

A geologic exploration of New Zealand's dynamic landscape



Instructors

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Course Description

This course explores the incredible geology of New Zealand: A landscape straddling two tectonic plates with active volcanoes, seismicity, magnificent mountains, glaciers, high-energy braided rivers, and a landscape that is being shaped right before our eyes in real-time. On the North Island we'll see active volcanoes and geothermal features that rival Yellowstone. On the South Island we'll explore the Southern Alps: a terrane of highly deformed rocks, caves, glaciers, and high-energy braided rivers.

Course Objective

Develop a strong understanding of how natural and developed environments come together, focusing on geology, water, climate, and life.

Learning Outcomes

After taking this course, students will be able to:

- Explain the geologic and geomorphic characteristics of New Zealand, including the origin of the islands and the tectonic setting (NS1).
- Recognize and explain the seismic and volcanic hazards associated with an active tectonic setting and human endeavors to forecast, mitigate, and live with these hazards (NS1, NS2).
- Identify the geomorphic processes (glaciers, high energy braided rivers, mass-movements, coastal processes) that predominate in a particularly dynamic landscape and develop the ability to differentiate between a hyper- active geomorphic landscape such as New Zealand and "more normal" geomorphic landscapes (NS1).
- Explain the feedback and interaction between mountain systems and climate (NS2).
- Recognize and interpret landforms produced by different climatic, tectonic, and volcanic episodes and reconstruct recent earth history on the basis of relic landforms such as ash fall deposits, glacial moraines, fluvial and marine terraces, hanging valleys, and fossils (NS1).
- Use scientific data and the physics of climate change to disentangle glacial expansion and retreat driven by astronomical forcing versus human impacts on atmospheric chemistry and radiation balance (NS2).

**Lafayette
College
Mission**

In an environment that fosters the free exchange of ideas, Lafayette College seeks to nurture the inquiring mind and to integrate intellectual, social, and personal growth. The College strives to develop students' skills of critical thinking, verbal communication, and quantitative reasoning and their capacity for creative endeavor; it encourages students to examine the traditions of their own culture and those of others; to develop systems of values that include an understanding of personal, social, and professional responsibility; and to regard education as an indispensable, lifelong process.

**Lafayette
College
Statement
on Diversity**

Lafayette College is committed to creating a diverse community: one that is inclusive and responsive, and is supportive of each and all of its faculty, students, and staff. The College seeks to promote diversity in its many manifestations. These include but are not limited to race, ethnicity, socioeconomic status, gender, gender identity, sexual orientation, religion, disability, and place of origin. The College recognizes that we live in an increasingly interconnected, globalized world, and that students benefit from learning in educational and social contexts in which there are participants from all manner of backgrounds. The goal is to encourage students to consider diverse experiences and perspectives throughout their lives. All members of the College community share a responsibility for creating, maintaining, and developing a learning environment in which difference is valued, equity is sought, and inclusiveness is practiced.

**Learning
needs**

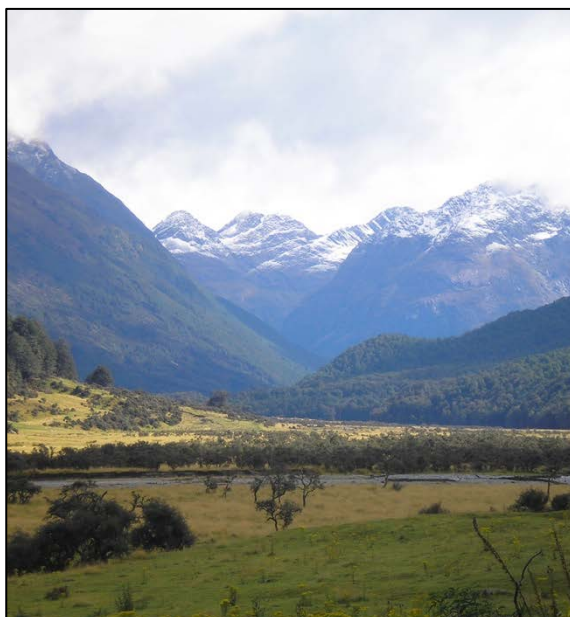
Lafayette is committed to providing support and reasonable accommodations for students with disabilities who self-identify with Accessibility Services. Students requesting accommodations to alleviate the impact of their disability should register their needs as soon as possible with the Accessibility Services Office, which is housed in the Academic Resource Hub (resourcehub@lafayette.edu). Once registered, students should request their accommodation letters to provide notification of their needs to their professors, on a semester by semester basis. Eligibility for, and provision of accommodations may be influenced by the changes to the academic environment that are necessitated by the COVID-19 pandemic. If you are in need of accommodations, or adjustments to your accommodation plan, it is your responsibility to contact Accessibility Services immediately to discuss your needs.

