which we sum up the light—do not localise the light, but throw it together—it does not matter whether your clock goes well or not, you are certain to have a result worthy of credit. But if you employ such an instrument as Prof. Respighi employed, and abolish the slit altogether, the weight of any observations made with such conditions is very great.

Captain Maclear, who was observing with me at Bekul, has undoubtedly shown that when the light of our atmosphere is cut off by the interposition of the dark moon, we see very many more bright lines than we do when this is not the case, the lines being of unequal height.

Mr. Pringle, also at Bekul, showed that, at the end of totality, many lines flashed into one of these instruments, carried under these difficult conditions.

Captain Fyers, the Surveyor-General of Ceylon, observing with a spectroscope of the second kind, saw something like a reversal of all the lines at the beginning, but nothing of the kind at the end.

Mr. Fergusson, observing with a similar instrument, saw reversal neither at the beginning nor the end.

Mr. Moseley, whose observations are of great weight, says that at the beginning of the eclipse he did not see this reversal of lines. Whether it was visible at the end he could not tell, because at the close the slit had travelled off the edge of the moon.

Prof. Respighi, using no slit whatever, and being under the best conditions for seeing the reversal of the lines, certainly did not see it at the beginning, but he considers he saw it at the end, though about this he is doubtful.

From the foregoing general statement of the observations made on the eclipse of last year, it will be seen that knowledge has been very greatly advanced, and that most important data have been obtained to aid in the discussion of former observations. Further, many of the questions raised by the recent observations make it imperatively necessary that future eclipses should be carefully observed, as periodic changes in the corona may then possibly be found to occur. In these observations the instruments above described should be considered normal, and they should be added to as much as possible.

I had intended, if time had permitted me, to point out how much better we are prepared for the observation of an eclipse now than we were when we went to India, and how a system of photograph record should be introduced into the spectroscopic and polariscopic work; but time will not allow me to do more than suggest this interesting topic. I am anxious, however, that you should allow me one minute more to say how very grateful we feel for the assistance rendered by all we met, to which assistance so much of our success must be ascribed. I wish thus publicly to express the extreme gratitude of every one of our Expedition to the authorities in India and in Ceylon for the assistance we received from them, and our sorrow that Admiral Cockburn, a warm and well-known friend to Science, who placed his flagship at the disposal of the expedition, and the Viceroy, whose influence in our favour was felt in every region of India whither our parties went, and to whom we gave up our ship, are now, alas! beyond the expression of our thanks. We are also anxious to express our obligations to the directors and officers of the Peninsular and Oriental Company for the magnificent way in which they aided us. If they had not assisted us as they did, Science would have gained very much less than she has done from the observations of the last eclipse.

SCIENTIFIC SERIALS

THE *Journal of the Quekett Microscopical Club* for October 1872, contains but three papers, of which the first is a short one by Dr. Guy, F.R.S., on the "Hand Illuminator Microscope," which is followed by a more elaborate communication of considerable length, by Mr. M. C. Cooke, on "Old Nettle Stems and their Micro-fungi," in which twenty-seven species of fungi are enumerated and described which develop themselves on the old stems of the common nettle.—C. H. Peck, of Albany, U.S., communicates an article on the disease of plum and cherry trees in the United States known as "black knot," and his observations on the structure and growth of the *Sphæria morbosa* (Schweinitz) which accompanies, or causes, these gouty excrescences. The record of the proceedings of the club completes the contents of the present number.

