The Journey To Understand Our Solar System

Mortal as I am, I know that I am born for a day. But when I follow at my pleasure the serried multitude of stars in their circular course, my feet no longer touch the Earth.

--Ptolemy, c. 150 AD

Fall 2012
101 Uris Hall
MWF 11:10-12:05

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Office Hours:	Tu/Th 2-4 pm or by appointment

Grading:	SU/Letter, 3 credits
Required Text:	The Cosmic Perspective (6th edition)

I. Introduction:

Ever wonder what the view from Mars would look like? Whether there is life beyond our planet? And what's so special about the Earth anyway? If so, this is the course for you.

This course chronicles mankind's journey to understand its place in the Solar System and beyond. We will encounter planets devastated by cataclysmic collisions, infernos of global volcanism, and canyons the length of the United States (to name a few). And through it all, we will walk in the shoes of the scientific giants who have (and continue to) put together these puzzle pieces into cogent physical and geological principles underlying planetary evolution.

I teach this course because it is set on the grandest possible stage. On it we are faced with scales so colossal and forces of nature so indomitable that they positively demand our interest. But while this wonder is an end in itself, the crux of this course lies in the process through which we gain and modify this knowledge—the scientific method. In this course you will learn to think like a scientist: questioning assumptions, and creating testable predictions.

II. Rationale:

This course is designed to meet natural science distribution requirements for students that don't (yet!) foresee themselves majoring in astronomy. There are therefore no prerequisites for this class.

III. Course Aims and Objectives:

Primary Aims

These are objectives that will carry over into other facets of your personal and professional life, whatever career you choose. As such, they are more important than any specific content in this course. The assignments and grade distribution are meant to address this prioritization. In this course:

- You will apply critical thinking skills to solving real problems. This involves questioning and analyzing assumptions, considering a model's consequences, and brainstorming ways in which to falsify your hypothesis. This is the scientific method. It is not the boring, sequential list you have probably had to memorize before, but a process to engage in. These skills will transfer to any career path you choose.
- You will take a step back and assess the reliability of the scientific method. We don't have the time or the resources to figure out everything for ourselves. If science is changing all the time, to what extent can we trust scientists' conclusions? This is an important evaluation for you to make for many facets of your life (e.g. health and environmental choices).

Secondary Aims

These goals address the justifications for distribution requirements in a liberal arts education. They are predicated not on tangible outcomes directly observable in the way we lead our lives and work, but on the idea that an education that broadens our horizons enriches us. Reading Shakespeare will not help you professionally, but it brings into focus elements of what it is to be human. Similarly, in this course:

- You will gain a perspective of humanity's place in the cosmos, and develop a grander view of the processes that shape and allow our existence. I want you to leave this course with a wonder and curiosity that drives you to read more on the subject for pleasure. Of course it's difficult for me to grade you on this (and if I could it would defeat the purpose). So I will turn this goal on myself: if you are ever bored in class, please take note of the topic and let me know when I ask for feedback!
- You will apply and synthesize core principles in planetary science to their varied expressions across Solar System bodies and exoplanets. While the content of this course is not its primary justification, it is the vehicle for understanding the scientific process. As a bonus, the 'vehicles' in this course crash through space at 70,000 mph, collide cataclysmically, and apocalyptically erupt.

Specific Learning Objectives:

By the end of this course, you will:

- Assess the reliability of scientific conclusions and create criteria for distinguishing between conclusions of varying worth.
- Predict the motion of the stars and Sun in the sky and orient yourself using them (trip to observatory and daily observations).
- Predict lunar phases and rising/setting times.
- Predict the variation of the Sun's position with season.
- Be able to roughly and quickly estimate quantities.
- Apply ratios to solving astronomical and real-world problems.

- Compare and contrast the surface expressions of weathering, volcanism, impacts and tectonism across different planets.
- Separate facts from speculations regarding global warming and identify its consequences.

IV. Expectations:

Of you:

- Be engaged in your own education. This means arriving to class on time, being an active participant, and doing the readings prior to coming.
- Set time aside for this class. A 3-credit course expects you to spend 6-9 hours per week *outside* of class time on the course.
- Be respectful of others, both with your words and actions. This extends to the use of electronics (see full policy below).

Of me:

- Communicate openly. I will strive to motivate the logistical, teaching, and content choices I make for this course. Expectations for the course and specific assignments will be clearly articulated.
- Be prepared and on time for classes
- Respond to feedback. Education is not a one-way street. I will ask for your feedback at several points in the course, respond to it in class and adapt the course as necessary.

