The following projects have been proposed by scientists at Lowell Observatory and the US Geological Survey who would like a Space Grant Undergraduate Research Internship student. All projects will be conducted at either Lowell Observatory or the US Geological Survey. If you are interested in one of these projects, please contact Dr. Barlow (Physical Sciences Room 200) who can give you more information about the Space Grant Internship Program requirements and the contact person for the project. You MUST contact the mentor to talk to them directly about the project, and both you and the mentor must agree to the working relationship before submitting the Internship application.

Deadline for Student and Mentor applications (both must be submitted) is Friday, March 11, 2011. Off-campus projects often get taken quickly, so do not wait until just before the deadline to inquire about these projects. Mentors often have other commitments (such as observing and/or conferences—in particular, USGS scientists will be gone to a conference the week that the applications are due) which take them away from Flagstaff for periods of time, so the sooner you can contact them, the better your chances of getting the project you want.

Lowell Observatory: (Directions: Lowell Observatory is located on Mars Hill just west of downtown Flagstaff. From NAU you go north on San Francisco, turn left on Route 66, and go straight (onto West Santa Fe Avenue) as Route 66 curves to the left under the railroad tracks. Follow West Santa Fe past Thorpe Park (on the right), then follow the signs up to Lowell Observatory.

1. Young Binary Star Systems:  THIS INTERNSHIP HAS BEEN FILLED
Over the past two decades, astronomers have discovered that most stars tend to form in binary or multiple systems, unlike our own Sun. One important area of study has thus become the characterization of these young star binary systems: how many there are in different nearby star forming regions, are they as common among the most massive as among the least massive stars, what are the mass ratios of the component stars, can planets form in these systems, etc. Unfortunately, such investigations are relatively rare and incomplete. Astronomers have only fully characterized the components in about 60 or 70 young binaries.

I would like to collaborate with a Space Grant student on the completion of a study of young binaries in the Taurus star forming region using data already collected at the University of Hawaii 88" telescope, possibly supplemented with data we might obtain from the Lowell 72" telescope at Anderson Mesa. The data consist of low-resolution, infrared spectra of each component in a number of binaries, in addition to infrared photometry of the same systems. We will use these data to determine the stellar spectral types and the presence of circumstellar accretion disks around the binary components. These disks are important because they are the sites of planet formation.

Ultimately we will use the results of this project together with data from the literature to make statistical inferences about binary stars, i.e. mass ratio distributions, separation distributions, etc.
The goal of analyzing these data is to understand better binary star formation and planet formation in binaries.

Familiarity with Unix/Linux and IDL would be extremely useful. However, the most important skill a student can bring to this project is a willingness to learn, to work hard, and to be organized and self-disciplined.

**US Geological Survey:** (Directions: From NAU, take San Francisco north to the intersection with Forest (by the hospital). Turn right onto Forest and follow it up the hill (where it turns into Cedar). You will see a brown sign for Buffalo Park and the USGS—turn left onto Gemini Drive. The USGS is on the left just before you get to Buffalo Park.)

1. **Determining Mars Dune Field Composition using thermal and near infrared spectroscopy.**
   The Mars Global Digital Dune Database (MGD3) is nearing completion. This project will identify large dune fields within the MGD3 and use Mars Reconnaissance Orbiter CRISM, Mars Express OMEGA, Mars Odyssey THEMIS, and Mars Global Surveyor TES observations of these dunefields to determine mineralogical composition. Initially, the focus will be using the most recent mid-afternoon THEMIS multispectral images to determine mineral composition using spectral deconvolution (developed by ASU). Once THEMIS compositions have been determined, areas of unique composition will be analyzed using higher spatial resolution near infrared datasets, e.g. CRISM, and higher spectral resolution thermal datasets, e.g. TES. If time allows, comparisons will be made to observations from the European (French) infrared imaging camera OMEGA.

   Student must be motivated, disciplined, and display a willingness to learn and work hard. Student must also have reliable transportation to the USGS.

2. **Surface Changes on Mars**
   Many regions of the Martian surface change appearance frequently as sand and dust are eroded and deposited by the wind. This ongoing NASA research project uses images from the Mars Reconnaissance Orbiter (MRO) spacecraft to monitor the Martian surface globally and identify the various processes causing the changes. The student will help assemble a "movie" of Mars using images from the Mars Color Imager instrument on MRO, determine where changes are currently taking place, and suggest targets for more detailed investigation with the high resolution "spy camera" on MRO, HiRISE.

   The ideal student will have a strong interest in pursuing planetary science as a career. The work will be carried out on US Geological Survey computers, and the student must complete training and security requirements at least 8 weeks prior to the start of the project. Familiarity with unix/linux and scripting languages such as perl are helpful but not required. Once the procedures are understood, much of the work can be performed remotely from home or campus.
Now in its fourth year, the NASA Space Grant Internship project Saving Space: Preserving and Promoting Historic Photographs in the USGS/NASA Regional Planetary Information Facility is moving into a new phase. Previous NASA Space Grant Students have performed the tedious but necessary labor of stabilizing and organizing the materials in the USGS Astrogeology photo collection, and now a student is preparing captions for our testing and training subcollection, which contains more than 500 images of 1960s-era astronaut training and equipment tests. In the coming year, we plan that our NASA Space Grant Intern will caption a second subcollection and begin to transfer photos from the completed first subcollection to our website to make them publicly accessible.

Preferred qualifications: An ability to perform research in our primary-source document collection in order to write captions; an ability to write two-sentence captions; attention to detail; archival or museum career aspirations; some interest in space exploration and experience with scanning images are pluses.