

PTY5 595B
Evolution of the Terrestrial Planets
Fall 2018
Kuiper Building, room 312
Tuesday/Thursday, 12:30-1:45

Description of Course

This course will explore the evolution of the terrestrial planets (including the Moon), with an emphasis on internal evolution and geodynamics. We will focus on each individual body, and the processes and properties that governed its evolution from accretion to present-day. In so doing, we will build on the theory taught in other classes, but with a greater emphasis on application to the planets. Lectures will be supplemented by readings and discussions.

Instructor and Contact Information

Dr. Jeff Andrews-Hanna
Kuiper 438
520-626-3338
jcahanna@lpl.arizona.edu (preferred mode of contact)

Office hours: Thursday, 2:00-3:00 PM, Kuiper 438
I am also available to meet at other times – please e-mail to set up a meeting

Web information: This course will use a D2L page:
<https://d2l.arizona.edu/d2l/home/720155>

Course Format and Teaching Methods

Lectures will be supplemented by in-class discussions.

Course Objectives and Expected Learning Outcomes

The objective of this course is to cover the fundamental processes and events in the evolution of the terrestrial planets, as well as major unresolved questions.

Absence and Class Participation Policy

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable: <http://policy.arizona.edu/human-resources/religious-accommodation-policy>.

Absences preapproved by the UA Dean of Students (or dean's designee) will be honored. See <http://policy.arizona.edu/employmenthuman-resources/attendance>.

Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures and discussion section meetings. Students who miss class due to illness or emergency are required to bring documentation from their

health-care provider or other relevant, professional third parties. Failure to submit third-party documentation will result in unexcused absences.

Course Communications

Information pertinent to this course will be conveyed by announcements in class, through messages to your official University of Arizona e-mail address, and by D2L.

Required Texts or Readings

Required readings from the literature will be posted to the course D2L site in advance of discussions.

Recommended Texts or Readings

Geodynamics (Turcotte and Schubert) is an indispensable reference that should be on the shelf of every planetary scientist.

Additional readings related to the lecture material will be posted to the course D2L site.

Required or Special Materials

None.

Required Extracurricular Activities (if any)

None.

Assignments and Examinations: Schedule/Due Dates

Papers: Students will be required to complete two writing assignments. Students will write a mid-term paper as a review of a topic of interest relevant to the bodies discussed in the first half of the semester. A final paper can be on any topic related to the course content, and is expected to include an element of original work. Due dates for papers will be announced in class.

In-class discussions: Students will be assigned papers to read in advance of in-class discussions on topics related to the lecture material. Discussions will occur approximately on a bi-weekly basis. Students will take turns presenting short summaries of the papers for the discussions.

Grading Scale and Policies

Letter grades will nominally be assigned based on the following distribution:

- A: 90% and higher
- B: 80-89%
- C: 70-79%
- D: 60-69%
- F: <60%

The different components of the course will be weighted as follows:

- Writing assignments: 75% (25% midterm, 50% final)
- Discussions: 25%

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading->

[system#incomplete](#) and http://catalog.arizona.edu/policy/grades-and-grading_system#Withdrawal respectively.

Accessibility and Accommodations

At the University of Arizona we strive to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, you are welcome to let me know so that we can discuss options. You are also encouraged to contact Disability Resources (520-621-3268) to explore reasonable accommodation.

Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See

<http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

Policy on plagiarism

The University of Oxford defined plagiarism as “presenting someone else’s work or ideas as your own, with or without their consent, by incorporating it into your work without full acknowledgement” (<https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism>).

Plagiarism of any form or amount will not be tolerated in this class. Willful acts of plagiarism will be met with the strictest penalties, up to and including immediate failure of the class. Even unintentional plagiarism will be penalized. You are responsible for understanding what constitutes plagiarism and avoiding it in your writing. The writing assignments may require the use of information from a variety of sources. In such cases, the information must be written in your own words and the sources of information must be properly cited. All work turned in for the writing assignments must be original work by the student done for this class (work done previously for other classes or purposes may not be used for this class).

The University Libraries have some excellent tips for avoiding plagiarism, available at <http://new.library.arizona.edu/research/citing/plagiarism>.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>.
Student Assistance and Advocacy information is available at <http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

Confidentiality of Student Records

<http://www.registrar.arizona.edu/personal-information/student-information>

Subject to Change Statement

Work and course requirements are subject to change at the discretion of the instructor with proper notice to the students.

“Subject to Change Statement” Subject to Change

The above Subject to Change Statement is also subject to change at the discretion of the instructor with proper notice to the students.

Course schedule: TBD

Noteworthy dates:

- 10/2: No class (Bombardment workshop)
- 11/20,22: No class (Thanksgiving)
- 11/27-12/4: Final student presentations

Course topics (provisional)

Origin of the planets

- Basic models of solar system origin
- Pebble accretion
- Grand tack
- Late Heavy Bombardment

Earth

- Plate tectonics
- Mantle convection
- Mantle plumes
- Dynamo

Moon

- Impact origin and accretion
- Differentiation, magma ocean, KREEP
- Orbital evolution
- Thermal evolution
- Crustal structure
- Volcanism and tectonism
- Impact basins and mascons
- Magnetic anomalies and

Mercury

- Structure and origin
- Bombardment history

- Volcanic evolution
- Tectonic and thermal evolution
- Magnetic field

Venus

- Volcanic rises, crustal plateaus, planitia
- Volcanic features
- Coronae
- Tectonic features: rifts, ridge and fracture belts
- Gravity and compensation of topography
- Mantle convection and thermal evolution
- Geodynamic evolution: Stagnant lid convection, episodic or periodic behavior, plate tectonics

Mars

- Origin and differentiation
- Dichotomy and history of bombardment
- Tharsis
- Extensional tectonics: Valles Marineris and rift zones
- Compressional tectonics
- Thermal and geodynamic evolution
- History of the magnetic field