

# IDS 2935 - Is the Planet Dying? -History of the birth and life crises of our dynamic planet

## Quest 2

### I. General Information

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#### **Class Meetings**

- Spring 2024
- Mon period 4; Wed period 3 & 4
- Location: FLG 0260 (Florida Gym, <https://www.at.ufl.edu/service-teams/classrooms/pictures-and-information/items/florida-gym-0260.html>)

#### **Instructor**

- Alessandro Forte, [forte@ufl.edu](mailto:forte@ufl.edu)
- Williamson Hall, Rm 222
- Office Hours: by appointment (contact instructor to schedule meeting)

#### **Teaching Assistant**

- Name: Gabriel Johnston
- Office location: Williamson Hall, Rm 224
- Office hours: by appointment

#### **Course Description**

Knowledge of the working of our planet, viewed as a whole system, has never been more important than it is today. Our planet is facing a rapidly expanding human population that is exposed daily to natural hazards such as climate change, earthquakes, volcanic eruptions and tsunamis. Moreover, human activities are understood to be in increasing competition with global-scale geological cycles on our planet and they are also driving a rapid drop in global biodiversity. It is therefore essential that we have a comprehensive understanding of the natural evolution of life on planet and how this evolution is connected to the global geologic evolution of our planet, from its core to the outer atmosphere, since the birth of our planet up to the present day. This understanding provides the scientific context for addressing a pressing question: What cataclysms or geological upheavals are responsible for the previous (five) “great dying” events (mass extinctions of life) over the past 550 million years, and how do they differ from the current global loss of biota, which is also likened to a mass extinction event?

In addressing this key question, this course will also tackle other related issues, such as how life began on our planet and how its evolution was conditioned by conditions maintained at the surface by global geological processes that occur inside and on our planet. These geological processes are connected to deep movements of rocks that cause continents to “drift”. The challenge is to understand why these deep movements occur and how they are linked to the evolution and workings of the ocean and atmosphere at the surface. To address these critical issues, this course will also explore the nature of the dynamical processes operating deep inside, and at the surface, of our planet. These dynamics are manifested by constant movements in all the envelopes: gaseous, liquid, and solid, which constitute the whole of our planet and which are interconnected and interdependent. Earth scientists have mapped and studied the structure and composition of the continents and the deep ocean floor, gaining an understanding of the planet's origin and history. They have also developed methods to peer into the depths of the Earth and have discovered that its solid interior is slowly stirred by vast currents of hot rocks and that these movements have shaped the surface, and the evolution of the whole planet, for hundreds of millions of years. Space exploration activities have allowed us to understand how all objects in the solar system contain traces of planetary evolution that help us better understand the history of the Earth.

With these (literally and figuratively) deep perspectives on our planet, this course aims to provide a comprehensive view of how the Earth functions as an ever-changing dynamical system. This journey through Earth System science will integrate multiple disciplines that include biology, chemistry, geology, geophysics, hydrology, oceanography and meteorology. Students will learn the origin and dynamics of the great forces that shape the evolution of our planet, from the deep interior to its surface. They will also learn that the Earth is made up of an interconnection of dynamical systems exhibiting complex behaviors at multiple spatial and temporal scales, which are relevant to society.

## **Quest and General Education Credit**

- Quest 2
- Physical Sciences

*This course accomplishes the [Quest](#) and [General Education](#) objectives of the subject areas listed above. A minimum grade of C is required for Quest and General Education credit. Courses intended to satisfy Quest and General Education requirements cannot be taken S-U.*

## **Required Readings and Works**

### Required:

Grotzinger, J., Jordan, T.H., Press, F., & Siever, R. (2007). “Understanding Earth” (5<sup>th</sup> Edition). W.H. Freeman, New York.

### Recommended:

Kump, L., Kasting, J.F. & Crane, R.G. (2010). “The Earth System” (3<sup>rd</sup> Edition). Prentice Hall.

All other readings and works are available in Canvas.

