



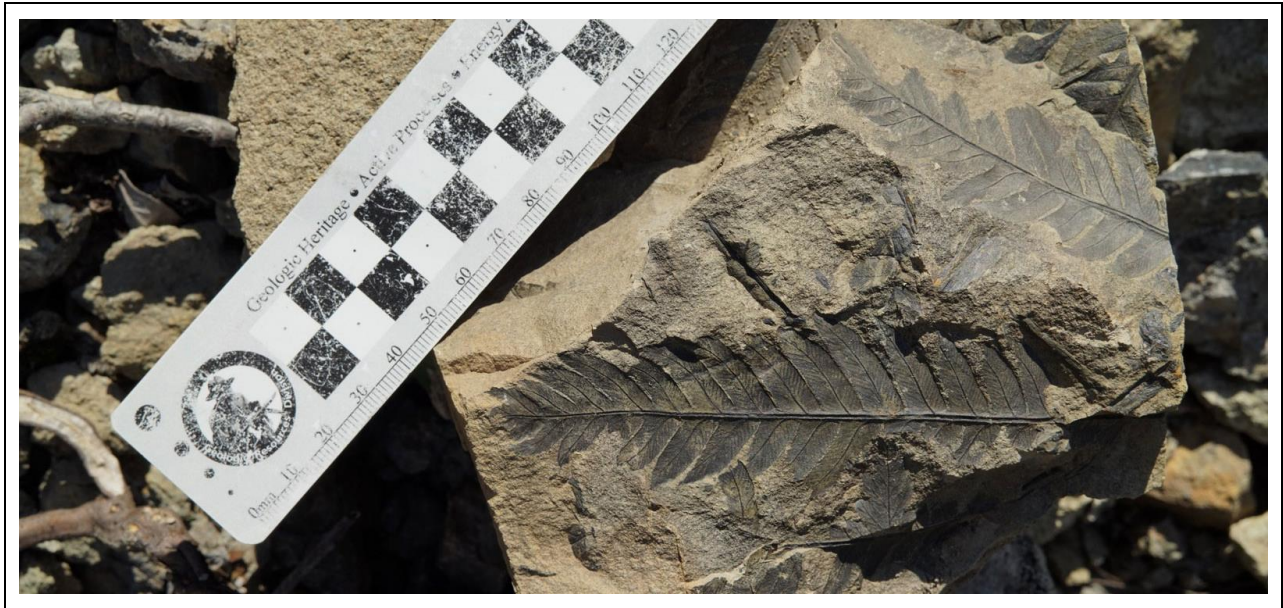
## PALEONTOLOGY OF THE LOST COAST OF ALASKA

*August 26 - 30 online, Sept 2 - 13 onsite*

**Academic Credits: 6 Semester Credit Units**

### FIELD SCHOOL DIRECTOR

**Paul C Murphey, PhD**



### OVERVIEW

Though Alaska today is commonly associated with snow and cold temperatures, Alaska's climate has varied over the millennia from tropical to arctic, creating habitats for a variety of land and sea life. Alaska has a rich fossil record of terrestrial and marine organisms spanning from the Precambrian to the Pleistocene. It is a geologically complex region, having been episodically inundated with shallow seas, subject to volcanic eruptions and the accretion of oceanic and continental tectonic plates, and witnessing everything from ice ages to tropical climates throughout its long history. Its diverse fossils include ancient stromatolites; beautifully preserved and diverse fossil plants; marine invertebrates such as ammonites, brachiopods, corals, and crabs; diverse vertebrates including fish, ichthyosaurs, dinosaur body fossils and footprints; and ice age mammals such as mammoths, camels, and short faced bears.

This program will explore The Lost Coast of Alaska, contributing to the understanding of the fossil record and geology of this area. The team will depart from Cordova on Prince William Sound, and then head south, stopping at Wingham Island with its trove of concretions; historic Kayak Island; Icy Bay with its

many glaciers; Malaspina Glacier (the largest piedmont glacier in the world), Yakutat, Lituya Bay, and finally Glacier Bay. The expedition will travel on board the *Endeavour*, a 72-foot US Coast Guard-designated research vessel with a professional captain and crew.

This program includes a week of online coursework and preparation with Dr Murphey and two weeks of field exploration and research onboard the *Endeavour*. The expedition team will fly into Cordova and depart from Gustavus, both airports served by Alaska Airlines. Note that this program is limited to 6 students.