**Federal
Credit Hour
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. <http://registrar.lafayette.edu/additional-resources/cep-course-proposal/>

Academic Honesty

Integrity is of paramount importance and we 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 to the chair of Geology and Environmental Geosciences and to the Dean of Students.



	Ballance, P., 2017, New Zealand Geology: An Illustrated Guide: The Geological Society of New Zealand in Association with GNS Science, p. 377. (ch. 9: Taupo; ch. 19: Southern Alps). Cronin et al., 2021, The geological history and hazards of a long-lived stratovolcano, Mt. Taranaki, New Zealand, New Zealand Journal of Geology and Geophysics, 64:2-3, 456-478, DOI: 10.1080/00288306.2021.1895231.
Readings	Leonard et.al., 2021, Ruapehu and Tongariro stratovolcanoes: a review of current understanding, New Zealand Journal of Geology and Geophysics, 64:2-3, 389-420, DOI: 10.1080/00288306.2021.1909080. Ritter et al., 2011, Process Geomorphology: Waveland Press, p. 652, ISBN-13: 9781577666691 (ch. 6: Fluvial Processes; ch. 7: Fluvial Landforms). <i>Additional readings will be distributed with the course pack and/or linked on Moodle.</i>
Assessments	• Quizzes (10%) • Midterm exam in New Zealand (30%) • Final exam in New Zealand (30%) • Adopted feature field guide contributions and discussions (10%) • Class discussions, verbal engagement with reading questions (10%) • Maintaining an organized, detailed, field notebook with responses to discussion questions and data from field activities (10%)
Grading Policy	These numbers indicate the minimum score that must be earned for each corresponding letter grade. Grades are firm (no rounding!) and non-negotiable. • Excellent work: A (≥ 94%), A- (≥ 90%); • High-quality work: B+ (≥ 87%), B (≥ 84%), B- (≥ 80%); • Sufficient work: C+ (≥ 77%), C (≥ 74%), C- (≥ 70%); • Insufficient work: D+ (≥ 67%), D (≥ 64%), D- (≥ 60%); F (<60%).
Attendance Policy	Participation in all activities specific to this class is REQUIRED. This includes pre and post trip activities as well as all activities during the trip. Each activity missed will result in a direct 5% reduction in final grade.
Alcohol Policy	This policy is designed for the safety of individuals and the group. We will be at altitude most days and we will also be changing altitude frequently. Alcohol and altitude are a bad mix! If you are of legal drinking age in New Zealand, the professors will not prohibit you from having a single beer or a glass of wine with dinner at restaurants. Do not, under any circumstances, consume any hard liquor. Do not, under any circumstances, purchase take-away alcohol for consumption outside of restaurants. Alcohol is strictly forbidden in our vehicles and at all of our lodging locations. Violations of this policy will be taken seriously and will lead to consequences deemed appropriate by the professors (e.g., reduction of grade, exclusion from activities, removal from the course, etc.).
AI Policy	Students are not allowed to use advanced automated tools (artificial intelligence or machine learning tools such as ChatGPT or Dall-E 2) on assignments in this course. Each student is expected to complete each assignment without substantive assistance from others, including automated tools.

