the Palace, by the Council, the charity and its endowments shall be administered by a body of governors fifteen in number. Of these the master and clerk of the Drapers' Company shall be two, the Drapers' Company shall nominate six, the Central Governing Body two, the County Council one, and four shall be coopted members. So long as university education is carried on by the Council in the present college premises, the governing body shall grant the use of them at a rent of 1*l.* per year. The scheme goes on to state that the Drapers' Company shall pay to the governing body the sum of 7000*l.* per annum. The company may, however, discontinue such payment on giving notice and, at the expiration of five years, paying for the purpose of the scheme the sum of 30,000*l.* If at the date whereon the payment of 30,000*l.* becomes due university education is being carried on in the present college premises, the money shall be applicable for the future maintenance of the East London College as may be directed by the Board of Education. So long as university education is carried on and the annual payment from the Drapers' Company is received, the amount is to be paid for the purposes of the East London College, and the scheme determines that the part of the endowment of the charity which is held for educational purposes consists of the present college premises, so long as university education is carried on there, the sum of 7000*l.* per annum so long as it is paid by the Drapers' Company or the 30,000*l.* to be paid by the company in the event of the discontinuance of the annual payment. The educational endowment is to be administered under the title of the East London College as a separate educational foundation for the promotion of university education.

We learn from *The Pioneer Mail* that new buildings of the Poona Agricultural College were opened by Sir George Clarke, the Governor of Bombay, on July 18. The college at present consists of two large buildings, and another is in course of construction. In the main building all work except that relating to chemistry and physics will be done, the smaller one adjoining being devoted solely to these latter subjects. The complete course at the college lasts three years and includes practical farming, general chemistry, botany, agricultural engineering, veterinary science, agricultural climatology, entomology, and so on. During the course of his address Sir George Clarke said there is only one fault in the Bombay Agricultural Department: it is far too small, in comparison with the needs of cultivators and the vast magnitude of the task which it has undertaken. "If I were an Indian politician," he continued, "I should worry Government, in season and out of season, to spend more money upon the improvement of agriculture and the acquisition and spread of knowledge. We require much more research work because the problems of India are her own, and careful investigations carried on in other countries may be valueless in our special conditions. We want more demonstration farms where cultivators can receive an object-lesson by which the advantages of improved methods can be brought home to their minds. I should like to see many more lecturers employed in going about among villages to instil new ideas and to awaken interest. I think we should also establish rural schools where the elements of practical agriculture could be taught in the vernacular. The demands upon the Government are now so many and so insistent that we cannot do all we wish. If the nature and vast importance of agricultural work were more widely known, I am certain that our many wealthy and generous philanthropists would come forward to help. There can be no better proof of patriotism and no better way of promoting prosperity than the increase and development of the production of the land, which lies within our power if adequate means were available."

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society.—Prof. J. H. **Poynting**: Small longitudinal material waves accompanying light waves. (Received July 26.)

All experiments on the pressure of light agree in showing that there is a flow of momentum along the beam. This flow is manifested as a force on matter wherever there is a change of medium. When the light is absorbed, the momentum is absorbed by matter. When the beam is shifted parallel to itself there is a torque on the matter effecting the shift. The momentum would therefore appear to be carried by the matter, and not merely by the æther. Though there is an obvious difficulty in accepting this view when the density of the matter is so small as it is in interplanetary space, it appears to be worth while to follow out the consequences of the supposition that the force equivalent to the rate of flow of momentum across a plane perpendicular to a beam of light acts upon the matter bounded by the plane. This rate of flow per square centimetre is equal to the energy density or energy per cubic centimetre in the beam. Of course, in experiments, only the average of the rate of flow during many seconds and the average energy per cubic centimetre in a length of beam of millions of miles is actually measured. But on the electromagnetic theory of light, which suggested the experiments and gives the right value for the pressure, this pressure is equal to the energy density at every point of a single wave.

