



# Princeton University

## Department of Geosciences and Geological Engineering Program



## Junior Independent Research Guide

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<b>Topic</b>	<b>Page #</b>
<b>Important Deadlines</b>	<b>3</b>
<b>I Junior Advisors</b>	<b>4</b>
<b>II Interviews with Advisors</b>	<b>4</b>
<b>III Fall Semester</b>	<b>4</b>
Junior Colloquium	4
Junior Independent Research	4
Selection of project & Research Advisor	5
Conducting Independent Research	5
Funding	5
Preparation and Submission of JIR Report	6
Oral Presentation	6
Tips for Oral Presentation	7
Grading	7
Late Submission	8
<b>IV Spring Semester</b>	<b>8</b>
Junior Independent Research	8
<b>V. Opportunities for Undergraduate Research Support</b>	<b>9</b>
Summer Support for Senior Independent Research	9
PEI Grand Challenges Internship Program	9
Department of Geosciences JIR Support	9
Research Support from Advisor's Projects	9
Mellon May's Undergraduate Fellowship Program	9
<b>VII Appendix</b>	<b>10</b>
i) Fall and Spring Term Junior Independent Work Proposal Form	10
ii) Sample Outline of Written Junior Independent Work	12
iii) Sample Evaluation Form for Oral Presentation	14
iv) Sample Evaluation Form for Written Report	15

## **IMPORTANT DEADLINES FOR JUNIOR FUNDING OPPORTUNITIES**

### **SUMMER SUPPORT FOR JUNIOR INDEPENDENT RESEARCH**

**CURRENT SOPHOMORES** wishing to conduct independent fieldwork with a faculty member during the summer prior to their junior year in preparation for the fall JP project must submit a proposal in the spring. Students must discuss their plans with their Department advisor and faculty member with whom they wish to conduct the fieldwork, write a proposal and have it approved from the advisor before submitting it to the undergraduate work committee for evaluation. Please see instructions for the proposal under *Funding Opportunities*.

**Junior Independent Research proposals (JIRP) for summer fieldwork funding due:**

*3<sup>rd</sup> Monday of April*

(download form: <https://www.princeton.edu/geosciences/undergraduate/opportunities/>)

### **SUMMER SUPPORT FOR SENIOR INDEPENDENT RESEARCH**

Juniors wishing to apply for summer research grants to conduct fieldwork or laboratory analyses in preparation for their upcoming senior independent thesis projects should discuss the project with their faculty advisor. They must write a proposal and get it approved from the advisor in the spring of their Junior year before submitting it to the Dean's Office and the undergraduate work committee for evaluation. Funds up to a maximum of \$5000 may be available from the Office of the Dean. Supplementary funds not to exceed \$1000 may be available from the Geosciences Department.

**Senior Independent Research proposal (SIRP) for summer fieldwork funding due at the Dean's Office:**

*3<sup>rd</sup> Monday of March*

**Senior Independent Research proposal (SIRP) for summer fieldwork funding due in the Geosciences:**

*3<sup>rd</sup> Monday of April*

### **FALL SEMESTER JIRP FUNDING OPPORTUNITIES**

Juniors may apply for funding for the Fall term Junior Independent Research Project (JIRP) to cover laboratory and other research-related expenses. They should discuss the project and need for funding with their faculty advisor, write a proposal and get it approved from their advisor prior to submitting it to the undergraduate work committee for evaluation. Funding may not exceed \$500.

**Fall Junior Independent Research proposal form due:**

*1<sup>st</sup> Monday of October*

(download form: <https://www.princeton.edu/geosciences/undergraduate/opportunities/>)

**Fall Junior Independent Research proposal for funding due: 1<sup>st</sup> Monday of October**

Download form: <https://www.princeton.edu/geosciences/undergraduate/opportunities/>

## **SPRING SEMESTER JIRP FUNDING OPPORTUNITIES**

Juniors may apply for funding for the Spring term Junior Independent Research Project (JIRP) to cover laboratory and other research-related expenses. They should discuss the project and need for funding with their faculty advisor, write a proposal and get it approved from their advisor prior to submitting it to the undergraduate work committee for evaluation. Funding may not exceed \$500.