Note that this program is limited to 6 students and will take place on board a research vessel, with tight quarters. Students and staff will share space on the ship and students will all share one bunk room for sleeping.

### ACADEMIC CREDIT UNITS & TRANSCRIPTS

**Credit Units:** Attending students will be awarded 6 semester credit through our academic partner, Connecticut College. Connecticut College is a highly ranked liberal arts institution with a deep commitment to undergraduate education. Students will receive a letter grade for attending this field school (see assessment, below). Students are encouraged to discuss the transferability of credit units with faculty and registrars at their home institution prior to attending this field school.

**Transcripts:** An official copy of transcripts will be mailed to the permanent address listed by students on their online application. One more transcript may be sent to the student's home institution at no cost. Additional transcripts may be ordered at any time through the [National Student Clearinghouse](#).

### PREREQUISITES

No previous coursework is required. However, this course will also benefit students who have previous experience in paleontology, geology, archaeology, and/or natural history in general.

### COURSE OBJECTIVES

The field area, as its name "The Lost Coast" implies, is located in a remote part of Alaska. With the exception of expeditions completed by the USGS decades ago and a 2021 expedition completed on the *Endeavour* by Dr. Murphey and colleagues in 2021, little is known about the fossil record in the area we will explore. Therefore, this program will make an important contribution to understanding the fossil record of The Lost Coast of Alaska. Our explorations will provide baseline data and fossil specimens that will guide future research efforts.

The goal of this field research program is to collect fossils and make observations that will verify and contribute to the accuracy of the geologic maps of the Lost Coast of Alaska. We will prospect and explore rocks of the Paleocene and Eocene Orca Group, the Eocene Tokun and Stillwater formations, the Oligocene and Miocene Redwood and Poul Creek formations, and the Oligocene Kulthieth Formation. We will also investigate Mesozoic rocks units to be determined as expedition planning continues. In addition to our own experiences and data collected during the 2021 expedition, we will be utilizing existing fossil locality data provided by the USGS and other agencies/institutions and geologic maps of the Lost Coast to prospect areas suitable for fossil preservation, verify geologic mapping, and document

fossil localities. This information will guide future efforts to explore high potential areas and develop research questions, especially those focused on Paleogene and Neogene depositional environments and paleoenvironments of the Lost Coast. The fossil record can be combined with sedimentologic, isotopic, geochronologic, and paleomagnetic data to provide a robust record of past environmental and climatic change as Dr. Murphey and colleagues are currently engaged in for Eocene rock units in Utah with funding from the National Science Foundation.

## **LEARNING OUTCOMES**

Students will gain a foundation of geologic and paleontological knowledge along with specific topics suited to the field locations and tasks we will perform during the field research portion of the program.

By the end of the program, students will be able to use the following tools and techniques:

- Reading topographic and geologic maps
- Fossil prospecting
- Fossil locality documentation
- Fossil collection and documentation (splitting concretions, surface collection, splitting shale, etc.)
- Use of Abney level, Brunton compass, and Silva compass to determine dip and strike and take bearings
- Geologic mapping and point collection using ESRI field maps
- UAS surveys and basic photogrammetry
- Taking field notes and maintaining a field journal

## **ASSESSMENT**

Students will be evaluated on their participation in group discussions and activities, as well as performance on assignments, including:

1. Students will record observations, questions and reflections in a field journal, which will be collected and reviewed periodically. This field journal will serve as a record of each student's evolving understanding of paleontology, geology and the natural history of the areas explored.
2. Students will also be expected to clean and prepare curatable fossils for transfer to the Alaska State Museum, including providing appropriate documentation, and will be evaluated on their participation.
3. Students will each make a presentation at the end of the expedition, describing and situating one or more of their findings in relation to the geology and natural history of the area. This presentation must include the use of maps, photographs and/or field sketches, basic research on fossils discovered, and/or measurements or other analyses.

## **COURSE SCHEDULE**

All IFR field schools begin with an orientation that addresses local and program protocols concerning student behavior, appropriate attire, local practices and sensibilities that may be unfamiliar, potential fauna and flora hazards, IFR harassment and discrimination policies, and the student Code of Conduct.

