

effectively. The discs were worked by a hand-pulley and fly-wheel, controlled by a clock beating seconds loudly. The residual sensations obtained, by noticing at what speed the sound became continuous, ranged from 0.0231 secs. in the case of U_{128} , frequency 128, to 0.0049 secs. in the case of U_{1024} , frequency 1024. The smallest consonant intervals were determined by noticing when the beats coalesced into a smooth tone. The residual sensations deduced from these experiments were found to be about one-third greater than those obtained by the former method.—Petroleum in its relations to asphaltic pavement, by S. F. Peckham. While it has been well known for years that bitumens occur in great variety, the selection of a proper material for softening the asphalt, to the exclusion of others less desirable or wholly unfit, appears to have escaped attention. A properly selected material should enter into chemical union with both the constituents of the bitumen in the asphalt, thereby increasing its adhesive and binding properties upon the other constituents of the mastic. The proportion of bitumen to sand and other non-bituminous ingredients should be as 1 : 9, a larger amount of bitumen making the pavement too soft, and a smaller amount giving too little stability.—The age of the extra-moraine fringe in Eastern Pennsylvania, by E. H. Williams, Junr. All observations tend to the conclusion that there was but one ice age in Pennsylvania, and that a short and recent one.—The internal work of the wind, by S. P. Langley (see Notes).—Post-glacial æolian action in Southern New England, by J. B. Woodworth. This paper treats mainly of the action of blown sand in carving rocks and boulders.

In the *Botanical Gazette* for November, 1893, we find a paper on the Food of green plants, by Mr. C. R. Barnes, in which he proposes the term *photo-syntax* for the process of formation of complex carbon compounds out of simple ones under the influence of light.—Mr. H. L. Russell continues his account of the Bacterial flora of the Atlantic Ocean in the vicinity of Woods Holl, Massachusetts; and Miss F. D. Bergen, her useful Record of popular American plant names.

The third and concluding part of vol. vi. of Cohn's *Beiträge zur Biologie der Pflanzen* contains three important papers.—Dr. M. Scholtz describes the changes in position which take place in the flower-stalk of *Cobæa scandens* before and after flowering. It affords the first recorded instance of an organ with complicated anisotropy. During the development of the bud the flower-stalk exhibits strong negative geotropism and positive heliotropism. After the opening of the flower, which is strongly proterandrous, changes take place in the position of the stamens and style which bring the stigma nearly into the position previously occupied by the anthers.—Herr G. Karsten gives further details of the embryology of *Gnetum*; the development of the male, of the imperfect female, and of the perfect female flowers being described in detail. In the perfect female flowers there are always at first several embryo-sacs; and in some species two or three of these remain till the period of fertilisation, and are capable of impregnation. The actual process of impregnation presents some analogy, on the one hand, to that in the Coniferae, on the other hand to that in the Casuarineæ. The generative nucleus of the pollen-grain divides within the pollen-tube, as in the Coniferae. The two portions of this nucleus enter the embryo-sac and coalesce with one of its nuclei. In some species secondary embryos are produced.—R. Hegler gives details of experiments on the influence of mechanical traction on the growth of plants.

Bulletins de la Société d'Anthropologie de Paris, Tome iv. (4e Série), No. 10.—The greater part of this number of the *Bulletins* is occupied by the replies of M. J. M. van Baarda to the questions of the Anthropological Society with regard to the island of Halmahera, or Gilolo, in the Moluccas. M. G. de Mortillet contributes some palæographical notes on the lower valley of the Seine; and MM. E. Fournier and C. Rivière describe the discovery of objects of the Robenhausian period in the Grotto Loubière, near Marseilles.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 18.—"On the Transformation of Optical Wave-Surfaces by Homogeneous Strain." By Oliver Heaviside, F.R.S.

"On the Reflection and Refraction of Light." By G. A. Schott, formerly Scholar of Trinity College, Cambridge.