**Spring Junior Independent Research Proposal (JIRP) due: 2<sup>nd</sup> Monday of February**  
(see back of JIR Guide for example)

**Spring Junior Independent Research proposal for funding due: 2<sup>nd</sup> Monday, February**  
Guidelines below

## **GUIDELINES FOR JUNIOR INDEPENDENT RESEARCH PROJECT (JIRP) PROPOSALS:**

If a JIR project requires funds, for example, for fieldwork, to purchase laboratory supplies, purchase equipment time and analyses that cannot be covered by the student's Research Advisor, the students should discuss their needs with their Research Advisor and Academic Advisor. They should submit a carefully crafted research proposal that is no more than 3 pages in length, single spaced, with figures, work plan, budget and bibliography included.

The proposal must include:

- Tentative title
- Statement of hypothesis
- Significance of project, summary of objectives, original contribution, expected results (150 words)
- How hypothesis be tested (objectives, methods)
- Original contribution (original analysis of field, laboratory or previously published datasets, and/or the development of quantitative and/or analog models).
- Work Plan: set up schedule from beginning to end of project.
- Budget: Funding is merit-based. If funds are required, submit an itemized budget with reasonable expenses for fieldwork, travel and/or laboratory analyses. **In general, funding from the Department is limited to \$500 for analytical work on campus. If a student is spending the summer in JP (or ST) related fieldwork, the undergraduate work committee may recommend additional funding for subsequent laboratory analysis.**
- The proposal and budget must be approved by your Research Advisor.

Upload the proposal to Geosciences Undergraduate website for Juniors:  
<https://www.princeton.edu/geosciences/undergraduate/opportunities/>

## **IMPORTANT DEADLINES FOR JIRP:**

### **FALL SEMESTER**

**Fall Junior Independent Research Papers due:** *10<sup>th</sup> of January*

Download form: <https://www.princeton.edu/geosciences/undergraduate/opportunities/>

**Fall Junior Oral presentations:** *2<sup>nd</sup> Monday of January*

Guidelines below: upload pdf file by midnight before presentation.

Download pdf:

[http://www.princeton.edu/geosciences/undergraduate/pdfs/Tips\\_for\\_Oral\\_Presentation.pdf](http://www.princeton.edu/geosciences/undergraduate/pdfs/Tips_for_Oral_Presentation.pdf)

### **SPRING SEMESTER**

**Spring Junior Independent Research Papers due:** *1<sup>st</sup> Monday of May*

Guidelines below

Download form: <https://www.princeton.edu/geosciences/undergraduate/opportunities/>

**Spring Junior Oral Presentations:** *2<sup>nd</sup> Monday of May*

Guidelines below, upload pdf file by midnight before presentation.

Download pdf:

[http://www.princeton.edu/geosciences/undergraduate/pdfs/Tips\\_for\\_Oral\\_Presentation.pdf](http://www.princeton.edu/geosciences/undergraduate/pdfs/Tips_for_Oral_Presentation.pdf)

## **I. JUNIOR ADVISORS**

Each Geosciences junior has been assigned to a faculty member from the Undergraduate Work Committee. The students are expected to meet their advisor for discussions on curriculum, course selection, choice of a junior paper topic, study abroad plans, etc. Once the courses are selected after discussions with your advisor, turn in your signed fall and spring course worksheet to the undergraduate coordinator. Any course changes should also be discussed and approved by your adviser or the undergraduate chair. You will be informed of who your Geoscience advisors are at the beginning of each academic year.

## **II. INTERVIEWS WITH ADVISORS**

The curriculum has been revised, and each student is expected to discuss the details of new requirements with their advisor. All juniors should schedule a time to meet with their Advisor in the first two weeks of the semester. This meeting usually involves discussion of:

- major area(s) of interest within Geosciences,
- plans for fulfilling Departmental course requirements,
- funding for independent research,
- choice of a junior research paper
- summer internships.