Bulletin de l'Académie Royale de Belgique, No. 7. This number contains a paper, by M. P. J. Van Beneden, on the fossil whales of Antwerp, in which he describes several new types, among others, one (named Cetotherium) characterised chiefly by the articular condyle on the inferior maxillary, and forming a transition-type between the Balænoptera and the Cetodonts. Four species of Cetotherium are described. G. Dewalque gives a description, with plate, of a new fossil sponge, met with in the Eifel system; a species of the Astræospongium of Roemer, so named from the six-rayed star forms composing it. A new mode of estimating the advantage of binocular vision over monocular, as regards the brightness or clearness of objects, is proposed by H. Valerius. He employs Foucault's photometer, which consists of a long box, having a glass disc fixed in one end of it, and a pasteboard diaphragm in the direction of the axis of the box, moveable to or from the disc with screws. Lights are placed on either side of the diaphragm, which thus forms shadows on the disc, and the diaphragm is so adjusted that the shadow from each light occupies half of the disc. The lights having been so adjusted that the disc seems uniformly lighted, their relative intensities are as the squares of the distances separating them from the disc. M. Valerius uses, for his purpose, a prismatic tube, through which he observes the disc of the photometer. It contains a vertical screen which conceals one-half of the disc from one of the eyes. Suppose the disc to be receiving equal quantities of light from the two sources, the observer, on looking through the tube, finds that the half-disc seen with only one eye, appears less illuminated than the other. The equality is restored by moving one of the lights, and the distance of the motion is measured.—This paper is followed by one on formulæ in Ballistics, by J. M. De Tilly.—In the literature department, Baron Kervyn de Lettenhove gives an interesting account of certain documents which he examined at Hatfield House, bearing on the later history of Mary Queen of Scots. He discusses the celebrated casket letters, two of which are preserved at Hatfield, and are considered by him to be translations from the Scotch text. The letters are given in lithograph.—E. Varenbergh communicates an account of a journey made by three Flemish gentlemen to Nuremberg in the thirteenth century; an exact statement being made of the expenses incurred in travelling. One or two minor articles complete the number.

Poggendorff's Annalen der Physik und Chemie.—No. 7 (1872) commences with a paper of careful research, by H. Knoblauch, on the passage of heat-rays through inclined diathermanous plates. The rays, polarised by a Nicol's prism, were caused to pass horizontally to the plate, which was moveable about a vertical axis, and, passing through it, affected a thermopile. Two things determine the passage of radiant heat through inclined plates—the nature of the ray's polarisation, and the absorptivity of the substance composing the plate. These two influences are fully investigated and their effects described.—A continued account, by Hagenbach, of researches on Fluorescence is followed by a somewhat mathematical paper by Ketteler (also a continuation), on the influence of astronomical motion on optical phenomena. Dr. Stoletow discusses at some length the "Function of Magnetisation" of soft iron, and a description is given by G. Vom Rath, of the meteoric stones which fell at Ibbenbühren in 1870. W. Beetz, in a short note, contests the assertion of Zöllner, that an electric current is generated in the flowing of water, pointing out that, in the experiments made, the electric phenomena probably arose from the actual formation of a voltaic element consisting of two different metals (of tap and pipe), and the water, so that the same thing might be observed though the water was at rest. Zöllner's theory of terrestrial magnetism connects itself with the observation in question, as he supposes the flowing liquid masses in the earth's interior generate electric currents by their motion. This number contains, in addition, two contributions on the structure of hailstones, and one or two other short notes.

No. 8 contains the concluding part of Herr Hagenbach's researches on Fluorescence. His experiments, made with a great variety of substances, confirm Stokes's laws. He considers that all the rays are capable of exciting fluorescence. The maxima of the fluorescence varied from 7 (in chlorophyll) downwards. The spectrum of the fluorescent light varied also for different substances, but no necessary connection was apparent between the "intermittence" in the fluorescence of the ordinary spectrum, and that in the fluorescence spectrum. Change of solvent often displaced the maxima. He points out the similarity between phosphorescence and fluorescence, and thinks these are phenomena differing not in kind, but only in degree.—In the next paper

