DIGITIZING THE RONALD GREELEY SLIDE COLLECTION. D.A. Williams, D.M. Nelson, [1]School of Earth and Space Exploration, Arizona State University, Tempe, AZ 85287-1401 (David.Williams@asu.edu).

Introduction: NASA has tasked the nine US Regional Planetary Image Facilities (RPIFs) to digitize their holdings of hardcopy and photographic materials and place them online, so that they will be more accessible to the wider planetary science community. The Ronald Greeley Center for Planetary Studies, the NASA RPIF at Arizona State University (ASU), received a 3-year grant in 2014 from NASA's Planetary Data Archiving, Restoration, and Tools (PDART) program to digitize our unique archive of field and aerial photographs that ASU professor Ronald Greeley (1939-2011) collected of terrestrial geologic features as planetary analogs. As we continue to implement that project, this year we received a new 1-year PDART grant to digitize the 35mm slide collection of Dr. Greeley. This abstract describes that project.

Background: Planetary geologist Ronald Greeley was an active researcher from the late 1960s up until his death in 2011, in which his primary focus was studies of terrestrial and planetary volcanic and aeolian features (e.g., [1]). To support interpretation of lunar, martian, venusian, and other planetary geologic features seen in images from NASA missions, Dr. Greeley conducted extensive, NASA-funded, field studies in volcanic terrains and in dune fields across the United States and around the world. He also led extensive laboratory experiments in aeolian erosion and deposition using the wind tunnels of the NASA Planetary Aeolian Laboratory, as well as experiments to understand lava flow emplacement using wax or other materials. **Table 1** summarizes the Greeley Slide Collection. Most of the slides are either of field sites of important terrestrial analogs to planetary geologic features, or of results from NASA-funded laboratory experiments of aeolian or volcanic processes in action.

Approach: For this one-year PDART proposal, we will digitize the 14,435 slides of the Greeley Collection, going sheet by sheet. Rather than do the work in-house with undergraduate student workers and purchased slide scanners, we will contract out the slide digitization to a local company, DigMyPics.com (Gilbert, AZ). This company was recommended to us by Dr. Mark Robinson (ASU professor and Lunar Reconnaissance Orbiter Camera (LROC) PI), who used them to digitize his own slide collection as well as that of the late USGS planetary geologist David Roddy. This company (https://www.digmypics.com/) has a well-defined process for cleaning, digitizing each slide at 4000 dpi as TIFF images, and manual color and exposure correction (caused by aging of the slides). The total cost to digitize the 14,435 slide collection is ~$9,300, and the quote is included in the Budget Justification.

After receiving the 1 terrabyte hard drive with the digitized photos, RGCPS Data Manager David Nelson will cross-reference each folder of scans with its slide sheet, including with each slide any descriptive information that Dr. Greeley wrote on the outside of each slide. Many of the slides include the date (month and year) in which the slide was made. Mr. Nelson will the generate PDS4 labels and include any metadata available, following the procedures he learned from the Planetary Data System (PDS) Geosciences Node from our recent prior PDART project.

Once the images and metadata are ready, they will be made available for peer review supervised by the PDS Geosciences Node. Following up after any reviewer-recommended changes, they will be published and posted as was done for our prior Amboy dataset https://rpif.asu.edu/fieldimgs_amboy_crater/.

Perceived Impact:

The Ronald Greeley Slide Collection contains much useful information on planetary geologic features studied on Earth and in the Solar System, and the information in these slides was instrumental in many of the early comparative studies of geological features on Earth with those on the Moon, Mars, and Venus, and, if digitized, these slides could be very useful to current and future planetary geologists beyond ASU. As recently as the previous decade, several individuals culled our archives for field and aerial photographs to enhance planetary geology field trips in central Arizona and Mexico (e.g., [2]-[4]). These digitized slides would also be useful, for example, for change detection studies in volcanic (e.g., Hawaii, Italy) and aeolian (e.g., California, Bolivia) terrains as applicable for continuing comparative planetology studies with Mars. In particular, as planetary exploration moves from less orbital missions to more landed and roving missions (especially for the case of the Moon and Mars), it will become more important to compare images of geological features from landed spacecraft to their terrestrial counterparts, to better understand the complexities of their formation and evolution. Digitizing

the Greeley Slide Collection will enhance such studies.