## **III. FALL SEMESTER**

### **Junior Colloquium**

An informal colloquium is organized during the Fall semester of the junior year to introduce the students to the department faculty members, and to expose the students to different active research areas in geosciences. The students can make use of the junior colloquium and junior independent research (discussed later) to sharpen their earth science knowledge and to become familiar with the research in the department. This is also a junior class meeting, and topics of common interest to students can be discussed at this time.

All juniors, including Geoengineers, are required to attend the Junior Colloquium. The junior colloquium is held at noon (12 to 1 pm) on Mondays.

### **Junior Independent Research (JIR)**

All juniors are required to conduct independent research both in the Fall and Spring semesters. Students are also required to submit written reports and to give oral presentations (10 minutes) to the department faculty and students on their JIR. Although the Geoengineers are not required to conduct JIR, some Geoengineers have done JIRs anyway, conducting independent research in Geosciences or in Engineering and receiving course credit.

### ***Selection of the Project & Research Advisor:***

Different research topics available at any given year are listed in the “*Shopping Guide*”, which students can obtain from the undergraduate coordinator. Students are also encouraged to consult with their department adviser for suggestions regarding the selection of the JIR project. If the students have other exciting ideas for possible JIR projects, they are encouraged to consult their academic Advisor to discuss the feasibility of these projects.

JIR projects for both the fall and spring terms typically involve literature reviews, data collection (i.e., field work, laboratory analyses, or data mining), and original data analysis. A student may choose to work on the same topic for the full year, or on two different topics, but the fall semester JIR must stand alone as a full project and will be judged on its own merits. ALL JIR work MUST include original data analysis. A literature review by itself does not qualify for a JIR project.

Once the student chooses a topic for their JIR from the *Shopping Guide*, the students are encouraged to schedule a meeting with the concerned faculty member (Research Advisor) to discuss the project details. The students should also complete the JIR Proposal Form (attached at the end of this booklet), get it signed by the Research Advisor and submit it to the undergraduate coordinator by the announced deadline (See above for details).

### ***Conducting Independent Research:***

The students are expected to meet their Research Advisor to review literature and discuss research progress as often as possible (~ once a week) to discuss the JIR progress. As noted above, JIR projects can involve a combination of original analysis of field, laboratory or previously published data sets, and/or the development of quantitative and/or analog models. The research advisor provides the necessary guidance to make progress on the JIR. Since the JIR report will also be evaluated by a second reader (another faculty member in the department, either chosen by the student or by the Undergraduate Work Committee), students should keep him/her informed about the progress on a regular basis.

### ***Preparation & Submission of JIR Report:***

The final report for the JIR (double spaced and single-sided) should follow standard scientific format (e.g. organization of the content, reference to citations, writing style of the report (e.g. page length, font size 12 (Helvetica or Times New Roman), as outlined in the sample written report of Appendix VII (ii). Illustrations must be of high quality with appropriate size text for viewing, black and white or color if necessary for clarity.

Three unbound copies (one original and two copies; color illustrations must be in color) of the report must be submitted by the deadline (see p. 3) to the undergraduate coordinator. The original copy will be submitted to the Lewis Library, and the other two copies will be returned to the student after grading by the Research Advisor and second reader.

The students get feedback on their written report, together with the marked copies of the JIR reports from their Research Advisor and the second reader. The students are encouraged to discuss the details of the comments provided in the feedback with their Research Advisor and the second reader before their oral presentation.

### ***Oral Presentation:***

The students give a 10 minute powerpoint presentation on their JIR to the faculty and students in the Department, which is followed by 5 minutes of discussion and questions. The presentation must have high quality illustrations of the results (must be readable by audience) that succinctly convey the major points of the independent work. Students are encouraged to consult with their Research Advisor to get help on the organization of research findings and in preparing the summary for the presentation. The students are also encouraged to give practice presentations to their friends or to their Research Advisor for comments on the presentation style and content.