A. Helland adduces a large amount of evidence to show that the fjords in Norway have been formed by glacial action.—H. C. Vogel describes some careful experiments on the spectrum of aurora, which he compared with the spectra of various gases in Geissler tubes. He regards it as a modification of the air spectrum; one line of the former, at least, corresponding with the maximum brightness of the latter, while the remaining lines probably appear in the spectra of atmospheric gases under certain conditions of temperature and pressure.—A new mode of measuring rate of rotation is proposed by A. Schuller. The principle is briefly this: A disc divided into three sectors (black, red, and green), rotates on a horizontal axis; a seconds pendulum fitted with a screen, in which is a vertical slit, oscillates at the back of it, and a ray of light passes through the slit and disc to a telescope through which the observer looks. The recurrence of particular colours observed gives a means of estimating the speed of rotation.—Among the remaining papers are one on a block of lava from the recent eruption of Vesuvius, one on compounds of thallium, and one on a new form of the Noë thermopile.

SOCIETIES AND ACADEMIES

LONDON

Mathematical Society, Nov. 14.—Mr. W. Spottiswoode, F.R.S., President, in the chair.—The following gentlemen were elected as officers and members of council for the ensuing session:—President, Dr. Hirst, F.R.S.; Vice-Presidents, Prof. Crofton, Mr. S. Roberts, and Mr. Spottiswoode; Treasurer, Mr. S. Roberts; Secretaries, Mr. M. Jenkins, Mr. R. Tucker; other members, Prof Cayley, Prof. W. K. Clifford, Mr. T. Cotterill, Mr. J. W. L. Glaisher, Rev R. Harley, Prof. Henrici, Mr. C. W. Merrifield, Prof. H. J. S. Smith, Mr. J. Stirling, and Mr. J. J. Walker. Messrs. Glaisher and Harley were elected in the room of Dr. Sylvester and the Hon. J. W. Strutt. The new president having taken the chair, alluded in feeling terms to the loss the mathematical world and the Society had just experienced by the death of Dr. Clebsch, of Göttingen, who had been elected a foreign member in December last. Mr. Spottiswoode then read his paper, "Remarks on some recent Generalisations of Algebra." It gave an analysis of methods used by Prof. Peirce, of Harvard, in his "Linear Associative Algebra," and by Dr. Hermann Hankel in his "Vorlesungen über die complexen Zahlen und ihre functionen," Part i. Prof. Henrici exhibited a series of models of cubic surfaces, and pointed out the several singularities, and explained how the models were constructed. Prof. Clifford next read a paper "On a theorem relating to polyhedra analogous to Mr. Cotterill's theorem on plane polygons," and exhibited several illustrative models. The plane theorem is "for every plane polygon of n vertices there is a curve of class $n-3$ touching all the diagonals; the number of diagonals is such as to exactly determine this curve and no more; and when the curve touches the line at infinity the area of the polygon is zero." The analogous theorem in space should therefore apply in the first instance to those solids whose volume can be expressed as the sum of tetrahedra, having one vertex at an arbitrary point of space, and the other three at three vertices of the figure; that is to say, it should apply to solids having triangular faces. For such solids the author finds that the analogy is very complete and exact. Defining the plane which contains three vertices and which is not a face, as a diagonal plane and a line joining two vertices, but not being an edge as a diagonal line, he proves the following theorems:—"For every polyhedron of n summits having only triangular faces ($\triangle$ faced n-acron, Cayley) there is a surface of class $n-4$, touching all the diagonal planes. This surface contains all the diagonal lines. The diagonal planes and lines are so situated, however, that the conditions of touching the planes and containing the lines are precisely sufficient to determine a surface of class $n-4$. When this surface touches the plane at infinity, the volume of the solid is zero." Prof. Clifford then proceeded to apply these propositions to polyhedra having other than triangular faces.—A paper by the Hon. J. W. Strutt was, in his absence, taken as read. Its title was "Investigation of the disturbance produced by a spherical obstacle on the waves of sound." The problem to which chief attention is given in the paper is that of a rigid spherical obstacle, which is either fixed, or (more generally) so supported that, when disturbed from the position of equilibrium, it is urged back by a force proportional to the displacement. The mathematical solution is worked out without any limitation as to the size of the sphere; but in drawing conclusions from it, attention is confined for the most part to the case when the diameter of the sphere is small compared to the length of the sound waves. Mr. Strutt then considers the problem of a fluid spherical obstacle, working it out in full for a very small sphere; and afterwards he investigates anew the same problem by a very different analysis, not restricted to the case of a sphere or an abrupt variation of mechanical properties on the one hand, but on the other less general in requiring the variation and the region over which it occurs to be small. In conclusion he indicates the solution of the problem when the source of sound is at a finite distance from the obstacle, the primary waves being accordingly spherical instead of plane.—The following abstract of M. Hermite's paper "sur l'intègration des fonctions circulaires," was furnished by Prof. Cayley. M. Hermite's paper relates to the integral