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Chemical Society, December 21, 1893.—Dr. Armstrong, President, in the chair.—The following papers were read:—Corydaline. Part iii. : Oxidation with potassium permanganate, by J. J. Dobbie and A. Lauder. The authors have investigated corydaline acid, $C_{11}H_7N(OMe)_4(COOH)_4$, obtained by oxidising corydaline with potassium permanganate.—The properties of α -benzaloxime and some of its derivatives, by W. R. Dunstan and C. M. Luxmore. Both α -benzaloxime and its acetyl-derivative may be obtained in the solid state by cooling. The authors are at present examining a number of addition products of the former substance with the halogen acids.—The interaction of acid chlorides and nitrates, by H. E. Armstrong and A. Lapworth.—The freezing points of triple alloys, by C. T. Heycock and F. H. Neville. The existence of a compound of silver and cadmium of the composition $2AgCd$ seems probable from the results of freezing point determinations of mixtures of these metals in tin, lead, or thallium solution. The behaviour of solutions of silver and cadmium in bismuth points to the formation of the compound $4AgCd$. Aluminium and gold appear to form the compound $AuAl_2$ when dissolved together in molten tin.—Synthesis of pentamethylenecarboxylic acid, hexamethylenecarboxylic acid, hexhydrobenzoic acid, and azelaic acid, by E. Haworth and W. H. Perkin, jun. The authors have prepared the acids mentioned above from the products of interaction of a mixture of tetra- and penta-methylene bromides and ethylic sodiomalonate.—The conversion of ortho-into para- and of para-into ortho-quinone derivatives: I. The condensation of aldehydes with β -hydroxy- α -naphthylamine, by S. C. Hooker and W. C. Carnell.—The synthesis of lapachol, by S. C. Hooker. An isomeric of lapachol is obtained by heating an acetic acid solution of hydroxynaphthoquinone with valeric aldehyde and hydrochloric acid.

Geological Society, January 10.—W. H. Hudleston, F.R.S., President, in the chair.—The following communications were read:—On the Rhætic and some Liassic Ostracoda of Britain, by Prof. T. Rupert Jones, F.R.S. The published observations on the occurrence of these Microzoa in the Rhætic and Lower Liassic strata of England, chiefly in Gloucestershire and Somerset, by the Rev. P. B. Brodie, H. E. Strickland, C. Moore, and others, were given; and the various notices of the so-called *Cypris liassica* in various palæontological works were considered. Numerous specimens submitted by the Rev. P. B. Brodie, the Rev. H. H. Winwood, and Mr. E. Wilson, and some few examined in the Geological Society's collection, have been studied, with the result of determining the characters and alliances of *Darwinula liassica* (Brodie) and of six or seven other species found in the same and the associated series of strata. The *Darwinula globosa* (Duff), from Linksfield, Morayshire, was also critically re-examined as one of this interesting series of Rhætic Ostracoda. The other species belong for the most part to *Cytheridea*; thus most of them probably lived in brackish or estuarine waters. The President and Dr. Henry Woodward spoke on the subject of the paper, and the author replied.—Leigh Creek Jurassic Coal-Measures of South Australia: their origin, composition, physical, and chemical characters; and recent subaërial metamorphism of local superficial drift, by James Parkinson. This paper dealt with the lignitic coal of Leigh Creek and associated rocks. Analyses were given, as illustrating comparisons between the Leigh Creek coal and Jurassic and other coal-bearing rocks found elsewhere. The author discussed the origin of the Leigh Creek deposits, and described certain peculiarities noticeable in the superficial materials. The President and Mr. Browne made a few remarks upon the subject of the paper.—Physical and chemical geology of the interior of Australia: recent subaërial metamorphism of Eolian sand at ordinary atmospheric temperature into quartz, quartzite, and other stones, by James Parkinson. South of the Flinders Range fragments of stone of all sizes are found on the ground, the origin of which the author discussed. He maintained that they were formed by subaërial metamorphism of Eolian deposits. A discussion followed, in which the President, Mr. R. D. Oldham, Prof. T. Rupert Jones, Dr. H. Woodward, Mr. Marr, Dr. G. J. Hinde, and Mr. E. T. Newton took part.

