



Topics in Stable Isotope Paleoecology Prof. Mark T. Clementz

1885-0105

Intensive course – 25-28 March 2024
9:00-16:00 daily

Paleoecology is the study of past interactions between organisms and their environment over a broad timescale (10 ka to 3.5 Ga). Stable isotope analysis has become an increasingly important tool for quantitatively testing questions concerning these interactions in the past. This class will focus on the Cenozoic Era (past 65 Myrs) and provide an introduction to stable isotope methods, an overview of the major events that have shaped the diversity and history of life on Earth during this time interval, and how stable isotope analysis has provided greater insight into these events. Students will benefit from a combination of lectures and class exercises, during which they will develop their ability to critically evaluate scientific articles through research and discussion.

The following topics will be presented and discussed in class: Stable Isotope Terminology and Methods, Cenozoic Climate and Environmental Change, Fossil Preservation and Diagenesis, Chemical Preparation Methods for Isotope Research, Isotopes in the Fossil Record.

Course Outline:

Day1:

Introduction to Stable Isotope Geochemistry
Overview of Cenozoic Climate

Day2:

Carbon Isotopes in Nature

- The Carbon Cycle
- Carbon Isotopes and Primary Producers
- Carbon Isotopes and Diet
- Carbon Isotopes: Case Studies

Day3:

Oxygen Isotopes in Nature

- The Water Cycle and Isotopes
- Oxygen Isotopes and Vertebrates
- Oxygen Isotopes: Case Studies



Day4:

Strontium Isotopes in Nature

- Tectonics, Seawater, and Continental Weathering
- Strontium isotopes in Food Webs
- Strontium Isotopes: Case Studies

Day5:

Future Directions in Stable Isotope Ecology

Student Presentations

Text(s) and Readings

- Textbook: Principles of Stable Isotope Geochemistry 2nd Edition, 2017, Sharp, Zachary (Free, PDF)
- Carbon and Oxygen Isotopes: Westerhold et al. 2020. An Astronomically dated record of Earth's climate and its predictability over the Last 66 million years. Science. 369: 1383-1387.
- Strontium Isotopes: Bentley RA. 2006. Strontium Isotopes from the Earth to the Archaeological Skeleton: A Review. Journal of Archaeological Method and Theory 13(3): 135-187.