have been used as solvents, and many remarkable results obtained. The importance of the paper may be gathered from the fact that in it is described "a method by which vulcanized india-rubber of any quality or character whatever, as well as the undecomposed or reclaimable part of rubber-waste, may be dissolved or liquefied in a reasonably short time, the solutions possessing any desirable degree of viscosity or diluteness, from which india-rubber may be regained on evaporation of the solvents."—Report of the examination by means of the microscope of specimens of infusorial earths of the Pacific coast of the United States, by Dr. Arthur M. Edwards. Seven new fluviatile fossiliferous deposits from Oregon, California, and Washington are described.—The Tonganoxie meteorite, by E. H. S. Bailey. An analysis of the meteorite gave the percentage composition: Fe 91·18, Ni 7·93, Co 0·39, P 0·10, and a trace of copper. The weight is $23\frac{1}{4}$ lbs., specific gravity 7·45, shape an irregular triangular pyramid $9\frac{1}{2}$ inches long by $6\frac{1}{2}$ inches wide by $4\frac{1}{2}$ inches deep. A fine figure showing numerous pittings on the surface of the meteorite accompanies the paper.—Proposed form of mercurial barometer, by W. J. Waggener.—Colour photography by Lippmann's process, by Charles B. Thwing. The results obtained seem to indicate—(1) that mixed colours may be reproduced with a fair degree of accuracy; (2) that an exposure sufficiently long to give a clear image of the red is quite certain to obliterate the blue by over-exposure; and (3) that an over-exposure may completely reverse the colours, causing the original colours to appear on the reverse, and the complementary colours on the film side of the plate.—New analyses of uraninite, by W. F. Hillebrand. From the analyses it appears that the species may be broadly divided into two groups, one characterized by the presence of rare earths and the almost invariable presence of nitrogen, the other containing little or no nitrogen and no rare earths. Varieties of the former group occur in more or less well defined crystals, whilst members of the latter group are usually devoid of crystalline form.—The Tertiary silicified woods of Eastern Arkansas, by R. Ellsworth Call. The investigation has led to the following conclusions:—(1) The silicified woods of Eastern Arkansas are all of Tertiary age. (2) They are derived from the beds of Eocene clays that underlie the sands and gravels in which they commonly occur. (3) They are silicified lignite; the process of silicification has occurred either while they were still in clays, or most often after they were removed and buried in the sands or gravels. (4) They possess as yet no taxonomic value in determining the relative ages of the members of the Tertiary series.—Occurrence of sulphur, orpiment, axd realgar in the Yellowstone National Park, by Walter H. Weed and Louis V. Pirsson.—Mineralogical notes, by L. V. Pirsson. Some specimens of cerussite, hæmatite, and cassiterite, gypsum, and pennine are described.—Peridot dykes in the Portage sandstones, near Ithaca, N.Y., by J. F. Kemp.—A new locality of meteoric iron, with a preliminary notice of the discovery of diamonds in the iron, by A. E. Foote. The existence of black and white diamonds in the meteorite appears to be established by indifference to chemical agents and hardness. Carbon in the form of an iron carbide also occurs with the diamonds. The meteorite was found in Cañon Diablo, Arizona. Three figures accompany the paper.—The South Trap Range of the Keweenawan series, by M. E. Wadsworth.—Geological facts noted on Grand River, Labrador, by Austin Cary.

SOCIETIES AND ACADEMIES.

LONDON.

