IN THE FIELD

This guide is designed to introduce what to expect, how to prepare, and how to stay safe in the field. Inside this guide, there are a few suggested resources. Use only those resources that are relevant to you and will help you to make progress on the goals you have set.

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Why fieldwork?

Fieldwork and field trips are a valuable part of the Earth and space sciences, especially as a part of geoscience education for both undergraduate and graduate studies. Fieldwork provides the opportunity to apply knowledge beyond the classroom, develop critical thinking and collaborate.

Fieldwork can be a very intensive learning experience, often involving a lot of work in a short period of time. However, it is incredibly rewarding, as it provides an opportunity to get out of the lecture hall and into hands-on work. Here is where you get to know your peers and your mentor/instructor in a much different context.

Your field experience can vary dramatically depending on its scientific objectives and the site location. For instance, you may conduct fieldwork in very remote places or in cities, at sea or in the mountains, in the summer or winter, in-person or remotely. The key to fieldwork is to be adaptable and to work with your mentor to make sure you are on the same page and understand your wants and needs for the field experience. In the field, you may contribute to:

See a list of discussion prompts for you to think about and discuss with your mentor or advisor in our Fieldwork Discussion Guide.

- The production of a field notebook with detailed notes, observations, interpretations, sketches and diagrams with detailed notes, observations, interpretations, sketches, and diagrams
- Hand-drawn or digitally archived field maps of a particular area
- A field report (produced afterward) that uses your field photographs and summarizes your interpretations, which may integrate scientific literature about the field area

You are about to embark on a truly different experience from what the classroom can offer. You are likely flooded with different emotions including *anticipation and excitement* about a unique and different

opportunity, but you also may have some *anxiety* and *fear* about the unknown. Know that this is normal! Despite possible conflicting emotions, focus on what you hope to learn while you are out in the field, and try to have specific goals in mind. Learn more about geoscience fieldwork in this article on field-based learning by the Science Education Resource Center (SERC), or read more about being flexible in the field in this *Nature Reviews Earth & Environment* article.

Safety in the field

Safety first! Always remember that fieldwork is potentially hazardous: Often the places that provide the best exposure for outcrops are inherently dangerous like cliffs or roadsides. Research the location where your fieldwork will take place, listen to your mentor or group advisor and know that they will likely have the best information to keep you safe in your surroundings and don't forget to advocate for your needs and safety. Below are some safety guides and resources on how to approach safety in the field. It is good to review these resources before entering the field so you can address any questions or concerns beforehand.

1. "Playing It Safe in Field Science," *Eos*, May 2022
2. Implementing Effective Field Camp Policies and Procedures, AGU/American Geosciences Institute (AGI) Heads and Chairs webinar
3. Safety (10 pages), *GEO REU Handbook: A Guide for Running Inclusive and Engaging Geoscience Research Internship Programs* (1st ed.), http://dx.doi.org/10.5065/ycba-qw42
4. REU Safety: In Your Program and in Your Field (54:00), NCAR & UCAR Science Education (In this video, an excellent panel of experts discuss various safety practices when in the field.)

Ethical behavior in the field

Often not included in the top safety advice, but critically important, is creating an inclusive and welcoming environment to conduct your fieldwork study. This includes not only feeling safe when asking questions or leading the research of you and your peers, but also creating a welcoming environment for anyone, no matter their gender, sex, abilities or beliefs. An inclusive field course should understand the needs and the strengths on both an individual and a group level. It should provide appropriate support, considerations and accommodations. It should build positive and supportive relationships among all who are involved.

Here are a few resources that touch on how to make sure you are acting inclusively for everyone in your group:

1. Preventing Bullying and Harassment in the Field, AGI Webinars
2. Field Trips for All: Accessibility and Inclusivity for Students with Disabilities, AGI Webinars
3. "Ten Steps to Protect BIPOC Scholars in the Field," *Eos*, November 2020
4. "To Support LGBTQ+ Researchers Doing Fieldwork, 'an Eye Toward Safety' Is Key," *Science*, February 2023
5. Women on Arctic Fieldwork, APECS Webinars, November 2021

Story Highlight

As some of the above resources attest, gender equality, sexual or racial comments and harassment in the workplace can happen. In the 11-minute video "Hazards of Fieldwork While Black," scientist Josh Anadu speaks from the heart about his experience of racism in the field at his job. The video's content is difficult and emotional, but it is on an important topic that needs to be recognized and addressed.

How can we sample more ethically?

