Now and then, new “stars,” or novae (singular: nova; plural: novae) appear in the sky. These new stars are white dwarf stars that are members of binary star systems. If the white dwarf’s companion is close enough, the white dwarf will pull some of the companion’s matter off its surface. The matter forms a disk around the white dwarf, and spirals down to accumulate on the surface of the white dwarf. If the layer of accreted hydrogen gas on the white dwarf becomes too thick, hydrogen nuclear burning reactions ignite explosively, and blow the accreted material out into space.

Sometimes these nova explosions are visible in the sky. A naked-eye nova (one that can be seen with an unaided eye) occurs every few years. Astronomers discover many fainter, more distant novae each year. A good place to look for novae is the nearby Andromeda Galaxy because that galaxy has so many stars which can become novae.

This project involves the discovery of new novae in the Andromeda Galaxy using data obtained on the WIYN 0.9-m telescope at Kitt Peak in southern Arizona. With NovaSearch, you have the opportunity to examine real astronomical data to make an original discovery of a nova in the Andromeda Galaxy. This homework will be completed in two parts, with the first part due on Sept. 28, and the second part (NovaSearch II) due on Oct. 26.

Images of the Andromeda Galaxy can be found on the NovaSearch website at www.astro.indiana.edu/novasearch. The data can be found with the "View Data" link and additional useful information can be found with the "" link.

From the "View Data" link, select one quadrant of the Andromeda Galaxy (NE, NW, SE, or SW). Select a year for which at least 15 epochs of observation are available. Once you have selected a year of observations, you can examine each of the observations obtained that year using the arrow keys under the image that is displayed. You can also cycle rapidly through all of the images for that year using the "" keys under the image.

1. Find the date on which each image was taken in the year you have selected.

2. Prepare a table that includes three columns: date, image quality, faintest magnitude.

3. For each image in the year you selected fill in the table with your estimate of the quality of the image (a description of the appearance of the stars - sharp, fuzzy, very fuzzy….) and an estimate of the magnitude of the faintest stars you can detect in the image. (You can compare each image to a standard image with magnitudes labeled for some stars by clicking the "Compare Magnitudes" button.)
4. In some images, artifacts appear in the data that are not real stars. Many of these artifacts are caused by cosmic rays that pass through the detector during the integration. Describe how you can differentiate between real stars and artifacts. (Your browser's magnify button will allow you to magnify parts of the image for closer inspection.)

5. In the square below, sketch the position and brightness of all of the "permanent" stars visible in the quadrant you have selected (a "finding chart"). The brightness of stars can be shown using larger dots for brighter stars and smaller dots for fainter stars.

NE | NW
---|---
SE | SW

You only need to sketch ONE quadrant, not all four.

Hand in a photocopy of your table and finding chart. Keep the originals for use in the second NovaSearch assignment.