

Geology Senior Thesis Guidelines (2015-2016)

The senior thesis experience is a great opportunity for you to pull together several aspects of geology that you have learned throughout your time at Pomona College. This graduation requirement is your opportunity to develop, implement and complete a significant research project of your own design. Your senior thesis is a body of work that reflects both your existing geological knowledge and your abilities to develop and complete an independent research project. Geology senior thesis research may include field-based projects, laboratory-based experimental projects, numerical modeling of geologic phenomena and literature reviews. In each of these different types of theses, independent *critical analysis* of the data collected or reviewed is an important significant component.

Successful independent research involves several steps. With guidance from your advisor you will identify a scientific question, design a strategy to address that question, implement your strategy (with modifications as needed), analyze your results, and present your results to the Geology Department both in written form and via public presentations of your work.

A few details:

Readers: Each senior thesis will be read by at least two Pomona College Geology faculty members: your primary advisor (chosen by you in consultation with the faculty) and a second faculty reader (chosen by the Geology faculty). Your first reader is your science advisor; your second reader can ensure that your finished product is understandable to someone not intimately associated with the project.

Deadlines: Throughout your senior year, there will be several thesis project deadlines¹ for you to meet; these are described in the following pages. These have been established to ensure that you continue to make forward progress on your thesis project throughout the year. As with any professional endeavor, these deadlines are fixed - you should plan your time accordingly. However, we recognize that sometimes the unexpected happens and a deadline cannot be met. You get one freebie - you can submit up to one week late the proposal, progress report, Introduction/Methods/References sections, or final revised thesis without penalty! (NOTE: you may NOT use this freebie for submitting the first version of your thesis - the deadline for that is firm).

Submissions: You will submit portions of your thesis in both electronic and physical forms. Electronic submissions must be a single file (text, figures, and tables in one file) with the file name including both your last name and the type of submission (e.g., Reinen_Proposal.pdf). Multiple files for a single submission are not appropriate. Please follow the directions in the attached guidelines to ensure that you submit the correct form of file (e.g., .pdf, .ppt). Electronic submissions (e.g. .pdf files, PowerPoint files) should be placed in the **Assignments folder** in our folder on Sakai (**GEOL192**). Please turn in all physical reports, theses, etc. to Lori Keala in the Geology Department office (room 232). Lori will then distribute these to your advisor(s). Don't wait for the last minute – give yourself extra time to accommodate any problems that may occur with printing large files or with electronic submissions.

¹ The deadlines described here are the minimum deadlines set by the department that you must meet. You and your advisor are strongly encouraged to set up additional deadlines for your thesis work.

Grading: Several factors contribute to the final grade for your senior thesis exercise, including how successful you are in completing each stage of your project, your ability to meet deadlines, your participation in departmental senior thesis meetings, the sophistication of your data analysis, and your research presentations. Your written work will be evaluated according to the rubric on the last page of this handout.

Registration: all students working on Senior theses need to register for Geology 192 in both the fall and spring semesters. Scripps College students need to take the Scripps College senior thesis/project registration form to the Scripps Dean of Faculty office (Vice-President and Dean of Faculty Amy Marcus-Newhall in 2013) and request to have 2 off-campus readers, both from the Pomona College Geology Department. These readers should be your primary advisor and your second reader. If your second reader has not yet been identified, please indicate either the Geology Senior Thesis director (the professor of record for Geology 192) or the Geology Department Chair as the second reader on the Scripps College registration form. Scripps College students will also need a designated Scripps College thesis reader of their choosing.

Resources: Several resources are available to help you with different aspects of your thesis project. These include, but are not limited to:

The **Writing Center** (ground floor of Smith Campus Center across from the Living Room) offers students free, one-on-one consultations at any stage of the writing process — from generating a thesis and structuring an argument to fine-tuning a draft. We also work with students on all aspects of oral presentations. The Writing Fellows — Pomona students majoring in subjects including Economics, Computer Science, English, and History — will work with you on an assignment from any discipline. Consultations are available by appointment, which you can make online: <http://writing.pomona.edu>. The Writing Center also offers drop-in hours.

The **Quantitative Skills Center** (Pearsons 001) is a learning center dedicated to supporting quantitative skill development for Pomona students. They offer free group and individual study sessions facilitated by QSC Fellows. The QSC offers a number of course-specific study sessions, but you can also meet with a Fellow to review specific topics (for example: exponential and logarithmic functions, single and multivariate equations, balancing chemical equations, basic statistical analyses, etc.). To find out more details and sign up for a study session, visit www.pomona.edu/qsc.