Materials and Supplies Fees: n/a

## II. Graded Work

### Description of Graded Work

Assignment	Description	Requirements	Points
In-class activity	In a total of 10 Wed class meetings, students will receive a “critical thought question”, dealing with the material covered that week. The students will work in groups of 5, and each group will provide their answer to this question. The questions will involve an experiential learning component that tests problem solving and communication skills in a dynamic group setting.	Class participation including experiential learning	200
Attendance	In-class attendance is required to participate in the group activities described above. (5 points for 10 group meetings.)	Attendance	50
Homework	There will be a total of 7 take-home problem sets that test the students’ grasp of the material covered in the lectures.	Written work, submitted	350
Midterm Exam	In-class, open-book exam based on material covered in the first half of the course. Exam will be held just before the March break.	Written exam	100
Final Exam	In-class, open-book exam based on material covered in the second half of the course. This will be held at the end of Spring term (during exam week).	Written exam	100
Term Paper	Final critical essay. The length will not exceed 4 double-spaced pages (not including references). The students will be provided a list of questions that focus on outstanding issues and concepts covered in the course. Each student will be asked to select a question from this list as the focus of their essay.  The essay questions will motivate the students to carry out a critical and thoughtful reflection on the interconnected workings and equilibrium of the Earth System, in particular to carry out a self-reflection on our place and impact, as individual members of a single species, in this system.	Written essay, including self-reflection	200
<b>Total Points</b>			<b>1000</b>

### Grading Scale

For information on how UF assigns grade points, visit: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

A+	95 – 100%		C	67 – 69%
A	90 – 94%		C-	64 – 66%

A-	87 – 89%		D+	60 – 63%
B+	84 – 86%		D	55 – 59%
B	80 – 83%		D-	50– 54%
B-	75 – 79%		E	< 50
C+	70 – 74%			

## Grading Rubric(s)

This course is not designed to count toward a writing requirement (WR). Nonetheless, the following (WR) rubric will be used to evaluate and assess the written essays assigned at the end of term.

### Final Essay Rubric

	SATISFACTORY (Y)	UNSATISFACTORY (N)
CONTENT	The essay exhibits evidence of ideas that responds to the topic with complexity, critically evaluating and synthesizing sources, and provides an adequate discussion with basic understanding of sources.	The essay either includes a central idea(s) that is unclear or off-topic or provides only minimal or inadequate discussion of ideas. The essay may also lack sufficient or appropriate sources.
ORGANIZATION AND COHERENCE	The essay exhibits an identifiable structure, with well composed paragraphs, a clear thesis statement and also follows a logical progression of ideas.	The essay lacks clearly identifiable organization, may lack any coherent sense of logic in associating and organizing ideas.
ARGUMENT AND SUPPORT	The essay uses persuasive and confident presentation of ideas, strongly supported with evidence.	The essay makes only weak generalizations, providing little or no support, as in summaries or narratives that fail to provide critical analysis.
STYLE	The essay uses a writing style with word choice appropriate to the context and discipline. Sentences should display complexity and logical structure.	The essay relies on word usage that is inappropriate, or incorrect, for the context or discipline. Sentences may be overly long or short with awkward construction.
MECHANICS	The essay will feature correct or error-free presentation of ideas. The essay should contain no (or very few) spelling, punctuation, or grammatical errors.	The essay contains so many grammatical errors that they impede the reader's understanding or severely undermine the writer's credibility.

Responses to the in-class critical thought questions (10 in total) will be developed by student groups. 200 points are assigned in total to these in-class questions (20 points per question). Each group will submit a collective written response to the question that will be evaluated by the instructor based on the substance, content and scientific validity of the response. Each student in the group will receive a grade that measures their individual contribution (50% of total = 10 points), in addition to the group evaluation that is shared by all members (remaining 50% of the total = 10 points). A peer assessment

rubric (below) will be used to evaluate the individual contributions. An absent student, without adequate justification, will receive 0.

### Peer Assessment Rubric

The individual contribution of each group member will be evaluated with ++, +, +/-, -, -- in each column. The last column is reserved for any comments or explanations, as needed. An net (accumulated) total of five to six '+' marks corresponds to an "excellent" contribution (45 to 50% of total grade), four '+' marks is "good" (40% of total grade), three '+' marks is "sufficient" (30 % of total grade), two '+' marks is "insufficient" (20% of total grade) , one '+' mark is "poor" (10% of total grade) and zero '+' marks is "very poor" (0%).

