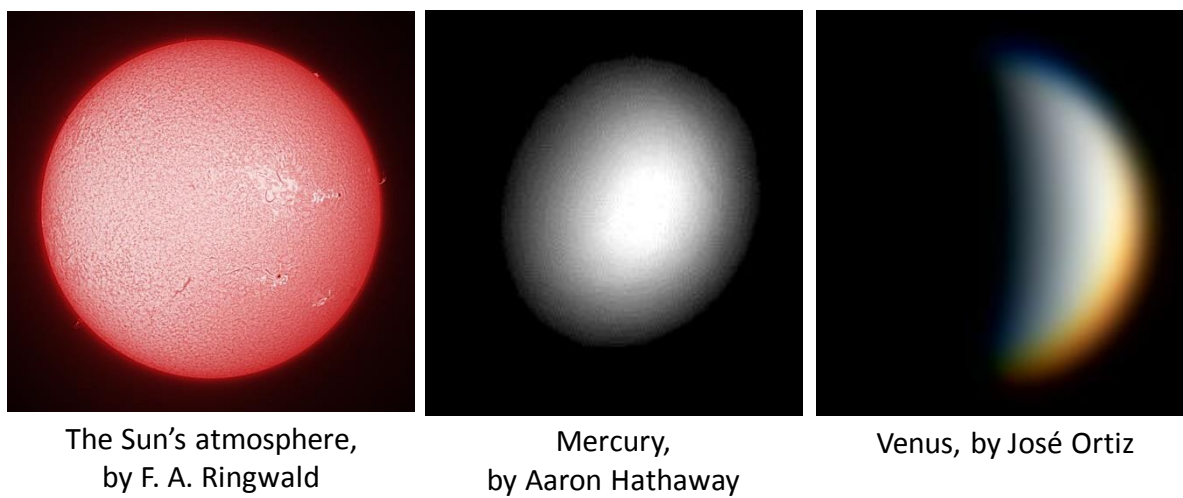


Fresno State's Observatories

Students train at Fresno State's Campus Observatory, near the Downing Planetarium.



The Sun's atmosphere, by F. A. Ringwald
Mercury, by Aaron Hathaway
Venus, by José Ortiz



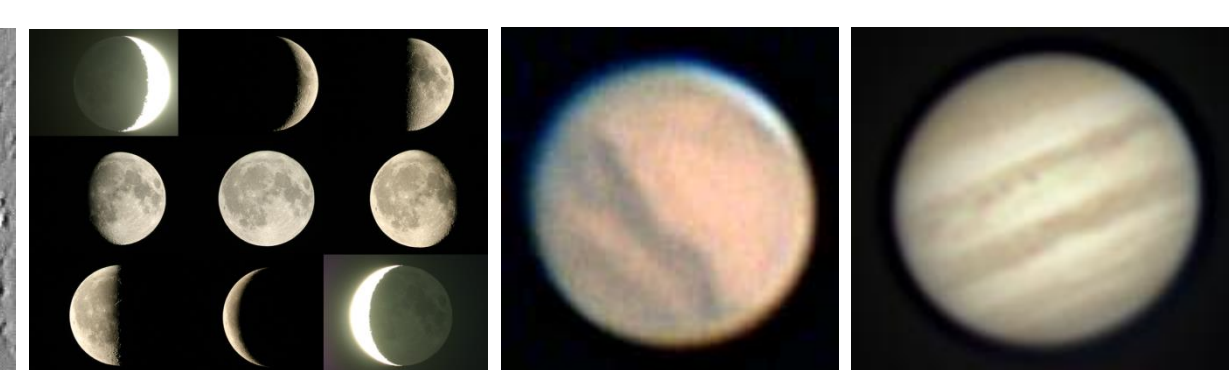
Partial solar eclipse in ultraviolet light, by Lorin Zozaya and Simon Gonzalez



Lunar eclipse, by Kendall Hall



Copernicus crater on the Moon, by Kendall Hall



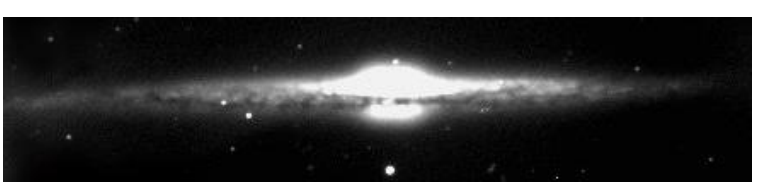
A month of Moon phases, by F. A. Ringwald
Mars, by Ashton Ellis
Jupiter, by Dan Chase and Scott Ender