As always, we encourage you to talk with the faculty and your fellow students in the Geology Department – we're happy to help!

Senior Thesis Schedule of “Events”:

Fall Semester, 2015

- 1) **Wednesday, 9/9, 4pm** - In this first meeting, all Geology seniors and faculty gather in room 136 to discuss the special demands and activities of the senior year. Topics discussed in this meeting include:
 - a) Elucidating the finer points and answering questions regarding the senior thesis,
 - b) Discussing graduate school application procedures and requesting letters of recommendation, both for grad schools and jobs,
 - c) Discussing job searches.

- 2) **Monday 9/21, 5 p.m.** - Submit² a digital one to two page proposal for your thesis project. You should work in consultation with your primary advisor to ensure that you present a well-defined project of sufficient depth (yet still manageable) to comprise a significant, new piece of work. Library theses will require an in-depth *critical analysis* of the literature, not just a book report/review of the literature. This document must be typed and grammatically correct. Your proposal should include:
 - a) The title of your proposed thesis,
 - b) A description of the objectives of your thesis project (i.e. what is the scientific question/hypothesis?),
 - c) A description of the significance of this project (i.e. what is the significance of your scientific question?),
 - d) How you intend to accomplish these objectives (include a description of what you have done, to date, to accomplish these objectives),
 - e) A list of funding supporting, or anticipated to be required to support, any aspect of your project (e.g. Keck Geology Consortium, Sigma Xi, Pomona SURP, etc.).

The geology faculty will review all proposals and your primary advisor will return it to you with comments within a week. Students are commonly asked to revise and resubmit proposals to ensure that you have a well-defined and articulated proposal. A well-defined project proposal is the first step toward proceeding with your project successfully. You may modify your goals (or append new ones) as new results develop in your research.

- 3) **Monday, 9/28, 5 p.m.** – Turn in a PowerPoint file with a single slide for your project. This is intended to go on the Geology department web page. Your slide should include your working title, your name, what you are doing, and your primary question (and acknowledge funding sources). It should also include some graphic to fire the imagination (a photo from your field area, a map, a graph, etc.). If you do include a graphic and it is not your original work, you must cite the source of your graphic. Include an acknowledgment of any funding received in support of your thesis work. See the senior thesis research page from the Pomona

² This is a single .pdf file, entitled something like LastName_Proposal.pdf (e.g., Reinen_Proposal.pdf). This should be typed, 11 pt font, 1.5 line-spacing, with 1” margins.

Geology web site for examples of these files. Your file should be called something obvious (e.g. LastName_Slide).

- 4) Friday, 10/30, 5 p.m.** – Submit³ a digital 2 page progress report on your thesis. Specify what you have done with your research to date, what you have learned from the research, and what you intend yet to do. Attach a complete list of references for your project, using the format in the journal *Geology* (you may continue to add references as your project progresses). Attach preliminary maps, graphs, cross-sections, data tables, etc.⁴ Describe any significant problems that have arisen, and how you are addressing them. If the focus of the research has changed owing to unforeseen difficulties or new discoveries, please specify these changes and how you intend to pursue your new goals.

In addition to evaluating formally the progress that you've made on your project, we will also informally evaluate:

- a) Mechanics of the paper (grammar, spelling, etc.),
- b) Flow of the paper (inter- and intra-paragraph),
- c) Content (accuracy and logic of the scientific argument or critical analysis, etc.),
- d) Sophistication of the scientific argument/critical analysis (analysis beyond a mere presentation of the “facts”),
- e) Adherence to guidelines (proper reference style, etc.).

These are things we will be evaluating formally in all subsequent written submittals. Your faculty advisor will review your progress report and return it to you with comments (written and oral) within a week.

- 5) Tuesday and Thursday, 11/10 and 11/12 (11:00-12:15) dates/times may change.** – Public presentations of senior research projects and progress; all Geology seniors are required to attend. Each senior must come prepared to give a ~12 minute presentation on his/her thesis work. PowerPoint may be used (but the file must be given to the Geology Technician at least 30 minutes prior to the start of the meeting), maps and rock samples may be shown, etc. This presentation should include: your science question/hypothesis, its relevance, your methods to address the question, and your progress to-date. Presentations should essentially duplicate what is embodied in the progress reports submitted earlier. *Please keep to your time limit to ensure that everyone has time to present.* This meeting will be open to the public.
- 6) Wednesday, 11/25, 3 p.m.**- Submit⁵ a digital copy of the Introduction, Methods, and References sections of your thesis, as well as a detailed outline of the remaining sections of your thesis. These should be professional presentations of what you feel is the best work you

³ This is a single .pdf file, entitled something like LastName_ProgressReport.pdf (e.g., Reinen_ProgressReport.pdf). This should be typed, 11 pt font, 1.5 line-spacing, with 1” margins.

