**EARTH 110A - Evolution of the Earth**

**Logistics, Syllabus & Readings - Fall 2018**

**Course Description:** This course covers the processes and trends that have shaped the planet Earth from the time of its origin to today. Solar energy and plate tectonics are the primary abiotic factors that have influenced conditions at the Earth's surface, and the atmosphere, hydrosphere, and biosphere of Earth have responded to these factors in different ways through geologic. Topics to be covered include: formation of the Earth; geologic time; tectonic processes; the origin of life; evolution of, and interaction among, the crust, atmosphere, hydrosphere, and biosphere.

**Lecture:** Tu-Th 11:40-1:15 PM, **Nat Sci Annex 101**

**Lab:** Tu 5:00-8:00 PM, W 9:00-12:00 PM, Th 4:00 -7:00 PM, **E&MSD236**,

**Recommended Texts:** *Lunine, Evolution of a Habitable World (2013); Also: Kump, Kasting, Crane, The Earth System (3rd Ed.).* Other readings will be posted on the course website.

**Instructors:**


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**TAs**:

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**TAA**: TBA

| Lec# Day | Date W/Z* | Topic | Reading |
|---|---|---|---|
| 1-Th | 9/27 W | Introduction: The Earth as an evolving geologic body | Lun. Ch. 1, Lun. Ch. 2 |
| 2-Tu | 10/2 W | Formation of Earth/Moon system; Venus, Earth & Mars;<br>Primordial oceans and atmospheres | Lun. Ch. 4, Lun. Ch. 10, Lun Ch.11, Wicander & Monroe Ch. 8:157-159, Catling & Zahnle 09, |
| 3-Th | 10/4 W | Absolute dating: Radioactive decay dating techniques. Radiogenic isotope tracers | Stanley 6:129-139,143-151, Faure 8:99-114, Also: Lunine Ch. 7, 8 |
| | | **Lab 1: Bolide Impacts** | |
| 4-Tu | 10/9 W | Early crustal evolution and Archean tectonics | |
| 5-Th | 10/11 Z | Primordial Ocean: The origin of life | Sephton 04 |
| | | **Lab 2: Radioactivity and Absolute Dating** | |
| 6-Tu | 10/16 Z | Greenhouse, Radiative Balance & Faint Young Sun Paradox | Kump et al. 3, Lunine 14:165-171 |
| 7-Th | 10/18Z | The Archean and Proterozoic expansion of life | Lunine 17:165-171, |
| | | **Lab 3: Solar Radiation Balance** | |
| 8-Tu | 10/23 Z | Biogeochemical cycles: coupling between C and O; Tracking carbon flow with isotopes | Stanley 10:221-238, Kump, Ch.7; |
| 9-Th | 10/25 W | Maintenance of planetary topography | Turcotte & Schubert 2:73-74 |
| | | **Lab 4: Biogeochemical Box Modeling*** | |
| 10-Tu | 10/30 | **MID-TERM EXAM** | |
| 11-Th | 11/1 W | Plate tectonics in space & time: ridges, subduction zones and transforms | Kump et al. 6:106-125 |
| | | **Lab 5: Isostasy** | |
| 12-Tu | 11/6 Z | Relative measures of geologic time,<br>Paleoclimate Indicators and other Proxies | Lun. Ch.6, Kump et al. 12; Oxygen Isotopes Primer |
| 13-Th | 11/8 W | Plate tectonics continued: subduction zones and ridges | |
| | | **Lab 6: Plate Tectonics** | |
| 14-Tu | 11/13 W | Tectonic cycles and non-tectonic heat loss | Lunine 16: 206-210 |

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| 15-Th | 11/15 Z | Snowball Earth | Hoffman & Schrag 2000 |
| | | **Lab 7: Fossils and Extinction** | |
| 16-Tu | 11/20 Z | The Cambrian explosion & Phanerozoic diversity patterns | Stanley: part of chapters 12 and 13<br>Video<br>Attenborough (Links to an external site.)Links to an external site. |
| | 11/22 | Holiday! | |
| 17-Tu | 11/27 W | Changes in sea level: from tectonics to temperature | Lunine Chap 18 |
| | | **Lab 8: Snowball Earth 1** | |
| 18-Th | 11/30 Z | Mass extinctions: patterns and process | |
| 19-Tu | 12/4 Z | Atmospheric & oceanic circulation | Kump et al. 4 Kump et al., 5 |
| 20-Th | 12/6 Z | Hot Worlds: Greenhouse and gateways Cold Worlds: Mountains, weathering and orbital wobbles | Kump Ch 14<br>Natl. Geo. Hothouse Earth<br>Washington Post (Mar 2018) |
| | | **Lab 9: Snowball Earth and Climate Indicators** | |
| W | **12/11** | **FINAL EXAM 8-11 AM in Nat Sci 101** | |

*W/Z tells you who's lecturing...

**Recommended Text:**

- ***Evolution of a Habitable World,* Jonathan Lunine (Cambridge University Press, 1999, 2013),**
- ***The Earth System, L.* Kump, J. Kasting, R. Crane (Prentice Hall, 2nd, 3rd edition)**

Readings will be posted on the course website for download.

Course website: **Canvas; Readings are now being posted in a Readings Folder under "Files" on the Canvas website. Some PDF files are password protected (password:** *archean*)

Collaboration: You may work together on homework assignments. However, each student is responsible for turning in her/his own assignment, and ensuring that it is their own work. Verbatim or close-to-verbatim copying of homework assignments is not permitted.

You must show your work to receive credit on calculation problems; and, explanations for answers must be given in your own words.