Zoological Society, January 16.—Sir W. H. Flower, K.C.B., F.R.S., President, in the chair.—The Secretary read a report on the additions that had been made to the Society's menagerie during the month of December, 1893.—Mr. Sclater exhibited and made remarks on a drawing of the head of a monkey (*Cercopithecus erythrogaster*) in the Paris Museum, forwarded to him by M. Pousargues, of that institution.—An extract

was read from a letter received from Mr. C. B. Mitford, describing an invasion of locusts observed at Free Town, Sierra Leone. Mr. C. O. Waterhouse had referred the specimens of these insects sent home to *Pachytylus migratoroides*. A further extract from the same letter gave an account of the occurrence of the elephant in the district of Sierra Leone.—Mr. R. Lydekker gave an account of some of the principal objects observed during his recent visit to the La Plata Museum, calling special attention to the splendid series of remains of Dinosaurian reptiles, of Cetaceans, and of Ungulates of three different sub-orders. Mr. Lydekker also made remarks on some of the specimens of Edentates, and of the gigantic birds of the genus *Brontornis*.—Mr. Lydekker also exhibited a painting of the head of a wild goat (*Capra agagrus*) of unusual size.—On behalf of Mr. J. Jenner Weir, a specimen of the Tsetse Fly (*Glossina morsitans*) from the Transvaal was exhibited.—Mr. Tegetmeier exhibited a curiously barred variety of the common pheasant.—A communication was read from Prof. W. N. Parker, containing remarks on some points in the structure of the young of the Australian Echidna.—A communication was read from Mr. Roland Trimen, F.R.S., giving an account of a collection of butterflies made in Manica, Tropical South-east Africa, by Mr. F. C. Selous in the year 1892. Of 166 species represented in the series, 44 were stated to be of general distribution, and of the remainder (amongst which were nine apparently new to science) 26 were peculiar to the South-Tropical area of Africa.—A communication received from Dr. A. B. Meyer contained remarks on a rare African monkey (*Cercopithecus wolffi*), accompanied by a coloured drawing.—Dr. A. Günther, F.R.S., gave an account of a collection of reptiles and fishes made by Dr. J. W. Gregory during his expedition to Mount Kenia. The collection contained examples of 37 species of reptiles, 9 of Batrachians, and 13 of fishes. Several species of reptiles were new to science, amongst which were two new lizards—*Bunocnemis modesta*, g. et sp. n., of the family Geckotidæ, with imbricate scales and large scattered conical tubercles on the hinder part of the hind limbs; and *Agama gregorii*, allied to *A. cyanogaster*, but with lateral, not tubular nostrils. Six new fishes were also characterised and named:—*Chromis niger*, *Chromis spirurus*, *Alestes affinis*, *Labeo gregorii*, *Barbus tanensis*, and *Barbus latensis*.

Royal Meteorological Society, January 17.—Dr. C. Theodore Williams, President, in the chair.—The council in their report stated that the Society had made steady and uninterrupted progress during the year, there being an increase in the number of Fellows, and the balance of income over expenditure being greater than in 1892. They also reported that Dr. C. Theodore Williams, previous to vacating the office of President, had expressed a desire for the formation of a fund for carrying out experiments and observations in meteorology, and that he had generously presented to the Society the sum of £100 to form the nucleus of a research fund.—The President, Dr. C. Theodore Williams, in his valedictory address gave an account of the climate of Southern California, which he made most interesting by exhibiting a number of lantern slides. In the autumn of 1892 Dr. Williams visited this favoured region, chiefly with a view of investigating its present and future resources, and its suitability for invalids. After describing the entrance into California from Utah and Nevada, the general geography, and the mountain ranges, he pointed out that the mountain shelter is tolerably complete, and that the protected area consists of (1) valleys, chiefly running into the coast range from the sea, and rising to various elevations, such as the fertile San Fernando and San Gabriel valleys, or else (2) more or less extensive plains, as those of Santa Aña and San Jacinto. Southern California is subdivided into two portions, eastern and western, by the Sierra Nevada, and its spurs, the San Gabriel and San Bernadino mountains. The climate of the eastern portion, which is an arid region, is very dry, very hot in summer, and moderate in winter. The climate of the western portion has three important factors, viz. (1) its southern latitude, (2) the influence of the Pacific Ocean, and especially of the Kuro Suvo current, which exercises a similar warming and equalising influence on the Pacific coast of North America as the Gulf Stream does on the western coasts of the British Isles and Norway; and (3) the influence of mountain ranges, these affording protection from northerly and easterly blasts, and also condensing the moisture from the vapour-laden winds blowing from the Pacific. Dr. Williams then gave particulars as to the temperature and rainfall at Los Angeles, San Diego, Santa Barbara, and Riverside. From these it appears that the climate of Southern California is warm and