All students are required to upload a pdf file of their presentation by midnight the night before the presentation: <https://www.princeton.edu/geosciences/undergraduate/opportunities/>. The undergraduate coordinator will download the pdf files the next morning and set them up on the departmental laptop for the presentations. *Student who fail to upload the presentation in time will get an incomplete.*

### ***Tips for Oral Presentation:***

- Avoid the temptation to include too much material. Concentrate on getting your main points across (this is all your audience will remember after they listen to a half-day of presentations anyway). A good rule of thumb is 8–10 slides for a 10-minute talk, but this will vary (some overheads may require 2-3 minutes; others 20-30 seconds).
- Think about what you would like to say as you prepare your figures, and use your figures as a guide to help you through your talk. This will minimize the amount of rote memorization or “note cards” required. If you have to say a lot that is not directly related to the figure on the screen, your job will be more difficult. If you find yourself in this position, consider adding another figure or editing what you say.
- Make text legible from the back of the room! This includes axis labels! For an overhead transparency, this probably means at least a 14-point font (but check it out; the projector in room 155 is pretty close to the screen).
- Avoid an abundance of “text-only” slides. These put the audience in the position of having to decide whether to read them or to listen to you read them. If you have a few such slides, it is a good idea to state the points that appear on the screen in a different way.

- Present your advisor with an anticipated outline for your presentation. He/she has many years of experience in giving short talks, and probably has a good view of the “big picture” surrounding your work (hopefully by this point you do as well).
- Practice your talk beforehand. In a 10-minute talk there is little margin for “hemming” and “hawing”.
- A clear distinction should be made between the background material and the work the student has conducted (for the benefit of those not directly involved in advising).

### ***Grading:***

The JIR will be graded based on the quality of the report and the oral presentation (examples of evaluation forms are attached at the end of this report). The JIR written report prepared by the student will be evaluated by the Research Advisor of the student, and the second reader of the report. The grades for the written report and the oral presentation are discussed in a department faculty meeting, and a final grade is assigned to a JIR project after some renormalization to ensure uniform and equitable grading.

### ***Late Submissions:***

Any late submissions of the report will result in a significant drop in the grade. Late papers for which no extension has been granted will be subjected to a penalty of 1/4 of a letter grade per weekday or one letter grade per week. Extensions must be requested at least 48 hours in advance and can only be given by the Departmental Representative after consulting with the Research Advisor of the student. Extensions are given for serious illness or other equally compelling reasons. Any submissions after University deadline must be approved by the Dean’s Office, or the student receives an F.

It is very important for the students to familiarize themselves with academic regulations regarding plagiarism. The students are advised to look at the handbook released by the university on how to write a junior paper (*Writing A. J.*).

## **IV. SPRING SEMESTER**

### **Junior Independent Research (JIR)**

The format for conducting the spring term JIR is the same as for the Fall project, and the student may refer to the above description for details regarding submission of the report, and grading policy.

## **V. OPPORTUNITIES FOR UNDERGRADUATE RESEARCH SUPPORT**

### **SUMMER SUPPORT FOR SENIOR INDEPENDENT RESEARCH**

Students interested in pursuing senior independent research (SIR) in summer may obtain funds from the Dean's office by submitting a research proposal by the 2<sup>nd</sup> Monday in March (see proposal guidelines). These funds can be used to support the student's summer stay on the campus, purchase of chemicals, lab-ware, travel for fieldwork and sampling, and to conduct studies outside the campus. The size of funds can vary significantly - anywhere from a few hundred to as high as \$5,000 dollars. The Dean's office sends the announcement in early Spring. For information on this grant, deadline and application see: <https://www.princeton.edu/geosciences/undergraduate/opportunities/>.

### **PEI/Grand Challenges Internship Program**

PEI/Grand Challenges Internship is open to all Princeton freshmen, sophomores and juniors with an interest in environmental topics, regardless of academic major.

Interested students are encouraged to attend the internship session in January to learn about summer internship opportunities and application details.

