prisms, so as to give to each eye-piece a full field of view. There was also a screw with a right- and left-handed thread for separating the tubes to suit the width between the observer's eyes. An ingenious application of reflectors at the top of the eye-pieces effected a perfect inversion of the image, so that the instrument could be used for dissecting purposes. It was also a point of special interest in the history of the development of the binocular microscope, that so early as this Prof. Riddell had applied two mirrors for the purpose of equalising the illumination in both fields.—Mr. Crisp exhibited a "twin" simple microscope having two lenses of different powers, also two forms of magnifiers sent by Mr. Hippisley as examples of the capabilities of lenses made out of spherules of glass, and of a simple method of holding them.—Dr. Maddox read his paper, further experiments on feeding insects with the curved or "comma" bacillus.—Mr. Crisp said they had received six slides of material taken from the intestines of Lieut. Kisslingbury, U.S.N., one of the victims of the unfortunate Greeley Arctic Expedition. When the question of cannibalism was being discussed, his body was exhumed, and a good deal of the flesh was found to have been cut off the bones. In order to ascertain if possible what was the last food of which the deceased had partaken, and to establish whether the officers had joined in the cannibalism of the men, the contents of the stomach were submitted for examination. The letter of Mr. C. E. Alling, accompanying the slides (which were sent by Dr. Mandeville and himself) was read to the meeting. Mr. Groves said that although it might be possible to say, from an examination of these slides, whether the material consisted of the flesh of a mammal, a bird, or a fish, it would be quite impossible to say if it was human flesh or not, unless it happened that some hair had been taken with it. Mr. Crisp said that this opinion was confirmed by Prof. Stewart of the Royal College of Surgeons, who, however, thought that a means of identification might be found in the small hairs of the general surface of the body. The slides, however, showed no such hairs.—Mr. P. D. Penhallow's note as to a handle for cover-glasses was read.—Mr. C. Beck exhibited a compact form of Mr. Stephenson's catadioptric illuminator.—Mr. Kitton's and Mr. Kain's notes on balsam of Tolu were read, and Mr. Kitton's note on a new diatom, *Navicula Durrandii*.—Mr. J. C. Stodder's note was read, giving the views held by the late R. B. Tolles on the formation of a small battery of objectives to cover reasonably well all the requirements of the general microscopist: 3 in., 1 in. (30°), 4-10 in. (110° dry), 1-10 in. (oil-glycerin-water immersion with a balsam angle of not much less than 120° for best results).—Mr. C. D. Ahrens' paper on an improved form of Stephenson's erecting and binocular prisms was read, in which he proposed to unite the lower prisms by a wedge of glass. He also proposed an alteration in the upper prisms (when they are used in place of a plate of glass).—Mr. T. B. Rosseter's paper on the uses and construction of the gizzard of the larva of *Corethra plumicornis* was read by Prof. Bell, and prepared specimens in illustration exhibited.—Mr. Dowdeswell's paper on the cholera comma-bacillus was read.—The President called the attention of the meeting to the death of Mr. Robin, the eminent histologist, and one of the Honorary Fellows of the Society.—Seventeen new Fellows were elected and proposed.

PARIS

Academy of Sciences, November 9.—M. Jurien de la Gravière in the chair.—Determination of the mechanical work effected in human locomotion (one illustration), by MM. Marey and Demeny. This is an attempt to estimate the quantity of muscular energy developed by man in the various forms of locomotion from the physiological standpoint, which is shown to be different from the mechanical. Three chief elements in the measurement of muscular action in horizontal movement are here considered separately: The labour expended along the vertical; the labour expended along the horizontal; and the labour required for the oscillation of the lower member during its suspension.—Variations in the mechanical labour expended in the different attitudes of man during locomotion (three illustrations), by the same authors. The estimates here recorded are the results of experiments made on two persons only, walking and running on the level. The experiments will require to be repeated on a large number of subjects in order to determine the influence of weight, height, slope of the ground, and thus arrive at a mean average.—On the radicular nature of the stolons of Nephrolepis: a reply to M. P. Lachmann, by M. A. Trécul.—On the derivation of the solutions in the theory of the Cremona transformations, by M. de Jonquières.—Note on the combe of Péguère, near the thermal station of Cauterets, Pyrenees, by M. Demontzey. The destructive landslips to which this upland valley has long been subject, are shown to be due to denudation and erosive action, hence may be prevented by gradually restoring the vegetation along the steep slopes of the surrounding mountains.—Experimental researches tending to show that the muscles affected by *rigor mortis* remain endowed with vitality till the appearance of putrefaction, by M. Brown-Séquard. Experiments made on dogs some days after being killed seem to render it probable that muscular rigidity is not a state of absolute death, but a transition from life to death, a transition which may last for weeks.—On the action of a mixture of sulphate of copper and lime on the mildew of the vine, by MM. Millardet and U. Gayon.—Analytical theory of the movements of Jupiter's satellites, second part: Reduction of the formulas to numbers, by M. C. Souillart.—An undated letter of the Countess de Lafayette (reign of Louis XIV.) addressed to Segrais, and inviting him to witness "the experiment with an artificial fire giving warmth the whole day for two sous," by M. Feuillet de Couches.—Application of M. Lœwy's new methods for the determination of the absolute co-ordinates of the circumpolar stars without the necessity of ascertaining the instrumental constants (right ascensions), by M. Henri Renan.—On the numerical tables intended to facilitate the transformations of co-ordinates in astronomical calculations, by M. Vinot.—On the irregular integrals of linear equations, by M. H. Poincaré.—Note on the compressibility of fluids, by M. E. Sarrau. The formula—

