Instructor:
Dr. Tamara Carley
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Classroom: Van Wickle 15
Office: Van Wickle 101c
Research Lab: Van Wickle 1c

Days and Times:
Lecture: MWF 9:30-10:20 am
Lab: M 1:15-4:00 pm
Office-hours: WF 11:30-12:30 pm,
F 2:30-4:00 pm, & by appointment

Course Objectives: Our dynamic planet, and our lived experience on Earth, is shaped by complex interactions between the geosphere, hydrosphere, atmosphere, and biosphere. This semester we will explore the geochemical aspects of these interconnected Earth spheres using a "source to sink" mentality. After reviewing fundamental chemistry concepts, we will consider the generation, evolution, and destabilization of a large body of magma. We will then examine the impacts of a supersized eruption on climate, water systems, soil, and human health. Finally, we will consider the formation, composition, and properties of Earth materials extracted from these systems for economic purposes, and the environmental ramifications (and remediation strategies) associated with our resource use. Geochemical concepts learned during our progression from "source" (magma) to "sink" (clays, soils, and ore deposits) will include: solid-earth equilibria (igneous, metamorphic, sedimentary, and weathering reactions), radioactive and stable isotope geochemistry, geochronology, oxidation-reduction reactions, natural aqueous solutions, solid-aqueous equilibria, and more.

Learning Outcomes:

- Identify the environment of formation for important rock types and explain formation as related to broad scale earth processes (e.g., plate tectonics, petrogenesis, weathering, etc.).
- Understand major events and rates of change through geologic history and describe methodologies used to determine age relationships between Earth materials.
- Understand that the Earth is a complex system of interacting rock, water, air, and life.
- Know how to acquire, interpret, and access sound scientific data and information.

Textbook: *Geochemistry* by William White (ISBN: 9780470656686).

Talkin' rocks: I'm here for you! I'm very happy to discuss the course, assignments, your experience, and this dynamic planet of ours. My office hours are listed at the top of this syllabus, and I'm also happy to see you by appointment or drop-in (but let's talk about the "law of angles"). Please note that I will often hold my "office hours" in my research lab. I limit my time on email outside of standard business hours. Plan accordingly!

A typical day / the way I teach: I am a fierce proponent of active learning and challenge-based learning. I plan to keep traditional lecturing to a minimum. The majority of our shared class time will be dedicated to hands-on investigation, problem-solving exercises, demonstrations, discussions, and more. You will learn a great deal about geology; you will also improve your scientific literacy, critical thinking, and communication skills. This approach to teaching and learning has huge benefits, but it requires a great deal of participation, cooperation, engagement, and enthusiasm on your part. Thanks in advance!

Attendance: If you are healthy and it is safe for you to participate in face-to-face opportunities, I expect you to come to class and lab and participate fully. Be punctual. If you are unwell and your attendance will jeopardize the health and wellbeing of yourself and your community, I expect you to be responsible and stay at home. If you find that you need to miss excessive classes for health and wellness reasons, we will work together with your class Dean to develop a strategy for success. Failure to attend class, punctually, will negatively impact your grade for "The Daily."

Technology in the classroom: Please develop the habit of bringing a laptop and cellphone to lab (let me know ASAP if this poses a problem—we'll figure it out). However, please consider our classroom to be a *laptop and phone free space* during lecture (the use of tablets for note taking is acceptable). I will be very clear about times when laptops and phones may be used. Failure to cooperate will negatively impact my ability to teach, your ability to actively engage and participate, and your grade for "The Daily."

Academic Accommodation: In compliance with Lafayette College policy and equal access laws, I am available to discuss appropriate academic accommodations that you may require as a student with a disability. Requests for academic accommodations need to be made during the first two weeks of the semester, except for unusual circumstances, so arrangements can be made. Students must register with the Office of the Dean of Advising and Co-Curricular Programs for disability verification and for determination of reasonable academic accommodations.

Moodle: We will use Moodle frequently—for communication, daily reading assignments, resource distribution, and assignment submissions. Please familiarize yourself with Moodle and develop a habit of checking it frequently. Please let me know if you have any questions or concerns.

Moodle Disclaimer: Moodle contains student information that is protected by the Family Educational Right to Privacy Act (FERPA). Disclosure to unauthorized parties violates federal privacy laws. Using Moodle will make student information visible to other students in this class. This information is protected by these federal privacy laws and must not be shared with anyone outside the class.

Federal Credit Hour Compliance Statement: The student work in this course is in full compliance with the federal definition of a four credit hour course. Please see the Registrar's Office web site for the full policy and practice statement.

Academic Honesty: Integrity is of paramount importance and I hold it in the highest regard. The official college policy is*: "To maintain the scholarly standards of the College and, equally important, the personal ethical standards of our students, it is essential that written assignments be a student's own work, just as is expected in examinations and class participation. A student who commits academic dishonesty is subject to a range of penalties, including suspension or expulsion. Finally, the underlying principle is one of intellectual honesty. If a person is to have self-respect and the respect of others, all work must be his/her own."* Any perceived breach of academic integrity will be reported immediately to the head of the Department of Geology and Environmental Geosciences and to your class Dean.

