dicates. Similar estimations made at considerable intervals of time might show whether the brightness of these bodies is undergoing increase, diminution, or a periodic variation.

The paper concludes with some observations on the measures of the diameters of some of the planetary nebulæ. A very careful set of measures of 4232, 5 Σ, by the Rev. W. R. Dawes, F.R.S., is given, which makes the equatorial diameter$=15''\cdot 9$. Also measures by the author of 1414, 73 H. IV. which give its diameter in R. A.$=30''\cdot 8$.

February 22, 1866.

J. P. GASSIOT, Esq., Vice-President, in the Chair.

The following communications were read:—

I. "Account of Experiments on the Flexural and Torsional Rigidity of a Glass Rod, leading to the Determination of the Rigidity of Glass." By Joseph D. Everett, D.C.L., Assistant to the Professor of Mathematics in the University of Glasgow. Communicated by Professor William Thomson, F.R.S. Received February 1, 1866.

(Abstract.)

In these experiments a cylindrical rod of glass is subjected to a bending couple of known moment, applied near its ends. The amount of bending produced in the central portion of the rod is measured by means of two mirrors, rigidly attached to the rod at distances of several diameters from each end, which form by reflexion upon a screen two images of a fine wire placed in front of a lamp-flame. The separation or approach of these two images, which takes place on applying the bending couple, serves to determine the amount of flexure.

In like manner, when a twisting couple is applied, the separation or approach of the images serves to determine the amount of torsion.

The flexural and torsional rigidities, f and t, which are thus found by experiment, lead to the determination of Young's Modulus of Elasticity, M (or the resistance to longitudinal extension), and the absolute rigidity, n (or resistance to shearing); M being equal to f divided by the moment of inertia of a circular section of the rod about a diameter, and n being equal to t divided by the moment of inertia of a circular section about the centre. The "resistance to compression," k, is then determined by the formula

$$\frac{1}{3k}=\frac{3}{M}-\frac{1}{n},$$

and the "ratio of the lateral contraction to longitudinal extension," σ, by the formula

$$\sigma=\frac{M}{2n}-1.$$

The values found for the flint-glass rod experimented on were, in grammes' weight per square centimetre,

$$M = 614,330,000,$$
$$n = 244,170,000,$$
$$k = 423,010,000,$$
$$\sigma = \cdot 258.$$

The mode of experimenting is somewhat similar to that by which Kirchhoff investigated the value of σ for steel and brass; but there are several points of difference, especially this—that the portion of the glass rod, whose flexure and torsion are measured, is sufficiently distant from the places where external forces are applied, to eliminate the local irregularities produced by their application.

II. "Note on the relative Chemical Intensities of direct Sunlight and diffuse Daylight at different altitudes of the Sun." By Henry E. Roscoe, F.R.S., and Joseph Baxendell, F.R.A.S. Received February 8, 1866.

The method of determining the chemical intensity of daylight described by one of us* presents a convenient means of experimentally comparing the intensity of the chemically active rays which reach the earth's horizontal surface directly from the sun with that of the same rays reflected from the atmosphere and constituting diffuse daylight. For this purpose it is only necessary alternately to expose pieces of the standard sensitive paper, according to the method described in the memoir above mentioned, to the action of the total light of day, and to the diffuse daylight alone, which is easily done by cutting off the sun's direct rays from the sensitive paper, by throwing upon the paper a shadow cast by a small screen, having an apparent diameter slightly greater than that of the solar disk. In the first case the chemical intensity of the total daylight, in the second that of the diffuse light is determined; the difference between these two observations giving the chemical intensity of the direct sunlight. As the experiments which we have already made in this direction have led us to conclusions differing altogether from those derived from theoretical considerations concerning the relative chemical intensities of direct and diffuse sunlight, we think that, although this investigation is incomplete, the results are worthy of the attention of the Society. No direct photometrical determinations of the relative intensity of sun and diffuse light have up to this time been made; but Clausius † has calculated this relation for varying altitudes of the sun, founding his calculations upon the hypothesis (generally adopted by meteorologists to explain the red tints of the morning and evening sky) that the diffused light is reflected, not from the par-

* Bakerian Lecture, 1865. Phil. Trans. 1865, p. 605.

† Poggendorff's 'Annalen,' Bd. lxxii. p. 294.