favours the volcanic dust theory; for it is strange that I should never have noticed it before, if it is of common occurrence; still we know that a phenomenon is more easily seen again after it has once been observed, than seen in the first instance. Can these pink rings be accounted for optically? If they could, would it not throw much light upon the cause of the fine sunrises and sunsets?

With regard to the height of the film which has caused these, I should like to ask whether it is considered proved that the sun is actually shining on it so far into the twilight, or whether the glow may not be caused by reflection from bright sky upon which the sun is really shining. The after-glow among the Alps is clearly caused in this latter way, and not by the sun shining upon the mountains them elves. At the same time, the appearance of cirrus clouds dark against the bright sky, as occurred this morning at about 7.40 a.m., seems to point to the film being far above them. THOS. WM. BACKHOUSE

Sunderland, December 19, 1883

P.S.—This morning the pink half-ring was again conspicuous, only the inner half was nearly white; within was the blue, darkish, as before. It was at its best at 8.10 a.m.

December 20, 1883 T. W. B.

I learned from a Dutch paper (but I forget from which) that a *blue sun* was observed at Paramaribo in the beginning of September (I think it was the 2nd or the 6th).

Stuttgart, January E. METZGER

The following letter appears in the *Times* of Tuesday:—

"A shower of matter having 'a white sulphurous appearance' is reported from the vicinity of Queenstown, Cape Colony, towards the close of November. The appended paragraph, giving an account of the phenomenon, is extracted from a Kimberley (Griqualand West) newspaper of December 1. Taken in connection with the description in your correspondence columns of December 25 of a somewhat analogous shower at Scutari, the paragraph is certainly interesting, and, perhaps, of value to physicists investigating the cause of the recent celestial phenomena. "WALTER CLARK

"Edinburgh, January 3

"'We were informed yesterday of the occurrence at Glen Grey, about twelve miles from Queenstown, of a phenomenon which, while it lasted, nearly terrified the white and native population out of their wits. On the afternoon of Wednesday a thick shower of matter, presenting a white sulphurous appearance, fell in the valley in which this village is situate, and, passing right over it from east to west, covered the entire surface of the country with marble-sized balls of an ashy paleness, which crumbled into powder at the slightest touch. The shower was confined to one narrow streak, and while it lasted, we are told, the surrounding atmosphere remained unchanged and clear, as it had been before. Great noises accompanied the shower, and so frightened the people working in the fields, who at first were under the impression that it was a descent of fire—the white substance glistening in the sun—that on perceiving it they fled into their houses for shelter No damage was caused by what fell, and upon examination of the substance afterwards it was found to be perfectly harmless. At first the little balls were soft and pulpy, but they gradually became dry and pulverised, crumbling at the touch. We have before us a piece of earth on which one of them fell, and the mark left behind resembles a splash of lime-wash or similar matter. It does not smell of sulphur.'"