The Earth and space sciences are based on measurements made in the field. Considering the ethics of visiting and sampling in a location is important when going into the field. This *Eos* Editors' Highlights discusses going beyond legal permitting requirements to engagement of Indigenous expertise and respect of peoples' relationship to place. Along the same lines, Ryan-Davis and Scalice [2022] summarizes three main take aways to ensure that we sample more ethically in the geosciences. In this paper the authors recognize that cocreating guidelines and practices with Indigenous partnership and expertise are essential to geoethics and equity. They suggest the following:

- Valuing Indigenous expertise and knowledge will expand geoethics and improve fieldwork practices
- Geoscience curriculum and review processes can explicitly include legal and ethical protocols that uphold Indigenous rights
- Archiving samples reliably, sharing sample collections and asking, *Is this sample necessary to collect?* will help to minimize oversampling

This Discover article discusses how what you do in the field can impact far more than just your dataset.

Remember to continue to be responsible, respectful and ethical when it comes to fieldwork.

Skills gained through fieldwork

What excites you most about the field opportunity? What specific topics, brought up in discussion with your mentor and the scientific objectives of the field experience, are fascinating to you? Think about your career goals too. Will fieldwork help bring an area of interest to life in a way that could help solidify your career interests, whether in this particular subject or another?

The skills you gain in the field can be invaluable in any career. Keep note of what you accomplish in the field, and you'll be able to draw on those experiences for your resume, interviews and more. Here are a few examples on how you can write about fieldwork on your resume to highlight some popular soft skills:

See what SERC has to say about the benefits of geoscience fieldwork.

- **Data analysis:** Fieldwork often requires a data analytics component, which can provide invaluable experience for jobs within and outside of the Earth and space sciences. You may be expected to analyze your observations and synthesize conclusions from your data. Be prepared to discuss the tools and methodologies you used in your fieldwork to collect and analyze data, as well as how your experience has strengthened your research and analytics skills.
- **Problem-solving and adaptability:** Because fieldwork is conducted outdoors, you will be unable to control a lot about the experiment and trip. The weather conditions may become unfavorable, you may encounter hazards getting to your study site, something may go wrong with your equipment...the possibilities are endless. A large part of successful fieldwork is being able to adapt to unexpected circumstances and think on your feet. You may identify solutions to obstacles or adapt experimental methods to be successful despite unforeseen circumstances.

- **Communication skills:** Fieldwork involves communicating before, during and after the excursion. Before the trip, you'll likely coordinate and communicate on the where, when and hows of the project. While you're in the field, your team will have to collaborate, and you'll need to communicate your observations and findings accurately. After the excursion, you'll often be expected to present findings and may need to learn how to communicate to a variety of audiences and author scientific papers if there is a report or paper component to your project.
- **Teamwork:** You will often work with a group of peers and one or more project leaders in the field. You may learn how to effectively communicate on a team, divide labor and resolve conflict. Use words like *collaborated* and *supported* to discuss actions and accomplishments made as a team during your fieldwork.

- **Attention to detail:** A key component of fieldwork is attention to detail, which is part of the reason you'll likely be expected to keep a field journal of your observations. You'll keep meticulous records and collect and interpret detailed data. You may also want to discuss taking measurements and ensuring their accuracy and precision.
- **Project management:** Fieldwork is, at its heart, project work! It takes a lot of planning and preparation, carrying out multiple tasks alongside others, and often compiling findings into polished presentations or reports. You can discuss how you planned and implemented your project from beginning to end—and don't forget to list the results of your hard work!

Additional resources

Gaming-Based Virtual Field Trips

Students can gain so much value from field trips incorporated into their geoscience education, but not everyone is able to participate. If you are or have students who cannot participate in field trips, consider embarking on a game-based virtual field trip, such as this one to the Whaleback anticline. In this way, you or your students can participate and learn from the context of the field.

Into the Great Unknown

Read some exciting stories from the field in this issue of *Eos*, to take a deep dive into some of today's most interesting geoscience research projects and how their participants handle work "out of the office."

Community of Inclusion

Improving access and inclusion for everyone starts by working together as a community. The International Association for Geoscience Diversity fosters a geoscience community dedicated to advancing inclusion efforts and access for people with disabilities in the geosciences. It provides a variety of resources and support for students and professionals. Check out its annual accessible geology field trips to see how it makes fieldwork equitable and inclusive.

Fieldwork is for everyone, but we have work to do to make it so. The project looks to tackle the topics of developing equity and inclusion in fieldwork and promoting a sense of belonging in geoscience. Participate in their community of practice of undergraduate field educators and/or view their discussion series for insights on belonging in field education.

CIMER Resources on Mentoring

The Center for the Improvement of Mentored Experiences in Research (CIMER) offers a variety of resources on best practices when in mentoring relationships specific to field or topic of study. "Mentorship Education for Field Geology," available in this CIMER resource offers a comprehensive, research-based mentor training module for mentors of field geologists. It addresses various topics such as addressing equity and inclusion, aligning expectations and cultivating ethical behavior.