**Stable Isotope Biogeochemistry**

**Primary Instructors:** Dr. Ben Gill
bcgill@vt.edu
Associate Professor, Geosciences

Dr. Rachel Reid
rebreid@vt.edu
Research Scientist, Geosciences

**Course Overview:** In this course we will explore how stable isotopes can be used to address a variety of research questions in geology, paleobiology, ecology, and other environmental sciences. Lectures will focus on the systematics and applications of carbon, nitrogen, oxygen, hydrogen, and sulfur isotopes in modern and past marine and terrestrial systems. Through individual or small group research projects, students will learn to collect, prepare, analyze, and interpret stable isotope data.

**Learning Objectives:**

- To establish the vocabulary and fundamental knowledge of theories and concepts in isotope biogeochemistry, to accurately communicate about and interpret stable isotope data, and to evaluate published literature.

- To appreciate the breadth of applications for stable isotope biogeochemistry and gain an understanding of the fundamental processes that lead to isotopic sorting in natural systems.

- To achieve competency in the quantitative evaluation of isotopic data from data correction (linearity, drift, normalization) to statistical analysis (e.g., Bayesian isotope mixing models).

- To gain familiarity with the laboratory and field sampling techniques necessary for conducting isotopic research and the instrumentation used for isotopic analysis.

**Textbooks:**
*Principles of Stable Isotope Geochemistry*, by Zachary Sharp, Open Educational Resources Publishing, 2nd Edition, 2017. Available online at https://digitalrepository.unm.edu/unm_oer/1/

*Stable Isotope Ecology*, by Brian Fry, Springer-Verlag New York, 2006. Available for download through the Virginia Tech Library: https://link.springer.com/book/10.1007/0-387-33745-8

**Grading:**
25% Attendance and participation in paper discussions
25% Paper presentation
50% Class Project
- Project description and reference list (10%)
- Experimental plan and methods (10%)
- Report (15%)
- Project Presentation (15%)

**Course Outline:** (listed as topics and percentage of time spent on each topic)
1. Introduction (16%)
2. Oxygen and Hydrogen isotopes (17%)
3. Carbon isotopes (33%)
4. Nitrogen isotopes (17%)
5. Sulfur isotopes (17%)