$$p = \frac{R\,T}{v-a} - \frac{K}{T(v+\beta)^2}$$

proposed by M. Clausius for carbonic acid, in which p = the pressure, v = volume, and T = absolute temperature, is shown to be applicable to other gases. The author claims that for these gases he had deduced the elements approaching the critical point before the experiments of MM. Wroblewski and Olszewski.—On two new kinds of radiophones, by M. E. Mercadier. With these instruments, which he names the "thermo-electrophone" and the "thermo-magnetophone," the author thinks it will be possible, with an intense solar radiation, to reproduce articulate speech.—An explanation of the anomalous magnetic effects produced by the discharges of condensers, by M. Ch. Claverie.—Note on Schlœsing's law respecting the solubility of the carbonate of lime by carbonic acid, by M. R. Engel.—On a coloured reaction of rhodium, by M. Eugène Demarçay. Certain blue solutions of rhodium yield with potassa a greenish precipitate, which changes to a dark blue in acetic acid. This colouration appears due to the formation of a salt corresponding to the green hydrate of bioxide of rhodium.—On the antiseptic and other properties of rosolene (retinol, $C_{32}H_{16}$), by M. Emile Serraut.—On the root of *Danais fragrans*, Comm. (yellow liane) and its chemical composition, by MM. Edouard Heckel and Fr. Schlagdenhauffen.—On the composition and fermentation of interverted sugar, by M. Em. Bourquelot.—On the hypnotic properties of phenylmethylacetone (acetophenone), by MM. Dujardin-Beaumetz and G. Bardet.—On the nervous system of Phylloxera, by M. Victor Lemoine.—On the Limaciæ of the neighbourhood of Saint-Vaast la Hougue, department of La Manche, by M. S. Jourdain.—Variations in the respiration of plants at the different stages of development, by MM. G. Bonnier and L. Mangin.—On a rare amygdaloid granite from the Riaillé Quarry, Saint-Hilaire de Loulay, Vendée, by M. Stanislas Meunier.—On some fragments of human skulls and a potsherd found in immediate association with two skeletons of *Ursus spelæus* in the Nabrigas Cave, Lozère, on August 28, 1885, by MM. E. A. Martel and L. de Launay. The discovery of these remains seems to place beyond doubt the existence of man already possessing a knowledge of the potter's art at the epoch of the Cave bear in the Lozère district.—On the relation of whirlwinds and waterspouts to cyclones, by M. Ad. Nicolas.—Remarks on M. Jourdy's "Geology of East Tonkin," by M. Albert Gaudry.