### Online Component

During the one-week online portion of the course, students will be expected to complete all readings and attend daily online lectures and discussions. A typical day during the online phase of the program

includes 20-40 pages of reading, preparation for class discussions, and participating in a 90-minute lecture and discussion online.

Lecture topics and required readings will cover:

- Introduction to Geology
- Historical Geology and Geologic Time
- Introduction to Paleontology
- Geologic History of Alaska
- History and Natural History of the Lost Coast

Online discussions will include:

- Previous paleontological work along the Lost Coast
- Types of fossils likely to be encountered
- Working with topographic and geologic maps
- Field notes and field data collection
- Discussion of assigned readings

### Field Research component

Students will fly to Cordova, Alaska and transfer to our research vessel, the *Endeavour*. Activities for the next two weeks will take place on the ship. Important note: As we are conducting field research, changing conditions, including weather, can dictate our exact schedule. We will follow the following schedule to the extent possible, but we must all be prepared for changes to the itinerary due to weather, unexpected findings, or other conditions.

### September 2

Orientation; safety onboard the research vessel, including safety drills; shared duties and responsibilities onboard; safety in the field.

Lecture: Lost Coast geology and paleontology. Using areal images to plan for fossil prospecting. Skills training: Using ESRI field maps to collect data and to visualize geologic mapping and the distribution of fossil localities.

### Sept 3 - 12

Exploring the geology, paleontology and natural history of Alaska's Lost Coast

Our days will begin early in the morning with observations and discussions on the *Endeavour*. We will use observation, maps and aerial imagery to plan our fossil prospecting. Students will receive training on the use of tools, maps and surveys and will have the opportunity to practice the use of various tools in the field, including:

- Abney level
- Brunton compass
- Silva compass
- ESRI Field Maps
- UAS surveys and basic photogrammetry
- Fossil collection techniques (splitting concretions, surface collection, splitting shale, etc.)

- Fossil locality documentation

We will use the Endeavour's shore boats to bring us to land for exploration. Students will be expected to document each day's exploration in their field journal. Exact locations for exploration will be determined by our study of the field maps, surveys, observations and weather conditions. We will make our way up the Lost Coast over the course of the two weeks.

Onboard lectures will include:

- Basic invertebrate paleontology and paleobotany (including lab exercise with example fossils)
- Basic vertebrate paleontology (including lab exercise with example fossils)
- Principles of sedimentology and stratigraphy
- Coastal and glacial geomorphology
- UAS photogrammetry
- Example Research Project 1: The Uinta Basin Project
- Example Research Project 2: High Resolution Surface Analysis at Dinosaur Ridge
- Introduction to mitigation paleontology

Students will participate in evening discussions on the Endeavour, reflecting on the day's work and relating required readings to our findings. Evening sessions will allow students to present their findings and allow the team to collectively discuss how our explorations can be applied to future work. Additional readings and resources will be available on the vessel.

### Sept 13, Gustavus

Student presentations

Our field work concludes with final discussions and a wrap up. Students will be taken to the airport, if desired.

## **REQUIRED READINGS**

PDF files of all mandatory readings will be provided to enrolled students. Students are encouraged to download and/or print readings prior to traveling. Course participants are expected to be prepared to engage the discussions led by facilitators, all of whom will be looking for compelling evidence that students have read and thought about the assigned readings prior to the scheduled day on which they are first discussed.

### **I. VIDEOS**

A. The Science of Geology:

[https://www.youtube.com/watch?v=fgnvKVzZZes&list=PLcl\\_IGDDt5A65hZDfQVPMEUzDRYYXWHoy](https://www.youtube.com/watch?v=fgnvKVzZZes&list=PLcl_IGDDt5A65hZDfQVPMEUzDRYYXWHoy)

B. A Brief History of Geologic Time: <https://ca.pbslearningmedia.org/resource/history-geologic-eons/history-geologic-eons/>

