

Participatory Exploration for Inspiration and Education (12)  
Educating the Next Generation (2)

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STRENGTHENING THE CONNECTION BETWEEN SPACE AND SOCIETY: A COMPARATIVE  
ANALYSIS OF SUPERNOVAE DISTRIBUTION IN THE ANDROMEDA GALAXY FOR  
SECONDARY SCHOOL STUDENTS

**Abstract**

In order to prepare students in grades 4-12 for a global workforce, NASA supports and offers science, technology, engineering, and math (STEM) immersion education for secondary students. Secondary schools, through the NASA Explorer School program, the Spitzer Space Telescope, the National Optical Astronomy Observatory, and the WISE (Wide Field Infrared Survey Explorer) Telescope Teacher Ambassador program, offer authentic research opportunities for students. Spitzer and WISE studied the sky in infrared light. Among the objects WISE studied are asteroids, the coolest and dimmest stars, and the most luminous galaxies. The lessons learned from the NASA Explorer School program and the Spitzer and WISE teacher and student programs can be applied to other programs, engaging students in authentic research experiences by using data from space-borne and earth-based observatories such as Kitt Peak Observatory. Several ground based telescopes at Kitt Peak Observatory study visible light from objects such as novae. Utilizing a student research immersion philosophy along with data analysis skills learned from the Spitzer and WISE student research programs, an analysis of novae rate with respect to location in the Andromeda galaxy was conducted using images of the Andromeda galaxy taken from the WIYN 0.9 meter telescope on Kitt Peak. The Andromeda galaxy was divided into sixteen fields and rate of novae was compared between fields. A comparison was made between the 12 outer fields (spiral arms) and the 4 inner fields (central bulge). Novae were found by "blinking" images of the each field throughout 100 epochs of data. Blinking is a technique used to compare images of fields and noting brightness (via x,y coordinates) in one field that is not visible in the same field during a different epoch. Although the central bulge would be expected to contain more novae due to stellar density novae proximity of stars to each other, analysis of data indicates that the greatest concentration of novae appeared in outer regions.

The most concentrated distribution of novae was in field 2 (upper left edge) with an average of 11.3 novae. The least novae were in area 7 (central right) with an average of 1.3 novae. It is probable that the collective intensity of light emerging from the central core obscured the brightness of the novae. The novae may correlate with the pattern of the spiral arms in Andromeda. In addition, we will discuss secondary education infrared and visible light outreach activities and extensions.