

**THE RONALD GREELEY CENTER FOR PLANETARY STUDIES: THE NASA RPIF AT ARIZONA STATE UNIVERSITY.** D. M. Nelson<sup>1</sup>, D. A. Williams<sup>1</sup>, and A. E. Zink<sup>1</sup>, <sup>1</sup> School of Earth and Space Exploration, Arizona State University, Tempe, AZ 85287-3603 (davidmnelson@asu.edu).

**Introduction:** The NASA Regional Planetary Information Facilities (RPIFs) are a network of 16 centers that archive images, maps, literature, and education outreach materials from past and current planetary missions. Nine of the RPIFs are located in the US, while seven other are found in Canada, France, Germany, Israel, Italy, Japan, and the UK. The RPIFs were originally established in the 1970s to serve two primary functions: 1) to archive photographs and literature from active and completed planetary missions, and 2) to provide researchers and the public access to the archive for scientific research, future mission planning, and education/public outreach (EP/O) [1]. While each RPIF houses a variety of similar products, each one possesses unique datasets that were developed over time, often from original research conducted at the host institution. Historically, the RPIFs primarily served only their local planetary communities. Now, the RPIFs have begun working together to share information, knowledge, and eventually digital datasets, making them available to a wider community.

The Ronald Greeley Center for Planetary Studies (RGCPS) is the RPIF located at Arizona State University (ASU), Tempe, AZ. The leadership of the RGCPS is currently working to expand the services and means of data distribution to make our Center more relevant in the digital age. As part of this expansion, we have developed a Geographic Information Systems (GIS) laboratory. In addition, we are in the process of compiling a fully-searchable online catalog of our archive and are producing digital copies of the unique products located in our facility for distribution via the Internet.

**The RGCPS:** The RGCPS was originally established in 1977 at ASU by Professor Ronald Greeley as the Space Photography Laboratory (SPL) in order to be a branch of the U.S. Geological Survey RPIF [2]. In 1982, the SPL became a full, independent RPIF, and in 1992 was moved to a 2740 ft<sup>2</sup> climate-controlled lab. After the death of Dr. Greeley in 2011, the facility was renamed the “Ronald Greeley Center for Planetary Studies”.

Since its inception nearly 40 years ago, the Center has accumulated a significant number of unique products in its archive (Table 1). These include: 1) aerial photographic prints, 35 mm slides, and radar-derived photographic prints of the NASA SIR-C/XSAR mission, which serve as observations of terrestrial geological features that can be used as planetary analogs (particularly volcanic and aeolian features relevant to lunar

and Mars research); 2) photographs, 35 mm slides, and 16 mm film movies of field and laboratory experiments, including the experiment records from the NASA Ames Vertical Gun Facility and the Planetary Aeolian Laboratory wind tunnels; and 3) a series of classic NASA Technical Reports, Special Publications, and other documents from the 1970s-1990s, many produced by the late ASU professor Ronald Greeley and colleagues. The RGCPS also houses a fully-operational wet darkroom for the generation of photographic prints to support research and EPO activities, and is the only RPIF that has such a capability.

The GIS lab in the RGCPS is available to the public for planetary research. It consists of five Windows™ workstations, with an additional three being used exclusively for active missions and research. Each of the workstations have installed: licensed copies of ArcGIS™ 10.3 [3], JMars [4], Adobe Photoshop and Illustrator [5], and have access to a Linux server for image processing with ISIS 3 (Integrated System for Imagers and Spectrometers) [6] and VICAR (Video Image Communication And Retrieval) [7] software.

**RGCPS Services:** One of the most important goals of the RGCPS has always been to support planetary geology research for faculty, staff, and students, and to promote and disseminate the results of NASA Planetary missions, especially those associated with ASU (e.g., Mars Pathfinder, Mars Exploration Rovers, Galileo, Mars Express, and DAWN).

To this end, our staff is well versed with our archive and can direct visitors to finding the correct materials. We are currently building our archive database by tagging our documents with the International Standard Book Numbers (ISBN) and entering the information using Koha software (an open source Integrated Library System build using MySQL). This database will be searchable through any standard web browser.

Because the RGCPS is located in ASU’s School of Earth and Space Exploration, we are ideally situated to help faculty and students work on active and past planetary missions. For example, Director Williams is currently working on mapping projects of the dwarf planet Ceres, as imaged by the Dawn mission, and of Mars, using images from the High Resolution Stereo Camera on the Mars Express mission. Additionally, we have faculty and students working on funded research that include investigating tectonic features on Europa using

Galileo data, and mapping Ascraeus Mons, Mars, with multiple mission datasets in our GIS lab.

