Using Extraterrestrial Activities in the Physical Geology Classroom to Encourage Critical Thinking

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WHY LOOK BEYOND EARTH FOR LEARNING OPPORTUNITIES?

We use extraterrestrial content to familiarize students with basic geological concepts and processes. The Solar System’s diverse geological settings provide a wealth of opportunity for teaching introductory geology. Volcanism on Io, weathering on Venus, impact cratering on Mars, and Lunar fault scarps (and quakes!) all provide students with low-stakes locations for learning the scientific process of discovery. Since landscapes beyond Earth are less familiar to introductory geology students than those of their home world, they cannot be expected to know as much about them up front. This frees them from concern over having the right answer and instead encourages creative thinking...an essential component of scientific inquiry!

Recruitment benefits of extraterrestrial content: T. Gregg (#192-1), TUESDAY 8:30am.

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STUDENT ASSESSMENT: IMPACT LAB

When asked to assess two (out of nine) labs in a Physical Geology course at Northern Virginia Community College (NVCC), ~30% of the students (5 out of 16) chose to comment on the Impact Lab (modeled after material developed by NASA). This lab asked students to create and diagram several impact craters, calculate the effects of mass and speed on energy released during impact, and think about where in the Solar System they would find craters. There was general consensus that it “was helpful in understanding how craters impact planets and what happens to the ejecta” by being able to “compare visually the different craters we made” and see how “impacts change based on angle and speed.” One student specifically commented that it “would have helped even more to compare velocity and angle [of impact] by looking at actual craters on the Moon, Mars, etc.”

These comments 1) demonstrate an understanding how impact cratering is a geologic process that happens throughout the Solar System, and 2) highlight the usefulness of working with examples from diverse settings.

“Your class rekindled my childhood fascination with space.”
- Postbaccalaurate student preparing for geophysics graduate school

Online resources and acknowledgements

Many resources exist for teaching geology concepts using otherworldly settings. Dig around online, use materials presented here (we’re happy to share!), and/or develop your own.

- Impact Lab: adapted from NASA materials
- Venus volcanoes map: http://volcano.oregonstate.edu/oldroot/volcanoes/planet_volcano/venus/large_shield.html
- Mercury map: from USGS/Smithsonian/USNRL, and display the Venus and Mercury maps as PowerPoint slides.
- Radioactive decay assignment (in-class)
- IMPACT LAB
- Exam questions
- Student Assessment: Impact Lab
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