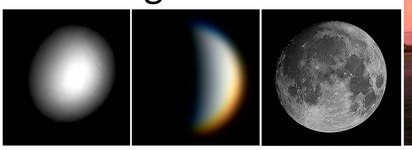
What's new at Fresno State's Observatories

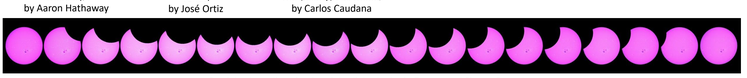
Students train at **Fresno State's Campus Observatory**, near the Downing Planetarium.



Mercury, by Aaron Hathaway

Venus, by José Ortiz

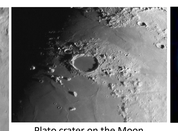
The (nearly) Full Moon, by Carlos Caudana



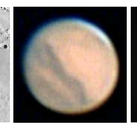
Partial solar eclipse in ultraviolet light, by Lorin Zozaya and Simon Gonzalez

Lunar eclipse, by Kendall Hall

Copernicus crater on the Moon, by Kendall Hall, processed by Miguel Dizon

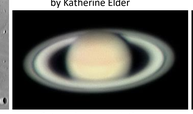


Plato crater on the Moon, by Katherine Elder



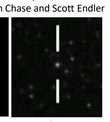
Mars, by Ashton Ellis

Jupiter, by Dan Chase and Scott Endler

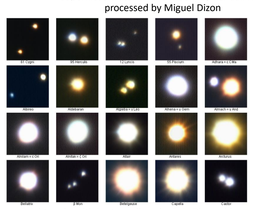


Saturn, by Aaron Hathaway

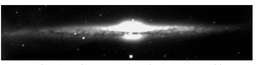
Uranus and Neptune, by Matthew Garrett



Pluto, by F. A. Ringwald



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



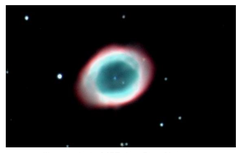
Edge-on galaxy NGC 4565, by F. A. Ringwald

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

M51, the Whirlpool Galaxy, by David Reynolds and John Prigge

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.

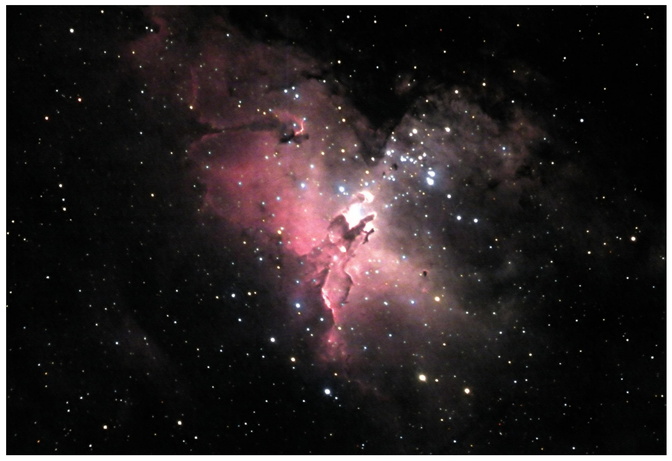
Students are welcome to participate in hands-on research on cataclysmic variable stars, symbiotic stars, flare stars, exoplanets, meteors, starburst galaxies, quasars, and black holes.

Professor Frederick A. Ringwald, with Fresno State undergraduates Carlos Caudana, Miguel Dizon, Katherine Elder, 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 Endler, 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.

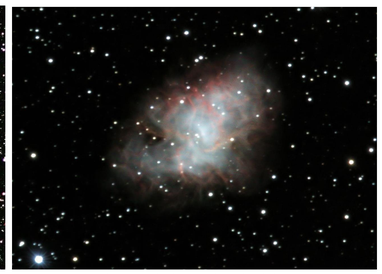
The image **at right** was taken at the remote observatory in the same amount of time, by physics graduate student Gerald Rude.

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 4610 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.

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



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

The station was among the first eight Sierra Remote Observatories, built in 2007. Sierra Remote now has over 30 telescopes.
Sierra Remote was founded by Dr. Greg Morgan, Dr. Keith Quattrocchi, and Dr. Mel Helm.
It is now is operated by Dr. Helm, Dr. Quattrocchi, Larry Van Vleet, and Geoff Stone.
We also thank the Downing family for the Downing Planetarium, which began all of this.

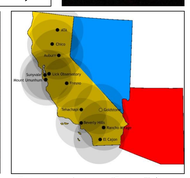
Publications from Fresno State's station at Sierra Remote Observatories include 7 papers published in refereed journals, 5 of which had student co-authors, as well as 4 M.S. theses for the Department of Physics at California State University, Fresno.

Allsky Meteor Camera

in collaboration with Dr. Peter Jenniskens (SETI Institute/NASA Ames Research Center)

Professor Ringwald to the right of the camera, attached to the remote observatory. It was unusually snowy during installation!

The first bright fireball appeared just 12 nights after installation. The Big Dipper is at left. The camera shows where meteors come from.



The camera (marked "Fresno") fills a hole in sky coverage over California. The next goal is to recover meteorites.

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