Student name:

Peer name	Effort: contributes to group work, shows initiative, is responsible	Team work: collaborates with others, communicates openly, is considerate (only 1 or 0 '+' marks for this)	Intellectual input: tackles question directly and incisively, substantial input to discussions and to written response	Comment or explanation
1				
2				
3				
4				
Yourself:				

## III. Annotated Weekly Schedule

**Students: note that the following syllabus is a guideline and there may be changes to the class schedule as the term progresses. Please refer to our Canvas page, and messages you will receive, for updates and adjustments that may be required.**

*\*In the following, the presentation notes are copies of the lecture slides used by the instructor in each week's course. These will be provided in advance of each course and will also serve as a resource for assignments. Students are encouraged to review these notes prior to the lectures.*

Week	Topics, Homework, and Assignments
Week 1	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Course Introduction</li> <li>• <b>Summary:</b> Major questions. A "call to conscience". "Big Bang" to present day: a chronology. Deep time and uniformitarianism. Scientific method. Earth's external shape.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 40 pp.</li> <li>• <b>Required Readings/Works:</b> "Understanding Earth": pp. 1-14</li> </ul>

Week	Topics, Homework, and Assignments
	<p>Siever (1983). The dynamic earth. <i>Scientific American</i>, <b>249</b>(3), 46-55.  <u>Note: in the following, "Understanding Earth" will be simply abbreviated "UE"</u></p> <ul style="list-style-type: none"> <li>• <b>Assignment:</b> In-class critical thought questions (Wed).  Distribute list of topics (major scientific questions) to be addressed in Term Paper submitted at the end of the course.</li> </ul>
Week 2	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Introducing the Earth System</li> <li>• <b>Summary:</b> Earth envelopes. Structure and composition. "Floating" continents. The Earth System. Plate Tectonics.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 40 pp.</li> <li>• <b>Required Readings/Works:</b>  UE: pp. 1-14  Steffen <i>et al.</i> (2020), The emergence and evolution of Earth System Science. <i>Nat Rev Earth Environ</i> <b>1</b>, 54–63.</li> <li>• <b>Assignment:</b> Take-home problem set (due following Mon)</li> </ul>
Week 3	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Origins: Earth Formation</li> <li>• <b>Summary:</b> Solar System formation. Earth accretion. Moon formation. Atmosphere-Ocean formation. Diverse terrestrial planets.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 55 pp.</li> <li>• <b>Required Readings/Works:</b>  UE: pp. 189-212  Lin (2008). The genesis of planets. <i>Scientific American</i>, <b>298</b>(5), 50-59.  Jewitt &amp; Young (2015). Oceans from the Skies. <i>Scientific American</i>, <b>312</b>(3), 36-43</li> <li>• <b>Additional/Supplementary Works:</b>  Catling &amp; Zahnle (2009). The planetary air leak. <i>Scientific American</i>, <b>300</b>(5), 36-43  Goldreich (1972). Tides and the earth-moon system. <i>Scientific American</i>, <b>226</b>(4), 42-53  Allègre &amp; Schneider (1994). The evolution of the Earth. <i>Scientific American</i>, <b>271</b>(4), 66-75;</li> <li>• <b>Assignment:</b> In-class critical thought questions (Wed).</li> </ul>
Week 4	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Measuring Time</li> <li>• <b>Summary:</b> Relative geologic time. Radiometric dating. Absolute geologic time. Sequence stratigraphy.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 20 pp.</li> <li>• <b>Required Readings/Works:</b>  UE: 169-186  York (1993). The earliest history of the earth. <i>Scientific American</i>, <b>268</b>(1), 90-96.  O'Nions <i>et al.</i> (1980). The chemical evolution of the Earth's mantle. <i>Scientific American</i>, <b>242</b>(5), 120-133</li> <li>• <b>Assignment:</b> In-class critical thought questions (Wed).</li> </ul>
Week 5	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Plate Tectonic System</li> <li>• <b>Summary:</b> A scientific revolution. Seafloor spreading. Plate mosaic. Magnetic reversals. Mantle convection.</li> </ul>