- C. Historical Geology: [https://www.youtube.com/watch?v=zBPypMM\\_R2M](https://www.youtube.com/watch?v=zBPypMM_R2M)
- D. Plate Tectonics:  
[https://www.youtube.com/watch?v=z58vSr\\_VTvk&list=PLcl\\_IGDDt5A65hZDfQVPMEUzDRYYXWHoy](https://www.youtube.com/watch?v=z58vSr_VTvk&list=PLcl_IGDDt5A65hZDfQVPMEUzDRYYXWHoy)
- E. Lecture 8 – Sedimentary Rocks, the Archives of Earth History Part I:  
<https://www.youtube.com/watch?v=6I7oqjD0Cx8>
- F. Geology 20 (Glaciers and Ice Sheets):  
<https://www.youtube.com/watch?v=6VkbOSKQP1A>
- G. Glacial depositional environments and stratigraphy (GEO GIRL):  
<https://www.youtube.com/watch?v=1wroG2YkLRo>
- H. PBS Documentaries (NOVA) (available on Amazon Prime)
- Episode 1: Ancient Earth: Birth of the Sky
  - Episode 2: Ancient Earth: Frozen
  - Episode 3: Ancient Earth: Life Rising
  - Episode 4: Ancient Earth: Inferno
  - Episode 5: Ancient Earth: Humans
- I. The History of Earth’s Moon: How a Disaster Created Life and the Moon:  
<https://www.youtube.com/watch?v=sSxZuEfsF6c>
- J. A Snowball Earth: How the Ice Age Nearly Wiped Out All of Life:  
<https://www.youtube.com/watch?v=xhVFZFm44SQ>
- K. The Volcanic Eruption that Wiped Out 95% of Life on Earth:  
<https://www.youtube.com/watch?v=gZsz39REQ2Q>
- L. Mesozoic Era – Geologic and Biological Evolution and Extinction of Dinosaurs (GEO GIRL): <https://www.youtube.com/watch?v=uO05x2PHyXk>
- M. How Dinosaur Footprints Survived 65 Million Years:  
<https://www.youtube.com/watch?v=S-idnQZNIzE>
- N. The Dinosaur Detectives of Real-Life Jurassic Parks (Martin Lockley – TED):  
<https://www.youtube.com/watch?v=JSiRpwZbZ7Q>
- O. The Mystery of the Eocene’s Lethal Lake:  
<https://www.youtube.com/watch?v=KNvRLVBKn-I>

- P. Paleocene-Eocene Thermal Maximum to Eocene-Oligocene cooling (GEO GIRL):  
<https://www.youtube.com/watch?v=Eq4Dx-JPBuE>
- Q. Greening of the Earth: Plant Evolution and the Fossil Record with Eric Fuselier:  
<https://www.youtube.com/watch?v=-RPhN6bVt3U>
- R. Geological maps – Reading layers in a landscape:  
[https://www.youtube.com/watch?v=rwPSNgX1QJ0&list=PLxvNbEa7Qws68JKh6DA\\_0h5b-dmM7j6qu](https://www.youtube.com/watch?v=rwPSNgX1QJ0&list=PLxvNbEa7Qws68JKh6DA_0h5b-dmM7j6qu)
- S. Geo-Files: Reading a geologic map: <https://www.youtube.com/watch?v=91u7BnfgdGc>
- T. Geologic Maps: depicting a 4<sup>th</sup> dimension:  
<https://www.youtube.com/watch?v=DoDPsfMUrxI>

## II. READINGS (will be provided to students in PDF format)

Abbe, C., 2022, The Geography and Geology of Alaska: A Summary of Existing Knowledge: Legare Street Press, 424 p.

Plafker, G., 1967, Geologic map of the Gulf of Alaska Tertiary Province, Alaska: U.S. Geological Survey Miscellaneous Investigations Map I-484. 1 sheet (scale 1:500,000).

Golder, F.A., 1925, Bering's Voyages: Volume II: Steller's journal of the sea voyage from Kamchatka to America and Return on the Second Expedition, 1741-1742: In: An Account of the Efforts of the Russians to Determine the Relation of Asia and America: American Geographical Society Research Series No. 2, 319 p.

