Barnard.

covered by Espin. Not on charts.] The inversion of numerical order in this case is due to precession.

219. Barren region, very large and indefinite; few stars. About 1° *n* of BD + 28° 666, 5·7 mag.

19. A large dark area, part of a long sinuous lane; nearly 1° *sp* Σ572 (6·5, 6·5).

22. Another dark area in same lane, about ½° *f* the last.

221. A rather bare region, larger than field of 36′. About 1° *sp* BD + 31° 815, 9·0 mag.

224. A dark patch, about half diameter of field. About ¾° *sf* BD + 10° 760, 7·0 mag.

225. A dark extension of about ¾° from B30. Directly *s* of BD + 12° 801, 6·9 mag.

30. A large dark area, with few stars; about ½° *f* BD + 12° 801.

31. A darker patch of B30, a little to the *nf*.

32. An extension from the *s* end of B31, towards the *f* side.

226. A dark spot, about ¼° diameter; ½° *s* of the cluster N.G.C. 1960 (M36).

34. Another dark patch, rather indefinite; ½° *sf* BD + 32° 1064, 7·0 mag.

35. Oval dark streak, tapering to *f* end, with a 9·5 mag. star on *n* edge. It is about 1° *f* BD + 9° 925, 7·5 mag.

36. A dark lane about 2° long, and rather narrow, running from *sp* to *nf*. It is about 1° *n* of 52 Orionis, at its *sp* end.

227. A dark round spot, about 1° *f* 64 Orionis, a little to the *s*.

Mr. Frederick J. Hanbury's Observatory,
Brockhurst, East Grinstead.

On the Significance of Baxendell's Nebulosity.

By J. G. Hagen, S.J., Assoc.R.A.S.

Baxendell discovered his nebula (*N.G.C.* 7088) half a century ago. Since then very little attention has been paid to it, although it is closely attached to the bright globular cluster *Messier* 2. Baxendell's letter to W. H. M. Christie is printed in *M.N.*, **41**, 48 (1881). It says: "I have seen it [the nebula] on several nights and have no doubt of its existence." The instrument was probably the 5-inch refractor mostly used by Baxendell in his variable-star work.

The first astronomer who afterwards looked at the nebula was Dr. Dreyer. In a note to his *N.G.C.* (p. 225) he says: "I have seen it without difficulty in the Armagh 10-inch refractor." The nebula is also mentioned by Bigourdan in his "Observations," where "quelques traces de nebulosité" were suspected.

1. The nebula is described by Baxendell in these words: "It seems to be similar in character to the large Nebula near the Pleiades, but is slightly less bright." Dreyer calls it "a very large and very diffused nebulosity."

It belongs in fact to the class of Herschel's extensive milky nebulosities and of Barnard's "Dark Objects," though not found in either of their catalogues. Nor is it mentioned in the *Publications of the Lick Obs.*, vols. xi. (1913) and xiii. (1918), nor in the *Córdoba Photographs*, vol. xix. (1897).

In the course of the Vatican review of the *N.G.C.*, Baxendell's nebulosity was observed in the years 1915 and 1917 as "obscure" and of density III–IV (on a scale of five). The observation was independently confirmed by Dr. Fr. Becker at Potsdam. In the Vatican *Zone Catalogue* * it is described as *np* attached to the globular cluster *Messier* 2, elongated in a *pf* direction and extending over 0·8 by 1·0 degrees. It is not found in the Vatican *General Catalogue*, because all the obscure nebulæ of Dreyer's *N.G.C.*, seventeen in number, are relegated to a special Table VI., p. xxiv. of the Introduction.

The co-ordinates of cluster *Messier* 2 for 1930 are $21^h\ 30^m$ and $-\ 1°\ 8'$. It comes into convenient position in the months of September, October, and November. This year (1929) the writer called attention to it in the *Astr. Nachr.*† Several observers reported by letter that they saw the nebula quite clearly, at Brockhurst, Potsdam, and Stonyhurst, with refractors from six to fifteen inches aperture. Special credit is due to Father O'Connor's observations because, after finding Baxendell's nebula "without difficulty" in the Stonyhurst 15-inch refractor, Father O'Connor discovered another extensive nebula about one degree further south, and even a third one, half a degree in a *p* direction from the second. The clear dark sky between the three nebulæ and their difference in density gave him the guarantee that there could be no illusion. The second and third nebulæ are genuine Herschel fields. Their densities, as estimated at Rome, are IV–V for the second, and V for the third nebulosity. The observer will readily find all three, if his field of view is not too small.

2. Although Baxendell's nebula is the faintest of the three near the cluster *Messier* 2, its peculiar significance is in the line of photography. As it is closely attached to a globular cluster, photographs of that region have been taken before, though none was ever published.

Dr. Shapley, kindly responding to a letter, sent us prints from one of the best plates of *Messier* 2 taken with the 60-inch reflector at Mount Wilson, with 55 minutes exposure, by Professor Duncan in 1919. The stars of the cluster came out with wonderful sharpness, but of nebulosity there is no trace.

An exposure of 12 hours was made by M. de Kerolyr in his mountain observatory at Digne (B.-A.) with an Opto-Lumière plate. The print which M. de Kerolyr sent us shows no trace of nebulosity.

