

Borelli⁵ was offering his objectives on the open market, and later Sir Jonas inserted a price-list in the same publication,⁶ the inference being that he had purchased one for Flamsteed's use.

It is recorded in the *Journal of the Royal Society*⁷ that on "November 3, 1737, Mr. Hodgson made a present of the object glass of a 90-foot tube, being that which Mr. Flamsteed designed to have used in the well at the Observatory at Greenwich, but was prevented by the damp of the place." This was the James Hodgson, assistant at Greenwich 1696–1702, who married Flamsteed's niece and inherited some of his property.

The object glass, some $9\frac{3}{4}$ inches diameter and rather badly scratched and chipped, is at present on view at the Science Museum.

Flamsteed's well was a failure, but although he doubtless hoped to use this lens to make observations of γ Draconis by day, there is nothing to show that he expected to do so by virtue of the depth of the shaft.

Royal Greenwich Observatory,
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1956 January 5.

References

- (1) *The Observatory*, **26**, 102, 138, 179 (1903).
- (2) Greenwich records, quoted here by permission of the Astronomer Royal.
- (3) *Life of the Rev. John Flamsteed*, 1835.
- (4) Flamsteed's account of these tests strongly indicates that the large telescope shown in *Historia Coelestis* 1712, and on a manuscript plan, was originally erected for this purpose. After the failure of the well, the pole-and-tube mounting may have been adapted for general use with a 60-foot object glass.
- (5) *Phil. Trans.*, XI, 691, 1677. Pierre Borel (1620–1689), member of the Académie Royale des Sciences and author of *De vero telescopii inventore*, 1656, is often confused with Giovanni Borelli (1608–1679) owing to the identical latinizing of their names into "Borellus". Although in connection with these long-focus lenses the *Philosophical Transactions* and *Mémoires de l'Académie Royale des Sciences* both refer to "Borelli"; the Académie des Sciences confirms that the maker was Borel.
- (6) *Phil. Trans.*, XII, 1005, 1678.
- (7) C. R. Weld, *History of the Royal Society*, Vol. I, p. 255.

THE FLAMSTEED 90-FOOT LENS

By A. Hunter and E. G. Martin

Through the kindness of Dr. Calvert, the Science Museum, South Kensington, have recently allowed us to examine this lens, now the property of the Royal Society, to whom it was given by James Hodgson in 1737.

The lens is 9.75 inches in diameter, 0.36 inches thick and weighs 39½ ounces. One surface is nearly plane, the other having a number of patches, each about a quarter of an inch square, which are no longer transparent. There are several considerable chips in the edge of the lens. Two main tests were made. First the lens was set up in the upper gallery of the Observatory, where it is possible to project a beam over a length of 100 feet. A sodium lamp illuminated an artificial star (pinhole) which was projected through the lens to a 16-inch flat mirror, thence reflected back through the lens to an eyepiece or knife-edge close to the artificial source.

The knife-edge and source were carried on a single support which could slide over a distance of about 30 inches.

This test revealed that the lens is of very poor quality, the resulting image consisting of a general blur with bright points superimposed. The smallest disk was about 4 mm in diameter. It would appear that the one recorded use of this lens on a star was sufficient to cause Flamsteed to put the lens aside and make no further use of it.

The second test was to use the same type of optical arrangement, but reducing the length of path by inserting in addition an 8-inch visual achromatic lens of 107 inches focus, formerly the object glass of the Melbourne transit circle. The focal length of this lens had been carefully measured previously, and now the difference of focal length of the Melbourne lens alone and the Melbourne and Flamsteed lenses combined was measured. The derived focal length of the Flamsteed lens in sodium light was 87 feet 5 inches $\pm$ 0.7 inches. Measures made at λ 5270 and λ 6220 gave 86 feet 11.2 inches and 87 feet 7.7 inches respectively, with similar probable errors to the measures in sodium light. Having measured the radii of curvature of the surfaces of the lens, a refractive index in sodium light was derived of 1.5204 ± 0.0040 . This corresponds very closely to the value for a normal Chance hard crown glass, type 519604, and the measured points in other colours fit the dispersion very well. Owing to the poor definition of the lens these focal lengths are not as reliable as those of a modern lens, but the measures were less difficult than the poorly defined direct focal image would lead one to expect.

Royal Observatory, Greenwich.
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THE RETIREMENT OF MR. H. W. NEWTON

The work of the great national observatories differs from that of the University research institutions in at least two respects. Many of their programmes are of a routine character, pursued faithfully over many years to lay a foundation of basic observations: as a result the work is frequently carried out by a staff whose labours are either concealed in anonymity or relegated to the end of a formal introductory paragraph. Some comment on both of these features is justified in a notice of the latest volume from the Royal Greenwich Observatory,* for its material content is drawn from solar data collected during eighty years of continuous observations, and its publication coincides with the retirement of Mr. H. W. Newton, who has guided those observations for half this period.

Regular daily photography of the Sun began at Greenwich on 1874 April 27, to ensure the continuity of observations which had previously been made at Kew. The homogeneous collection of photospheric observations now contained in *Greenwich Photoheliographic Results* is unique, and the most valuable single source for detailed studies of photospheric activity. Its value has been enhanced rather than diminished by the multi-

* Royal Greenwich Observatory: *Sunspot and Geomagnetic-Storm Data derived from Greenwich Observations, 1874-1954*. London, H.M. Stationery Office, 1955.