Harriman, E.H., Merriam, C.H., 2022, Alaska: Geology and Paleontology: Legare Street Press, 320 p. (assigned readings will be provided in PDF format)

Hayes, M.O., Michel, J., Holmes, J.M., 2015, A Coast Beyond Compare: Coastal Geology and Ecology of Southern Alaska: Pandion Books, 350 p. (assigned readings will be provided in PDF format)

Stow, D.A.V., 2005, Sedimentary Rocks in the Field, a Colour Guide: Manson Publishing, 307 p. (available to students in PDF format)

Stowell, H.H., 2006, Geology of Southeast Alaska: Rock and Ice in Motion: University of Alaska Press, 152 p. (assigned readings will be provided in PDF)



## **PART II: TRAVEL, SAFETY & LOGISTICS**

### **NOTICE OF INHERENT RISK**

Traveling and conducting field research can involve risk. The IFR engages in intensive review of each field school location and programming prior to approval. Once a program is accepted, the IFR reviews each program annually to make sure it still complies with all our standards and policies, including those pertaining to student safety. Participants should also take every reasonable step to reduce risk while on IFR programs, including following the safety advice and guidelines of your program director, being alert to your surroundings and conditions, letting someone know where you will be at all times, and assessing your personal security.

The IFR does not provide trip or travel cancellation insurance. We strongly encourage participants to consider purchasing this insurance, as unexpected events may prevent your participation or cause the program to be canceled. Insurance is a relatively small cost to protect your educational investment in an IFR program. When comparing trip cancellation insurance policies, make sure the policy covers the cost of both airfare and tuition.

Please note that the schedule outlined in this syllabus can be disrupted by unforeseen circumstances, including weather, revisions by local permitting agencies, or conditions onsite. While this schedule represents the intentions of the program, adaptability is an intrinsic part of all field research, and necessary alterations to the schedule may happen at any time.

If you have any medical concerns, please consult with your doctor. For all other concerns, please consult with the program director and staff.

### **PROGRAM SPECIFIC FIELD CONDITIONS**

Alaska in September brings cool weather with rain on and off. Be prepared for changeable weather with appropriate clothing and footwear. We recommend bringing layers to maintain comfort, as it could be quite warm during the day and quite cool at night. Good footwear with grippy soles (textured rubber) to wear on the ship is very important, as the deck of the ship can get slippery. We will search for fossils in any weather. See the equipment section for recommendations. The ship will anchor in protected areas along the coast, though some rocking of the boat is to be expected at anchor and when underway.

This research program takes place online and aboard a research vessel. Personal space is limited, and participants will live collectively. A positive attitude, flexibility and openness to others are essential to a tight research crew. Students will share a bunk room on the ship and will have rotating duties, including meal preparation, cleaning and watch duties. There are spaces on the ship to study, eat, and relax, but students should be prepared for limited privacy.

We will have safety orientations onboard the ship, including how to move safely between the research vessel and shore boats, and from shore boats to land. We will be underway on the



water for the majority of the in person portion of the program. Students must always act with the safety of everyone on board in mind. This team approach to exploration is very rewarding, and can lead to lasting friendships, but it is not for everyone. If you have concerns about life on the ship, please talk with your program director.

### **ACTIVITY LEVEL**

Students should expect to walk and hike along the coast as we explore, which can include uneven and slippery surfaces, crossing streams and marshes, and climbing over downed trees and rocks. There will be a moderate amount of such physical activity daily. Students will move from the research vessel to shore boats to land frequently. Students will also move around the ship, which involves climbing stairs, and participate in shared duties such as food preparation, cleaning, and watch duties.

### **VISA REQUIREMENTS**

Visa is not required for US citizens.

### **STUDENT HEALTH**

An IFR field school is designed to provide safe, positive, and constructive experiences for participating communities, students, and researchers. We are committed to protocols and practices that support the health and well-being of all involved in our field school projects, including the members of the community in which these projects take place.

We recommend that students adopt best practices for arriving in a good state of health to protect themselves and their peers' readiness to set about the work of the field school. A thriving field camp environment is a constant exchange of energy, patience, effort, respect, and service. Arriving healthy is every student's first act of service — their first opportunity to behave in a way that respects the safety and wellness of one another.

### **TRAVEL (TO AND DURING THE PROGRAM)**

Natural disasters, political changes, weather conditions and various other factors may force the cancellation or alteration of a field school. IFR recommends students only purchase airline tickets that are fully refundable and consider travel insurance in case a program or travel plans must change for any reason. General information for this program is below, but keep in mind we will discuss any updated travel information during the program orientation.

Students should fly into Cordova, Alaska, arriving by 3 PM on Sept 2. Students will be met at the airport and brought to the research vessel Endeavour. Students will spend the next 11 days onboard the ship, transferring to shore boats to explore the coast. Students should plan to fly out of Gustavus, Alaska, departing no earlier than noon on Sept 13. Students will be transferred to the airport in Gustavus if desired.

