# Promoting Accessibility in Geoscience Education: What Practices from Planetary Science Can We Apply?

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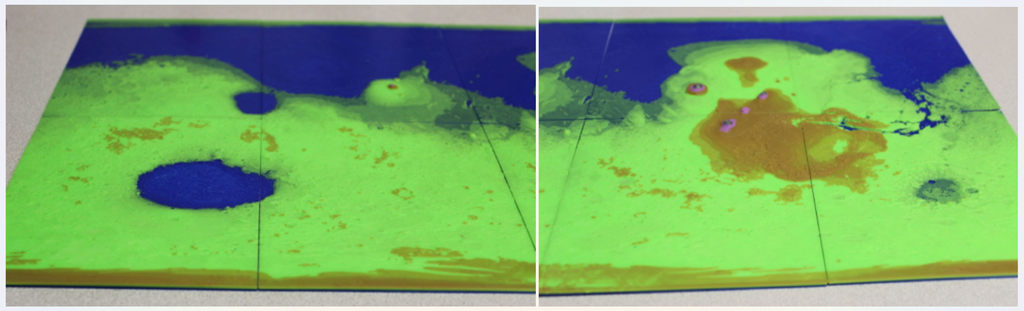
## Introduction

- Individuals identifying as having a disability are underrepresented in the physical sciences
  - 13% of the US population counted in the 2010 census, but only 9% of professional physical scientists (6% in physics/astronomy). [1]
  - This is an opportunity for educators to increase interest in the physical sciences by developing accessible instructional methodologies.
- Planetary science has adapted to explore inaccessible locations: the technologies that allow for studies of bodies outside the Earth should be adaptable to making science classrooms and labs inclusive.
  - ***Efforts to increase accessibility in geoscience education can benefit from the experience of planetary scientists.***

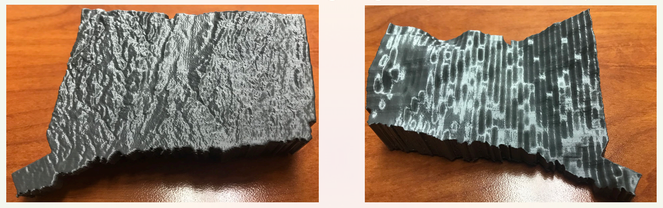
## Examples: 3-D Models

- Models provide both visual and tactile representations of data: typically shape or terrain models, but could be generated for any spatial dataset. Introductory students may find models easier to interpret than maps. (Some sample models and exercises are online at http://www.physics.ccsu.edu/piatek/3d.html
  - In addition to different colors, different textures can be used to represent important surface characteristics

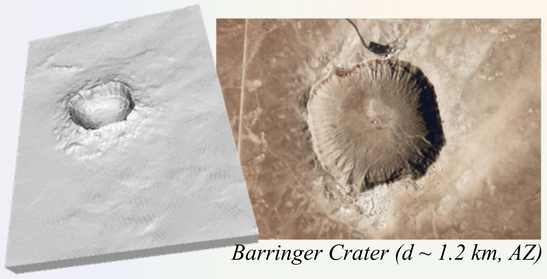
*The Martian Hemispheric Dichotomy:* models derived from HRSC-MOLA topography (below) provide a tactile representation of roughness and elevation in addition to visual changes in colors.



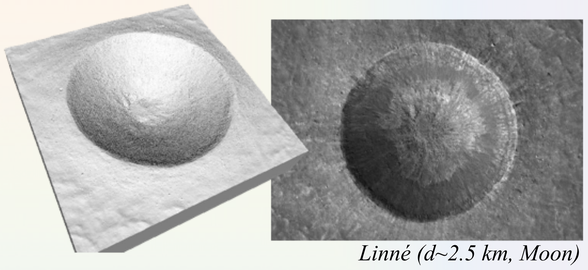
*Correlation of Gravity and Topography.* 3D models provide both visual and tactile ways to examine how gravity and topography are related. (Model based on LiDAR elevation and inverted Bouguer gravity from the USGS).