$$\int f(\sin x, \cos x)\, dx$$

where f is any rational function of $\sin x$, $\cos x$. The substitution of $e^{xc}=z$, where $c=\sqrt{-1}$, converts this into an integral of the form $\int \frac{F_1(z)}{F(z)}dz$, where $\frac{F_1 z}{F z}$ is a rational function of z, viz. $F_1 z$ and Fz are each of them a rational and integral function of z. The last mentioned integral is treated by the ordinary method of the decomposition of rational fractions; and the gist of the paper is in the transformation of the resulting expressions back from the new variable z to the original variable x, so as to obtain the required integral $\int f(\sin x, \cos x)\, dx$, in terms of the circular functions of x. It is shown that the process leads to an equation of the form $\int (\sin x, \cos x) = \Pi x + \Phi x$, where Πx is a rational and integral function of z, $\sin x$, $\cos x$: and Φx is of the form

$$\begin{aligned}\phi x = C + a \cot \frac{x-a}{2} + a_1 \frac{d}{dx} \cot \frac{x-a}{2} +, \&c.\\ + b \cot \frac{x-\beta}{2} + b_1 \frac{d}{dx} \cot \frac{x-\beta}{2} +, \&c.\\ + \&c.\end{aligned}$$

each series, and also the number of the different series, being finite: so that the integration is made to depend upon the integrals

$$\int \Pi\, x dx \text{ and } \int \cot \frac{x-a}{2} dx = 2 \log \sin \frac{x-a}{2}$$

The paper contains processes for the complete determination of the coefficients, C, a, a_1, &c. and other interesting matter.

Meteorological Society, Nov. 20.—Dr. Tripe, president, in the chair.—On the storms experienced by the Submarine Cable Expedition in the Persian Gulf on November 1 and 2, 1869, by Mr. Latimer Clark. The first storm occurred at 9 o'clock at night, when the vessels of the expedition were about 130 miles from Bushire, and burst upon them without any preliminary warning, lowering the temperature by nearly 30° in a few minutes. It was accompanied by heavy rain and much lightning and thunder, and progressed from N.W. to S.E. After the tempest had lasted for two hours the wind changed to a gale from S.E., and subsequently fell calm as before The next day the cable was spliced up, and paying out had scarcely re-commenced, with a strong south-east wind, when notice was received that another violent storm from the north-west had passed Bushire, and was on its way down the Gulf. At 3 o'clock black clouds were seen rising, and at 3.52 the storm burst forth with the same suddenness and fury that characterised the previous one. Being daylight many phenomena were observed which were missed the night before. As the clouds approached they gathered into a peculiar form, resembling the cap of a large mushroom, extending across the heavens from one horizon to the other. The lower edge had a rounded and wrinkled margin, but was very sharply defined; the surface was composed of innumerable similar strata, as if melted pitch had been poured out and allowed to solidify in numerous cakes, each rather smaller than the one below.* Suddenly there came a profound calm,

* This is the form of cloud mentioned by M. Poey in NATURE, Vol. iv. No. 103.