Paleoclimates: Climates of the Past, Key to the Future

Lecture: Tu Th 1:40-3:00 PM, Wellman room 119
Ofc hrs: Tu/Wed 11:00-12 PM or by appointment
Also Class Chat Room discussions on Canvas as needed

Instructor: Prof. Howard Spero
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TA Ofc hrs: Tu & Wed 3:30-4:30 PM, Earth Phys. Sci. Bldg room 1119

COURSE OBJECTIVE: To establish a fundamental understanding of how the Earth's climate system operates through time by examining the 1) the processes and mechanisms that control planetary climate throughout Earth history, 2) the critical interactions between geology, oceanography and atmospheric circulation and their control on the climate system and 3) critical discussions of key climatic events in Earth history that have molded the Earth's climate as documented in the geological record.

COURSE ORGANIZATION: Two lectures per week. There will be one midterm (25% of grade), a final exam (50% of grade) and a term paper (25% of grade). The exams will be a mix of short answer, and essay/thought questions. Although the final will not be cumulative, the questions will build on concepts and examples dealt with during the first half of the course in an integrative way. More on this later in the quarter.

GRADING OPTIONS: Letter grade only

READINGS: The course will utilize one text (available as a PDF on the Canvas site or you can buy it on Amazon.com)

Earth's Climate - Past and Future 2nd or 3rd ed. by William F. Ruddiman
Note: I have uploaded a pdf of the 2nd edition in the Canvas website for downloading

In addition to the Ruddiman text, I will ask you to read a mixture of review papers from journals such as *Scientific American*. I will either upload pdfs of these papers on Canvas or you can access them through the UC digital library and download/read them.

WEB SITES: There are a number of excellent web sites that I will recommend which provide images and information on up to date topics that are not available in the readings. See the course Canvas page and please log on to them.

TERM PAPER: The course requires each student to submit a **9-10 page term paper** on some topic in **paleoclimatology** or **paleoceanography.** I will provide a list of topics that past students have written about as examples of potential term paper topics, ***but you can select any topic that interests you as long as it is related to paleoclimatology or paleoceanography***. If you would like to write about a topic not on the list, please email me or come by my office to discuss the idea and get prior approval. I know the literature, so I can make sure your topic has sufficient research material for a paper topic. ***I require each student to submit their choice of topic by January 16***, so start exploring subjects and find something that sounds interesting to you.

Climates of the Past: Key to the Future
Geology 108 - Winter 2020

LECTURE SCHEDULE

Jan	7	Introduction, atmosphere composition, greenhouse effect (1)
	9	Ocean-Atmosphere interactions: Weather, wind patterns and currents (2)
	14	Ocean-Atmosphere interactions: Weather, wind patterns and currents (3)
	16	The climatic tools & evidence; *term paper topics due* (4)
	21	Geochemical Carbon cycle: Faint Young Sun Paradox, Weathering & carbonate production (5)
	23	Geochemical Carbon cycle II: Plate tectonics, Mars vs Venus and Earth, Gaia concept (6)
	28	Geologic Time Scale, Paleogeography and Climate History - Neoproterozoic (Snowball Earth) and Paleozoic (the Permian Extinction) (7)
	30	Paleogeography and Climate History of the Mesozoic through K/T boundary (8)
Feb	4	Climate History of the Early Cenozoic; The Paleocene-Eocene Thermal Maximum event (9)
	6	**MIDTERM**
	11	Himalaya uplift, glaciation of the Antarctic, Eocene to Miocene (time permitting) (10)
	13	Miocene, Pliocene, Pleistocene, Northern Hemisphere glaciations; Gateways and Ocean circulation change in the Neogene (11)
	18	History of orbital theory and Milankovich cycles (12)
	20	Ice sheets and sea level changes during the last glacial and deglaciation (13)
	25	Ice cores and the history of atmospheric fluctuations (14)
	27	Abrupt climate change: Younger Dryas; Heinrich events and Dansgaard-Oeschger cycles (15)
Mar	3	Little ice age, Holocene sea level change, Maunder Minimum (16)
	5	Climate, ENSO and human evolution since the Pliocene (17)
	10	The Anthropocene, climate, drought and civilization change (18)
	12	Regional climate, ice sheet dynamics and the IPCC report (19)

EXAMINATIONS: There will be two exams during the quarter. The midterm will cover lectures 1-9; the final will cover the remaining lectures. The tests will contain both short answer (fill in the blank and multiple choice) and essay type questions with a mix that will be near 50:50. The final examination is **NOT** cumulative (so you don't have to ask me this question - I'll just know you never bothered to read this handout!!). ****However***, each examination will build on concepts established during the quarter.

Final Examination – March 19 (Thursday) 08:00-10:00AM

Note: With the exception of a doctor's note for illness, you MUST take the final exam during its assigned time period