Week	Topics, Homework, and Assignments
	<ul style="list-style-type: none"> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 50 pp.</li> <li>• <b>Required Readings/Works:</b> UE: pp. 18-42 Heirtzler (1968) Sea-floor spreading. <i>Scientific American</i>, <b>219</b>(6), 60-73. McKenzie, (1983). The Earth's mantle. <i>Scientific American</i>, <b>249</b>(3), 66-81</li> <li>• <b>Additional/Supplementary Works:</b> Hurley (1968). The confirmation of continental drift. <i>Scientific American</i>, <b>218</b>(4), 52-68 White &amp; McKenzie (1989). Volcanism at rifts. <i>Scientific American</i>, <b>261</b>(1), 62-71. Smith &amp; Christiansen (1980). Yellowstone Park as a window on the earth's interior. <i>Scientific American</i>, <b>242</b>(2), 104-117</li> <li>• <b>Assignment:</b> Take-home problem set (due following Mon).</li> </ul>
Week 6	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Imaging the Deep Interior</li> <li>• <b>Summary:</b> A seismological revolution. 3-D Earth structure. Mapping convection currents. Connections to surface dynamics.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 30 pp.</li> <li>• <b>Required Readings/Works:</b> UE: pp. 324-338 Anderson &amp; Dziewonski (1984). Seismic tomography. <i>Scientific American</i>, <b>251</b>(4), 60-71 Gurnis (2001). Sculpting the Earth from inside out. <i>Scientific American</i>, <b>284</b>(3), 40-47.</li> <li>• <b>Assignment:</b> In-class critical thought questions (Wed).</li> </ul>
Week 7	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Global Energy Balance</li> <li>• <b>Summary:</b> Introduction. Solar radiation. Electromagnetic spectrum. Greenhouse effect: Feedbacks. Geothermal energy. Energy Budget.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 60 pp.</li> <li>• <b>Required Readings/Works:</b> UE: pp. 352-355 Schneider (1989). The changing climate. <i>Scientific American</i>, <b>261</b>(3), 70-79. Pollack &amp; Chapman (1977). The flow of heat from the Earth's interior. <i>Scientific American</i>, <b>237</b>(2), 60-77.</li> <li>• <b>Additional/Supplementary Works:</b> Kasting et al. (1988). How climate evolved on the terrestrial planets. <i>Scientific American</i>, <b>258</b>(2), 90-97.</li> <li>• <b>Assignment:</b> In-class critical thought questions (Wed).</li> </ul>
Week 8	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Climate System</li> <li>• <b>Summary:</b> Solar input. Subsystems: atmosphere, hydrosphere, cryosphere, lithosphere, biosphere. Atmosphere-Ocean general circulation.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 70 pp.</li> <li>• <b>Required Readings/Works:</b></li> </ul>