Saturn, by Aaron Hathaway
Uranus and Neptune, by Matthew Garrett
Pluto, by F. A. Ringwald



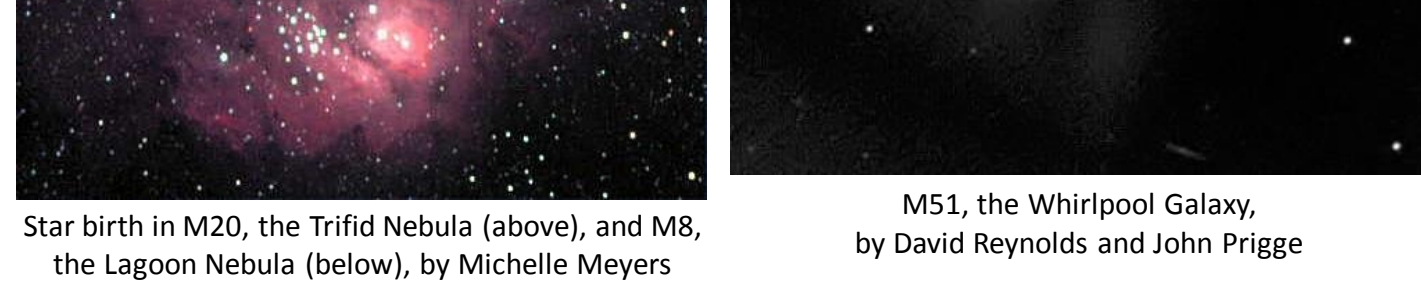
Bright and multiple star galaxy, by F. A. Ringwald



Edge-on galaxy NGC 4565, by F. A. Ringwald



Star death in M27, by Philip Sarkisian. When the Sun dies 7.6 billion years from now, it will do this.



Star birth in M20, the Trifid Nebula (above), and M8, the Lagoon Nebula (below), by Michelle Meyers



M104, the Sombrero Galaxy, by John Prigge and David Reynolds



Star death in M57, the Ring Nebula, by F. A. Ringwald and Greg Morgan

Fresno State Physics has a vigorous **Astronomy program**, with our Campus Observatory, our station at Sierra Remote Observatories, and our work with *Hubble Space Telescope* and other NASA spacecraft.

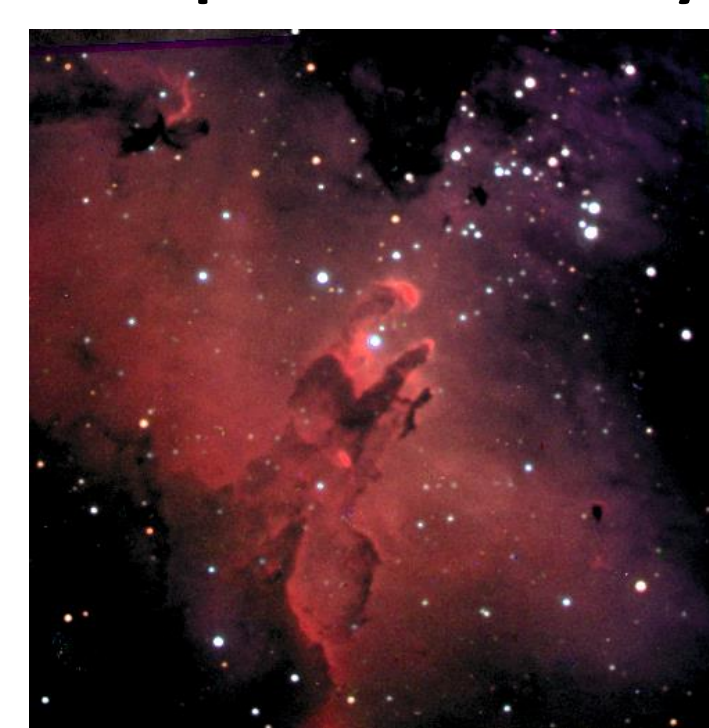
Students are welcome to participate in hands-on research on exoplanets, cataclysmic variable stars, flare stars, and black holes.

