

APS Graduate Program in *Astrophysical and Planetary Sciences*



University of Colorado at Boulder



HST image of NGC1741 by APS Graduate Kelsey Johnson



18" telescope at Sommers-Bausch Observatory



Graduate Student Seminar



HST picture of Mars by CU researcher Steve Lee

A Tradition of Excellence

The Department of Astrophysical and Planetary Sciences (APS) at the University of Colorado (CU) has a reputation of excellence, nationally and internationally. Consistently ranked among the top programs in the country, the department enjoys a diversity of research interests with 24 rostered faculty, 50 research and affiliated faculty and approximately 50 graduate students. The program successfully integrates astrophysics and planetary science, with strong components in observation, theory, and space instrumentation. This diversity facilitates interaction and collaboration between the disciplines and enables students to explore a wide variety of research areas. In addition, the Sommers-Bausch Observatory on campus provides excellent hands-on observational experience. APS also supports the world-class Fiske Planetarium which offers a unique opportunity for public outreach. These campus resources are complemented by several affiliated research organizations in Boulder and by national telescope facilities including the Apache Point Observatory 3.5 m telescope (APO 3.5m).

Academics

The first two years of graduate school focus on a core curriculum that covers radiative transfer, gas and fluid dynamics, and mathematical methods. There is a wide variety of astrophysics and planetary science courses available as well. Some students take advantage of the strong interdisciplinary nature of APS by taking classes in other departments such as Physics, Atmospheric and Oceanic Sciences, Aerospace Engineering, and Geology.

To qualify for PhD. Candidacy, students pass two exams: a written test based on course work, taken after the third semester, and an oral exam based on independent research, presented after the fourth semester. The average time to complete a Ph.D. is 5.5 years.

All graduate students in the Department of Astrophysical and Planetary Sciences are awarded research or teaching assistantships with tuition waivers. The department stresses the importance of teaching experience and encourages all students to supplement their research with teaching.

Research

The University of Colorado is involved in research across the forefront of astronomy. The primary focus of the graduate program is to teach the techniques for outstanding research. Graduate students can conduct research in every area in the department and in many of the affiliated institutions. Students successfully compete for observing time at major ground- and space-based observatories across the entire spectrum including the APO 3.5m. Proprietary and guaranteed observing accompanies CU's world class instrumentation and space physics programs. These areas complement CU's strength in theoretical astrophysics and planetary science. Active theoretical research includes both analytical work and extensive numerical modeling, and making use of local and national computing facilities.

Research in Planetary Science

- Planetary rings and solar system dynamics
- Planetary magnetospheres
- Sun-Earth connections
- Origins of planetary atmospheres and disks
- Martian volatile evolution
- Galilean satellites and the Io plasma torus

Research in Astrophysics

- Solar physics
- Astrophysical fluid dynamics
- Stellar atmospheres, radiative transfer, and stellar winds
- Star formation and molecular clouds
- Plasma astrophysics and magnetohydrodynamics (MHD)
- Interstellar and intergalactic matter
- Supernovae, gamma-ray bursters and their remnants
- Cosmic X-ray sources, accretion disks, AGN, and black holes
- Galaxy formation and evolution, quasars and starburst galaxies
- Clusters of galaxies, cosmology, and large-scale structure

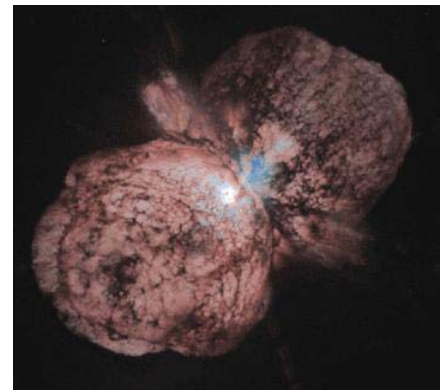
Instrumentation

CU has established itself as a premier developer of space hardware. Current and recent projects include the Ultraviolet Imaging Spectrometer (UVIS) aboard Cassini, the UltraViolet Spectrometer (UVS) on Galileo, the Far Ultraviolet Explorer (FUSE), the Cosmic Origins Spectrograph (COS) to be installed on the Hubble Space Telescope in 2005, the Solar-Stellar Irradiance Comparison Experiment (SolStICE on UARS), the Solar Atmosphere Variability Experiment (SAVE, part of the EOS), and the Solar Extreme-UV Explorer (SEE, on TIMED). In addition, CU's sounding rocket program and sub-millimeter and X-ray astrophysics labs offer graduate students a unique opportunity to assume responsibility for all aspects of instrumentation. We are now building an IR camera for the APO 3.5m telescope.