Week	Topics, Homework, and Assignments
	<p>UE: pp. 348-352  Stewart (1969). The atmosphere and the ocean. <i>Scientific American</i>, <b>221</b>(3), 76-87  Broecker (1983). The ocean. <i>Scientific American</i>, <b>249</b>(3), 146-161  Ingersoll (1983). The atmosphere. <i>Scientific American</i>, <b>249</b>(3), 162-175</p> <ul style="list-style-type: none"> <li>• <b>Additional/Supplementary Works:</b>  Webster &amp; Curry (1998). The oceans and weather. <i>Scientific American</i>, <b>9</b>, 38-43.</li> <li>• <b>Assignment:</b> <a href="#">Midterm Exam, open book (Wed)</a>  Take-home problem set (due following Mon)</li> </ul>
Week 9	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Climate Variations</li> <li>• <b>Summary:</b> Earth orbital and insolation variations. Ice Ages. Carbon cycle. 20<sup>th</sup> &amp; 21<sup>st</sup> century warming.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 60 pp.</li> <li>• <b>Required Readings/Works:</b>  UE: pp. 352-368.  Broecker &amp; Denton (1990). What drives glacial cycles? <i>Scientific American</i>, <b>262</b>(1), 48-56  Berner &amp; Lasaga (1989). Modeling the geochemical carbon cycle. <i>Scientific American</i>, <b>260</b>(3), 74-81</li> <li>• <b>Additional/Supplementary Works:</b>  Broecker (1995). Chaotic climate. <i>Scientific American</i>, <b>273</b>(5), 62-68  Alley (2004). Abrupt climate change. <i>Scientific American</i>, <b>291</b>(5), 62-69  Collins <i>et al.</i> (2007). The physical science behind climate change. <i>Scientific American</i>, <b>297</b>(2), 64-73.</li> <li>• <b>Assignment:</b> In-class critical thought questions (Wed). Take-home problem set (due following Mon)</li> </ul>
Week 10	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Climate Feedbacks on Tectonics</li> <li>• <b>Summary:</b> Topography and relief. Erosion and sedimentation. Landscape evolution.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes</li> <li>• <b>Required Readings/Works:</b>  UE: pp. 531-548  Ruddiman &amp; Kutzbach (1991). Plateau uplift and climatic change. <i>Scientific American</i>, <b>264</b>(3), 66-75  Pinter &amp; Brandon (1997). How erosion builds mountains. <i>Scientific American</i>, <b>276</b>(4), 74-79</li> <li>• <b>Additional/Supplementary Works:</b>  Hodges (2006). Climate and the evolution of mountains. <i>Scientific American</i>, <b>295</b>(2), 72-79.</li> <li>• <b>Assignment:</b> In-class critical thought questions (Wed).</li> </ul>
Week 11	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Origins of Life</li> <li>• <b>Summary:</b> Early 20<sup>th</sup>-century theories. What is life? Miller-Urey experiments. Organic molecular basis. When did life first appear? Habitable conditions.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 70 pp.</li> </ul>



Week	Topics, Homework, and Assignments
	<ul style="list-style-type: none"> <li>• <b>Required Readings/Works:</b> UE: pp. 265-267 Ricardo &amp; Szostak (2009). Origin of life on earth. <i>Scientific American</i>, <b>301</b>(3), 54-61 Shapiro (2007). A simpler origin for life. <i>Scientific American</i>, <b>296</b>(6), 46-53</li> <li>• <b>Additional/Supplementary Works:</b> Trail et al. (2022), Rethinking the search for the origins of life, <i>Eos</i>, <b>103</b>, <a href="https://doi.org/10.1029/2022EO220065">https://doi.org/10.1029/2022EO220065</a>. Szostak (2018). How did life begin? <i>Nature</i>, <b>557</b>(7706), S13-S13.</li> <li>• <b>Assignment:</b> In-class critical thought questions (Wed). Take-home problem set (due following Mon)</li> </ul>
Week 12	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Biosphere System</li> <li>• <b>Summary:</b> Ecosystems. Nature’s producers and consumers. Feedbacks. Energetics. Biogeochemical cycles. Tree of Life. Microbes. “Extreme” life.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 70 pp.</li> <li>• <b>Required Readings/Works</b> UE: pp. 240-254 Cloud (1983). The biosphere. <i>Scientific American</i>, <b>249</b>(3), 176-189 Davies (2007). Are aliens among us? <i>Scientific American</i>, <b>297</b>(6), 62-69.</li> <li>• <b>Assignment:</b> In-class critical thought questions (Wed).</li> </ul>
Week 13	<ul style="list-style-type: none"> <li>• <b>Topic:</b> Geobiology</li> <li>• <b>Summary:</b> Earliest life. Archean and Proterozoic eons. Rise of atmospheric oxygen. Supercontinent cycle. Cambrian explosion of life.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 30 pp.</li> <li>• <b>Required Readings/Works</b> UE: pp. 254-261 Knoll (1991). End of the Proterozoic eon. <i>Scientific American</i>, <b>265</b>(4), 64-73 Hoffmann &amp; Schrag (2000). Snowball earth. <i>Scientific American</i>, <b>282</b>(1), 68-75</li> <li>• <b>Additional/Supplementary Works:</b> Nance et al. (1988). The supercontinent cycle. <i>Scientific American</i>, <b>259</b>(1), 72-79 Barley et al. (2005). Late Archean to Early Paleoproterozoic global tectonics, environmental change and the rise of atmospheric oxygen. <i>Earth Planet. Sci. Lett.</i>, <b>238</b>(1-2), 156-171 Kump (2008). The rise of atmospheric oxygen. <i>Nature</i>, <b>451</b>(7176), 277-278 Zerkle <i>et al.</i> (2018). Biogeodynamics: bridging the gap between surface and deep Earth processes. <i>Phil. Trans. Roy. Soc. (A)</i>, <b>376</b>(2132), 20170401.</li> <li>• <b>Assignment:</b> In-class critical thought questions (Wed). Take-home problem set (due following Mon)</li> </ul>
Week 14	<ul style="list-style-type: none"> <li>• <b>Topic:</b> “Great Dying” Events</li> <li>• <b>Summary:</b> Phanerozoic mass-extinctions. Mantle “superplumes” and igneous provinces. Siberian and Deccan Traps. Chicxulub impact. Paleocene-Eocene Thermal Maximum.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes: 30 pp.</li> </ul>