Attention had been called to Baxendell's nebula by Dr. Fr. Becker in the *Astr. Nachr.*‡ in 1925. It did not remain unheeded. Director Schorr of the Hamburg Observatory reports in the *V.J.S. der Astr. Ges.*§ that Dr. Baade made exposures with the large reflecting telescope

* *Spec. Vat.*, **10**, 324 (1922). The diameters should be in heavy type.
† *Beobachtungs Zirkulare*, 1929, Nos. 30, 34.
‡ Band 224 (1925), 115/6. § Band 64 (1929), 198.

without obtaining any impression of the nebula. The exposures were made first with ordinary plates, then with red-sensitive plates, and finally with panchromatic plates. The light was made to pass through a yellowish filter, except in the first case. The exposure times varied from 90 minutes to 4 hours. Though the result was negative, Dr. Baade intends to continue his experiments with plates of still higher sensitivity in the long-wave spectral region.

The short notice of the writer in the two circulars of the *Astr. Nachr.* induced Dr. Shapley to have some special plates taken at Harvard around the region of Baxendell's nebula. He kindly sent us a print from a plate of 90 minutes exposure, made with the 16-inch Metcalf telescope, using a yellow-sensitive plate and a yellow filter. The result was likewise negative. So also was the result of two plates taken at Helwan with the 30-inch reflector and exposures of 60 and 70 minutes.

3. It may be questioned whether we are on the right way to solve the problem. It seems quite possible that the secret lies in the developer. All our astrophotographic methods operate with light coming exclusively from stars, either directly or indirectly. There are, however, certain photoluminescences whose chemical process is still involved in deep mystery. The light of extensive nebulosities may well have impressed many plates, but may just as well have remained latent because the specific developer was not applied.

Instead of spending hours in exposing plates, would it not be advisable to expose a dozen plates on one night, and to develop them all in different ways? Chemical science will have to come to the astronomer's aid.

The trial could even commence in daytime with terrestrial clouds when they cover the whole sky and are not illuminated from the outside. Their greyish tint presents a striking resemblance to Herschel's nebulosities. Existing photographs seem to show that terrestrial clouds have never been photographed in *their own* light. A useful study in this respect can be made on a photograph of a thunderstorm made at Toronto by the U.S. Weather Bureau, and reproduced in the new edition of the *Encyclopedia Britannica*.* The dark patches of that picture might have shown some light if developed in a different manner.

At the Heidelberg meeting of the *Astr. Ges.* it was mentioned † that "the crucial test" of the existence of Herschel's nebulosities will be a photographic trial by means of visual-colour filters. Does not Baxendell's nebulosity seem to reverse the case? Its existence is so well assured by experienced observers that it may with some right present itself as a crucial test for what our present photographic skill is able to accomplish. Indeed, Baxendell's nebula seems now to invalidate the objections that are raised, from the photographic point of view, against the reality of Herschel's milky nebulosities.

Vatican Observatory:
1929.

* Volume 14, facing page 114.
† *V.J.S. der Astr. Ges.*, **63** (1929), 322.

Reduction of Occultations observed in 1928. By B. M. Peek.

During 1928 I observed twenty-eight occultations of stars by the moon, four of them with the 8½-inch reflector at Mr. C. S. Saxton's observatory at Frome in Somerset, and the remainder with the 150-mm. Zeiss refractor at my observatory at Herne. The co-ordinates of both observatories are given in *N.A.* for 1929.

I have since reduced the observations, using the method given by Innes,* and the operation has been performed in duplicate in order to make the detection of error tolerably certain. In accordance with the recommendation of Professor E. W. Brown, the moon's place and parallax have been taken from the ephemeris for a time 0·212 minutes later than that actually observed, which is equivalent to applying an average correction of about 7 seconds of arc to its tabular longitude.

The star places have been taken whenever possible from *N.A.*, which, with the exception of ϵ Geminorum, gives the positions as taken direct from W.Z.C., which is accordingly quoted as the authority in Table I. The remaining positions have been very kindly collected from the various catalogues at no small expense of labour, weighted, and forwarded to me by Dr. L. J. Comrie and Mr. T. Whitwell, and are the best available for the stars in question ; these are referred to as C.W., a numerical suffix up to 5 denoting the weight assigned to each position.

All the phenomena recorded are disappearances, all but two of which took place at the dark limb. My usual method of recording by means of a stop-watch registering tenths of a second was employed, and normally the times have been corrected by $-0^{s}\cdot5$ to allow for lag in starting the watch ; as, however, it is usually possible to estimate departures from the normal in starting, this correction has often been modified in accordance with the impression created at the time of observation.

For convenience of printing, the results are shown in two tables, Table I. giving the particulars of the observation, star place, etc. ; Table II. the results of the reduction and remarks.

It seems worth noting that a rough inspection of the values of $\sigma' - \sigma$ does not lead one to conclude that the average residuals for stars below 8th magnitude are any greater than for the brighter stars. It therefore seems well worth while to include these fainter stars in any observing programme. The star B.D. + 16° 2106, mag. 9·3, whose disappearance was observed with the 6-inch refractor on May 25, was about as faint as could have been observed under the existing conditions, the moon's altitude being only about 15° and age 6½ days. Under favourable circumstances far fainter stars could be observed if reliable places for them were available.

The disappearance of W.Z.C. 695 on 1928 April 28 was remarkable. I was using the 8½-inch reflector at Frome, and Mr. Saxton a 3-inch refractor about 25 yards south of the 8½ inch. The disappearance for me was very gradual, lasting for about 0·75 seconds, while Mr. Saxton recorded no gradual fading, but a preliminary jump more than a second before

* Union Observatory Circular No. 56, 1922, Sept. 12.