Professor Frederick A. Ringwald, with Fresno State undergraduates Ashton Ellis, Matthew Garrett, Kendall Hall, Aaron Hathaway, Kelly Khamvongsa, Nathan Miller, José Ortiz, Jonathan Roveto, Philip Sarkisian, and Lorin Zozaya, and graduate students Dan Chase, Randal Clark, Scott Ender, Simon Gonzalez, Michelle Meyers, John Prigge, David Reynolds, Gerald Rude, Dillon Trelawny, and Kenia Velasco (Department of Physics) and Dr. Greg Morgan (Central Valley Astronomers)

How much of an improvement is the remote observatory?

Campus Observatory

Fresno State's station at Sierra Remote Observatories

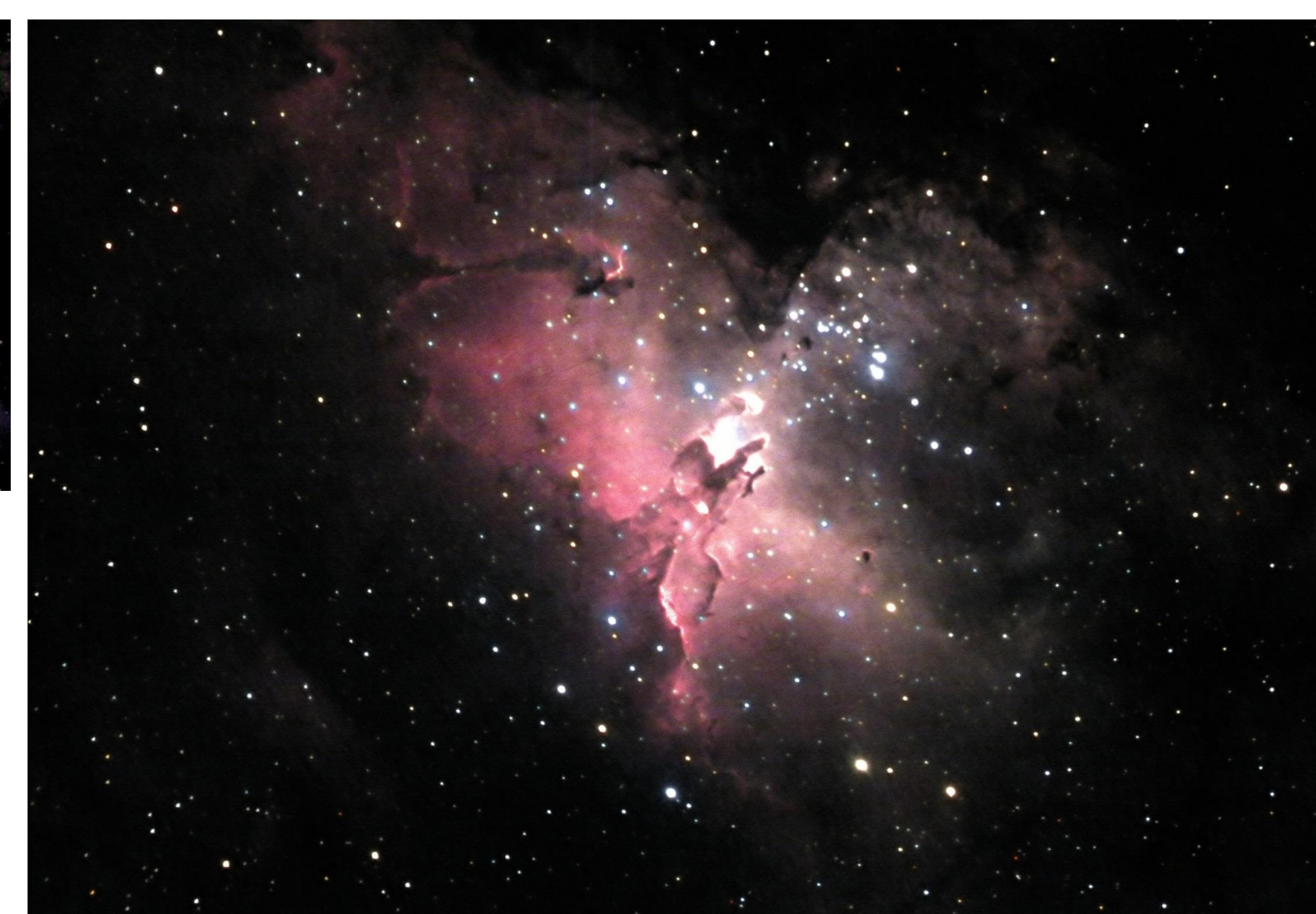


Both images here show M16, the Eagle Nebula, where stars are forming.