Week	Topics, Homework, and Assignments
	<ul style="list-style-type: none"> <li>• <b>Required Readings/Works</b> UE: pp. 261-265 Alvarez &amp; Asaro (1990). An extraterrestrial impact. <i>Scientific American</i>, <b>263</b>(4), 78-84 Courtillot (1990). A volcanic eruption. <i>Scientific American</i>, <b>263</b>(4), 85-93 Erwin (1996). The mother of mass extinctions. <i>Scientific American</i>, <b>275</b>(1), 72-78 Kump (2011). The last great global warming. <i>Scientific American</i>, <b>305</b>(1), 56-61</li> <li>• <b>Additional/Supplementary Works:</b> Coffin &amp; Eldholm (1993). Large igneous provinces. <i>Scientific American</i>, <b>269</b>(4), 42-49 Ward (2006). Impact from the deep. <i>Scientific American</i>, <b>295</b>(4), 64-71</li> <li>• <b>Assignment:</b> <a href="#">Florida Museum of Natural History visit</a> &amp; <b>critical thought questions (both on Wed). Take-home problem set (due following Mon)</b></li> </ul>
Week 15	<ul style="list-style-type: none"> <li>• <b>Topic:</b> 6<sup>th</sup> Mass Extinction</li> <li>• <b>Summary:</b> Present-day signs and evidence. Debate. Comparisons with past events. Future scenarios.</li> <li>• <b>Lecture copy*:</b> Instructor presentation notes</li> <li>• <b>Required Readings/Works:</b> Wilson (1989). Threats to biodiversity. <i>Scientific American</i>, <b>261</b>(3), 108-117 Ceballos et al. (2015). Accelerated modern human-induced species losses: Entering the sixth mass extinction. <i>Science advances</i>, <b>1</b>(5), e1400253 Wheeling (2020), How modern emissions compare to ancient, extinction-level events, <i>Eos</i>, <b>101</b>, <a href="https://doi.org/10.1029/2020EO142456">https://doi.org/10.1029/2020EO142456</a></li> <li>• <b>Additional/Supplementary Works:</b> Joel (2018), How did life recover after Earth's worst-ever mass extinction?, <i>Eos</i>, <b>99</b>, <a href="https://doi.org/10.1029/2018EO109093">https://doi.org/10.1029/2018EO109093</a> Steffen et al. (2018), Trajectories of the Earth System in the Anthropocene. <i>Proc. Nat. Academy Sci.</i>, <b>115</b>(33), 8252-8259. Glikson (2018). The lungs of the Earth: Review of the carbon cycle and mass extinction of species. <i>Energy Procedia</i>, <b>146</b>, 3-11</li> <li>• <b>Assignment:</b> In-class critical thought questions (Wed). <b>Submit written term paper (Wed, final class)</b></li> </ul>
<b>Exam week</b>	<b>Open book, final exam</b>