Mathematical Society, November 12.—Prof. Greenhill, F.R.S., President, in the chair.—The President announced the recent decease of Mr. H. M. Jeffery, F.R.S., who was elected January 14, 1875.—The following gentlemen were elected to serve on the Council for the ensuing session: Prof. Greenhill, F.R.S., President; Dr. J. Larmor, Major P. A. MacMahon, F.R.S., and J. J. Walker, F.R.S., Vice-Presidents; A. B. Kempe, F.R.S., Treasurer; M. Jenkins and R. Tucker, Hon. Secs.; other members, Messrs. A. B. Basset, F.R.S., E. B. Elliott, F.R.,S. J. Hammond, C. Leudesdorf, A. E. H. Love, S. Roberts, F.R.S., Drs. A. R. Forsyth, F.R.S., J. W. L. Glaisher, F.R.S., and M. J. M. Hill.—The following communications were made:—On selective and metallic reflection, by A. B. Basset, F.R.S. It is well known that most transparent substances, which produce anomalous dispersion, exercise a strong selective absorption, and at the same time strongly reflect rays of the same periods as those whieh they absorb. Thus in fuchsine the order of the colours going up the spectrum is blue, indigo, violet; then there is an absorption band, followed by red, orange, yellow. The experimental laws relating to substances of this class may be summarized as follows: (1) the rays which are most strongly absorbed, when light is transmitted through the substance, are most strongly reflected; (2) when the incident light is plane polarized in any azimuth, the reflected light is elliptically polarized; (3) when sunlight is reflected, the colour of the reflected light, when viewed through a Nicol's prism whose principal section is parallel to the plane of incidence, is different from what it is when viewed by the naked eye. The phenomena of absorption, anomalous dispersion, and the like, have formed the subject of numerous theoretical investigations by German mathematicians. It is not the object of the present paper to propose any new theory upon the subject, but to discuss and extend the theory of von Helmholtz. The theory of von Helmholtz is an elastic-solid theory, which is based upon certain assumptions respecting the mutual reaction of ether and matter. The potential energy of the system may be conceived to consist of three distinct portions, viz. W_1, W_2, W_3, of which W_1 is the ordinary expression for the potential energy of an isotropic elastic solid; W_2 is a homogeneous quadratic function of the displacements of the matter; and W_3 is a similar function of the relative displacements of ether and matter, and is supposed to arise from the mutual reaction of ether and matter. Having obtained the expression for the energy of the system, the equations of motion can be at once written down; and it will be found, on integrating them, that the index of refraction, μ, of light of period τ, is given by the equation—

$$\mu^2 = \frac{\rho}{\rho_0} - \frac{\alpha^2\tau^2}{4\pi^2\rho_0}\left\{1 + \frac{\alpha^2k^2\tau^2}{4\pi^2\rho_1(k^2-\tau^2) - \alpha^2k^2\tau^2}\right\} \quad . \quad . (1)$$

