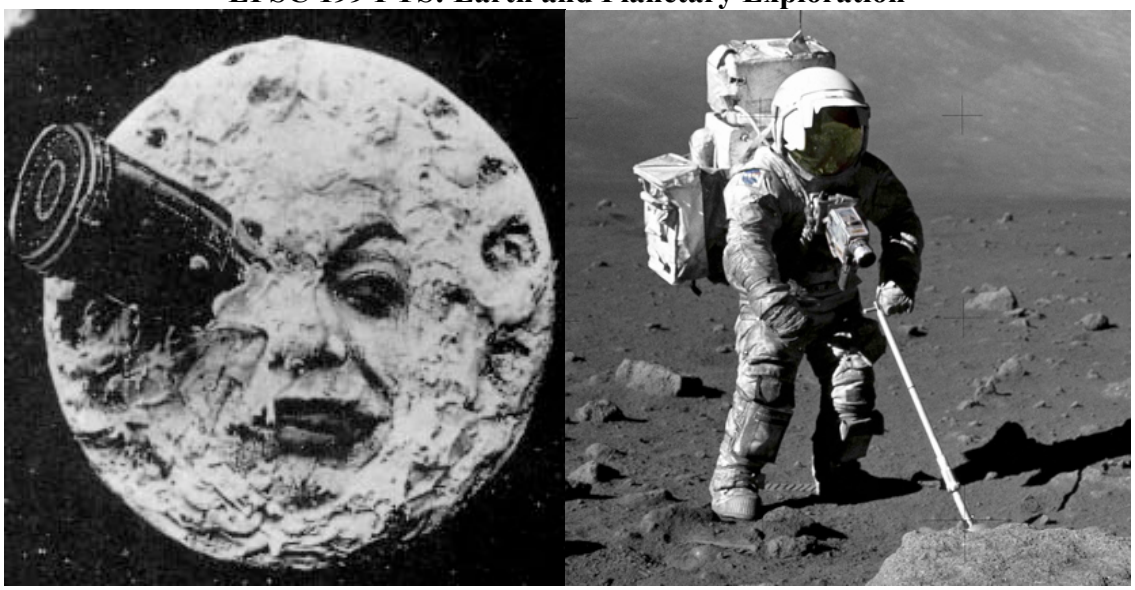
EPSC 199 FYS: Earth and Planetary Exploration



Fall 2013: evolution of hypotheses on lunar origins

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Method of Evaluation:

40% of the evaluation will be based on participation in the seminar course
Each student will be responsible for leading two to three class discussions

30% will be based on the take home problem sets (4 total)

30% of the evaluation will be based on the final presentation/paper
On an in-depth topic of your choice, related to the Earth's Moon

Class Information:

We will use e-mail and the web to deliver information:
myCourses
Departmental web page course site

Main Reading (in the Bookstore):

The Big Splat, or How Our Moon Came to Be by Dana Mackenzie (2003) Wiley

Course Outline

Students will examine the evidence for and against competing theories of the Moon's origin and the early evolution of the Solar System, using:

-physical and dynamical constraints of the Earth-Moon system.
-composition and isotopic evidence from terrestrial, lunar, and meteorite samples.
-observational evidence from other solar-system bodies.
-models of early solar system dynamics and the accretion.

Students will examine the evidence presented by reading some of the original sources, supplemented by general review articles, opposing view publications, and short lecture presentations. Each reading will have a set of questions that the students will be expected to be able to answer during discussion in class. There will also be take-home exercises that will involve the analysis of actual data sets or investigating physical constraints and models. The course will be run as a seminar-style course.

Students working alone or in small groups will choose a particular topic to study in depth, the results of which will be presented in class to their peers during the final portion of the class. This presentation and the accompanying write-up will serve as a final project.

Students will not be asked to master 19th century calculus using only a pencil and paper! Spreadsheet calculations and symbolic mathematics programs (e.g. MATLAB) will be used so that the students can solve interesting and relevant exercises and focus on the science (processes and evidence), rather than on the mechanics of mathematical manipulation.

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

Academic Integrity
McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/<http://www.mcgill.ca/students/srr/honest/>) for more information).

EPSC 199 schedule:
3Sep: First day introduction

Discussions:
5Sep: Mineral and Rock intro (Bill)

Read the two online Plate Tectonics primers:
http://www.learninggeoscience.net/free/00040/index.htm
http://pubs.usgs.gov/gip/dynamic/dynamic.html#anchor3819844

Where would you expect to find the oldest rocks on Earth? How about the youngest?
Where does the energy come from to change the surface of our planet?
How can we learn about the processes active at the time of the Earth's formation?

Tentative EPSC 199 schedule:

10Sep: Plate Tectonics (Bill)

12Sep: Big Splat Ch.s 1&2: Early Observations of the Moon (Marcus)

17Sep: Big Splat Ch. 3: Gallileo and Kepler ()

19Sep: Big Splat Ch. 4: The clockwork solar system ()

24Sep: Big Splat Ch. 5: The Fission hypothesis ()

26Sep: Big Splat Ch. 6: The Capture hypothesis ()

1Oct: Big Splat Ch. 7: The Co-accretion hypothesis ()

3Oct: Big Splat Ch. 8: Renaissance and Controversy ()

8Oct: Big Splat Ch. 9: Apollo science ()

10Oct: Big Splat Ch. 10: The giant impact ()

15Oct: Big Splat Ch. 11: The Kona Consensus ()

17Oct: Big Splat Ch. 12: constraints on the impactor (Theia) ()

22Oct: Big Splat Appendix: Did we really go to the Moon? ()

24Oct: The impact time scale ()
29Oct: South Pole-Aitken basin ():
31Oct: Oxygen Isotopes (Bill):
5Nov: The late heavy bombardment ()
7Nov: Late Heavy Bombardment constraints ()
12Nov: water and helium ()
14Nov: Water on Earth ()
19Nov: Impacts -a Good thing? ()
21Nov: the Apollo legacy (Bill)
26Nov: Project presentations
28Nov: Project presentations
29Nov: Project presentations
3 Dec: (final class)

To be Scheduled: field trip