

ERTH 2419 – On the Origin of Planets – Winter 2021

Course description: Origin and evolution of all planetary objects in the solar system. Topics include the geology of comets, asteroids, the terrestrial planets and rocky moons, Earth's formation and early evolution, ocean worlds, the search for exoplanets and detection of extraterrestrial life.

Prerequisites: none.

Lectures: Online, three hours a week (Monday from 8:35 to 11:25)

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TA:

Course objectives

By the end of this course, you will gain insight into our current understanding on the formation and evolution of planetary environments over geological time. After a gap in space exploration since the Apollo missions in the 70', a second Space Age has launched in 2018. International collaborations (e.g. JAXA, NASA, ESA, CSA) as well as corporations (e.g. SpaceX) are joining forces in order to expand our understanding and human presence deeper in the solar system. This new Space Age is quickly changing our vision of the solar system and scientific data is exponentially increasing.

Course Learning Outcomes

Using lessons learned from space exploration, sample return missions and the study of meteorites, you will be able to :

- 1) Identify the major and minor bodies that constitute the Solar System,
- 2) Describe how atmospheres form and how they behave through time,
- 3) Account for how oceans develop and where they occur in the Solar System,
- 4) Understand the variety of minor bodies in the Solar System, how those bodies formed, and where they are located,
- 5) Explain what conditions are required for planetary habitability, and whether those conditions may be, or once were, present on any Solar System bodies other than Earth,
- 6) State the principal methods by which exoplanetary bodies are discovered, and how our solar system compares with others so discovered,
- 7) Document the major milestones in Solar System exploration, and how these discoveries have impacted our understanding of Earth system science.

Evaluation

- 20%: Online quizzes. These will be covering the material seen in class.
- 30%: Missions presentations:
 - 15%: presentations to the class on current and future planetary missions
 - 15%: short (2-3 pages) report on missions
- 25%: Mid-term exam. Test examining the course content covered during the first half of the course.
- 25%: Final exam. Test at the end of the semester in which the material covered in the second half of the course will be examined.

Course topics (tentative order, might change during the semester)

Day	Lecture	Missions presentations
Jan. 11 th	Introduction; course overview; exams and grading scheme	None
Jan.18 th	How it all started – Big Bang theory and star formation	None
Jan. 25 th	Planetary formation and giant impacts	Soho, Solar Orbiter, Parker Solar Probe, Genesis
Feb. 1 st	The Earth-Moon system	Lunar Scout, Artemis program, Apollo 11, dearMoon project
Feb. 8 th	Meteorites	Hayabusa2, OSIRIS-REx, Psyche, Dawn
Feb. 15 th	Winter break	None
Feb. 22 st	Mid-term	None
March 1 st	The Solar System: inner planets Mercury and Venus	Bepicolombo, Messenger, Pioneer Venus 2, EnVision
March 8 th	The Solar System: inner planets Mars	Perseverance, Pathfinder, Curiosity, Viking, Insight, SpaceX Mars
March 15 th	Planetary atmospheres, icy and ocean worlds	Europa Lander, Caesar, Enceladus Life Finder, Stardust
March 22 th	The Solar System: Moons	Cassini, Dragonfly, Juice, MMX
March 29 th	Exoplanets	Cheops, Kepler, Hubble Space Telescope
April 5 th	Planet habitability conditions and the search for extraterrestrial life	
April 12 th		

Course requirements

- You are expected to attend all lectures
- Recording (audio or video) of lectures is forbidden unless requested by the Paul Menton Centre
- A written medical note must be submitted if you cannot meet a deadline. Please, note that in this course, on all occasions that call for a medical certificate you must use or furnish the information requested in the form found at :

http://carleton.ca/registrar/wpcontent/uploads/med_cert.pdf. Note also the contents of the 'deferral page' link.

cuLearn: Course lecture slides, assignments and quizzes will be posted on cuLearn. All information concerning the course will also be posted on the site. Note that posting of pdf copies of journal articles on cuLearn is a violation of copyright regulations. However, all students have access to journal articles via the library electronic subscriptions and each student is allowed one copy for personal use.

Academic Integrity

It is your responsibility to review Carleton's policy on Academic Integrity - Section 14 of the Calendar.

<http://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/aacadregsuniv14/>

Plagiarism

The instructor is required to report all incidents (or suspected incidents) of plagiarism to the Dean. All work handed in must be your own. Plagiarism and cheating are viewed as being particularly serious and the sanctions imposed are accordingly severe. Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy. The Policy is strictly enforced and is binding on all students. Plagiarism and cheating – presenting another's ideas, arguments, words or images as your own, using unauthorized material, misrepresentation, fabricating or misrepresenting research data, unauthorized cooperation or collaboration or completing work for another student – weaken the quality of the graduate degree. Academic dishonesty in any form will not be tolerated. Students who infringe the Policy may be subject to one of several penalties including: expulsion; suspension from all studies at Carleton; suspension from full-time studies; a refusal of permission to continue or to register in a specific degree program; academic probation; or a grade of Failure in the course.

Requests for Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Religious obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Academic Accommodations for Students with Disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the *Paul Menton Centre for Students with Disabilities* (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. carleton.ca/pmc.

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and its survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. <https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

For more information on academic accommodation, please contact the departmental administrator or visit: students.carleton.ca/course-outline