2025 DRAFT itinerary *all details are subject to change—watch and listen carefully for updates!*

International Flight Info:

- NZ 1 2JAN JFK – AUCKLAND 720P 725A (4JAN)
- NZ 558 23JAN CHRISTCHURCH – AUKLAND 400P 525P
- NZ 2 23JAN AUCKLAND - JFK 715P 500P

Day-by-day activity plan

- Dec 30: **North Island and South Island field guide contributions due as PDFs to Moodle no later than noon**
- Jan 02: **meet at JFK at 3:00 pm**, fly to Auckland;
- Jan. 04: arrive in Auckland, drive from Auckland to Waitomo: caves and wildlife;
- Jan. 05: drive from Waitomo to Taranaki: volcanic hazards, volcanic collapse, coastal processes, land use;
- Jan. 06: Taranaki: volcanic hazards, volcanic collapse, coastal processes, land use;
- Jan. 07: Taranaki: volcanic hazards, volcanic collapse, coastal processes, land use; (**expect a quiz before we leave Taranaki/New Plymouth**)
- Jan. 08: drive from Taranaki to Ruapehu: volcanic hazards, tectonics;
- Jan. 09: Ruapehu/Tongariro: volcanic hazards, tectonics;
- Jan. 10: Ruapehu/Tongariro: volcanic hazards, tectonics; (**expect a quiz before we leave Tongariro National Park**)
- Jan. 11: drive from Ruapehu to Rotorua via Taupo: volcanic hazards, tectonics;
- Jan. 12: Rotorua: geothermal features and alternative energy; Ruapehu to Christchurch;
- Jan. 13: Fly from Rotorua to Christchurch (**midterm exam and notebook assessment**);
- Jan. 14: Christchurch and the Banks Peninsula: volcanic hazards, tectonics, coastal processes, and marine life;
- Jan. 15: Christchurch: streams, rivers, deltas, and coastal processes; (**expect a quiz before we leave Christchurch**)
- Jan. 16: Drive from Christchurch to Franz Josef, visit Arthur's Pass: collisional tectonics, glacial geomorphology, braided rivers, karst;
- Jan. 17: Franz Josef: collisional tectonics, metamorphism, coastal geomorphology, glacial geomorphology
- Jan. 18: Franz Josef to Queenstown: glaciers, climate change, orogenic effects; (**expect a quiz before we leave Franz Josef**)
- Jan. 19: Queenstown: cultural day/free day;
- Jan. 20: Queenstown: glaciers, climate change, orogenic effects; to Mt. Cook: glaciers, climate change glacial geomorphology;
- Jan. 21: Drive from Queenstown to Mt. Cook: glaciers, climate change glacial geomorphology;
- Jan. 22: drive from Mt. Cook to Christchurch: reflections and wrap-up;
- Jan. 23: Fly from Christchurch to Auckland to JFK; individuals **disperse from JFK (final exam and notebook assessment)**.
- **Spring semester starts Jan. 27.**

Day-by-day logistics plan (lodging set, meal plans subject to some adaptability on-the-ground)