References:

[1] Greeley, R., and Iversen, J.D. (1985) *Wind as a Geologic Process*, Cambridge Planetary Science Series, New York, 333 pp.; [2] Greeley, R. (2011). The "Holey Tour" planetary geology field trip, Arizona, *in* Garry, W.B., and Bleacher, J.E., eds., Analogs for Planetary Exploration: *Geological Society of America Special Paper 483*, p. 377–392; [3] Greeley, R. and Cave, S. (2011). Warford Ranch volcano, Arizona, field exercise, *in* Garry, W.B., and Bleacher, J.E., eds., Analogs for Planetary Exploration: *Geological Society of America Special Paper 483*, p. 393-400; [4] Williams, D.A., Fagents, S.A., Greeley, R., and McHone, J.F. (2011). Field exercises in the Pinacate volcanic field, Mexico: An analog for planetary volcanism, *in* Garry, W.B., and Bleacher, J.E., eds., Analogs for Planetary Exploration: *Geological Society of America Special Paper 483*, p. 449–464

Table 1. Overview of the Ronald Greeley 35mm Slide Collection.

Location or Topic	Number of Slides	Comments
Amboy Crater, CA	640	Aerial & field photos, volcanic & aeolian features
Other CA: Lava Beds, Kelso, etc.	1,280	Aerial & field photos, volcanic & aeolian features
AZ, CO, NM, WA, Bolivia	798	Aerial & field photos, volcanic & aeolian features
Hawaii (1970s-1983)	2,756	Aerial & field photos, volcanic features, active flows
Idaho	1,705	Aerial & field photos, volcanic & aeolian features
Earth (various)	1,158	NASA images of Earth from orbit; Field photos: impact craters, sedimentary structures, glaciers, tectonic features, dikes & sills
Laboratory Experiments	1,029	Wind tunnel – erosion & deposition; Impact simulations – various targets; Volcanic: Wax modeling of lava flow emplacement; Sulfur lava flow experiments
Space Science	552	General planetary geology images, all bodies. Focus on impact cratering, volcanism, gradation
Mercury	154	Geologic features w/scale bars, geologic maps; science results from Mariner 10
Venus	582	Geologic features w/scale bars, geologic maps; science results from Venera, Pioneer-Venus, and Magellan
The Moon	1,040	Geologic features w/scale bars, geologic maps; science results from Lunar Orbiter, Apollo, Galileo EM-1, 2
243 Ida	16	Geologic features w/scale bars, geologic; science results from Galileo flyby 1993
Mars	1,120	Geologic features w/scale bars, geologic maps, science results from Mariner 9, Viking, MGS, MEx, MER
Jupiter System	1,266	Geologic features w/scale bars, geologic maps of Galilean satellites; science results from Voyager 1 & 2, Galileo
Saturn System	289	Geologic features w/scale bars, geologic maps of Saturnian satellites; science results from Voyager 1 & 2
Uranian System	31	Geologic features w/scale bars, geologic maps of Uranian satellites; science results from Voyager 2
Neptunian System	19	Geologic features w/scale bars, geologic maps of Neptunian satellites; science results from Voyager 2
Total Products	**14,435**	

NOTE: At the request of the NASA History Office, in 2019 we have already digitized four small slide collections as proofs-of-concept, which can be viewed online at the Greeley Center website:

1) Pioneer 11 at Saturn, 1979: http://rpif.asu.edu/slides_pioneer11/
2) Future planetary mission concepts, May 1977 to 2003: http://rpif.asu.edu/slides_mission_concepts/
3) Venera 15-16 radar images of Venus, 1983: http://rpif.asu.edu/slides_venera15-16/
4) Marsokhod Field Tests in Hawaii, 1995: http://rpif.asu.edu/slides_marsokhod/