To facilitate GIS research, the Data Manager is continuing to develop seminar-style classes on planetary GIS. These consist of hour-long sessions, which cover: an overview of the basic software components of GIS software, understanding and integrating image datasets into ArcGIS™, creating and editing vector data files, and correctly projecting planetary datasets onto different planetary bodies to enable surface measurements. Four sessions were presented in the Fall of 2015. Initially, these seminars will only be available to students and researchers at ASU, but will eventually be accessible to visiting planetary scientists in the American Southwest.

The RGCPS has always had a strong component of EP/O. We participate in three or four open-house departmental events per semester and one campus-wide event annually; where each event has drawn up hundreds to thousands of visitors from the public in the Center or at an associated display. For middle-school students, we host a two week summer camp entitled “Moon, Mars, and Beyond!”, and we frequently have school tours from these grades throughout the year. During these events, we distribute planetary-related posters (e.g., of Pluto, Vesta, or Mars), and discuss NASA missions and activities, as well as the research that is performed in the RGCPS.

**Long-term plans:** There are several long-term goals for the RGCPS, some of which we have already begun to implement. One of our higher priorities is to continue expanding our GIS capability, both in data availability and training. We are currently developing GIS projects for all terrestrial planets, outer planet satellites, and the larger asteroids. GIS databases for Io and Vesta, as well as Titan (through a collaboration with the RPIF at Cornell University), have already completed. These ready-made projects will furnish researchers with the base datasets needed to begin their research projects quickly.

Further, we are scanning portions of our earth-analog image archive, which include 9" x 9" aerial

photographs, field research photographs (from airplanes, on the ground, and of rock samples), and experiment photos and movies (wind tunnel, vertical gun, and volcanic wax modeling) (see Table 1). The photos are being scanned at 600 dpi, and metadata for each image are being collected for the development of an image database. The goal is to make the datasets compliant to NASA's Planetary Data System (PDS). We are also scanning rare special publications and reports in order to post PDF versions of the documents on our public website ([rpif.asu.edu](http://rpif.asu.edu)).

We are continuing to compile our archive database to include all images, maps, books, and journals though the Koha software system, with the eventual plan to make our entire catalog searchable through a web-based interface. A long-term goal might be to integrate our database with those of the other RPIFs in order to cross-reference all of our rare and unique documents through a single search capability.

A relatively new project is to make historic mission data products usable with modern software. For example, from 1999-2003, image mosaics were created at ASU with the then-new Galileo mission data, but now are in a nearly unusable, obsolete format. We are investigating ways to reconstruct and document the methods used to calibrate and mosaic the images, and to export the files into the ISIS 3 (\*.cub) format. By reinventing the RGCPS as a digital planetary archive and GIS laboratory, our goal is to facilitate planetary research not only by providing image datasets, but also the instruction to understand and process data from a variety of disparate planetary missions. In this way, we will bring the photograph-based image archives into the digital age.

#### References:

- [1] <http://www.lpi.usra.edu/library/RPIF/>
- [2] <http://rpif.asu.edu/wordpress/index.php/rgcps/about>
- [3] <http://www.esri.com>
- [4] <http://jmars.asu.edu>
- [5] <http://www.adobe.com>
- [6] <http://isis.astrogeology.usgs.gov>
- [7] <http://www-mipl.jpl.nasa.gov/external/vicar.html>

Data Product Type	Quantity	Comments
Photographs of Field Work	6,557	Combination ground & aerial images, sizes $\leq 8 \times 10"$
Photographs of Laboratory Work	2,117	PAL and Vertical Gun, sizes $\leq 8 \times 10"$
Aerial Photographs	8,249	Standard: 9.5x9.5"; also sizes: 8x10", 5x7", 4x5"
Site Studies	2,224	Radar, aerial. Overlays, negatives, maps (oversized)
35 mm slides	11,038	Field and experiment
Film	459	PAL wind tunnel experiments
VHS tapes	120	Mission animations, NASA mission press conferences
Publications and reports	30	Not listed on WorldCat, avg. 110 pages/pub.
<b>Total Products</b>	<b>30,794</b>	

Table 1. List of the unique photograph and film archives of the ASU RPIF.