Let us suppose that we have a train of plane polarised electromagnetic waves of sine form, the magnetic intensity being given by

$$H = H_1 \sin \frac{2\pi}{\lambda}(x - vt),$$

where H_1 is the amplitude of H. The electromagnetic energy per unit volume is $\mu H_1^2/8\pi$, and

$$\frac{\text{Energy in longitudinal waves}}{\text{Electromagnetic energy}} = \frac{\mu H_1^2}{32\pi\rho v^2} = \frac{1}{8}\,\frac{\mu H_1^2}{8\pi}\Big/\frac{\rho v^2}{2}$$

which is one-eighth of the electromagnetic energy divided by the energy which the matter would have if it were moving with the velocity of light in that matter.

This shows how infinitesimal is the fraction of the energy of the beam which is located in these waves of compression of the material.

The fraction is proportional to the intensity of the beam.

As an example, take a beam of the intensity of full sunlight just outside the earth's atmosphere, in which the energy flow is about $1{\cdot}4\times10^6$ ergs/sec. The energy density $\mu H_1^2/8\pi$ is therefore $1{\cdot}4\times10^6 \div v$. Put $v = 3\times10^{10}/n$, where n is the refractive index. The fraction is

$$\frac{1}{4}\cdot\frac{1{\cdot}4\times10^6\,n^3}{27\times10^{30}\,\rho}, \text{ or about } 1{\cdot}25\times10^{-26}n^3/\rho.$$

At the surface of the sun it would be about 40,000 times as much; say $5\times10^{-22}n^3/\rho$.

It is interesting to note that if a beam of light is incident on any reflecting or absorbing surface, and if the pressure of light is periodic with the waves, it must give rise to ordinary elastic waves in the material of frequency double that of the light waves.

EDINBURGH.

Royal Society, July 14.—Sir William Turner, K.C.B., president, in the chair.—Prof. F. A. **Forel**: Refractions at the surface of a lake, mirages, and *fata morgana*. In discussing mirages and refraction effects over the surface of a lake, one must distinguish between refractions in air over warm water and refractions in air over cold. In the former, with the warm layers below, the curve of refraction is concave upward; in the latter it is convex; and the horizon is, respectively, elevated above and depressed below its normal position. On a summer day, as the temperature of the air changes from being lower to being higher than the temperature of the water, there appears a phenomenon called by the Italian men of science the *fata morgana*. It has the appearance of a series of rectangles, as if some great cliff or the quays of an enormous city extended along the opposite side of the lake. The higher line of this striated zone coincides with the horizon of the refraction over cold water, and the lower line is continuous with the horizon of the refraction over warm water. The *fata morgana* is the fusion of the two types of refractions as the one succeeds the other.—J. Y. **Buchanan**: Experimental researches on the specific gravity and displacement of some saline solutions.

PARIS.