⁴ These should be included in your single .pdf file that you submit. However, you may turn in these additional pages to Lori if you cannot submit them digitally.

⁵ This should be a single .pdf file, entitled with your name (e.g., Reinen_IntroMethods.pdf). This is typed, 11 pt font, 1.5 line spacing, with 1” margins.

can do for these sections. Your submission should include at least the following, if applicable:

Title – your current working title. This may have changed from earlier submissions.

Introduction – a general introduction to the problem you are addressing with your study; a description of what has been done by previous researchers (e.g. previous studies, similar studies); neat figures (with figure numbers and captions) and location maps; a paragraph clearly identifying your study and how it contributes to the general knowledge in this field (e.g. how it relates to what has been done before).

Methods – field/data collection methods; laboratory/numerical analysis techniques; the design/make/model of all instruments used in the analyses.

References – only include references that have been cited in the text submitted; include a separate list (clearly identified as such) of additional references that you anticipate you may use in your final version.

Outline of the remainder of your thesis – include what you expect you will include in the rest of your thesis: headings, subheadings, and appendices. We encourage you to include a bulleted list of your observations and interpretations to date (we realize that your study is currently underway, and that these interpretations may change with time; just include what you've found so far).

A general table of contents might include some of the following (or other sections that better reflect your study):

- Abstract
- Introduction
- Methods
 - Field methods
 - Laboratory methods
 - Modeling methods
- Results
 - Field observations
 - Laboratory analyses
 - Modeling results
- Discussion
 - Relationships between ...
 - Implications for ...
 - ...
- Conclusions
- References

Your primary advisor will grade these sections; your second reader will provide written comments on these sections. These will be returned to you by your 2 faculty readers during the last week of classes. The grade associated with this assignment is meant to serve as a guide indicating whether you are proceeding along in a manner that will enable you to complete your thesis successfully and is not an indication of the final grade for your thesis. This submission will be graded on both content and writing/presentation style. The attached grading rubric combines both content and writing and provides approximate grade ranges for

submissions with certain characteristics. An individual submission may have characteristics from several grade ranges; the faculty will consider the merits of each when determining the grade.

Your primary advisor, in consultation with you, may set earlier separate deadlines for each section (or drafts of the sections).

- 7) At the end of the semester, the Geology faculty will meet and discuss the progress of each senior thesis student. All students will receive a grade of “N” on their grade reports for this semester; this means that your thesis is “continuing”. Once the final thesis is submitted and graded in the spring semester, the grade for your thesis will be reflected on your transcripts for both semesters.**

Spring Semester, 2016

- 8) First week of classes, Friday 1/22, 5 p.m.** – Submit a digital schedule (.pdf) which outlines your plans to complete your thesis on time. This schedule should indicate dates to complete specific research tasks and written thesis sections. You are encouraged to meet with your advisor over the next several weeks to discuss your progress, your results, and early drafts of sections of your thesis.
- 9) Monday 3/28, 5 p.m. THESIS SUBMISSION** – Submit⁶ a digital version (.pdf file) to our Sakai site. This product is what you consider to be the best, most professional version of your senior thesis. Do not make the mistake of considering this a “draft” – this is your best effort and what you would submit for your final thesis if the Department did not have the subsequent review process in place. Copies of senior theses from previous years are available for your perusal in the department (ask your advisor about good examples; see the Geology Technician for access). These theses must not be taken out of the Geology Department, and should always be returned to their storage spot immediately after each use or at the end of each day!
- In addition to the science content, your thesis should include:
 - Title page
 - Abstract
 - Table of contents, including listings of figures and tables
 - References
 - Appendices (these often contain tables of data, field notes, maps, ...)
 - Your thesis should be typed and include completed figures, maps, and photographs (if these are needed). If you draft your figures by hand, do not color in maps or diagrams. They must, however, be neatly inked in. Alternatively, if you use a software program to draft your maps and diagrams, make them as complete as possible, including coloration. Labels on maps and figures must be clear and legible.
 - Your thesis must include all project conclusions, interpretations, and significant, supportive data. No major work, such as looking at thin sections or executing a computer program, can be left pending upon submittal of the thesis.
 - Figures do not need to be imbedded in the text file (this can result in very large files). You can insert them between text pages, and they should be on the page immediately following the first time they are called in the text. Figures must be called in order (e.g. 1, 2, 3, etc.).
 - Your thesis must be paginated and page numbers should not be hand-written.
 - Follow the format used in the journal *Geology* for all citations and references. If you have any questions about how this is to be done, consult your advisor.
NOTE: Worldwide web citations are not acceptable. An exception can be made in some instances (e.g. government databases available only via the web). You must get prior approval from your advisor to use a URL as a citation in your thesis.