V. Grades:

The summary of the grade breakdown is as follows:

- Homework 20%
- Online Journal 10%
- Term Paper 30%
- Midterm 20%
- Final 20%

Homework (20%)

It is important to work through the homeworks and understand the reasoning. They should take about an hour each. Exams will be modeled after the types of reasoning and skills developed in the homeworks.

Homeworks will be handed out weekly and are due **Monday by 5:00 pm in my mailbox**. Late homeworks will be assessed a 10% late penalty per day. The lowest two homework grades will be dropped. This is to accommodate the unavoidable life situations that come up over the course of the semester for all of us. Don't blow them early! If you decide to just skip the first two homework sets and a real situation arises later in the semester (e.g. medical), you won't get extra drops!

Online Journal (10%)

After each class, there will be a reflection question posted on the blackboard site. You are to write a roughly 200 word response to each prompt (feel free to write more if you want!). These

are meant to motivate your own personal thinking, and can have a large effect on what you get out of this class. Some of the reflections will help you start thinking about the paper you will write for the course. You should consider that this paper, together with the journal, make up almost half your grade!

Journal entries are to be submitted through the blackboard discussion board by 11:59 pm EST on the night before the following class. As long as it is clear that you put some thought into the question you will be assessed full credit. The lowest two grades will be dropped.

Term Paper (30%)
Grade Breakdown:

• 1st draft:	12.5%	Due: 10/7/12
• Comments on Partner's draft:	5%	Due: 10/14/12
• Final draft:	7.5%	Due: 11/19/12
• Comments on Partner's final draft:	5%	Due: 11/26/12
• **Total:**	**30%**	

The term paper is divided into several waypoints to provide you the most feedback possible and enable you to create the best end-product achievable. A large key to success in this class is *putting in as much effort as possible early on*. This allows for commensurately better feedback and guidance, allowing you to sail smoothly through the remaining facets of the paper. It also takes work away from the end of the semester for you when you will be at your busiest. This prioritization is reflected in the way the grading is broken down. Specific guidelines and the grading rubric can be found on blackboard.

Midterm and Final (20% each)
These two tests will be scantron exams. They will not focus on recall (though some jargon presented in class will be necessary to understand the questions), but rather on critical thinking and the application of the principles you have learned about to new examples or hypothetical scenarios. They will be modeled after the homework questions. Mastery of the homeworks (the reasoning, not just the content) will be vital to success on the exams. Sample exam questions will be provided prior to each exam.

Clickers
In each class I will ask several clicker questions. These will provide you feedback on how well you understand the concepts at hand, and will provide me feedback with the pacing and difficulty of the material. They are meant to provide a low-pressure platform on which you can assess your own learning. As such, these questions will not be graded.

VI. Policies

Electronics
Cell Phones, Laptops and other electronics are not allowed in this course. If you were the only person in this class, I would be happy to let you make your own educational decision on this matter; unfortunately, your choices can potentially be very distracting for those around you. My experience, as surely you can corroborate, is that while some people in class do take productive

notes on their laptop, almost every laptop will also have Facebook or some other sort of social media open. Of course if you are a student with disabilities, I am more than happy to accommodate your needs (see below)

Accommodations for students with disabilities
In compliance with the Cornell University policy and equal access laws, I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances, so arrangements can be made. I encourage you to register with Student Disability Services to verify your eligibility for appropriate accommodations.

Academic Integrity

I take academic integrity issues very seriously, and any infractions will be dealt with swiftly. Not only does this constitute grounds for failing the course, it creates a permanent entry in your academic records that some institutions specifically request (e.g. law schools).

Don't take this to mean I don't want you to work with other students. You are encouraged to study together and to discuss information and concepts covered in lecture and section. You can give "consulting" help to or receive "consulting" help from such students.

However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, either electronically, or as a hard copy. Keep in mind that **the person providing the work is just as guilty as the person copying it.**

During examinations, you must do your own work. Any collaborative behavior during the examinations will result in immediate failure of the exam and further university action.

Plagiarism will similarly not be tolerated in any form. You are responsible for properly citing any information that you did not come up with yourself. Guidelines for citing work are provided in the paper guidelines on blackboard.

VII. Tentative Course Schedule

Week 1: Introduction; Traveling to the World of the Ancients (Eratosthenes, celestial sphere)
Week 2: Celestial Sphere continued
Week 3: Kepler, Brahe, Galileo and Newton
Week 4: Weathering, tectonism and plate tectonics
Week 5: Volcanism, Krakatoa, Ries
Week 6: Comets & Asteroids
Week 7: Impact Craters, Chicxulub, Ries
Week 8: Giant Impacts
Week 9: Giant Planets
Week 10: Atmospheres and Global Warming
Week 11: Planet Formation

Week 12: Exoplanets
Week 13: The formation of life
Week 14: Life on other planets