To study the fluorescent spectrum many physicists adopt the method of projecting a spectrum sufficiently pure to show the principal Fraunhofer lines, on a fluorescent body, solid perhaps, or the side of a glass vessel containing a fluorescent liquid, and determining the parts where the fluorescence appears, reaches a maximum, and disappears. Others develop the direct spectrum on the surface of a liquid; Herr Hagenbach places the slit and the prism horizontally, and projects the spectrum on the free surface of the liquid. The disadvantages of these two methods M. Lamansky (*Jour. de Phys.*, Dec.) has sought to avoid in a spectroscope he has had recently constructed by M. Duboscq, and which he finds very convenient. The collimator and the telescope of this direct vision spectroscope are fixed separately on a graduated circle; they may be placed at various angles in the vertical plane. The collimator is furnished with a small adjustable mirror for directing the luminous rays along the optic axis. In the prolongation of the collimator tube is placed the direct-vision prism and a lens which throws the spectrum on the surface of the liquid contained in a small vessel on a table which can be raised or lowered. The telescope is directed to the same liquid surface, and the focal distance of the ordinary telescope is shortened by the addition of a second object-glass, which may be removed at will. The division of the circle allows of determining the angles at which the coloured rays fall on the liquid surface and the angles at which the fluorescent spectrum is observed. A dark cloth may be thrown over the apparatus to exclude disturbing light.

AN interesting observation on the supernumerary or spurious rainbows occasionally seen lining the inner edge of the primary arc of a rainbow has been made by M. Montigny. These supernumerary rainbows usually consist of a red band touching the violet on the inner side of the bow, followed by green and violet, and passing again to red. Indeed it is possible occasionally to observe as many as four or five recurrences of the red and green tints. They are, however, almost always confined to the highest portion of the bow, and are rarely observed near the ground. M. Montigny, on August 30, 1879, watching a rainbow near Rochefort, a little before sunset, noticed that while the upper portion of the primary bow showed no trace of supernumerary bows, the lower portions on each side, which came out brilliantly against a stratum or zone of misty air, were furnished with no fewer than four supernumeraries of paler tint. According to the received theory of Young and Airy these bows are due to diffraction, caused by very small drops, the smallest drops giving the broadest and most brilliant fringes of colour. Usually it happens that in the higher regions of the air the falling drops are smaller than they are at the lower regions; hence the occurrence of supernumerary arcs at the upper part of the bow. In M. Montigny's observation, doubtless, the misty zone lying near the ground provided the drops of the requisite degree of smallness to produce the diffractive effects. This is, at least, his view of the case.

IN the December number of *Silliman's Journal* is a memoir of extreme interest by Dr. E. L. Nichols on the character and intensity of the rays emitted by glowing platinum. Several tables of statistics of observations are given, and two graphic charts which embody the tabular results. Reviewing the *à priori* law of Kirchhoff, concerning the emission of rays of greater refrangibility at higher and higher temperatures, he remarks: "Strictly speaking, however, the temperature at which each individual wave length becomes visible depends solely upon the sensitiveness of the observer's eye. We are furthermore forced to conclude from experiment that the more refrangible rays really exist at temperatures far below those at which we begin to see them. The directions of the curves (Plates I. and II.) seem to denote that all the rays studied begin to be emitted at some temperature not included in the interval embraced by the experiments. *I suspect indeed that all of them originate at some very low degree (the absolute zero?), and are recognizable no sooner, simply because the various instruments at command, the thermopile, eye, photographic plate, &c., are not more delicate.* That the various colours do not appear simultaneously, follows from the very different degrees of sensitiveness shown by the eye for different rays."

