

ON THE PROBABLE NUMBER OF NEBULAE.

By E. A. Fath.

In the *Astronomical Journal* for January 12, 1914, Nos. 658-659, the writer made an estimate of the probable number of nebulae which could be photographed on Lumiere Sigma plates with one hour's exposure, using the 60-inch reflector of the Mt. Wilson Observatory. In the same article the efficiency of the 60-inch reflector was compared with the Crossley reflector of the Lick Observatory and it was suggested that possibly Dr. Perrine's estimates * of the number of nebulae which could be photographed with the latter instrument under the given conditions might be too high. In a letter to the writer as well as in a note † in this publication Dr. Perrine takes exception to some of my conclusions and calls attention to certain matters which he believes fully justify his former estimates. To a certain extent these may be matters of opinion, but for the most part they could be settled by means of observations requiring only a few nights of work with the instruments mentioned above. The writer ventures the hope that those in charge may think it worth while to try to get these observations.

In the note of Dr. Perrine, mentioned above, the following statement is made: "There is a condition which has certainly tended to reduce the actual number of nebulae on the plates taken at Mt. Wilson which Dr. Fath does not appear to have investigated. The Mt. Wilson plates cover an area of sky nearly two and one-half times that of the Crossley plates. The images are considerably distorted at the edges of the Crossley plates and must be much more so at the edges of the Mt. Wilson plates, due not only to the larger area covered, but also to the larger angular aperture of the Mt. Wilson mirror, 1-5.0 as compared with the Crossley 1-5.8 * * *"

There is no question but that the images near the edges of the Mt. Wilson plates are badly distorted, but the distortion which might obliterate a star image is not so effective on a luminous area. In order to get some idea of the effect due to plate area and at the same time to make the comparison between the results obtained by the two instruments

fairer, the writer went over his reduction sheets and counted the number of nebulae in areas of different sizes on the plates. These counts were made of the nebulae in the central portions of the plates using squares with sides, 40, 50 and 60 minutes of arc in length. The center of each square was, of course, at the center of the plate. The total numbers of nebulae found within these areas and those on the entire plate are as follows:

40 min. sq.	50 min. sq.	60 min. sq.	Entire plate
392	578	772	1031

This gives an average of 2.82, 4.16, 5.55 and 7.42 respectively per plate. Multiplying these plate averages by the number of plates of the various sizes to cover the sky we obtain the following approximate numbers as the probable number of nebulae which can be photographed under the conditions given in the first article, namely, 262,000, 247,000, 229,000 and 162,000. This marked decrease shows clearly the effect of plate area, or rather, the increase in aberration with increase of the distance from the optical axis.

The counts also show that even when we take only the 40 minute square of the 60-inch plate and compare it with the results obtained from the entire Crossley plate, which measured about 50x60 minutes, and thus make allowance for the difference in angular aperture, there is still a discrepancy between the 262,000 of the writer and the half million of Dr. Perrine, which is hard to account for when it is remembered that in those areas where Crossley plates and the 60-inch plates could be compared the same number of nebulae could be found. The writer therefore ventures to suggest that possibly his original contention, namely that the discrepancy can be accounted for most easily by the lack of uniformity in the distribution of the Crossley plates, may still have something in its favor.

*Lick Observatory Bulletins, 3, 47, 1904.

†Astronomical Journal, 682, January 31, 1916.