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Photographic Accessories of the Drake Observatory

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PHOTOGRAPHIC ACCESSORIES CF THE DRAKE OBSERVATORY.

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The application of photography to astronomical research is one of the great achievements of science. While the "pioneering experiments" date back to the days of Dr. J. W. Draper and Warren de la Rue, the vastly interesting and valuable results belong to the present decade.

Astro-physics, "the new-born child of Astronomy", owes its phenomenal growth and development, if not its birth, to the photographic lens and camera.

It is certain that the sensitive plate will never be as satisfactory for general observations as the eye but it is vastly superior for some kinds of observations. Take the nebulae for example. Here the camera will obtain in the course of a few hours information and detail hopelessly beyond the power of any human eye. Moreover, it has no nerves or preconceived ideas; and you can depend upon its impressions.

The eight-and-one-fourth-inch equatorial of the Drake Observatory is equipped with a third or photographic lens. It was ground by Dr. J. A. Brashear, which fact alone is sufficient guarantee as to its quality. At the time the instrument was purchased, there was no provision made for a guiding telescope; and, as the exposures require hours in some instances, a guiding appartus is an absolute necessity. To obviate this deficiency, the small telescope or finder which is always attached to the side of a large telescope was pressed into service. One could hardly expect this to succeed, for it is ill adapted to the work in every respect. However, some fairly good results were obtained in this way; just enough to stimulate a great desire to do better. Feeling that it was not possible to do much better with the finder and that a new guiding telescope was entirely out of reach, I cast about for some solution of my problem; and I feel that I have happily found it in the simple and inexpensive right-angled eye-piece which I had attached to the side of my camera.

The heavy brass ring shown in Fig. 1 is rigidly attached to the eye end of the telescope by four heavy bolts and carries on its outer end the heavy camera box. The right-angled prism clearly shown in the cut overhangs the edge of the photographic plate and reflects the image of the guide star into the magnifying eye-piece attached to the side of the box. Here the image is made to coincide, by means of slow motion screws, with the intersection of two fine spider-lines. These lines are illuminated by a small incandescent lamp contained in the eye-piece tube. Fig. 2 shows the camera in place and ready for an exposure.

By this simple device, I have a guiding telescope of the same aperture and focal length as my photographic, and just as rigid. Fig. 3 shows the observer at work. Of course, the strain on eye and nerve is so great that

one cannot stand at the camera for much longer than fifteen minutes at a time, and must be relieved by a second observer. If one night is not sufficient for the exposure, the camera can be closed, the telescope turned into its usual position, and when the next clear night arrives, the telescope can be pointed to the same place, and the images superimposed with perfect exactness. Thus the long hours of exposure may be continued from night to night.

Fig. 4 is a reproduction of the results of an eight-hour exposure on the beautiful nebula in Orion. While much of the nebula and fine details in the original negative are entirely lost, there is still more to be seen than could possibly be discerned by the eye in the same telescope. Many fine drawings of this nebula have been made by eminent astronomers; but the autographic record made on a sensitive plate is so vastly superior to anything that has been done by eye and hand that photography is said "to have definitely assumed the office of historiographer to the nebula". The extent of the prodigious object had not been guessed at until the camera exposed its true form and outlying appendages. Portions which are now known to belong to the same mass were catalogued as separate nebulae.

The photographs of stars and star-clusters are even more wonderful and interesting than those of the nebulae. Fig. 5 shows the result of a two-hour exposure on the Double Star-cluster, in Perseus. The central portions are not so clearly resolved as they would be in direct vision; but the number and extent of the stars belonging to the cluster could never have been known by visual methods alone. By comparison with photographs taken in the past, or those to be taken in the future, any change in the cluster, either toward condensation or disintegration, could be readily noted.

Pictures of the moon were among the earliest results of celestial photography. The old question of lunar change seems to have been solved by the chemical eye. "Henceforth, at any rate," as Miss Clerke so beautifully puts it, "the lunar volcanoes can scarcely, without notice taken, breath hard in their age-long sleep." In Fig. 6,, the crescent is shown as taken by means of the three-inch amplifying lens. The lens is the work of Dr. John A. Brashear. Fig. 7, however, was originally taken without amplification, the image of the whole moon being less than one inch in diameter. The negative was then enlarged to six inches in diameter.

The field for research work along the lines of celestial photography is unlimited; and the ambitious young astronomer finds here a new and promising guide for his energies.