In this equation ρ is the density of the ether when loaded with matter, ρ_0 is the density of the ether *in vacuo*, and ρ_1 is the density of the matter; k is the free period of the matter vibrations, and α is a constant depending on the mutual reaction of ether and matter. If we suppose that the value τ_1 of τ, which makes the denominator vanish, corresponds to the double sodium line D of the spectrum, whilst a value τ_2, which makes $\mu = 0$, corresponds to the hydrogen line F, μ^2 will be negative when τ lies between D and F, and (1) accordingly represents a transparent medium (such as fuchsine) which has a single absorption band in that portion of the spectrum. Moreover, the dispersion is anomalous, since the value of μ when τ is a little greater than τ_1, is much greater than its value when τ is a little less than τ_2. To explain selective reflection, I have provisionally adopted Sir W. Thomson's hypothesis, that the ether is to be treated as an elastic medium, whose resistance to compression is a negative quantity, whose numerical value is slightly less than $\frac{4}{3}$rds of its rigidity. Under these circumstances, the amplitudes of the reflected light will be given by Fresnel's sine and tangent formulæ, according as the incident light is polarized in or perpendicularly to the plane of incidence. When μ^2 is a negative quantity, these formulæ become complex quantities of the form $\epsilon^{-2\iota\pi f/\lambda}$ and $\epsilon^{2\iota\pi f_1/\lambda}$, and this indicates that reflection is total, and is accompanied by a change of phase; moreover, since the changes of phase, f, f_1, are different, according as the incident light is polarized in or perpendicularly to the plane of incidence, it follows that if the former is polarized in any azimuth the reflected light will be elliptically polarized. From these results it appears that the colour of the reflected light is of a greenish yellow when viewed by the naked eye; but when it is viewed through a Nicol, whose principal section lies in the plane of incidence, a considerable portion of the yellow rays are refused transmission by the Nicol, and the light under these circumstances is of a much richer green. Cauchy's formulæ for metallic reflection may be obtained from Fresnel's sine and tangent formulæ, by assuming that μ ($= \sin i/\sin r$) is a complex quantity of the form $R\epsilon^{\iota\alpha}$; but the experiments of Jamin, and the calculations of Eisenlohr, show that the real part of μ^2 must be *negative*, which requires that α should lie between 45° and 90°. In fact, for silver, Eisenlohr finds that $\alpha = 83°$. Lord Rayleigh, on the other hand, has shown that, if we attempt to explain metallic reflection by introducing a viscous term into the ordinary equations of motion of an elastic solid, physical considerations require that the real part of μ^2 should be *positive*; he has also shown that a similar objection lies against attempting to explain metallic reflection on the electro-magnetic theory, by taking into account the conductivity. If, however, we start with von Helmholtz's theory, and introduce a viscous term into the *equations of motion of the matter*, it will be found possible for the real part of μ^2 to be negative, provided the free period of the matter vibrations lies between certain limits. We are thus able to construct a mechanical model of a medium which represents the action of metals upon ethereal waves, and which leads to the same formulæ for the amplitudes of the reflected waves as those given by Cauchy.—The contacts of systems of circles, by A. Larmor.—On a class of automorphic functions, by Prof. W. Burnside.—Note on the identity $4(x^p - 1)/(x \quad 1) = Y^2 \pm pZ^2$, by Prof. G. B. Mathews.—On the classification of binodal quartic curves, by H. M. Jeffery, F.R.S.—Researches in the calculus of variations; discriminating conditions in isoperimetrical problems, by E. P. Culverwell.—Note on Clifford's paper "On syzygetic relations among the powers of linear quantics," by Prof. Cayley, F.R.S.—Note on finding the G points of a given circle with respect to a given triangle of reference, by J. Griffiths.

Linnean Society, November 19.—Prof. Stewart, President, in the chair.—Mr. S. Jennings exhibited a collection of wild flowers made by him during a recent tour through the Rocky Mountains, California, and Mexico.—Prof. G. B. Howes exhibited some dissections of fish crania made by his pupil Mr. R. H. Burne, in which the parts of the skeleton were so displayed that they might be studied in relation to the rest of the head and to the leading cranial nerves.—Mr. E. F. Cooper exhibited specimens of a new variety of *Potamogeton* from Loughborough, lately described and figured by Mr. Alfred Fryer (*Journ. Bot.*, October 1891).—Mr. A. W. Bennett exhibited and made remarks upon some specimens of *Hydrodictyon utriculatum*, Roth. (*H. reticulatum*, De Toni), and some drawings of anomalous *Cypripedium* and *Disa*.—Mr. W. Carruthers, F.R.S., gave a graphic account of a recent visit to Sweden in search of original portraits of Linnæus, and detailed the results of his inquiries. His remarks were illustrated by an exhibition of engravings and photographs.—A paper was then read by Mr. Thomas Hick, on a new fossil plant from the Lower Coal-measures. An interesting discussion followed, in which Mr. Carruthers, Mr. G. Murray, Prof. F. O. Bower, Prof. Marshall Ward, and others took part.

PARIS.