temperate, and on the whole equable, with more moisture than that of Colorado, and that it is a climate which would allow of much outdoor life all the year round. The President next described the effect of the climate on vegetation, and showed what results had been obtained by diligent watering and gardening in this beautiful region. Wine and brandy are made in South California, but oranges and lemons are the leading crops, varied with guavas, pineapples, dates, almonds, figs, olives, apricots, plums and vegetables. On higher land, apples, pears and cherries bear well, and our English summer small fruit is also grown; while strawberries ripen all the year round, and are plentiful except in July and August. Dr. Williams concluded by saying that many an invalid has regained vigour and health, as well as secured a competence, in the sunny atmosphere of Southern California.—Mr. R. Inwards was elected President for the ensuing year.

Linnean Society, January 18.—Mr. W. Carruthers, F.R.S., Vice-President, in the chair.—Messrs. T. B. Cato, W. Elborne, and R. E. Leuch were admitted, and the following were elected:—Sir Hugh Law, Messrs. G. B. Rothera and Thomas Sim.—The chairman, before proceeding to the business of the evening, referred to the loss which the Society had sustained by the recent death of Mr. Richard Spruce, who had travelled and collected much in South America, and who was the recognised authority on *Hepatica*. It was much to be regretted that, having but lately presented to the Society a valuable paper on this subject, containing descriptions of a great number of new species, and illustrated with careful and beautiful drawings, he had not lived to see the published result of his labours. The chairman also feelingly referred to the death of Mr. Algernon Peckover, of Wisbech, who had been a Fellow since 1827, and who by his will had bequeathed to the Society a legacy of £100.—Mr. E. M. Holmes exhibited a flowering specimen of a new species of *Cascarilla* (*C. Thomsoni*), and the bark of the tree from New Granada; also two new foreign seaweeds, *Gelidium Beckii* from South Africa, and *Leptocladia Binghamia* from California, and three new British marine algæ, viz. *Entophyialis granulosa* and *Symploca atlantica* from Swanage, collected by himself; and *Vaucheria coronata* from Arbroath, collected by Mr. J. Jack.—Mr. Thomas Christy exhibited and made observations upon some remarkably long tendrils of *Landolphia Kirkii*, which served as an illustration to a paper subsequently read by Mr. Henslow.—Mr. J. E. Harting exhibited and made some remarks upon the plant debris ejected in the form of "pellets" or "castings" by rooks, and stated that a number of these pellets which had been examined were composed of the cuticles of the succulent root of the couch grass *Triticum repens*, commonly called "scutch," "squitch," and "twitch" grass, a most troublesome weed to the farmer. Mr. Harting also exhibited a rare Australian duck, *Stictonetta nevosa* (Gould), which had been obtained at Gippsland Lakes, Victoria, and of which very few examples were to be found in collections.—A paper was then read by the Rev. G. Henslow, on the origin of the structural peculiarities of climbing stems by self-adaptation in response to external mechanical forces. The purport of this paper was to prove, by an appeal to facts and experiments, the existence of the power in living protoplasm of responding to external and purely mechanical forces by enveloping supportive tissues, by means of which the plant is enabled to resist the effects of gravity, tensions, pressures, &c. In the case of climbers, not only is this principle illustrated wherever a force is felt, but whenever a strain is relieved of a force atrophy, or arrest of mechanical tissues takes place, supplemented, however, by an increase in the number and size of vessels. The conclusion arrived at was that while, on the one hand, the peculiar structures of climbers are all the outcome of a response to the external mechanical forces acting directly upon the stems, such structures are precisely those which are most admirably suited to the requirements of the stems themselves. The variations of structure characteristic of species, genera, and orders of climbing plants have been thus acquired in a definite direction, viz. of direct adaptability, this being effected, according to Mr. Darwin's statement, "without the aid of natural selection." The paper was criticised by Dr. D. H. Scott, Prof. Reynolds Green, and Mr. G. Murray, who, while testifying to the number of interesting facts brought forward by Mr. Henslow to support his views, were yet unable to agree with him in several of his conclusions. The paper was illustrated by a great variety of specimens and drawings, and was listened to with considerable interest by a very full meeting.

