

Blackboard course site: Please see the Blackboard site *Geology Senior Research & Honors Research 2016-17* for an electronic copy of this syllabus and other important information.

Summer-Fall Senior Year

Students should begin conducting research as soon as possible. The summer is an ideal time to do field work related to the project. Historically, the best projects have started data collection early and continued throughout the academic year. Most Honors research students have presented the results of their work at professional meetings: the deadlines for these meetings are typically many months beforehand. Thus, to present one must have the research to an advanced state by the deadline, not by the meeting.

FALL semester deadlines

Wednesday, August 24th

Students approved for Honors research must submit their application to the Charles Center. Application forms are available on the Charles Center website:

<http://www.wm.edu/as/charlescenter/student-research/honors/planning/index.php>

Friday, September 30th

Students submit a **progress report**. This report should include:

- 1) title of thesis research
- 2) description of research questions/goals
- 3) a statement on progress thus far
- 4) a statement on what remains to be accomplished

*This report should be submitted both to **Blackboard** and to your **research advisor** as a single pdf file. Students will be graded on this report (based on both the progress of the thesis research and quality of the report). The progress report will be evaluated by the faculty.*

Friday, November 11th

Students submit their **Introductory sections** (including Introduction, Background, Previous Work, Geologic Setting, and ANY other sections before Methods), Methods section, and the **appropriate figures** for those sections. Please note that the Introduction and Methods sections should be complete, including all **figures** as well as the **references cited** in those sections. *Note:* you may have already started on the Results & Discussion section- you can submit those as well.

*This material should be submitted both to **Blackboard** and to your **research advisor** as a single pdf file. Students will receive a grade for this report based on the quality of the writing, figures, and proper citations. The introductory sections will be evaluated by the faculty.*

Friday, December 9th

Students submit their revised **Introductory sections, Methods, and Results to date** section. Please note that this section should be complete, and include figures and references. *Note:* you may have already started on the Discussion section- you can submit that as well.

This material should be submitted both to Blackboard and to your research advisor as a single pdf file.

Students will receive a grade in the Fall semester based upon 1) meeting the aforementioned deadlines and 2) the quality of the work that is submitted.

Spring semester deadlines

By Friday, January 20th

Honors students must have successfully completed the departmental written exam (see below).

Wednesday, January 25th

Honors students must submit a list of potential committee members to their advisor(s). The committee should consist of at least three faculty, including 1) faculty research advisor, 2) another geology faculty member, and 3) a non-geology faculty member. This third committee member can be from any department on campus, although many students elect to have other science faculty (e.g. chemistry, physics, biology) on the committee. The committee may consist of more than three members and a number of Geology Honors committees have included scientists from outside William & Mary (VIMS, VDMR, USGS). The student should consult with their research advisor about the committee, but it is the student who asks other faculty to serve on the committee. Once the members of the committee have been identified, the advisor forwards those names to the Director of the Charles Center for approval. More info is available on the Charles Center website:

<http://www.wm.edu/as/charlescenter/student-research/honors/planning/index.php>

Friday, February 17th

Students submit their **Discussion** section. Please note that this section should be complete, and include figures and references.

This material should be submitted both to Blackboard and to your research advisor as a single pdf file.

Late February

Undergraduate Research Symposium @ William & Mary (voluntary)

Friday, March 24th

Students must submit their **COMPLETED THESIS** (with figures, plates, etc.). This material should be submitted as a single pdf file via Blackboard. This version of the thesis is not a rough draft, and should have already undergone several revisions with advisor input.

Failure to meet this deadline will result in a significant grade reduction.

March 30th to 31st

SE section meeting of the Geological Society of America- Richmond, VA (OPTIONAL)

5 p.m. Friday, April 14th

Honors students must submit their COMPLETED THESIS (with figures, plates, etc.) to their **Honors committee**. Please contact each committee member to ask what format (paper or electronic) they prefer. *Students must also schedule the time and date for the thesis presentation.*

Week of April 24th

Honors students present their thesis as a public event that is advertised to the departmental community. In addition to the Honors committee, other geology faculty, students, and friends are commonly in attendance. The purpose of the presentation is for the student to communicate to the William & Mary community; the nature of their project, the results, and the overall significance of their findings. The talk should be approximately 30-40 minutes in length and make use of the media available for delivering a visually stimulating presentation. A time for questions from the general audience follows the presentation. Afterwards, the general audience is dismissed and the Honors researcher fields questions from the committee. These questions are designed to give the committee a better understanding of what the student knows and their ability to think quickly and efficiently. After the committee's questions are complete, the student will be dismissed and the committee will decide whether the project is worthy of Honors. After the committee has made its decision, the student will be called back and informed as to the outcome. The whole proceeding (from the start of the presentation to the committee's decision) generally takes about 90 minutes.