Academy of Sciences, November 23.—M. Duchartre in the chair.—On some manuscripts with figures of historical interest relating to artillery and mechanical arts towards the end of the Middle Ages, by M. Berthelot. Some manuscripts from libraries at Munich, Venice, and Paris have been examined, and appear to be of interest as marking a stage in the development of applied sciences. A few of the mediæval figures are reproduced: one represents a diver in his costume; two others show primitive cannon, and one a small-arm used in the fifteenth century.—Preparation and properties of the phosphides of boron, by M. Henri Moissan. By the use of boron phosphoiodide, two boron phosphides may be obtained. The compound PB combines with HNO_3,H_2O with incandescence, and inflames in an atmosphere of chlorine in the cold. The compound P_3B_5 is much more stable, and is not acted upon in the cold by these two reagents.—On some variations of the glycolytic power of the blood, and on a new method of experimental production of diabetes, MM. R. Lépine and Barral.—M. A. Potier was elected a member of the Academy in the place of the late M. Edmond Becquerel.—*Résumé* of a verbal report on a note by Prince Tourquistanoff, entitled "Le Calendrier vérificateur," by M. Wolf.—*Résumé* of a verbal report on a note by M. de Cohorne, entitled "Le Régleur solaire," by M. Wolf.—Observations of the total eclipse of the moon of November 15, made at Bordeaux Observatory, by M. G. Rayet.—Remarks *à propos* of the observation of M. Rayet as to the possibility of photographing the moon during a total eclipse, by M. A. Gautier.—Remarks on M. Rayet's communication, by M. J. Janssen.—Researches on the motions of stars in the line of sight made with the Paris Observatory siderostat, by M. Deslandres. (For the last four communications, see Our Astronomical Column.)—Remark on a communication by M. Markoff relative to linear differential equations, by M. Painlevé.—On the flow of liquids in capillary tubes, by M. Albert Colson. The influence of temperature on the rate of flow of viscous liquids is seen from the following comparison of the times in which 5 c.c. of glycerine passed through the tube:—

Temperatures ...	21° ...	100° ...	150° ...	250° ...	265°
Duration of flow ...	8h. ...	360s. ...	114s. ...	40·5s. ...	33s.

The same tube passed 5 c.c. of water at 20° in 34 seconds. The author divides the liquids he has experimented upon into two classes, distinguished by being perfectly and imperfectly mobile. Ethers and aldehydes are representatives of the former class, for they appear to obey Graham's law that the duration of flow, or rather the rate of diffusion, is inversely proportional to the square root of the density. The values found for $\frac{t}{\sqrt{D}}$ in this class of liquids is practically constant. On the other hand, the liquids *imparfaitement mobiles*, such as alcohols and benzines, furnish irregular values.—Mechanical determination of the position of the atoms of hydrogen in organic compounds, by M. G. Hinrichs.—Aniline black in dyeing by the dry method, by M. A. Gautier.—On a codeïne violet, by M. P. Cazeneuve.—On the distribution of saccharine matters in the different parts of the edible *Cèpe* (*Boletus edulis*, Bull.), by M. Em. Bourquelot.—On the existence of veins of leucite in a Mont Dore basalt, by M. A. Lacroix. Leucite has not before been recognized in any of the volcanic rocks of the central plateau of France. The author fully describes the petrological characters of the specimens he has discovered, and also their peculiar mode of occurrence.—Earthquakes, submarine eruption, and elevation of land at Pantellaria, by M. A. Riccò. Earthquake shocks were felt at Pantellaria on October 14. On October 18, the sea to the west-north-west of the island, at a distance of about 5 kilometres, was seen in violent commotion, and a band of land about 1 kilometre long appeared, from which were ejected masses of heated rock and vapour. On approaching the place of eruption, a large number of dead fishes were found, and it was seen that the band was composed of an immense number of black floating masses of rock colliding together with great noise, and vaporizing the water over which they passed. On October 23 the position of the erupted island was determined as lat. 36° 50′ N., long. from Paris 9° 33′ E. The island was then about 200 metres long by 50 metres wide. The interior of some of the masses of rock was still hot enough to melt zinc.

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