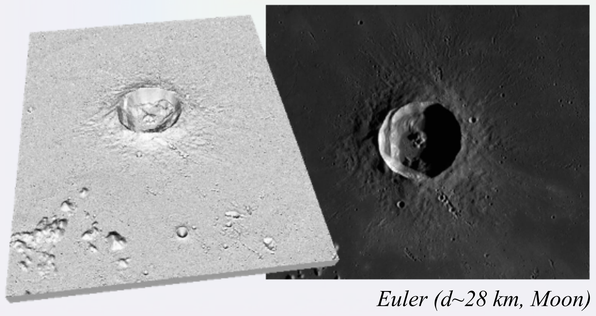
*Terrain Shape*: Although images convey morphology, the depth/diameter relationship in impact craters is also apparent in 3-D models, particularly for larger craters with lower depth/diameter ratios. Models also assist students in relating crater size to the differences between simple and complex craters. Many 3D models (including craters) are available from https://nasa3d.arc.nasa.gov.



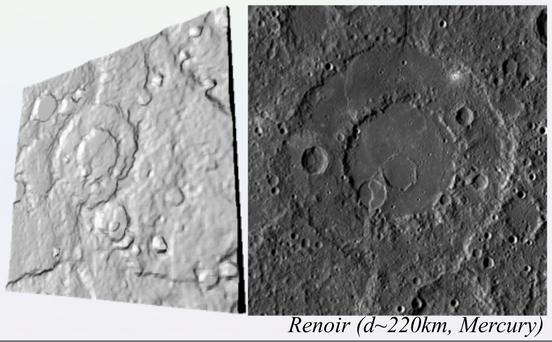
*Barringer Crater (d ~ 1.2 km, AZ)*



*Linné (d~2.5 km, Moon)*



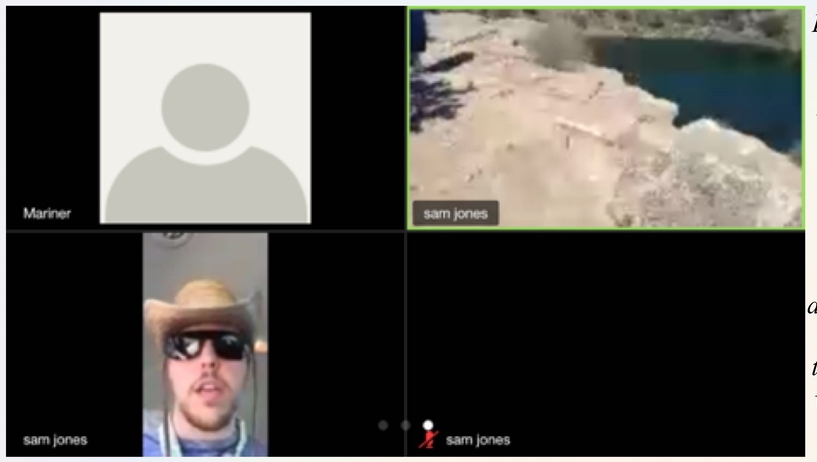
*Euler (d~28 km, Moon)*



*Renoir (d~220km, Mercury)*

## Examples: Accessible Field Experiences

- Remote sensing technologies can make inaccessible locations accessible:
  - Used at field locations, pairs/groups coordinate investigation data collection from different locations, allow all participants to make valuable contributions to data collection and benefit equally from the experience [e.g. 3].




*Example of remote video link between field partners: the student visible in the screenshot is in one location, while their partner with the video has hiked to another site of interest. (in this case, Montezuma Well National Monument, Arizona, commonly part of the "Holey Tour" of planetary analog sites[2]). This linked allowed all students in the project to explore to this limestone sinkhole, even though the path to the site required stairs and was not accessible to all participants.*

*Montage of photos from a 2017 field project at Renvyle Point (Ireland) that paired students with video equipment at a remote outcrop (top row) with less mobile students nearby (bottom row). The local area network is provided by the attenna visible in the lower middle photo.*

## Getting Involved!

- The expertise of planetary scientists in addressing problems of accessibility is an opportunity to help promote access to the physical sciences.
- Share and publicize resources you already have: *help us find yours!*
- Join a community of interested individuals at the IAGD: http://www.theiagd.org, follow @AccessibleGeo on Twitter, Facebook, and Instagram
  - *What is the IAGD?*
  - The International Association for for Geoscience Diversity (IAGD) was created in 2008 to improve accessible instruction in geoscience education and promote accessibility for geoscientists with disabilities.
  - The website hosts information and resources as well as a mailing list and online forum to connect the community.

www.theIAGD.org

International Association for Geoscience Diversity

**References:**

[1] NSF, 2017. Special Report 17-310. http://www.nsf.gov/statistics/2015/nsf15311/

[2] Greeley, R., 2011, GSA Special Paper 483, p. 377–391, doi:10.1130/2011.2483(23).

[3] Marshall, A.M. et al., 2018, AGU Fall Mtg., ED41C-1120.