Grade breakdown

Category	Brief Description	%
The Daily	Your engagement in and success with the day-to-day experiences of Geology 321 will be calculated using a combination of response notecards (typically 4 points), activity sheets (typically 8 points), and occasional quizzes (typically 12 points, announced in advance). Your lowest scores, up to 12 possible points (e.g., 3 response notecards or one quiz) will be factored out of your final grade.	**10**
Labs	Each lab activity (and the associated product) is weighted equally unless indicated otherwise. The standard deadline is Sunday at midnight, but you will be awarded a 5% bonus if you submit your lab on Friday before 5 pm (exceptions may apply). Many lab periods will be dedicated to progress on your grant proposal; those efforts will not be factored into this grade category.	**10**
Reading Reflections	You will have frequent (~twice-a-week) reading assignments from a mix of your textbook, *Elements* magazine, and scientific journal articles. On days with assigned readings, you must come to class with a 1-page, printed, reading reflection. Each reading reflection will be weighted equally (exceptions may apply and will be announced in advance). You may miss three reading reflections throughout the semester, or may submit all reading reflections with three counted as extra credit.	**20**
Exam 1	This 50-minute exam will cover material from both lecture and lab. The exam may include sample characterization and ID, labeling and interpreting graphs and diagrams, solving equations, and writing short-answer responses.	**20**
Exam 2	This 50-minute exam will follow the same format as Exam 1. < 25% of your exam grade will relate to major concepts from Exam 1, > 75% to new material.	**20**
Grant Proposal	Throughout the semester, you will write an NSF-EAR grant proposal (cover page + 15 pages of figures and text + extensive works cited + budget and budget justification) on a topic of your choosing. You will craft a research question, develop a research plan, gather preliminary data, place your preliminary data in a broader research context, and make a compelling case for the intellectual merits, broader impacts, novelty, and feasibility of your proposed work. You will also develop peer-review skills used in proposal and manuscript evaluations.	**20**

Course schedule: This schedule, like our dynamic planet, is subject to change. Check Moodle often.

Week	Theme	Important Dates
26 August	Elements, ions, and isotopes: Definitions, formation, and distribution	
02 September	Setting the scene for source to sink: Supervolcanoes to bentonites	
09 September	Using isotopes to decipher the origin and source materials of rocks and minerals	Sept. 9: Fieldtrip to Martin's Creek Quarry (12:30 pm departure)
16 September		
23 September	Using isotopes to determine crystallization ages and other geologic events	
30 September		
07 October	Transitioning from Source to Sink	Oct. 9: Exam 1 (W) Oct. 11: No class (F)
14 October	Exploring impacts of volcanic particulates (and anthropogenic pollutants) in the atmosphere	Oct. 14-15: No class or lab (MT)
21 October	Exploring impacts of volcanic gasses (and anthropogenic pollutants) in the atmosphere.	
28 October	Predicting the fate of volcanic ash (and other unstable materials) at Earth's surface	
04 November	Buying into economic incentives for living in volcanically active areas (agriculture).	Nov. 4: Fieldtrip to LaFarm (12:30 pm departure)
11 November	Buying into economic incentives for living in volcanically active areas (mineral resources)	
18 November		Nov. 18: Fieldtrip to Stirling Hill Mine (12:30 pm departure) Nov. 22: Exam 2 (F)
25 November	Thanksgiving	No class or lab this week
02 December	Wrap up	Dec. 6: Grant proposal due (F, 5 pm)
There is no final exam for Geology 321. Your reviews of three grant proposals are due at 5 pm on December 13th.		

Work Submission Deadlines:

- Reading reflections must be printed before the relevant class session and used in class. They will be submitted to Dr. Carley at the end of the relevant class session.
- Lab assignments and in-class activities with a take-home component (rare) will typically be due by Sunday at midnight. This includes:
    - Physical documents and self-assessment rubrics submitted to Dr. Carley's office;
    - Digital lab materials turned in via Moodle submission portal;
    - Extra credit seminar reflections via Moodle ~one week following the relevant event.
- Early work incentive: Earn a 5% bonus on labs+ submitted Friday by 5 pm (exceptions may apply).
- Late work will be accepted until graded work is returned to your classmates: 5% penalty if late on deadline day, plus an additional 25% penalty after that.
- Exams cannot be rescheduled (exception: unanimous class vote in favor of a change).

Work Return: You will be assigned a random 4 digit ID number to use on all of your notecards, self-assessment rubrics, etc. Respect the anonymity of the number. Graded work and exam scores will be placed in a folder, labeled with an anonymous ID #, outside Dr. Carley's office for you to pick up at your convenience. You can view and discuss your graded Exams 1 and 2 in a one-on-one meeting with Dr. Carley. In these meeting, you may earn back partial credit (up to 30% of points missed) by demonstrating improved understanding on previously-missed questions. Your Exam 1 meeting must take place before Exam 2; your Exam 2 meeting must happen before 5 pm on the last day of the semester.

Grade Communication: You are responsible for keeping track of your grades throughout the semester. You may inquire about your grade in office hours. Grades are non-negotiable.

Grading policy:

Exceeds expectations		Good, high-quality work			Sufficient; baseline expectations met			Room for improvement		
A	A-	B+	B	B-	C+	C	C-	D+	D	D-
94%	90%	87%	84%	80%	77%	74%	70%	67%	64%	60%
The provided numbers indicate the minimum score that must be earned for each corresponding letter grade. Grades are non-negotiable. Take advantage of extra credit!										

Extra Credit:

There are several regularly-available opportunities for extra credit in this class, such as early incentive bonuses for lab submission and point earn-back opportunities on exams 1 and 2. Separate from these opportunities, you may earn up to 5% extra credit towards your final grade. You can earn 0.25% toward your final grade by attending Brown Bag Seminars, signing the attendance sheet, and listening attentively. A short write up (2 pages, 1 inch margins, 1.5 spacing, size 12 font) can be turned in for up to 1% extra credit towards your final grade. The write up must contain: (1) a summary of the lecture; (2) an overview of issues you found particularly interesting; and (3) questions you have related to the content of the lecture. These will be accepted via Moodle, and are due by Sunday at midnight, the week following the event in question. If you are unable to regularly attend Brown Bag Seminars, you may petition to receive extra credit for attending other relevant campus or community events and submitting a write-up (same guidelines apply).