It is the Department's hope that all Honors projects that reach the presentation stage are Honors worthy (that is why there are so many other hurdles along the way). In the rare case in which a project, at this stage, does not merit Honors, the appropriate actions will be taken to drop Geo 495-496 from the student's record and to add Geo 491-2 (note: this will result in a change from six credits to four).

Friday, May 5th

Honors students must submit signed thesis cover sheet to the Charles Center.

Monday, May 8th

Honors students must submit:

- one electronic copy of their final corrected theses plus a copy of the honors cover sheet to Carol Roe (McGl 228). Please turn in your paper copies loose in a large envelope, do not bind or staple it, and put both your and your advisor's names on the front of the envelope.
- submit electronic copies (commonly called ETDs) to W&M Libraries' online scholarship platform, W&M Publish by 5 p.m. the Friday before Commencement.
- Paper and/or electronic copies to their advisor (**check with advisor for number of copies and formats**).

Description: Honors research is a yearlong program of research and study that students with a keen interest in the earth sciences might want to consider. Honors research is intended to be a self-motivated and self-driven project that is conducted in close

cooperation with a faculty advisor. The Department views Honors as a significant academic achievement and has set high standards. Honors research entails 1) writing and presenting a strong research proposal, 2) data collection throughout the academic year (and commonly during the summer), 3) a comprehensive written examination based on course work, and 4) a thesis and final presentation to a faculty committee and the department. Students completing Honors research earn six credits (three per semester) for their effort. Honors research is a great way to immerse yourself into the research process and delve deeply into a problem or topic that you find exciting: it is a significant undertaking, but there is also much to be gained from such an effort.

How Does Honors Differ From Senior Research (Geo 491-2)?

The Geology Department considers research experience to be a valuable part of the curriculum, thus all Geology concentrators are required to complete a research project during their senior year. But how does Honors research (GEO 495-496) differ from Senior research (GEO 491-2)? The simple answer to that question is Honors Research requires more time, a greater commitment, and a few more challenges (e.g. minimum G.P.A., comprehensive written exam, thesis committee) than Senior research. Honors research also entails more credits (six versus four) than Senior research. The Department thinks that Honors researchers should have a greater depth to their knowledge about both geology in general and the particulars relating to the project. Honors projects should be broader in scope and more ambitious than Senior research. Honors researchers are very independent and capable of making progress without having their faculty advisor laying out every step of the research. In contrast to some departments, Geology Honors researchers are collaborating with a faculty advisor, not serving simply as faculty research assistants. Many William & Mary geologists who have completed Honors research and then gone on to graduate study have commented that the work associated with Honors research was similar to the effort involved in obtaining a Masters degree.

General Information

The Geology Department considers research to be a valuable part of an undergraduate education in geology, thus all majors are required to complete a research project during their senior year. Senior research is a year-long program of independent research that culminates in a formal written thesis and oral presentation. The research is carried out in close cooperation with a faculty advisor, *although the responsibility for successfully completing the project lies with the student*. Senior research is your opportunity to explore a particular subdiscipline of geology in detail and to apply the research skills that you have mastered in your geology coursework to a specific research question that you find fascinating.

Eligibility and Admission to Honors Research

- A. Students must have (1) a minimum of 3.0 cumulative Grade Point Average, or (2) a 3.0 Grade Point Average for the junior year alone, or (3) special permission of the Committee on Honors and Interdisciplinary Studies (this only works in rare cases and the appeal must be initiated by the student and the department).
- B. If the G.P.A. requirement is satisfied the student should consult a faculty advisor and the chair to declare their interest in Honors research as early as possible (early in the spring semester of junior year).
- C. Admission to Honors research will occur when: (1) their eligibility is certified by the Director of the Charles Center and (2) their written research proposal and formal discussion with the faculty has been completed and accepted by the Geology faculty. Note: a student could meet the G.P.A. requirements, but not be granted permission to enroll in Honors because the faculty deems either the proposal or candidate's geologic background of insufficient qualify.