PARIS.

Academy of Sciences, January 15.—M. Loewy in the chair.—The death of M. P. J. van Beneden was announced, and a short account of his scientific career given by M. Émile Blanchard.—On the theory of the photography of simple and compound colours by the interference method, by M. G. Lippmann. The mathematical theory of the action of light on the photographic film is developed at length.—On a problem in mechanics, by M. A. Potier. The author gives a simple solution of the problem proposed by M. J. Bertrand concerning the law of the forces for a point describing a conic section.—Studies on the formation of carbonic acid and the absorption of oxygen by the detached leaves of plants. Experiments made at the ordinary temperature with the concurrence of biological activity, by MM. Berthelot and G. André. The results for wheat, *Corylus avellana* and *Sedum maximum*, are compared with the results, previously obtained and described, of strictly chemical character, and hence the results of the biological activity of the living matter of the leaves are deduced.—On a method for the study of gaseous exchanges between living things and the atmosphere which surrounds them, by M. Berthelot. A method is indicated whereby, by means of periodical analyses of an atmosphere, which is large compared to the respiratory needs of the living specimen, the changes caused by the organism can be examined while it is living in the normal manner.—On the chronostylographic method, and its applications to the study of the transmission of waves in tubes, by M. A. Chauveau. A description of the use of some improved instruments such as might be used for the study of the movements of all kinds occurring in the animal economy.—Observations on the *Epyornis* of Madagascar, by MM. A. Milne-Edwards and Alfred Grandidier. A quantity of new material from Madagascar has been examined with the result that the remains have been classed in two main divisions, *Epyornis* and *Mullerornis*, each with several described species.—Generalisation of some theorems in mechanics, by M. A. Kotelnikoff.—On the pendulum of varying length, by M. L. Lecornu. A mathematical study of the conditions during the oscillation of a pendulum of which the length varies in a definite manner.—Emission of sounds, by M. Henri Gilbault. It is shown that, in the ordinary case of vibrating bodies of three dimensions, the time occupied in communicating its energy to the air varies with the nature of the surface of each particular body.—Is there oxygen in the atmosphere of the sun? A note by M. Arthur Schuster. Attention is directed to a letter by the author published in NATURE (December 20, 1877) in connection with M. Duner's recent communication on this subject.—On the magnetisation of soft iron, by M. P. Joubin. The characteristic equation deduced from Rowland's experimental results is $x = I + 0.33(I - y) \pm 1.3 \sqrt{I - y}$

