

GUIDELINES FOR INDEPENDENT STUDY PROJECTS

Department of Earth, Environmental and Planetary Sciences Brown University 2020-2021

Introduction

GEOL1970 (Individual Study of Geologic Problems) provides an opportunity for you to experience what research in our discipline actually entails:

- to learn how to ask a well-defined, significant, and answerable question;
- to learn appropriate methods and collect your own data;
- to interpret your results and address their broader implications.

These goals are best fulfilled by hands-on experience; they cannot be learned passively in the classroom or by reading about other people's research results. A second and related goal is for you to take primary responsibility for your learning, including the necessary planning and time management.

This course provides an integrative "capstone" experience, which will allow you to get to know some professors, staff and grad students better than possible in typical academic courses, help you to decide whether (or not) to consider grad school and a career involving research, and provide you with skills (and a finished project) useful for job seeking.

Although GEOL 1970 is only required for ScB concentrators, AB students are strongly encouraged to take it; all that is required is the agreement of a faculty member to serve as the advisor. AB concentrators who wish to graduate with Honors (see separate document) must take 1970.

Choosing a topic and advisor:

Most students choose to work on an aspect of a professor's research project. There are several advantages to such a choice. Because the overall questions and methods are already reasonably well defined, it is easier to make significant progress over the course of one or two semesters. In addition, there are usually other people (undergrads, grad students, post docs) working on related aspects of the question, making for a supportive and enjoyable working environment.

How should you choose what area (or professor) for your 1970?

- If you have been working in a professor's lab during the year, or a previous summer, and now would like to dig deeper and actually do some research of your own, talk to the professor as early as possible, but no later than late spring of your junior year, and ask them to outline one or two possible research projects you could take on.
- If you have no previous research experience, you can look at faculty research web pages, talk to your concentration advisor, talk to current seniors, scan the complete list of thesis titles for each professor (on the department webpage and in GC028), and look

through some of the collected bound theses in GC028. Then make appointments to talk to one or two faculty members, and ask them to outline one or two research projects, and to suggest relevant papers to read as background.

- Most DEEPS concentrators do their research with a faculty member in this department. However, it is possible to work with a faculty member in another closely related department, such as EEB, or at a nearby or affiliated institution such as WHOI or MBL. If you wish to explore this option, talk to your concentration advisor. You will need to identify a faculty member in our department as co-advisor, and you should plan to stay in close touch with your co-advisor throughout your research. This faculty member will also read your thesis and (in consultation with your main advisor) assign the grade.
- Quite a few students begin research over the summer before senior year, and continue working on that project during the following year. It might be possible to continue summer research you do on an REU (elsewhere), as long as you identify a faculty member here to serve as advisor and do some of the actual research here, not just write up your summer work.
- It is possible to undertake a different kind of independent study. For example, if you have a strong interest and some experience in teaching, you might develop some teaching modules and/or models for a specific audience; Dan Bisaccio in EDUC is a valuable resource in this area. Or if you are interested (and somewhat experienced) in science communication, you might develop a virtual geology field trip, or geo-themed video/podcasts (similar to SciToons or Creature Casts). Or if you are interested in relating geoscience to a social or environmental issue, perhaps involving a co-advisor in a different department, that could be serve as a capstone project. Note that these are non-trivial undertakings; talk to your concentration advisor well in advance.

Procedures:

- For ScB students, the research for your 1970 course may have been initiated over the previous summer (or during a semester abroad), but it must be continued, and written up, during a semester here. AB students may choose to use a 1970 course to write a thesis based mostly on research completed during the previous summer.
- You should plan to spend as much time every week on your 1970 course as you would on your most demanding upper level science courses, normally 12-15 hrs/week. Because research seldom goes exactly as planned, you should always have back-up work you can accomplish if faced with temporary equipment failure, etc.
- The independent study project should result in a written paper following the format and style of regular scientific journals, by the end of the semester (date to be approved by the faculty advisor). The writing of a scientific paper is an integral part of doing the research; in the process of writing, you may discover gaps in the data or completely new connections. It is crucial to allow enough time to turn in a draft of the paper, have the faculty advisor read and comment on it, and then prepare a revised version.