## IV. Student Learning Outcomes (SLOs)

At the end of this course, students will be expected to have achieved the [Quest](#) and [General Education](#) learning outcomes as follows:

**Content:** *Students demonstrate competence in the terminology, concepts, theories and methodologies used within the discipline(s).*

- **Identify, describe, and explain** the components of the Earth System, including their physical and chemical structure, properties, and their dynamical evolution through time (**P**). **Assessment** through in-class activities, midterm and final exam, take-home problem sets.
- **Identify, describe, and explain** the physical/chemical coupling between the different components of the Earth System and their characteristic length and time scales, and the outstanding questions concerning positive/negative feedbacks between the component subsystems (**Quest 2, P**). **Assessment** through in-class activities, midterm and final exam, take-home problem sets.

**Critical Thinking:** *Students carefully and logically analyze information from multiple perspectives and develop reasoned solutions to problems within the discipline(s).*

- **Critically analyze** the geological data that constrain the time/spatial scales of the dynamic processes that couple the different components of the Earth System and **evaluate** the magnitude of their impact on the evolution of surface conditions on our planet. (**Quest 2, P**). **Assessment** through in-class activities, midterm and final exam, take-home problem sets.
- **Compare and contrast** how man’s impact rivals or competes with the natural evolution of the Earth System, and to what extent mankind has altered the planet’s equilibrium (**Quest 2, P**). **Assessment** through in-class activities, final exam, final term paper.

**Communication:** *Students communicate knowledge, ideas and reasoning clearly and effectively in written and oral forms appropriate to the discipline(s).*

- **Develop** a written analysis of physical/chemical Earth processes and the corresponding observations/data that provide a quantitative manifestation of these processes, in order to clearly address outstanding questions raised in the lectures (**Quest 2, P**). **Present** written and oral responses to these questions (**Quest 2, P**). **Assessment** through in-class activities, take-home problem sets, final term paper.

**Connection:** *Students connect course content with meaningful critical reflection on their intellectual, personal, and professional development at UF and beyond.*

- **Reflect on** how our assumptions, and lack of comprehension, of the physical/chemical processes controlling the dynamical equilibrium of the Earth System have led to a lack of appreciation of mankind’s impact on Earth’s natural evolution and how we may remedy this situation (**Quest 2**). **Assessment** through in-class activities and final term paper.

## V. Quest Learning Experiences

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### 1. Details of Experiential Learning Component

Students will interact in an in-class, group setting to address critical thought questions which are presented to them over the course of the term. These questions will engage and test problem solving and communication skills in a supportive group dynamic, thus enhancing and enriching their learning experience.

A visit will be organized to the Florida Museum of Natural History to view the permanent exhibit: [Florida Fossils: Evolution of Life and Land](#) . This exhibit features a display of the last 65 million years of Earth’s history, as told by the fossil collection, and also includes a component entitled “*Before Florida Formed*”, which presents a diorama describing the five mass-extinction events discussed in the course. This visit

will thus be a “hands on” complement to the course material. The key concepts acquired during this visit will be interrogated and graded by way of in-class “critical thought questions”.

## **2. Details of Self-Reflection Component**

Students will be encouraged and motivated to critically reflect on how the Earth System functions. This reflection, which will be stimulated through in-class activities, will encourage a new awareness of how mankind’s global footprint has rapidly become unsustainable and is generating new feedbacks that are upsetting the natural equilibrium of the Earth System. These reflections and awareness will also be encouraged during the preparation of the final term paper.

# **VI. Required Policies**

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## **Attendance Policy**

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

## **Students Requiring Accommodation**

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

## **UF Evaluations Process**

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

## **University Honesty Policy**

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report

any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

## **Counseling and Wellness Center**

Contact information for the Counseling and Wellness Center: <http://www.counseling.ufl.edu/> , 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

## **The Writing Studio**

The writing studio is committed to helping University of Florida students meet their academic and professional goals by becoming better writers. Visit the writing studio online at <http://writing.ufl.edu/writing-studio/> or in 2215 Turlington Hall for one-on-one consultations and workshops.

## **In-Class Recordings**

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.