If you missed your connection or your flight is delayed, please call, text or email your program director immediately. A local emergency mobile phone number will be provided to all enrolled students.

## ACCOMMODATIONS

Everyone lives aboard the *Endeavor* during the field research component of the program. The ship is 72 feet long with three bunk rooms and two heads, both with showers. The ship carries limited fresh water, therefore, students will be able to shower only every three days and will be able to do one load of laundry during the expedition. Students will all share one bunk room, accommodating 6 participants. Each student will have a drawer and space around their bed for storage, but space is limited on the ship and students are strongly encouraged to pack lightly (see the recommended packing list). There is a salon and galley for food preparation, and an open-air deck for observing, relaxing and group discussions. There is a small dog who shares the ship with us. You can learn more about the ship at: <https://www.alaskaendeavour.org/ship>.

Food is prepared in the ship's galley. Food will be purchased by the crew before departure. Students and crew will participate in food preparation on a pre-established rotation. Given the small size of the expedition, food can be purchased with student needs in mind. Vegetarian, gluten-free and vegan meals are all options we can accommodate. There is a refrigerator on board for fresh foods, though we will also buy foods that are shelf-stable to last throughout the two weeks on the boat. Students will also participate in regular cleaning of common areas on the ship. We will live and study closely together, which requires cooperation and collaboration among all onboard.

Wi-fi is available on the ship, though mobile phone service is not. Please explore options for making calls or texting on the web with your carrier. The ship has radios for emergency communications.

## EQUIPMENT LIST

1. 11 - 15" rubber/PVC boots or similar sturdy footwear.

We recommend 11-15" high rubber boots from Xtratuf, Grunden or similar. Lower, leather hiking boots will get wet and stay wet. Wool hiking socks are a good choice to pair with your boots. Please break the boots in before attending the field study portion of the program. These boots will be worn daily during the expedition.

2. Waterproof jacket and pants.

Please make sure these are waterproof and not just water repellent. Jackets that have ventilation (such as "pit zips") will allow you to regulate your body temperature better than those without. Jackets should have hoods. Rain pants are worn over other pants or long johns. Examples of good rain gear:

<https://www.rei.com/product/227570/rei-co-op-rainier-rain-jacket-mens>

<https://www.rei.com/product/227614/rei-co-op-rainier-rain-jacket-womens>

<https://www.rei.com/product/227615/rei-co-op-rainier-rain-pants-womens>

<https://www.rei.com/product/227731/rei-co-op-rainier-rain-pants-mens>

3. Digital camera with GPS encoding (cell phone with good camera resolution is fine)
4. Rite in the Rain All-Weather Geological Field Notebook  
[https://www.amazon.com/gp/product/B0011DGJSC/ref=ewc\\_pr\\_img\\_1?smid=ATVPDKIKXODER&pvc=1](https://www.amazon.com/gp/product/B0011DGJSC/ref=ewc_pr_img_1?smid=ATVPDKIKXODER&pvc=1).

### **RECOMMENDED PACKING LIST**

Due to limited space on board the ship, students are encouraged to pack lightly and bring quick drying clothing. Cotton dries slowly, so heavy cotton fabrics, such as denim, should be avoided. Bring clothing that you can layer so you will be able to regulate your body temperature as the weather changes.

- 3-4 Short sleeve T-shirts
- 2-3 Long sleeve shirts/layers that can be worn over T-shirts. Consider a warmer layer, such as a fleece jacket or thermal top as one of your choices.
- 2-3 pairs of long pants. Nylon or other quick dry fabrics are good choices.
- Leggings or long johns.
- 6 days worth of underwear and socks.
- If you get cold easily, bring a thermal layer, such as long underwear.
- A pair of sneakers or boat shoes.
- Modest pajamas or loungewear.
- Polarized sunglasses.
- Toiletries (the ship has soap and shampoo).
- Prescription medication - bring enough for the whole voyage.
- Day pack (bring a waterproof cover or sufficient zip top plastic bags to protect your gear).

Pack in a duffle bag, not a hard sided suitcase.

**Note:** the Ship will provide:

- Bedding
- Pillow
- Towels
- Soap and shampoo
- Sunscreen
- Fishing gear