⁶ This should be a single .pdf file, entitled with your last name (e.g., Reinen_Version1.pdf). This is typed, 11 pt font, 1.5 line spacing, with 1” margins.

We encourage you to have friends (science majors and others) read your thesis prior to submittal for clarity and content. If you are in doubt about the written quality of your thesis, contact consultants at the campus writing center or have a friend or acquaintance read it. If you are at loss about finding someone to help with your writing, see your advisor to get a referral. Peruse *Geology* to get a sense of the tone and quality of writing we expect from you.

Your primary advisor will grade your thesis; your second faculty reader will provide written comments. The grade associated with this version of your thesis (as well as your ability to make this deadline) will be included in the overall grade for your senior thesis.

This version of your thesis will be graded according to the rubric on the last page of this handout.

Your faculty readers will return your thesis to you, with corrections and comments about needed changes, or further necessary study, within one week following its submittal.

10) Friday 4/15, 4 p.m. – You have four items to turn-in by 4 p.m.:

- a) **Revised Thesis.** Submit one digital copy (.pdf; augmented by any other digital data files that are not part of the thesis itself, cleanly named and organized, that should be kept for archival purposes) of your revised thesis to go into the department's permanent collection. This revised thesis is the corrected version of your thesis – the one that will go into our library for permanent reference. Color, where appropriate, all figures and maps. For oversize figures or maps, carefully fold these and include them in a manila envelope to be bound with or glued to the inside back cover of your thesis. Once you submit your final draft, no further corrections on your written report will be made.
- b) **Data and thesis CD.** Burn a CD (available from the Geology Technician) with all your data files, thesis .pdf, and thesis figures. These files should be clearly identifiable by their names. Additional information may be required by your advisor – please discuss this requirement well in advance with your advisor.
- c) **Thesis abstract text file.** Submit a Microsoft Word text file of your thesis abstract and title to include in the presentation abstract volume. At the bottom of the page, list all funding you received to support your project (e.g. Keck Geology Consortium, Sigma Xi, department research funds, Smithsonian internship, ...). Your file should be called something obvious (e.g. LastName_Abstract.doc).
- d) **Modified PowerPoint file (1 slide for the Geology Department web page).** Your modified PowerPoint file should contain a single slide that summarizes your thesis, including acknowledging the source of any funding you received (see examples on the senior thesis page on the web). Your file should be called something obvious (e.g. LastName_Slide2).

11) Thursday, April 28 afternoon (tentative) - The final step is the senior presentation, to be given following submission of your corrected thesis. Please note that these presentations are formal, and must be delivered in a professional manner. You will also produce and present a poster on your thesis that will hang in the department for the next year. Guidelines for the presentations will be provided at a later date (to be provided in late March/early April).

The Senior Thesis presentations this year are likely to be held in an appropriate space within the Edmunds Building. The presentations are open to all interested persons from within and outside the department. Neat, professional attire is required! We socialize around the posters afterwards to celebrate your success, with refreshments provided.

12) At the end of the semester, the Geology faculty will meet and discuss each senior thesis. Thesis grades will be decided by the faculty with emphasis on the written thesis (original and revised), accuracy and sophistication of analyses, and will include weighting from the public presentation, Intro/Methods/Reference sections (Fall), effort, improvement, attendance at meetings, ability to meet deadlines, etc.

In general, the grading guidelines for the final thesis grade are:

- ~55% Final written thesis
- ~25% First version written thesis
- ~ 5% Met first version thesis deadline
- ~15% Other requirements from both semesters (other written assignments, poster, presentations, meeting attendance, other deadlines, etc.)