

# Geology 4460

## Planetary Geology

### Fall 2017

**Instructor:** Bob Howell

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Office Hours: Monday 1:10 – 3:00

Wednesday 10:00 – 10:50

Other times by appointment. You can also just stop by, and if I'm in and free I'll be happy to talk with you.

**Class web site:** <[http://geofaculty.uwyo.edu/rhowell/classes/planetary\\_geology/](http://geofaculty.uwyo.edu/rhowell/classes/planetary_geology/)>

**Text Book:** None required

There isn't any up-to-date planetary geology text available aimed at senior level students. We'll use some chapters from the references listed below, which are on reserve in the Geology Library, and we will rely heavily on papers from the scientific literature and from other references.

#### **General Planetary References on reserve in the geology library**

The Solar System (2<sup>nd</sup> edition) J. A. Wood 2000 Prentice-Hall

A very general overview of solar system formation and other background material.

Exploring the Planets (2<sup>nd</sup> edition) E. H. Christiansen and W. K. Hamblin 1995 Prentice-Hall

More detail on geologic processes on specific planets, and on solar system formation.

I will also be placing additional books and papers on reserve for specific topics.

#### **Course Format and Grading**

Two meetings per week will use standard lecture format. The third meeting (usually Friday) will at least in part be student led reports and discussions of more advanced material assigned from the research literature or other references. There should be the opportunity for each student to be involved in two or three presentations during the semester.

You will receive a grade for the last of these presentations. You will also be required to prepare an approximately 10 page report on that final paper, discussing not only it but other papers from the literature which are closely related to it. That report will be due at the end of the nominal final exam time on Dec. 12. To ensure that everyone reads the papers the class will be divided into approximately three groups and a day or two before the presentation each group will be assigned a short question to answer in class based on the content of the paper. The quality of those responses will also contribute to the final "presentation" grade.

Homework will be assigned each week, usually due the following week. I encourage students to work together to decide how to complete the homework, but in the end I want each student to separately work the problems or write the text which they turn in.

There will be a "midterm exam" at the end of the "core" section of the course, before we start the special topics section. This will actually be at the very end of October, or during the first week of November.

There will not be a final exam but your report (on the last paper you present, or on another topic approved in advance by me) will be due at the end of the nominal exam time – Wednesday, December 13 at 12:15 pm. If that final paper presentation was a team project, the team may submit a single final report.

**Students taking the 1-credit version of the course:** I've offered an option for students who have taken Planetary Geology before to take a 1-credit version covering only the last third of the semester, which will have different rotating topics than during their earlier course. They will be graded on their contributions to the discussion of

those final topics, and will be expected to make a presentation on one final paper and also submit a "last paper" written report like that described above.

**Grades will be computed as follows:**

Homework	35%
“Midterm” exam at end of “core” material	35%
Last paper presentation (plus earlier presentation “answers”):	10%
Last paper written report	20%

For this semester I will use the standard A,B,C,D,F grades WITHOUT the optional plus/minus grading.

**Material to be covered:**

Origin of the Solar System

- Origin of the elements
- Condensation and accretion in the solar nebula
- Evidence of early history from meteorites, asteroids, and comets
- Effects of large early collisions (earth-moon system)

Impact Cratering Processes

- Lunar crater morphology & lunar stratigraphy
- Dating of surfaces using cratering records

Comparative Planetology

- Thermal history vs. planetary size
- Origin & retention of atmospheres and volatiles
- Relative cratering rates and crater retention

Specific Examples: (We’ll cover in detail ~3 topics from the following partial list)

Moon and Asteroids:	Remote sensing of composition
Mars:	Surface (including glacial) processes
Vesta and Ceres:	Recent results for the Dawn spacecraft
Pluto:	Results from the July 2015 New Horizons flyby
Titan:	Volatiles and surface processes
Enceladus:	South polar plumes, possible subsurface ocean
Io:	Tidal heating; sulfur and ultramafic volcanism

**Statements required by the College**

**Academic Honesty:** I encouraged you to study together and also to discuss among yourselves how to complete homework assignments and to review for the exams. However, the final answers for homework you turn in must be your own calculations and your own writing. The answers on the exams must be your work alone. The in-class presentations will be group projects, with each member of a group receiving the same grade for their final presentation.

Academic dishonesty is defined in University Regulation 802, Revision 2, as “an act attempted or performed which misrepresents one’s involvement in an academic task in any way, or permits another student to misrepresent the latter’s involvement in an academic task by assisting the misrepresentation.” The University has procedures to judge possible violations, and can impose serious penalties.

**A&S - Students and Teachers Working Together:** A 5-page document with guidelines for instructors and students is available at:

<[http://www.uwyo.edu/as/\\_files/current/Students%20and%20Teachers%20Working%20Together.pdf](http://www.uwyo.edu/as/_files/current/Students%20and%20Teachers%20Working%20Together.pdf)> .

**Disabilities:** If you have a physical, learning, or psychological disability and require accommodations, please let the instructor know immediately. You will need to register with, and provide documentation of your disability to, University Disability Support Services (UDSS) in SEO, room 109 Knight Hall, 766-3073.