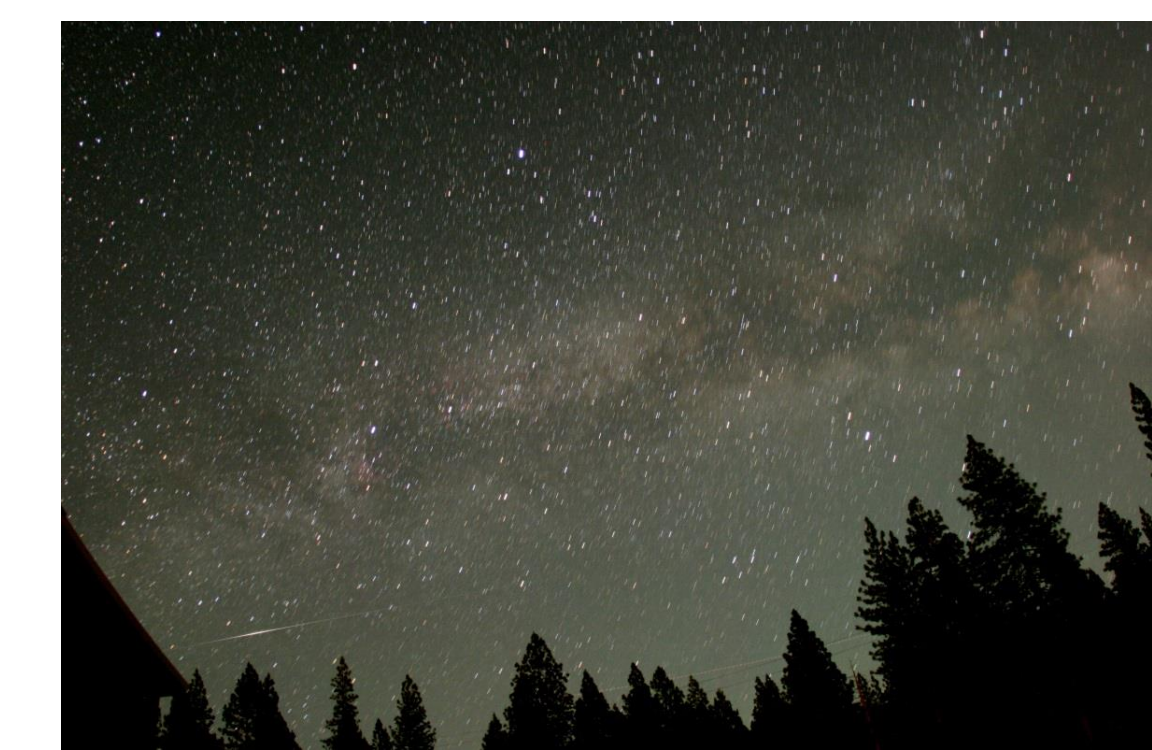
The image **above** was taken with the Campus Observatory, by math undergrad Nathan Miller.

The image **at right** was taken at the remote observatory in the same amount of time, by physics grad student Gerald Rude.

Notice how the remote observatory's image covers more of the sky, because of its more advanced telescope optics and camera. It shows fainter objects because of the dark sky, away from city lights. It also shows more detail, because the remote observatory is at an altitude of 4910 feet, above the obscuring turbulence of Fresno's air.



We do research at Fresno State's station at Sierra Remote Observatories, 47 miles from Fresno's city lights, near Shaver Lake.



My students and I operate the station mainly from campus, over the Internet.

The station was among the first eight Sierra Remote Observatories, built in 2007. There are now over 20. The project was founded by Dr. Greg Morgan, Dr. Keith Quattrocchi, and Dr. Mel Helm, and is now operated by Larry Van Vleet. We also thank the Downing family for the Downing Planetarium, which began all of this.