MR. JOHN TEBBUTT, of Windsor Observatory, N.S.W., writes as follows to the *Sydney Herald*:—The appearance presented by our evening skies for some weeks past has been the subject of general remark. Last evening, the 14th, the sky was almost cloudless after sunset, and the usual brick-red light again made its appearance along the west-south-west horizon. It was reflected apparently from an almost invisible and gauze-like cloud in the higher regions of the atmosphere. About seven o'clock the red glow was at its maximum, when a solitary cloud, whose apparent surface did not exceed ten square degrees, presented itself above it at an altitude of 25°. This cloud, which was at first white, quickly changed to a beautiful green, its borders being of a deeper tint. Of all the cloud phenomena that I have witnessed, it was one of the most remarkable. It retained its green colour for the space of about ten minutes, being all the time subject to much internal commotion. It soon afterwards resolved itself into several cloudlets, and finally disappeared. Two or three other small clouds were visible at the same time, and about the same altitude above the northern horizon, but these were of a gray colour throughout. The eastern sky about the moon was of that deep blue which is frequently observed to surround her when rising during the winter oppositions. Shortly after the dispersion of the green cloud, the ruddy glow gave place to the ordinary pale gray of the twilight, but by half-past seven o'clock the western sky became suffused with red, but this time of a clearer and more aurora-like tint. It did not appear, as in the former case, to be reflected from hazy cloud, and it extended much higher in the sky. This repetition of the ruddy glow on the same evening is a phenomenon which I had witnessed on several occasions during the present month. I remember that many years ago (probably twenty-five) a somewhat similar patch of red light used to make its appearance regularly after sunset in the west-north-west. This phenomenon occurred previously to the commencement of my regular meteorological observations in 1863, and was, I think, contemporaneous with a very dry winter. That the present ruddy skies are not merely a local phenomenon is obvious from the fact that they have been regularly observed during the past three months over a considerable portion of the Indian Ocean.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The following appointments have been made in accordance with Grace No. 19, confirmed on December 6 last:—J. H. Randell, B.A., Pembroke College, Assistant Demonstrator in Physics; J. C. McConnell, B.A., Clare College, Assistant Demonstrator in Physics; R. H. Solly, Demonstrator in Mineralogy, and Assistant Curator of the Museum; Walter Gardiner, B.A., Clare College, Demonstrator in Botany; A. Sheridan Lea, M.A., Trinity College, Senior Demonstrator in Physiology; W. D'Arcy Thompson, B.A., Trinity College, Junior Demonstrator in Physiology; A. Harker, B.A., St. John's College, Demonstrator in Geology. Baron Anatole von Hügel has been appointed Curator of the Museum of General and Local Archæology.

SCIENTIFIC SERIALS

THE *American Journal of Science*, December, 1883.—Some points in botanical nomenclature, a review of "Nouvelles Remarques sur la Nomenclature Botanique," par M. Alph. de Candolle, Geneva, 1883, by Asa Gray. The main object of this very valuable contribution to the vexed subject of botanic nomenclature is to enforce the principles and supplement the data supplied by M. de Candolle in his epoch making work. His doctrines are on the whole cordially accepted, and often very ably illustrated, while here and there some useful suggestive remarks and criticisms are offered on matters of detail upon which diversity of opinion and practice still prevails.—Pre-carboniferous strata in the Grand Cañon of the Colorado, Arizona, by Charles D. Walcott. The results are here embodied of over two months' careful examination especially of the Kaibab Division of the Grand Cañon and lateral gorges undertaken during the winter of 1882-3. The author, an active member of the United States Geological Survey, concludes that the Grand Cañon and Chuar groups correspond to that of the Keweenawan of Wisconsin, both being referable to the Lower Cambrian. Jointly with the Paradoxides horizon of Braintree, Massachusetts, and St. John's, New Brunswick, the olenellus of Nevada, Vermont, New York, and Newfoundland, and the Potsdam series of Wisconsin, New York, Canada, &c.; they constitute the Cambrian age as so far determined in North America.—Contributions to meteorology, nineteenth paper, with three plates, by Prof. Elias Loomis. This paper deals at some length with the barometric gradient in great storms. The results confirm in a general way the accuracy of Ferrel's formula:—

$$G = \frac{1076{\cdot}4\,(2n\cos\psi + \nu)\,sP}{\cos i\,(1 + {\cdot}004t)\,P'},$$

where G denotes the barometric gradient in millimetres per degree of a great circle, or sixty geographical miles. But it is shown that the effect of friction is considerably greater than was supposed by Ferrel.—A brief study of Vesta, by M. W. Harrington. The author considers it probable that this asteroid has a