Academy of Sciences, July 31.—M. le Général Bassot in the chair.—R. **Radau**: The tables of the moon, based on Delaunay's theory. The solar perturbations of Delaunay, with some additional corrections suggested by Andoyer, may be considered as sufficiently exact from the point of view of practical astronomy, but there is still a lack of agreement with the observed figures as tabulated by Hansen. Means are suggested for further reducing the differences between the observation and calculation.—P. **Villard**: A self-recording electrometer with carbon filaments. A U-shaped carbon lamp filament, carrying a small cylindrical mirror made of a short piece of glass capillary tube silvered inside, forms the moving part of the electrometer. The sensibility of the instrument can be readily modified so as to be suitable either for use in an observatory or in a balloon.—Lecoq **de Boisbaudran** and A. **de Gramont**: The spectrum of gluanum and its bands in different sources of light. The wave lengths of the principal components of three bands (green, blue, and indigo) are given. The general similarity with the corresponding aluminium bands is pointed out.—Édouard **Heckel**: The genus Spermolepis of New Caledonia and its relations with the genus Schizocalyx.—M. **Javelle**: The Wolf comet (1911*a*). Observations made at Nice with the 76 cm. equatorial. Data are given for July 15, 20, 21, 22, 26, 27, 28, and 29. The comet appeared as a feeble nebulosity, about 10 inches in extent, and with a nucleus below the 14th magnitude.—M. **Esmiol**: Observation of the Brooks comet (1911*c*) made at the observatory of Marseilles with the Eichens equatorial of 26 cm. aperture. Data given for July 22. The comet appeared as a round nebulosity, 0·2′ in diameter, with a nucleus of about the 12th magnitude.—M. **Borrelly**: Observations of the Brooks comet (1911*c*) made at the observatory at Marseilles with the comet-finder. Data given for July 22 and 23.—A. **Korn**: An important class of asymmetrical nuclei in the theory of integral equations.—May Sybil **Leslie**: The molecular weight of the thorium emanation. An application of the apparatus used by Debierne (effusion through a small orifice) for the determination of the molecular weight of the radium emanation to the thorium emanation. The results show that the molecular weight of the thorium emanation is in the neighbourhood of 200.—Edm. **van Aubel**: Hall's phenomenon and the transversal thermomagnetic effect in graphite. Graphite shows Hall's phenomenon in the opposite sense to antimony, or in the same sense as pure bismuth, like the other varieties of carbon.—L. **Dunoyer**: Researches on the fluorescence of the vapours of the alkaline metals.—William **Duane**: The mass of the gaseous ions. Under the experimental conditions described in the paper, all the results obtained were opposed to the hypothesis of the existence of positive ions.—J. **Danysz**: The β rays of the radium group. The β rays from the radium emanation have yielded a magnetic spectrum of seven homogeneous bundles, the velocities of which have been exactly determined.—Eugène **Cornec**: The cryoscopic study of some mineral acids and some phenols. The method used consists in neutralising the acid or phenol gradually by a strong base and determining the freezing point for each mixture; the neutral point is indicated by an angular point on the curve.—H. **Pelabon**: The metallography of the selenium-antimony systems. The results obtained confirm the conclusions drawn in an earlier paper from a study of the fusibility curves.—M. **Jouguet**: Indifferent points.—F. **Bodroux** and F. **Taboury**: The action of bromine in presence of aluminium-bromide on cyclohexanol and cyclohexanone.—F. **Bodroux**: The action of anisaldehyde and piperonylaldehyde upon the sodium derivative of benzyl cyanide.—A. **Barille**: The action of soda water upon lead, tin, and antimony. The causes of poisoning by chemical alteration. More lead and tin are dissolved by soda water from an alloy of tin and lead than from either of the pure metals, and this is true even for an alloy containing only 0·5 per cent. of lead. The author concludes that all the metallic parts of a soda-water siphon ought to be protected by enamel or similar means from contact with the liquid.—Marcel **Badouin**: Study of the action on the brain of the annular deformation of the skull of the Gallo-Roman period.—Maurice **Arthus** and **Boleslawa-Stawska**: Poisons and antipoisons. A criticism of the results of experiments by C. J. Martin and T. Cherry, on the interaction of a toxin and antitoxin *in vitro*. The authors' experiments with mixtures of cobra-venom and its antiserum lead to the conclusion that the neutralisation of the venom by the antivenom is practically instantaneous, and rather resembles the neutralisation of an acid by a base than a diastatic action. The same conclusion was arrived at when working with the venom of *Lachesis lanceolatus* and of *Crotalus terrificus* and their corresponding antivenoms.—M. **Maze**: Researches on the formation of nitrous acid in the plant and animal cell.—Gabriel **Bertrand** and Arthur **Compton**: The influence of the reaction of the medium on the activity of cellase. A new distinction from emulsine.—E. **Voisenet**: A ferment causing bitterness in wine, a dehydrating agent for glycerol. An account of the isolation of a bacillus, capable of transforming glycerol into acrolein.—C. **Levaditi** and S. **Muttermilch**: The diagnosis of sleeping sickness by the examination of the attaching properties of the serum.—Jules **Welsch**: A depression of the Lower Eocene north of Blaye in Cosnac (Charente-Inférieure).

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