AN interesting electric toy, contrived by M. Pfeiffer, is described in a recent number of *La Nature*. It is a small electrophorus consisting merely of a thin plate of ebonite about 1 mm. in thickness; the usual wooden disk with tinfoil is replaced by a small piece of tin about the size of a playing-card, attached to one of the faces of the ebonite plate. This electrophorus produces electricity with great facility. You have merely to place it on a wooden table and rub it successively on its two faces with the open hand; then on lifting it with the left hand and bringing the right hand near the tin plate, a spark is obtained 1 to 2 centimetres long. Several small accessories, skilfully contrived, are added to the electrophorus; among these are dancing puppets made of pith, which manifest very amusingly the phenomena of electric attraction or repulsion. Electrify the ebonite plate, put the three puppets on the tin, and then raise the plate from its support. One small personage lifts his arms above his head; the hair of a second stands out; and the third, lighter than the others, jumps about like a clown, while two pith balls placed at his side dance with him. M. Pfeiffer has also collected in one small box all the known accessories of an electric machine; a miniature Leyden jar, an electric carillon, a Volta pistol, a Geissler tube, &c., these being operated with the electrophorus.

SCIENTIFIC SERIALS

American Journal of Science and Arts, December, 1879.—Mr. Brooks here calls attention to an important difference in the breeding habits of American and European oysters; the eggs of the former are fertilised *outside* the body of the parent; and during the period which the European oyster passes inside the mantle cavity of the parent, the young American oyster swims at large in the open ocean. Mr. Brooks traces the successive stages of oyster development.—Mr. Harting writes on triple objectives with complete colour-correction.—There are geological papers on Virginia, on Galisteo Creek, New Mexico, and on Catrosa Co., Georgia.—Prof. Verrill describes two new species of cephalopods caught off the coast of Massachusetts; also what is the second known representative of the remarkable family of *Cirroteuthidæ*.—Dr. Nichol's researches on the character and intensity of the rays emitted by glowing platinum (see NATURE, vol. xxi. p. 184) are here given in detail.—Prof. Marsh's notes on Jurassic dinosaurs, and Dr. Draper's researches in photography of stellar spectra have been already noticed in our columns.—Prof. Peters contributes observations on the planets Hersilia and Dido; and in the "Scientific Intelligence" we note two useful lists of the (209) minor planets, numerical and alphabetical.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, January 8.—"On the Photographic Method of Mapping the Least Refrangible End of the Solar Spectrum (with a map of the Solar Spectrum from 7600 to 10750)," by Capt. W. de W. Abney, F.R.S., R.E.

The author refers to the sensitiveness of different forms of silver salts when exposed to the action of the spectrum, and shows how he has been able to prepare, by methods indicated, silver bromide which absorbs the red and ultra-red rays, and which is sensitive to these rays.

In his paper he describes the apparatus employed by him in the photography of the invisible least refrangible rays, both with a prismatic, and also with the diffraction apparatus. From photographs taken with the latter, he has constructed a map extending from λ 7600 to λ 10750, which he submits to the Society. He shows also that in the photographs of the prismatic spectrum, he has apparently reached the limiting length by comparing it with photographs of the diffraction spectrum. The author has also compared Lamansky's prismatic thermograph with his photograph. The paper closes with some theoretical remarks on the silver compounds employed.

Mathematical Society, January 8.—C. W. Merrifield, F.R.S., president, in the chair.—Prof. W. S. Burnside was elected a Member.—Prof. Cayley, F.R.S., communicated two formulæ in spherical trigonometry which are included in the one form—

$$\tan \tfrac{1}{2} c (\cos B - i \sin B) = \tan\left(\frac{c}{2} - \phi\right)$$

where

$$i = \sqrt{-1} \text{ and } \tan \phi = \tan \tfrac{1}{2} b (\cos A + i \sin A).$$

The note which the President read at the last meeting simply gives (as has been pointed out to him since) some symmetrical cases of the orthogonal transformation, of a much more general character (but unsymmetrical) given by Mr. Cayley, and reproduced in Salmon's "Higher Algebra" (3rd edition, p. 39). The symmetrical form may be obtained from the one there given by writing—