

OBITUARY.

JOHN WARE STEPHENSON.

Died 3rd May, 1901, aged 82.

Mr. J. W. STEPHENSON, F.I.A., F.R.A.S., actuary to the Equitable Life Assurance Society, was elected a Fellow of the Microscopical Society of London in 1861, and was Treasurer of the Royal Microscopical Society from 1872 to 1881. He contributed eighteen papers to the Society,* among which the more important are:—(1) on an Erecting Binocular¹; (2) on Bichromatic Vision²; (3) on a Polarizing Prism³; (4) on a Homogeneous Immersion Objective⁴; (5) on a Catoptric Immersion Illuminator⁵; (6) An N.A. Table⁶; (7) two papers on mounting in dense media⁷.

The first binocular Microscope was made in 1677, by Père Cherubin d'Orléans, Capucin, (François Laserré). The second binocular was proposed by Sir Charles Wheatstone in 1851; he was unsuccessful in persuading either Messrs. Ross, Powell, or Beck to construct it. The third was invented (1851), constructed (1852), and published (1853), by Professor J. L. Riddell of New-Orleans.† After this, many forms of binocular Microscopes appeared, notably Wenham's (1860), in the form as at present used. The binocular designed by Stephenson in 1870, which is still known by his name, is similar to that of Professor Riddell's, with the exception that the erecting prisms in Stephenson's are placed immediately over the dividing prisms instead of over the eye-pieces, as in Professor Riddell's. In 1872 Stephenson adapted his binocular to use with high powers, by making the divided prisms smaller, and lowering them down inside the mount close to the back lens of the objective; and, further, he made the erecting prism removable, so that a plate of black glass could be inserted in its place, to act as an analyser for polarised objects, the inclination of the body-tubes being at the proper polarising angle. The polarising and the high-power binoculars have not come into general use, but the instrument in its original form has been called by some of the most eminent microscopists of the day the best instrument for mounting and dissecting as yet devised. In 1873

* The titles of the various papers have been abridged.

¹ M.M.J., iv. (1870) p. 61, pl. 57; vii. (1872), p. 167, pl. 15; x. (1873) p. 41.

² Op. cit., vii. (1872) p. 215.

³ Op. cit., p. 246, fig. 1.

⁴ J.R.M.S., i. (1878) p. 51 (woodcut). ⁵ Op. cit., ii. (1879) p. 36 (woodcut).

⁶ Op. cit., p. 839. ⁷ Op. cit., iii. (1880) p. 564; ii. ser. 2 (1882) pp. 134 and 163.

† Q.J.M.S., ii. (1854) p. 18, figs. 2 and 3.

Mr. Stephenson first heard of Professor Riddell's priority of the invention, and at once acknowledged it before the Society.*

The papers on bichromatic vision and on a secondary polarising prism have probably not received the attention they deserve.

Professor Abbe's diffraction theory of microscopic vision was first noticed in the *Journal* of this Society † in July 1874, in an editorial paragraph on 'The Capability of the Microscope.' In the next year Dr. H. E. Fripp, in the *Proceedings of the Bristol Naturalists' Society*, ‡ gave a translation of the original paper. This translation was largely abstracted in the same year in the *Journal* of this Society, § and two years later, in January 1877, Mr. Stephenson read a paper, || again drawing the attention of the Society to this subject. He was (and remained, so far as we know) a firm believer in the truth of this theory and its necessary deductions.

The next paper, on a Homogeneous Immersion Objective, was at the time the cause of much dispute about priority. Sir D. Brewster in 1837, and Professor Amici in 1844, experimented with water- and oil-immersion lenses, the object of Brewster's experiments being to get rid of dispersion, and the object of those of Amici to diminish the excessive refraction at the plane surface of the front lens. Dr. Royston-Pigott, § in 1870, suggested turpentine ¶ as an immersion fluid, with a view to increase the aperture, because its refractive index was similar to that of balsam. He also published a table of the maximum apertures of dry, water-, and turpentine-immersion objectives in terms of crown-glass or balsam angles.

In 1871 Mr. R. B. Tolles⁹ of Boston contributed two letters to the *Monthly Microscopical Journal*, describing his experiments with balsam immersion objectives and condensers, and in one letter twice uses the word homogeneous in connection with this subject; he also says: "The case is totally and most obviously applicable to that of the ordinary balsam-mounted Microscope object for an aperture far above 82° of angular pencil actually traversing the object, and made available in the view to the eye of the observer. For obtainment of extremest angle, however, let one precaution be taken, viz., balsam be used above the slide and balsam below."

At this time (1871) a controversy about the aperture of objectives was going on, and letters frequently appeared in the *Journal* referring to experiments made with objectives immersed in balsam, and to the measurement of their balsam angles.

This controversy was still in progress in 1878, when Mr. Stephenson read before the Society his paper on a wide-angled immersion objective

* M.M.J., x. (1873) p. 41.

† Op. cit., xii. (1874) p. 29.

‡ Proc. Bristol Nat. Soc., n.s., i. (1875) p. 200.

§ M.M.J., xiv. (1875) pp. 191 and 245. || Op. cit., xvii. (1877) p. 82, pl. 173.

§ Op. cit., iv. (1870) pp. 26 and 140.

¶ Turpentine was chosen as being homogeneous, *quâ* dispersion, with the flint concave of a doublet front, and, *quâ* refractive index, with balsam.

⁹ M.M.J., vi. (1871) pp. 84 and 214.

without adjustment-collar. This paper informs us:—(a) that the author had suggested to Professor Abbe the desirability of constructing an object-glass corrected for use with some immersion medium optically identical with the cover-glass, for the purpose of removing all necessity for collar adjustment; (b) that Professor Abbe, acting on this suggestion, had measured the optical constants of nearly 100 different media, and had found that oil of cedar was the best for the purpose; (c) that Messrs. Zeiss had constructed a homogeneous immersion $\frac{1}{2}$ objective from Professor Abbe's formula. The lens was exhibited at the time.

Early in the next year (1879), Mr. Stephenson brought to the notice of the Society a catoptric immersion illuminator which he had designed a couple of years previously. This was an annular illuminator for wide-angled lenses, which would necessarily give a dark ground with narrower apertures; by the employment of suitable stops oblique light could be obtained in one or more azimuths. In 1885 he further amplified the idea by a catadioptric illuminator,¹⁰ but this new form did not prove as serviceable as the older one.

The next paper was a numerical aperture table giving, in addition to the N.A., the theoretical resolving power for objectives when illuminated by oblique light; it also contained three columns with the equivalent angular apertures of dry, water, and homogeneous immersion objectives, in this respect being an enlargement of Dr. Pigott's table¹¹.

There are two valuable papers by Mr. Stephenson upon mounting in dense media; among the substances experimented with were bisulphide of carbon, phosphorus, sulphur, biniodide of mercury, iodide of potassium, and oil of cassia; and in 1882 there is a statement that some slides containing diatoms mounted in phosphorus¹² in 1873 were still perfectly good.

¹⁰ J.R.M.S., v. (1885) ser. 2, pp. 207 and 523, figs. 44 and 112.

¹¹ M.M.J., iv. (1870) p. 26.

¹² Op. cit., x. (1873) p. 1.