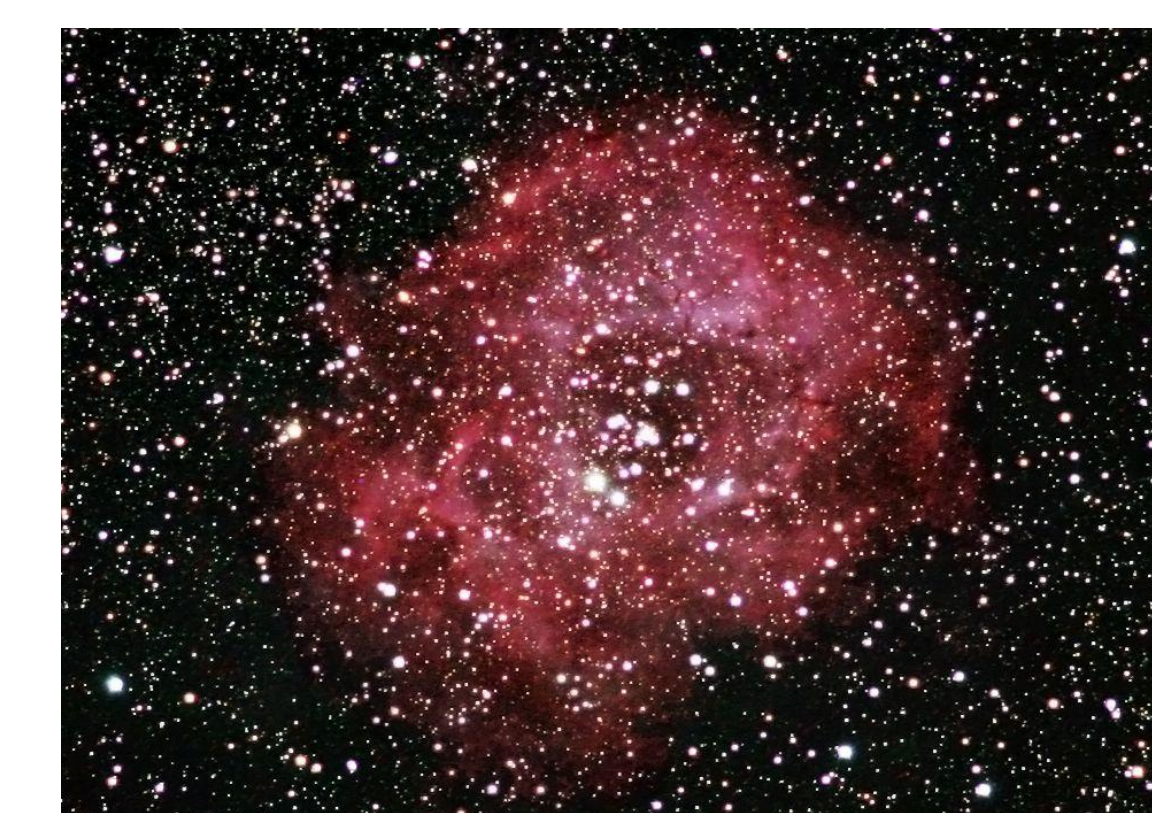
Publications from Fresno State's station at Sierra Remote Observatories

Papers published in refereed journals, with student co-authors underlined:

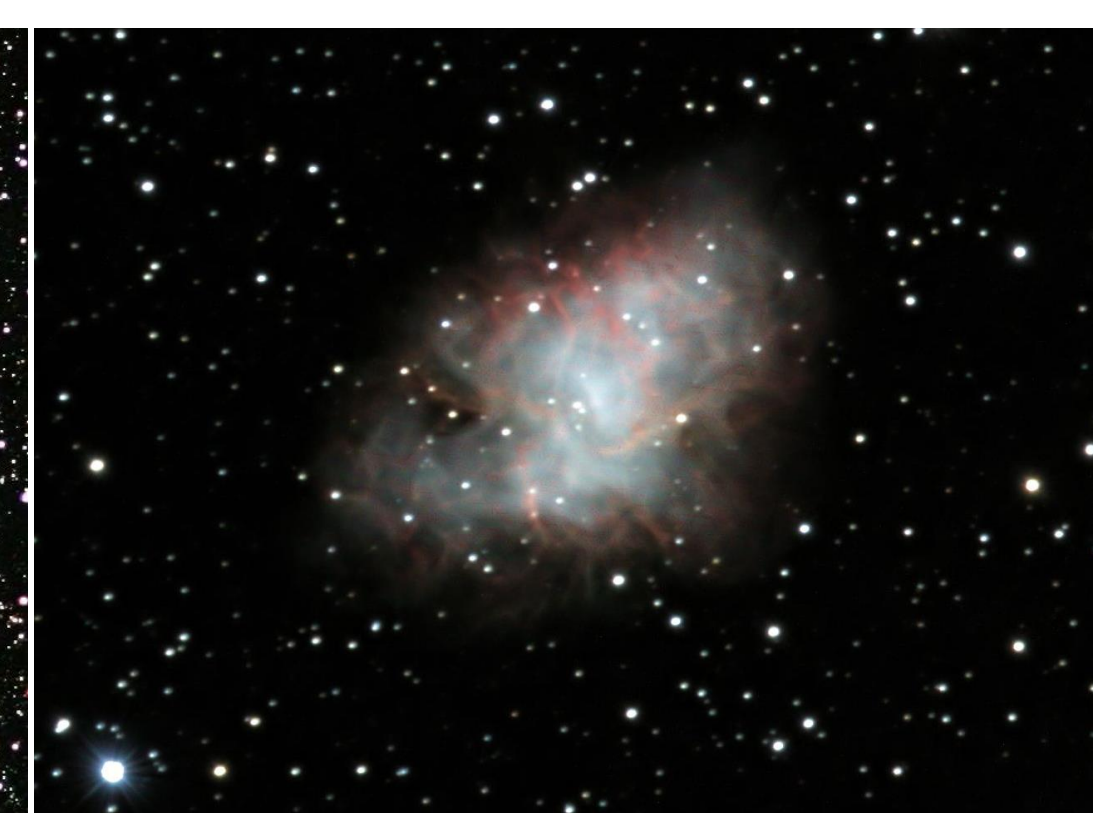
- (7) Ringwald, F. A., Rude, G. D. II, Roveto, J. J., Khamvongsa, K. S. 2012, New Astronomy, 17, 570-575, "The Photometric Period and Variability of the Cataclysmic Variable V849 Herculis (PG 1633+115)"
- (6) Rude, G. D. II & Ringwald, F. A. 2012, New Astronomy, 17, 533-536, "A Search for Superhumps in the Cataclysmic Variable SW Sextantis"
- (5) Rude, G. D. II & Ringwald, F. A. 2012, New Astronomy, volume 17, pages 453-457, "The Photometric Periods of the Nova-Like Cataclysmic Variable LQ Pegasi (PG 2133+115)"
- (4) Rude, G. D. II & Ringwald, F. A. 2012, New Astronomy, volume 17, pages 442-445, "The Photometric Period of the Cataclysmic Variable HV Andromedae"
- (3) Ringwald, F. A., Velasco, K., Roveto, J. J., & Meyers, M. E. 2012, New Astronomy, volume 17, pages 433-437, "The Orbital Period and Negative Superhumps of the Nova-Like Cataclysmic Variable V378 Pegasi"
- (2) Shears, J., Campbell, T., Foote, J., Garrett, R., Hager, T., Julian, W. M., Kemp, J., Masl, G., Miller, I., Patterson, J., Richmond, M., Ringwald, F., Roberts, G., Ruiz, J., Sabo, R., & Stein, W. 2011, Journal of the British Astronomical Association, volume 212, pages 96-104, "The orbital and superhump periods of the deeply eclipsing dwarf nova SDSS J150240.98+333423.9"
- (1) Kato T., (50 co-authors) Ringwald, F. A. (& 7 co-authors), 2010, Publications of the Astronomical Society of Japan, volume 62, pages 1525-1584, "Survey of Period Variations of Superhumps in SU UMa-Type Dwarf Novae. II: The Second Year (2009-2010)"

Masters of Science theses, for the Department of Physics, California State University, Fresno

- (4) The 2012 Outburst of the Soft X-ray Transient/Black Hole Candidate Swift J1910.2-0546/MAXI J1910-057 (2013), by Trelawny, Dillon.
- (3) Detecting Waves in Accretion Disks (2012), by Rude, Gerald.
- (2) Waves in an Accretion Disk: Negative Superhumps in V378 Pegasi (2010), by Velasco, Kenia.
- (1) A Search for Extrasolar Planets Using Echoes Produced in Flare Events (2009), by Clark, Randal Eugene.



Star birth in the Rosette Nebula, by F. A. Ringwald



Explosive star death in M1, the Crab Nebula, remnant of the supernova seen in 1054 A. D. by F. A. Ringwald