A Photographic Star Atlas

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A PHOTOGRAPHIC STAR ATLAS

This project was undertaken to provide useful reference material for a study of astronomy at University School. The normal star atlas, with plotted points for stars, has several drawbacks for use by students and professional astronomers. For the inexperienced student, it is hard to judge relative distance and brightness from points plotted on a small sheet of paper. For the advanced student and professional, a star atlas with plotted points provides neither locations with sufficient accuracy nor stars of lower magnitude of brightness which are needed for serious study. To solve this problem, a photographic star atlas was compiled as completely as was possible in the allowed time. For convenient use, this atlas was "keyed" to Norton's Star Atlas,* an atlas long popular with amateur astronomers. Each photograph in the atlas has a corresponding numbered rectangle in the Norton's Atlas. The Norton's Star Atlas can be used as it is intended to be used and when more information is needed about an area of the sky, the student is able to check the photographic atlas which shows objects 26 times as faint as are shown in the Norton's Atlas.

To compile this atlas, a film of high speed was needed along with an accurate means of following the movement of the stars with the camera to permit time exposures. After experimentation it was decided to expose Tri-X film for five minutes. An Edmond's equatorial telescope mount with a 200 MM f3.5 Vivitar lens attached to the schools' Nikon F camera, was used to take the photographs. Guiding was done with a 5" refracting telescope. Many of the pictures for this atlas were taken in this manner but none of these pictures were of high enough quality to be used. Despite many modifications to this equipment it was not possible to obtain pictures of stars that were clear images. The stars were streaks, not points, because of improper tracking. Also the pictures were not of the desired area of the sky.

At this time the setting circles supplied with the telescope were being used to "aim" the telescope and camera at the correct location in the sky for each picture. The declination (the distance north or south of the celestial equator) of the desired location was set on the setting circle on the declination axis of the telescope. To

set the polar axis, it was necessary to know the sidereal time of the location where the photographs were being taken, and the right ascension (the distance in hours east of the vernal equinox) of the location one wished to "aim" the telescope. Then it was necessary to subtract the sidereal time and the right ascension and set this number (the hour angle) on the right ascension of the setting circle. This was very time consuming and highly inaccurate. To solve this problem a larger declination setting circle was made and a new type of right ascension circle also had to be made and incorporated into the mount. In the old arrangement, the right ascension circle was permanently attached to the castings of the telescope mount and the pointer at which the readings were made moved with the polar axis. In the new arrangement, a larger setting circle was attached so that it moved with the polar axis and the pointer was then attached to the worm gear of the telescope drive. In this new arrangement the pointer is driven at sidereal time by the motor of the clock drive and the right ascension circle moves with the polar axis. Once the right ascension of an object being viewed is set, one only needs to set the declination and right ascension of a desired area to bring it into the field of view. Until the development of this new setting circle, the atlas could not have been completed to its present point.

To make up for the need to cut exposure times due to the inaccurate clock drive, the film was developed in Patterson's Quality Developer (PQD). PQD raised the speed of Tri-X from ASA 400 to ASA 3000. It was then possible to use 1 minute exposures and record about as many stars as with a 5 minute exposure at ASA 400.

Once the equipment was refined, the project became the routine matter of taking, developing, printing, identifying and labeling the pictures. This also took a lot of time but the result was an atlas of 102 photographs that covered about 2/3 of the sky visible from Cleveland from April to June under ideal conditions. This atlas was compiled under far from ideal conditions. City light caused a general "lighting" of the sky in the photographs and there was not a clear horizon at any available location for working on the atlas.

Major stars in each photograph were labeled and the photographs were mounted back to back on thin cardboard using a hot press. The cardboard was then punched

and put into a ringed notebook to form the atlas. This atlas is now in the posession of the University School Science Department.

*Norton's Star Atlas and Telescopic Handbook, Arthur B. Norton and J. Gall Inglis, Sky Publishing Corporation, 1959.