Department Written Exam

Before the start of the second semester of the Senior year, Honors students are required to take a comprehensive written examination on the Geology course work they have completed. The examination is composed of exams from each of the core courses and up to two elective courses. Students need to inform the Department Chair as to 1) when they will take the examination and 2) the courses that they will be examined on. Individual exams are designed to take ~40 minutes to complete and the entire examination will consume the better part of a day. The faculty will grade the examination promptly and the Chair will tally up the score. In order to pass the examination the student must earn a B average or higher ($\geq 80\%$) for the entire exam. A student may pass the examination if their cumulative average is $\geq 80\%$ even if they score $< 80\%$ on some individual examinations (Table 1-student X). Students who earn an overall average of between 75-80% will be allowed to retake subject examinations, but must raise their overall score to $\geq 80\%$ in order to pass (Table 1-student K). Students who earn $< 75\%$ on the examination have not demonstrated the required proficiency in geology and will not be given the opportunity for a retest (Table 1-student F). Students that earn less than a 70% on any examination (even if their overall average is $\geq 80\%$ must retake those subject tests; upon reexamination, these students must score better than 70% (Table 1-student Q).

Students who do not reach the 70% threshold on any of the reexaminations will not be allowed to continue with Honors research (regardless of their overall score).

Student	320	321	322	323	303	423	AVG	Outcome
X	83	88	91	82	78	86	84.7	Student Passes
Q	82	65	73	89	85	91	80.8	Student must retake Geo 321 and earn >70%
K	82	73	68	82	82	67	75.7	Student must retake Geo 322 & 423 and earn >70%. May retake Geo 321. Overall average must > 80%
F	78	62	66	73	80	77	72.7	Student Fails

Students who do not pass the exam must drop Geo 495-496 and enroll in Senior Research (Geo 491-2). The examinations, grading, retakes, and final outcome need to be completed before the end of the add-drop period during the spring semester.

Student responsibilities

1. Communicating regularly and effectively with your advisor
2. Surveying and evaluating the primary literature pertaining to your research
3. Refining your research questions/goals
4. Learning and applying data collection and analysis techniques
5. Collecting data throughout the year
6. Analyzing and interpreting those data
7. Writing a formal thesis (see format provided below)
8. Presenting your research to your peers and faculty in the geology department

Grading Policy

The Geology 495/496 is a 6-credit course sequence, and your final grade will be based on the following components:

- 30%** meeting required course deadlines and demonstrating progress on research activities throughout the Fall and Spring Semester
- 45%** the final thesis
- 25%** thesis presentation to committee

The assignment of grades for Honors is a collective effort involving all faculty members. At the end of the spring semester, we meet and review the work of each student, and attempt to arrive at some consensus regarding an appropriate grade. Our judgments are based on the tangible results of your work, and a variety of additional indications of your engagement with your project. Much of the input in our discussions obviously comes from your advisor. The list below includes many of the components that we consider and discuss in assigning your grade.

1. Quality of the final written thesis: including writing, figures, overall scientific quality, and how much effort was required by your advisor to edit your work
2. Quality of the final oral presentation: including professionalism, quality of oral component (organization, clarity, timing, etc.), quality of visual component (PowerPoint slides), overall scientific quality, response to questions
3. Did you have regular meetings with your advisor throughout the year? How many times did you cancel, or just not show up?
4. How successful were those regular meetings? Did you come prepared with questions, new results, new insights, or any indication of progress? Or, did you come having done little, just expecting your advisor to give you another task?
5. Did you complete various tasks in a timely fashion? How much did you do at the last minute?
6. How well did you master the literature on your topic? How diligent were you in seeking out material on your own? Did you read things without being continually bugged about it by your advisor?
7. How successful were you at making the project "your own"? In other words, did you show initiative, or simply go from one assigned task to the next without much independent thought? Your advisor has probably gone to a considerable amount of effort to come up with a project idea for you, and will also spend many hours helping you. We need to see that our efforts are matched by yours.
8. Did you do a brown bag?
9. Did you submit a minor research grant proposal (or any other proposal)?
10. Did you participate in the undergraduate research symposium?
11. If you received financial support for your project during the summer, did you maintain a strong commitment to your work during the academic year (i.e., when you weren't getting paid!)?
12. Did you present the results of your work at a professional meeting? We realize that not everyone is in a position to do this, and it certainly is not a requirement. However, this accomplishment is an indication of early progress, diligence, and . . . *results!*

In the list above, numbers 1 and 2 are obviously the most important. If you are making good progress throughout the year, as reflected in the other items, the final results of your work will almost certainly be of high quality. Unfortunately, the opposite is also true.

Formatting Your Honors Thesis

Your thesis is the written legacy of your research at William & Mary. Therefore, it needs to be loaded with data, well organized, and well documented. Here are some handy hints to help you format and organize your thesis.

Formatting instructions

Margins: 1.5" on the left and 1" on the top, bottom, and right sides.