BERLIN

Meteorological Society, October 13.—The President, Geheimrath Dr. Thiel, reported that, in accordance with a resolution passed by the Society in furtherance of the establishment of a thickly planted series of rain-stations, rain-gauges had been set up at seven places in the outskirts of Berlin to the north-west and west, and since July had been working well. It was to be hoped that their number would soon be increased and that a lengthened series of observations would yield data for an exact determination of how closely rain-gauges must be placed to each other, in order to obtain a correct representation of the rainfall of any district.—Dr. Hellmann then, after a brief historic survey of the institution of meteorological stations at high points, gave a full description of the meteorological observatory at Ben Nevis in Scotland, which he had visited in August last. The topographical situation of the station, the construction and position of the instruments, and the mode of observation were set forth, while some of the climatic peculiarities of this station, such as its great humidity, its small yearly and daily variations of temperature, its scanty sunshine, the frequent reversal of the change of temperature with the height, and other particulars, were also remarked on. Following up the minute description of this important high station in Scotland Dr. Hellmann enumerated all the stations on the peaks of mountains that had hitherto been erected, which comprised only the Puy de Dôme and Pic du Midi in France, the Säntis in Switzerland, the Schafberg and Hochobir in Austria, the Schneekoppe and Brocken in Prussia, and Mount Washington and Pike's Peak in the United States of America. Of these stations only the two French, the Swiss, and the Austrian were of the first rank, or between the first and second rank. In addition to these stations on mountain tops there was a whole series of high situated meteorological stations on mountain passes and plateaus in operation, which collected valuable material towards the meteorology of the higher atmospheric strata, in Italy, Switzerland, Germany, India, South America. In the case even of a temporary residence at high situated points brief but very valuable series of observations had been gained—at Ararat, for example. It must, nevertheless, be the endeavour of scientific meteorology to increase the number of mountain-top stations of the first rank, and the speaker expressed the hope that under the contemplated reorganisation of the meteorological service in Germany, and particularly in Prussia, at least one mountain-top station of the first rank, namely, on the Schneekoppe, which was very peculiarly adapted for this purpose, would be established. In the discussion which followed it was maintained on one hand that self-registering instruments at high stations were perfectly useless, and on the other hand that even tourists, many of whom every summer reached heights beyond 4000 metres high, might, by means of portable pocket instruments, supply contributions quite available towards the meteorology of the higher strata. A member of the Society gave some proofs to this effect, and mentioned the remarkable fact that the red-brown ring round the sun, which he had everywhere seen distinctly, appeared from Monte Rosa, not red-brown, but very distinctly reddish-yellow.—Dr. Börsch related that during a determination of longitude between Berlin, Breslau, and Königsberg, the observer in Berlin on August 2 was sensible of such lively disturbances of his level that he was obliged to discontinue for a time the use of the transit instrument, and considered the oscillations to be seismic. When he afterwards read in the newspapers of violent earthquakes in the interior of Asia having happened at the same time, he made inquiry of the observers at Breslau and Königsberg, and learnt that they too had been disturbed by lively oscillations of the ground. These vibrations had been all the stronger the more to the east was the station, a circumstance which likewise pointed to a connection with the earthquakes of the interior of Asia. More careful observation of such phenomena would render possible the exact measurement of the propagation of earth-vibrations.

VIENNA

Imperial Academy of Sciences, July 2.—Researches on the structure of striped muscles, by A. Rolett.—Contributions to general nerve and muscle physiology (eighteenth communication), on inhibitory effects produced by electrical stimulation of striped muscles and on positive cathodic polarisation, by W. Biedermann.—On pyroracemic glycide ethers, by F. Erhart.—Contributions to the theory of respiratory innervation (fifth communication), by Ph. Knoll.—Studies on the endosperm of some Gramineæ, by E. Tangl.—On a new hydrodensimeter, by A. Handl.—On the nutrition of ganglion cells, by A. Adamkiewicz.—On cyanhydrines of nitroso-compounds, by E. Lippmann.—Contribution to the knowledge of dichinolins, by O. W. Fischer.—On benzoyl-ecgonine and on its transformation to cocaïne, by Zd. H. Skraup.—Statistics of earthquakes from 1865 to 1885, by W. C. Fuchs.—Contribution to the morphology and anatomy of the Coccida, by E. Witlacil.—On the Lower Eocene formation of the Northern Alps and on its fauna (Part I. Lamellibranchiatæ), by K. F. Frauscher.—On para-chloraldehyde, by C. Natterer.—On the action of phenol and sulphuric acid on hippuric acid, by T. Zehenter.—On the gum-ferment, a new diastatic enzyma, by which the formation of gum and mucilage in the plants is induced, by E. Wiesner.

July 16.—Note on the meteorites of Angra dos Rais (Brazil), by G. Tschermak.—A contribution to the theory of the mechanics of explosion, by E. Mach and T. Wentzl.—On the anatomy of Tyroglyphidæ, by A. Nalepa.—Contributions to the theory of respiratory innervation (sixth communication), by Th. Knoll.—On the products of decomposition formed by the action of hydrochloric acid on albumins; II. on elastin, by T. Horbaczewski.—Researches on the cloacal epithelium of Plagiostomata, by T. H. List.—On chloro- and bromo-derivatives of phloroglucin, by R. Benedict and K. Hazura.—On the action of potassium cyanide on dinitro-derivatives of organic bases, by E. Lippmann and F. Fleissner.—Note on hydrobromo-apoquinine, by P. Julius.—On the action of ammonia on anthragallol, by G. von Georgevics.—On the behaviour of liquid atmospheric air, by T. Wroblewski.—On ethylsulphuric acids of some carbohydrates, by M. Hœnig and St. Schubert.—Contribution to chemistry of cerium-metals, by B. Brauner.—On the elements and ephemeris of Barnard's (Nashville) comet (July 7, 1885), by E. Weiss.—On the meteoric fall observed on March 15, 1885, by E. Holletschek.—Studies on pyridine-derivatives, by H. Weidel and F. Blau.—On the electric and thermic properties of salt-solutions, by James Moser.—On the formation of striped fibres from sarcoplasts, by T. Paneth.

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