- Many students choose to take two semesters of 1970, to be able to complete a more in-depth project. In such cases it is important to have an agreement in advance with your faculty advisor about what should be accomplished (and turned in) at the end of the first semester. (Note: obviously it is not OK to take a second semester of 1970 because you did not devote enough time to the project during the first semester.) Two semesters of 1970 is expected for Honors in the concentration. Please see the separate document on Honors for Honors-related deadlines.

- If you want to complete your 1970 in a single semester, it is highly desirable to take it in fall semester (for May graduates). That way you have January break to finish writing, if necessary, and you will get to know a faculty member well in time for them to write you a detailed letter of recommendation that winter for grad schools or jobs. Make sure to talk to your faculty advisor to ensure that your project is sufficiently focused and well-defined that it will be possible to finish in one semester. Also make sure to stay in close touch with your advisor throughout the semester.

RULES:

- **Students should identify a topic and faculty advisor prior to the semester in which they propose to do the research.** Professors may have limited lab space or time for undergrad thesis advising, and they need to plan in advance

- **Early in the semester in which you are taking 1970, by the last day for drop/add, you must submit to your faculty advisor and your concentration advisor a one to two page (typed) proposal defining the research question, the approach (methods), the scope of the results to be obtained (e.g. how many samples analyzed, how many models run, etc.), and a rough time table (including one semester or two).** The faculty advisor may wish to suggest changes in the scope or the approach, which will result in a new draft to which both the student and faculty agree.

- **In consultation with your faculty advisor, develop a plan for the frequency and nature of your meetings during the semester (one regularly scheduled meeting per week is strongly advised), deadlines for timely completion of various portions of the work, and the nature of the final written report.**

Advice:

- Before you leave campus the spring of your junior year, talk to several faculty, and come to an agreement with one. That way you can get started on your research, or at least some background reading, over the summer. Also talk to seniors, to get helpful advice about general strategies, and attend some of their thesis presentations.

- If you will be studying abroad in spring semester of your junior year, make sure to talk to your concentration advisor about an independent study project before you go.
- In consultation with your thesis advisor, make out a weekly “assignment” sheet for yourself at the beginning of the semester, and stick to it (or keep revising it as you learn what is realistic and feasible). Work backward from the absolute deadlines at the end of the semester (or academic year), allowing adequate time for writing and revision; you will be surprised at how little time is actually available for data gathering.
- Some projects may involve expenses for travel or supplies that are not covered by the advisor’s research grant. In such cases you can obtain modest funds from the department (generally <\$500); consult your concentration advisor.
- We strongly recommend that everyone who completes a 1970 course should schedule a time to present the results of their work to the department, friends, and family. Consult with your faculty advisor and concentration advisor to identify a good date, time and room. In addition, we request that you provide one bound copy of your thesis to the department, to join the collection in GC028.

Final thoughts:

Completing an independent research project can be one of the most challenging but ultimately satisfying experiences of your Brown career. At times you may be frustrated by equipment malfunctions and impatient with the pace of data collection, but when you have new results of your very own that you can interpret and relate to theories, models, predictions, or previous results – that is truly exciting!

AB as well as ScB alums report that completing a thesis proved to be enormously useful. It provides experience with real-world (messy) data sets that are highly relevant for real-world jobs, and with the nature of cutting-edge research questions that will help you to decide about pursuing graduate education.

Many seniors have the opportunity to present their research results in a poster or talk at a regional or national meeting (e.g. the American Geophysical Union meeting in December, the LPSC in mid-March, or the NE section of the Geological Society of America in late March). The experience of having practicing geoscientists show interest in your results, plus the opportunity to hear talks and see posters on a wide variety of current research areas in the geosciences, can be enormously rewarding as well as useful for making contacts with potential grad school advisors and/or employers.

Note that even if you decide that you do not really enjoy hands-on research, it is not at all wasted time; that is a very useful discovery.

Geoscience is by nature very interdisciplinary – with other sciences but also with other fields involving societally important topics such as water quality and quantity, river and coastal flooding, soil quality and erosion, natural hazards. All of these areas have enormous implications for sustainability, and thus a senior capstone project that addresses some of these links could be satisfying as well as useful in helping you to think about post-grad possibilities.