Line spacing: double-spaced

Font: Times or Times New Roman

Font size: 12 pt for normal text, 14-18 pt for title page

Page numbering: centered at the bottom of the page (on all pages following the title page)

Outline

Please use this outline to help you organize your thesis-- but be sure to review your potential outline with your advisor before you start writing! Not all theses will include every section and some may include different sections. All theses should include: a title page, table of contents, list of figures, list of tables, abstract, conclusions, acknowledgements, references cited, and appendices. The sections should follow this general order:

- Title page: must contain the title of your project, your full name, Williamsburg VA, and the date (see Charles Center website for format: <https://swem.wm.edu/services/thesis-dissertation-submission>)
- Table of Contents: see sample Table of Contents for format
- List of Figures
- List of Tables
- Abstract: no more than one page
- Introduction
- Background (and/or Geologic Setting)
- Methods (or alternative heading)
- Results
- Discussion
- Conclusions
- Acknowledgements
- References Cited
- Appendices

Figures

Figures should be high quality and as large as is practical. They should be numbered consecutively and *inserted into the text* (usually on their own pages) following (not before) the first reference to the figure in the text. More than one figure can be included on a page. All figures need detailed captions, which should be included at the bottom of the figure. Color figures may be used. Photomicrographs are best as color figures. Scanned color images must be printed at the highest possible resolution (these typically look washed out or pixelated). Color photocopies are also acceptable. Use the appropriate program to make figures and avoid pixelated images.

References Cited (reprinted from the Information to Authors: *GSA Bulletin*)

All references must be cited parenthetically in the text and listed in the References Cited section. List references alphabetically by author's surname. For references with two authors, list alphabetically by first author's surname and then alphabetically by second author's surname. For references with more than two authors, list alphabetically by first author's surname and then chronologically, earliest year first. Distinguish by addition of letters those references that would otherwise have identical citations (e.g., Smith, 1979a, 1979b). Do not abbreviate journal titles or book publishers in references. For references that do not match any of the examples given here, include all information that would help a reader locate the reference.

Abstract

Sammis, C.G., 1993, Relating fault stability to fault zone structure: Geological Society of America Abstracts with Programs, v. 25, no. 6, p. A115-A116.

Book

Vail, P.R., Audemard, F., Bowman, S.A., Eisner, P.N., and Perez-Cruz, C., 1991, The stratigraphic signatures of tectonics, eustasy and sedimentology-An overview, *in* Einsele, G., et al., eds., Cycles and events in stratigraphy: Berlin, Springer-Verlag, p. 617-659.

Journal

Doglioni, C., 1994, Foredeeps versus subduction zones: *Geology*, v. 22, p. 271-274.

Comment, Discussion, Reply

Retallack, G.J., 1993, Classification of paleosols: Discussion: Geological Society of America Bulletin, v. 105, p. 1635-1636.

Guidebook

Blackstone, D.L., Jr., 1990, Rocky Mountain foreland exemplified by the Owl Creek Mountains, Bridger Range and Casper Arch, central Wyoming, *in* Specht, R., ed., Wyoming sedimentation and tectonics: Casper, Wyoming Geological Association, 41st Annual Field Conference, Guidebook, p. 151-166.

In Press

Hoffman, H.J., and Masson, M., 2002, Archean stromatolites from Abitibi greenstone belt, Quebec, Canada: Geological Society of America Bulletin, v. 114 (in press).

Map

Abrams, G.A., 1993, Complete Bouguer gravity anomaly map of the State of Colorado: U.S. Geological Survey Miscellaneous Field Studies Map MF-2236, scale 1:500,000, 1 sheet.

Open-File Report

Alpha, T.R., 1993, Landslide effects: U.S. Geological Survey Open-File Report 93-0278-A, 43 p.

Proceedings from a Symposium or Conference

Baar, C., 1972, Creep measured in deep potash mines vs. theoretical predictions, *in* Proceedings, Canadian Rock Mechanics Symposium, 7th, Edmonton: Ottawa, Canada Department of Energy, Mines and Resources, p. 23-77.

Thesis

Wopat, M.A., 1990, Quaternary volcanism and tectonics in the Mexican volcanic belt near Tequila, Jalisco, southwestern Mexico [Ph.D. thesis]: Berkeley

Websites

USGS website. <http://www.usgs.gov/>. Accessed 1/1/14.

Appendices

All of the data you collect during the course of your senior research should be included in your thesis as appendices. These should be laid out in table form and serve as a data repository.

Digital Archive

All of your work (including your data and analyses) should be saved in electronic format. See your advisor for information on which folders and files to include and what format should be used.

(sample)

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