Having a life as a Graduate Student

With so many outdoor activities available to CU students, it's a wonder they stay in their offices! The Rocky Mountains lie right next door to the CU-Boulder campus, affording superb skiing, hiking, camping, and rock climbing. Boulder is home to world-famous athletes from runners to bikers to skiers. The city has a reputation for being one of the sunniest spots in the country, with a temperate climate throughout its seasonal changes.

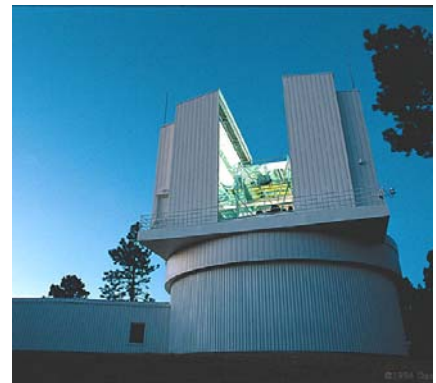
Boulder and the Denver area host many cultural facilities and events. Boulder is a stimulating town, with a colorful outdoor pedestrian mall, numerous bike paths, and many fine microbreweries and restaurants. The APS department organizes several intramural teams, including softball, ultimate Frisbee and volleyball. APS graduate students have no shortage of work and play.



HST Image of Eta Carina by CU researcher Jon Morse



The FUSE spectrograph, built at CU



Apache Point Observatory 3.5 m telescope



The department Ultimate Frisbee Team in action

After Graduate School

APS has an average of six Ph.D. graduates per year who typically continue their research in prestigious post-doctoral positions. The department also encourages students to broaden their options by providing opportunities to participate in areas such as secondary and undergraduate education, computation, and the design and fabrication of space hardware.

Accordingly, some graduates choose to pursue astronomy-related careers such as teaching, public outreach, instrumentation, industry or science journalism.

Faculty Members and Research Areas

Armitage, Philip: Theoretical Astrophysics, Planet Formation
Ayres, Thomas R: Solar and Stellar Spectroscopy
Bagenal, Fran: Magnetospheres & Sun-Earth Connection
Baker, Daniel: Earth's Magnetosphere & Sun-Earth Connections
Bally, John: Star Formation, Outflows, & Molecular Clouds
Begelman, Mitchell: Accretion Disks, AGN, & Black Holes
Betz, Albert: Infrared Instrumentation
Brummell, Nicholas: Computational MHD, Solar Physics
Cash, Webster: X-ray Instrumentation
Ellingson, Erica: Observational Cosmology & Galaxy Evolution
Ergun, Robert: Magnetospheres, Aurorae, Instrumentation
Esposito, Larry: Planetary Rings, Venus Atmosphere
Glenn, Jason: Millimeter/Sub-mm Instrumentation, High-Z Galaxies
Green, James: Ultraviolet Instrumentation
Halverson, Nils: Millimeter/Sub-mm Astronomy
Hamilton, Andrew: Large Scale Structure, Cosmology
Hart, John: Dynamic Oceanography & Planetary Atmospheres
Linsky, Jeffrey: Stellar and Solar Atmospheres, Local ISM
McCray, Richard: Supernovae & Their Remnants
Perna, Rosalba: High-Energy Astrophysics, Gamma-Ray Bursts
Pappalardo, Robert: Planetary Surfaces, Europa and Icy Bodies
Rast, Mark: Solar Physics
Schneider, Nickolas: Io Plasma Torus
Shull, Michael: Interstellar & Intergalactic Matter Theory
Snow, Theodore: Dust & Interstellar Medium
Stoche, John: Observational Cosmology, IGM, AGN
Toomre, Juri: Solar Physics & Computational Fluid Dynamics

Associated Institutions in Boulder

Ball Aerospace and Technology Corporation
Center for Astrophysics and Space Astronomy (CASA)
Center for Integrated Plasma Studies (CIPS)
Colorado Space Education Initiative (CSEI)
High Altitude Observatory (HAO)
Joint Institute for laboratory Astrophysics (JILA)
Laboratory for Atmospheric and Space Physics (LASP)
National Center for Atmospheric Research (NCAR)
National Institute of Standards and Technology (NIST)
National Oceanic and Atmospheric Administration (NOAA)
Program in Atmospheric and Oceanic Science (PAOS)
Southwest Research Institute (SwRI)

Graduate Courses

- Cosmology
- Fluid Dynamics
- Galaxies
- Gas and Radiation Physics
- High Energy Astrophysics
- Instrumentation
- Interstellar Medium
- Mathematical Methods
- Observational Astronomy
- Planetary Atmospheres
- Planetary Magnetospheres
- Planetary Origins and Evolution
- Planetary Surfaces
- Plasma Astrophysics
- Stellar Atmospheres
- Stellar Structure and Evolution

Application Information

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