diameter of over 500 miles, that she resembles the moon in her albedo, hence lacks an appreciable atmosphere and water, that the irregularities of her light indicate a very rough surface and rotation on her axis; lastly, that what is true of Vesta is likely to be true, *mutatis mutandis*, of the other asteroids.—On a new form of selenium cell and some electrical discoveries made by its use, by Charles E. Fritts. This new form of selenium cell has the following properties:—(1) its resistance can be made as low as desired, down to nine ohms; (2) the light is made to strike the cell in the same plane as the current; (3) it is far more sensitive to light than any before known, one cell having had fifteen times as high resistance in dark as ordinary diffused daylight in a room. Since the paper was written, the author announces the discovery of a new form of selenium, quite colourless and transparent, obtained under conditions excluding everything but selenium.—The Ischian earthquake of July 28, 1883, by C. G. Rockwood, jun. The author concludes that this disturbance had its orgin in a rupture taking place along an old volcanic fissure running roughly north and south, and extending radially under the northern slope of Mount Epomeo; and that the cause of the increased tension resulting in this rupture must be referred to the residual volcanic activity which Ischia shares with the adjacent mainland, rather than to any merely local subsidence, as suggested by Prof. Palmieri.

Annalen der Physik und Chemie, Bd. xx. No. 11, 1883.—R. Clausius, on the theory of dynamo-electric machines. This is a remarkably clear and able paper, dealing with the fundamental points in the theory of dynamo-electric machines in a masterly way, and introduces several new notions requiring the determination of the arbitrary constants in different machines. The questions of self-induction and mutual induction between different segments of the armature receive special attention. The author promises a further paper with applications of the equations.—L. Sohncke and A. Wangerin, on interference-phenomena in thin and particularly in wedge-shaped films. This paper is a continuation of one in last month's issue, giving new fundamental formulæ for Newton's rings and other interference-phenomena of thin films.—B. Hecht, on the determination of the axis-ratios of the elliptic paths in elliptic polarisation in quartz. A discussion of formulæ of Cauchy, Lommel, Voigt, and Jamin, in reference to the author's experiments.—W. Voigt, on the theory of light: a polemic against Herr Lommel respecting the latter's views on the possible intermolecular friction of the luminiferous ether.—H. Wild, on the application of his photometer as a spectrophotometer; this instrument, constructed by Hermann and Pfister, of Bern, contains a slit, a calc-spar rhombohedron, a Foucault prism, a second rhombohedron, a selenite plate, a Nicol prism, a pair of adjustable glass prisms, a 5-prism Amici direct-vision prism, and sundry lenses. The light to be examined has to pass through these successively.—Researches on forced vibrations of plates; part ii., on vibrations of square plates, by A. Elsas. This paper, which is accompanied by a set of forty-nine figures, is in continuation of a previous research on forced vibrations of round plates. The author points out that we already have the well-known researches of Chladni and Wheatstone on the figures due to natural vibrations of such plates. The aim of this research was to ascertain whether Savart's rule, that the forms of the forced vibrations merge into one another by a perfectly continuous series of modifications, is true for square plates; whether the figures corresponding to forced vibrations agree with those of the free vibrations of the same pitch; and whether the legitimacy of Wheatstone's method of superposition is confirmed or disallowed. The most important of all the results is that it is impossible for a square plate to vibrate in response to any time whatever, higher than its own fundamental, that may be forced upon it.—On Boltzmann's theory of elastic reaction, by Prof. E. Riecke; a mathematical discussion of Boltzmann's equations.—On aqueous solutions, by J. A. Groshans. A discussion of the dependence of the density of the solution on the quantity and molecular constitution of the soluble substance.—Measurement of the quantity of electricity produced by a Zamboni's pile, by Prof. E. Riecke. The values were calculated from currents traversing a long-coil galvanometer and a very high resistance.—On the galvanic-temperature coefficients of steel, rod-iron, and cast-iron, by V. Strouhal and C. Barus. For steel this coefficient diminishes as the hardness of tempering increases, while the specific resistance increases with the hardness. Glass-hard steel has about three times the specific resistance of soft steel.—On the relation between viscosity and electric resistance of solutions of salts in various solvent media, by E. Wiedemann. There appears to be no such relation as has been conjectured to exist.—On Arabian measurements of specific gravity, by E. Wiedemann.—Simplifications in experimenting with the air-pump, by K. L. Bauer, suggests the expedient already well known in England, of placing a sheet of soft caoutchouc under the receiver of the pump instead of greasing its rim; also similarly between the edges of the Madgeburg hemispheres. Gutta-percha paper is suggested as a substitute for bladder to be burst by air-pressure.