where $x = \frac{I}{I_c}$ and $y = \frac{K - K_c}{K_c - K_0}$; I is the intensity of magnetisation, and K the susceptibility of the material.—The relation of storms at Parc de Saint-Maur to the position of the moon, by M. E. Renou. The author believes that he has shown that, in this district, storms are more frequent with a northern than with a southern declination of the moon.—On the combination of hydrogen and selenium in an unequally heated space, by M. H. Pélabon. A thermodynamical study of the reaction, showing that the experimental results agree with the predictions.—Ceric bichromate and the separation of cerium from lanthanum and didymium, by M. G. Bricout. A crystalline bichromate is deposited electrolytically from a solution of cerous carbonate in chromic acid, lanthanum and didymium give no deposit on the positive pole from chromic solution, hence a method for the separation of cerium as a pure soluble salt.—Researches on the desiccation of starchy matters, by MM. Bloch.—On the liquid from albuminous perititis, by M. L. Hugouneq. Analyses show that the peritistial exudation resembles that of "hyarthro-e" most nearly.—Influence of atmospheric agencies, particularly light and cold, on the pyocyanogenous bacillus, by MM. d'Arsonval and Charrin.—On the amibocytes, the oogenesis and the ovi-deposition of *Micronereis variegata*, by M. Émile G. Racovitza.—On the synchronism of the coal basins of Commentry and St. Etienne and its consequences, by M. A. Julien.—On the epidermis of the egg-bearing peduncles and seeds of *Bennettites Morirei*, by M. O. Lignier.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—The Fauna of the Deep Sea: Dr. S. J. Hickson (Kegan Paul).—The Technique of Post-Mortem Examination: Dr. L. Hektoen (Chicago, Keener and Co.).—Climates of the United States, in Colors: Dr. C. Denison (Chicago, Keener and Co.).—Physiology Practicum: Dr. B. G. Wilder (the Author, Ithaca).—Biologischer Atlas der Botanik, Serie "Iris," Erläuternder Text: Dr. A. Dodel.—Ditto, Tafel 1 to 7 (Zürich, Schmidt).—The Royal Natural History, Vol. 1. Part 3 (Warne).—Ninth Annual Report of the Bureau of Ethnology (Washington).—Annals of the Astronomical Observatory of Harvard College, Vol. xxix., Miscellaneous Researches made during the Years 1883-93 (Camb., Mass.).—Ditto, Vol. xxv., Comparison of Positions of Stars &c., &c.: W. A. Rogers (Waterville, Me.).—Ditto, Vol. xl. Part 2, Observations made at the Blue Hill Meteorological Observatory, Mass., U.S.A., in the year 1892: A. L. Rotch (Camb., Mass.).—Ditto, Vol. xxxi. Part 2, Investigations of the New England Meteorological Society for the year 1891 (Camb., Mass.).—Heat, an Elementary Text-Book, Theoretical and Practical: R. T. Glazebrook (Cambridge University Press).—The Yoruba-Speaking Peoples of the Slave Coast of West Africa: A. B. Ellis (Chapman and Hall).—Congrès International de Zoologie, Deux. Session à Moscou, Deux. Partie (Moscou).

PAMPHLETS.—Sugar Maples, and Maples in Winter: W. Trelease (St. Louis, Mo.).—Royal Gardens, Kew, Official Guide to the Museums of Economic Botany, No. 3, Timbers, 2nd edition (Eyre and Spottiswoode).—Notes of Research on the New York Obelisk: A. A. Julien.—Some Ancient Kelics in Japan: R. Hitchcock (Washington).—The Ancient Burial Mounds of Japan: R. Hitchcock (Washington).—Shinto, or the Mythology of the Japanese: R. Hitchcock (Washington).—The Ainos of Zezo, Japan: R. Hitchcock (Washington).—The Ancient Pit Dwellers of Zezo, Japan: R. Hitchcock (Washington).—Bibliography of the Salishan Languages: J. C. Pilling (Washington).—The New Nauticality of the Nile: Drs. Sarraf and Nimir (Cairo).—Report of the Superintendent of the U.S. Naval Observatory for the Year ending June 30, 1893 (Washington).—The Cincinnati Southern Railway: J. J. Hollander (Baltimore).

SERIALS.—Zeitschrift für Wissenschaftliche Zoologie, lvii. Band, 2 Hef (Williams and Norgate).—The Psychological Review, No. 1 (Macmillan).—The Botanical Gazette, December (Bloomington).—Gazzetta Chimica Italiana, Vol. 2, fasc. 12 (Palermo).—Palestine Exploration Fund, Quarterly Statement, January (Watt).—The Quarterly Journal of Microscopical Science, January (Churchill).—Quarterly Review, January (Murray).—Zeitschrift für Physikalische Chemie, xiii. Band, 1 Hef (Leipzig).—Journal of the Franklin Institute, January (Philadelphia).—Journal de Physique, January (Paris).—Proceedings of the Academy of Natural Sciences of Philadelphia, 1893, Part 2 (Philadelphia).—Bulletin of the U.S. National Museum, No. 46.—The Mariapoda of North America: C. H. Bollman (Washington).—Rendiconto dell' Accademia delle Scienze Fisiche e Matematiche, Serie 2, Vol. 7, fasc. 8 and 12 (Napoli).—Astronomy and Astro-Physics, January (Wesley).—Nuovo Giornale Botanico Italiano. Nuova Serie (Vol. 1, No. 1 (Firenze)).

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