- Jan 02:
 - **meet at JFK at 3:00 pm**, fly to Auckland;
- Jan. 04:
 - At airport: use ATMs to get local currency; if planning to purchase NZ SIM card for phone, get now; eat breakfast.
 - Locations: drive from Auckland to Waitomo.
 - Lodging: Waitomo Chalets.
 - Meals: all meals are on your own today.
- Jan. 05-07:
 - Locations: drive from Waitomo to Taranaki (Jan 05), stay in New Plymouth Jan. 05-07.
 - Lodging: Egmont Eco Leisure Park in New Plymouth.
 - Meals: Group groceries for simple breakfast and picnic-style lunch provided; dinner on own.
- Jan. 08-10:
 - Locations: drive from Taranaki (Jan. 08) to Ruapehu, stay in Ruapehu Jan. 08-10.
 - Lodging: Forest and Bird field station in Whakapapa.
 - Meals: Group groceries for simple breakfast and picnic-style lunch provided; group dinner (preparing ourselves) Jan. 08, Group dinners at neighboring lodge Jan. 09-10.
- Jan. 11-12:
 - Locations: drive from Ruapehu to Rotorua (Jan. 11), stay in Rotorua Jan. 11-12.
 - Lodging: Rock Solid Backpackers in Rotorua.
 - Meals: Group groceries for simple breakfast and picnic-style lunch provided; dinner on own.
- Jan. 13-15:
 - Big transitions: Jan. 13, Fly from Rotorua to Christchurch (**midterm exam** and **notebook check**).
 - Lodging: Hotel Give in Christchurch.
 - Meals: all meals on your own.
- Jan. 16-17:
 - Location: Drive from Christchurch to Franz Josef (Jan. 16), stay in Franz Josef Jan. 16-17.
 - Lodging: Stay at Franz Josef Holiday Park in Franz Josef.
 - Meals: Group groceries for simple breakfast and picnic-style lunch provided; dinner on own.
- Jan. 18-20:
 - Location: Drive from Franz Josef to Queenstown (Jan. 18), stay in Queenstown Jan. 18-20.
 - Lodging: Stay at Pinewood Lodge in Queenstown.
 - Meals: All dinners on own, free-day all meals on own; academic days simple breakfast/lunch groceries provided.
- Jan. 21:
 - Location: Drive from Queenstown to Mt. Cook.
 - Lodging: High Country Lodge in Twizel.
 - Meals: Group groceries for simple breakfast and picnic-style lunch provided; dinner on own.
- Jan. 22:
 - Location: Drive from Twizel to Christchurch.
 - Lodging: Hotel Give in Christchurch.
 - Meals: Group groceries for simple breakfast and picnic-style lunch provided; dinner on own.
- Jan. 23:
 - Fly from Christchurch to Auckland to JFK; meals on own. Individuals **disperse from JFK (final exam and notebooks due)**.

Day-by-day readings and resources *all details are subject to change—watch and listen carefully for updates!*

Dates	Place	Textbook readings	Other readings & supplemental materials	Helpful resources
01/02	JFK→Auckland	Ballance (2017): Boxes 2.1-2.4, plate tectonics	"Earth has a hidden 8th continent;"	Student-generated field guide pages for the North Island
01/04	Waitomo	Ballance (2017): Boxes 2.7a/b, limestone	Glow worm materials	Minerals softer than glass, Sedimentary rock ID guide
01/05- 01/07	New Plymouth & Taranaki	Ballance (2017): Boxes 9.2a/b, andesitic volcanoes & cone collapse events Chapter 11, Taranaki, the basin and the volcano	Taranaki maps and diagrams	Minerals softer & harder than glass, Igneous rock ID guides
01/08	Taranaki → Tongariro	Ballance (2017): Chapter 10, Whanganui Basin	---	Minerals softer & harder than glass, Sedimentary rock ID guides
01/09- 01/10	Tongariro	Ballance (2017): Chapter 9, Taupo Volcanic Zone Focus: Southern Taupo Volcanic Zone, boxes 9.2-9.4	Tongariro maps, photos, and diagrams	Minerals softer & harder than glass, Igneous rock ID guides
01/11- 01/12	Rotorua	Ballance (2017): Chapter 9, Taupo Volcanic Zone Focus: Central and Northern Taupo Volcanic Zone	Oraeki Korako materials	Minerals softer & harder than glass, Igneous rock ID guides
01/13	Rotorua→Christchurch	---	---	Student-generated field guide pages for the South Island
01/14- 01/15	Christchurch	Ballance (2017): Chapter 15, Eastern South Island Boxes 7.2a/b, limestone; and 10.3, terrace landforms Ritter et al., (2011): Chapter 6, Fluvial Processes— <i>review for remainder of trip!</i> Chapter 7, Fluvial Landforms— <i>review for remainder of trip!</i>	Christchurch earthquake kills 185	Minerals softer & harder than glass, Sedimentary rock ID guide
01/16	Arthur's Pass	Ballance (2017): Chapter 19: The Alpine Fault and the Southern Alps Box 15.3: metamorphism	---	Minerals softer & harder than glass, Sedimentary and Metamorphic rock ID guides
01/17	Franz Josef	Review Balance (2017) chapter 19 Review Ritter et al., (2011) chapters 6 and 7	---	Minerals softer & harder than glass, Sedimentary and Metamorphic rock ID guides
01/18- 01/20	Queenstown			
01/21- 01/22	Twizel & Mt. Cook → Christchurch			
01/23	Christchurch→JFK			