SOCIETIES AND ACADEMIES

LONDON

Chemical Society, December 20, 1883.—Dr. W. H. Perkin, F.R.S., president, in the chair.—The following gentlemen were elected Fellows of the Society:—W. P. Bloxam, A. Cobb, J. C. Chambers, A. E. Ekins, F. P. Haviland, F. Keeling, W. H. R. Kerry, J. J. Pilley, M. Percy, J. Phillips, A. W. Rogers, W. J. Saint, G. Smith, A. Smithells. The following papers were read:—Researches on the gums of the arabin group, by C. O'Sullivan. Part I. Arabic acid; its composition, and the products of its decomposition. In this most important paper the author has studied the action of dilute sulphuric acid upon arabic acid. The arabic acid was prepared by the method of Neubauer, and the sulphuric acid was allowed to act for various lengths of time from fifteen minutes to several hours. The molecule of arabic acid, $C_{89}H_{142}O_{74}$, is broken down, a series of eleven acids of gradually decreasing molecular weight (differing by $C_6H_{10}O_5$) having been isolated, and the barium salts formed and analysed; the lowest acid is $C_{23}H_{38}O_{22}$, and is comparatively stable; these acids the author calls α, β, &c., arabinosic acids. Simultaneously a series of sugars having the composition $C_6H_{12}O_6$ is formed of gradually decreasing optical activity, which the author names α, β, γ, and δ arabino-e. Arabic acid is the chief constituent of all the lævorotatory gums, but other acids are present which bear a simple relation to it. In a future paper the author promises an account of the dextrorotatory and optically inactive gums, the acids of which are built up in the same manner as arabic acid.—On the decomposition of ammonia by heat, by W. Ramsay and S. Young. This decomposition commences about 500°, and is nearly equal in extent with porcelain, glass, iron, and asbestos, but at 780° ammonia is almost completely decomposed by passing through an iron tube. Copper, when heated, is not so active.—On the halogen compounds of selenium, by F. P. Evans and W. Ramsay.—On the preparation of pure chlorophyll, by A. Tschirch. This substance is obtained by the action of zinc dust on chlorophyllan (*Bot. Zeit.*, 1882, 533); its spectrum is identical with that given by living leaves.

Zoological Society, December 18, 1883.—Prof. W. H. Flower, F.R.S., president, in the chair.—Dr. F. Leuthner read an abstract of a memoir which he had prepared on the Odontolabini, a subfamily of the Coleopterous family Lucanidæ, remarkable for the polymorphism of the males, while the females remained very similar. The males were stated to exhibit four very distinct phases of development in their mandibles, which the author proposed to term "priodont," "amphiodont," "mesodont," and "telodont." These forms were strongly marked in some species; but in others were connected by insensible gradations, and had been treated by the earlier authors as distinct species. The second part of the memoir contained a monograph of the three known genera which constitute the group Odontolabini.—Mr. E. B. Poulton, F.Z.S., read a memoir on the structure of the tongue in the Marsupialia. The tongues of species of nearly all the important groups of this subclass were described in detail. It was found possible to classify the tongues in three divisions. Of these, *Halmaturus* was the type of the lowest, *Phalangista* of the intermediate, and *Perameles* of the most advanced, division.—Mr. J. Wood-Mason, F.Z.S., read a paper on the Embiidæ, a little-known family of insects, on the structure and habits of which he had succeded in making some investigations during his recent residence in India. He came to the conclusion that the Embiidæ undoubtedly belong to the true Orthoptera, and are one of the lowest terms of a series formed by the families Acridioideæ, Locustidæ, Gryllidæ, and Phasmatidæ.—Mr. G. A. Boulenger, F.Z.S., read an account of a collection of frogs made at Yurimaguas, Huallaga River, Northern Peru, by Dr. Hahnel. The collection contained examples of eighteen species, eight of which were