<http://www.princeton.edu/pei/undergrads/internship/appliation/>

### **Department of Geosciences Support for JIR**

In addition to these funds, the department may contribute funds not to exceed \$500; funds will be merit based upon review of the proposal and budget submitted. Download form: <https://www.princeton.edu/geosciences/undergraduate/opportunities/>.

### **Project Support from Research Advisors:**

If the student's JIR is part of an ongoing research project of his/her advisor, the Research Advisor may also have funds available.

### **Mellon May's Undergraduate Fellowship Program (MMUFP)**

The MMUFP is an international educational initiative that provides financial support and opportunities for professional development to students who are committed, as future professors, to addressing the consequences of racial and ethnic disparities in higher education; and who will serve as role models for all youth. The program aims to reduce the serious under-representation on the faculty of individuals from certain minority groups. Princeton University's MMUFP Program provides financial assistance and structured opportunities for professional development to juniors and seniors who intend to pursue a doctoral degree in Earth Sciences (among others). [www.mmuf.org](http://www.mmuf.org)

**FALL AND SPRING TERM JUNIOR INDEPENDENT WORK PROPOSAL FORM**

*Must be filled out electronically (2 pages) and signed by your advisor; E-mail form to the undergraduate Coordinator, Room 110, Guyot Hall, Sheryl Robas: [srobas@princeton.edu](mailto:srobas@princeton.edu)*

Name \_\_\_\_\_

1. Tentative Title:

2. State your hypothesis:

3. Significance of Project (150 words; summary of objectives, original contribution, expected results)

4. Objectives and Methods; how will you test your hypothesis?

5. Original contribution: (original analysis of field, laboratory or previously published data sets, and/or the development of quantitative and/or analog models).

6. Work Plan: Propose schedule for the full duration of the project, including expected completion dates for data collection, analysis, writing etc.

F) Budget: Funding for JIR Projects is based on merit. If funds are required (e.g., fieldwork, lab analysis, travel) submit an itemized budget with reasonable expenses. Funding from the Geosciences Department may not exceed \$500. Students are encouraged to apply for outside funds (see undergraduate website on funding sources, applications and deadlines).

Signature of Advisor: \_\_\_\_\_ Date \_\_\_\_\_

Suggested second advisor/reader (signature not required):

\_\_\_\_\_

## **SAMPLE OUTLINE OF WRITTEN JUNIOR INDEPENDENT WORK**

- A. **Title page:** must have the following information shown as illustrated (condensed)

### Fossil plants of Argentina

by

John F. Jones '12

Junior Independent Work

Fall or Spring Paper

Advisor: John P. Stevens

Department of Geosciences

Princeton University, Princeton, NJ 08544

**DUE DATE**

- B. **Abstract** (200 words max; no references, must summarize objectives, methods, results and conclusions)
- C. **Introduction:** (purpose and scope of study, background information, etc.; illustration with caption of study area, geographic map with location; reference any statements of fact, claims, information obtained etc., style of in-text references: (Fisher, 1998; Murray et al., 2010).
- D. **Methods:** (fieldwork, material (type of samples) and analytical methods used)
- E. **Description of Results:** (subtitled as necessary, illustrations of data, data tables may be placed in appendix), give references wherever you take information or data from other studies.
- F. **Interpretation of Results:** subtitled as necessary, (how do you interpret your data, how does it relate to published data of similar type, you may illustrate your interpretation), give references wherever you take information, interpretations or data from other studies.
- G. **Conclusions:** (what is your overall conclusion of the project's outcome? You may write this as a short summary or as a number of bullet points specifying a series of specific conclusions.)
- H. **Acknowledgments:** Funding sources, people who helped you with the study, read and corrected your drafts etc.

**I      References cited:** use citation style as follows:

Dessert, C., Dupre, B., Gaillardet, J., Francois, L.M., and Allegre, C.J., 2003. Basalt weathering laws and the impact of basalt weathering on the global carbon cycle. *Chemical Geology*, 202, 257-273.

Wedepohl, K.H., 1971. Environmental influences on the chemical composition of shales and clays. In: Ahrens, L.H., Press, F., Runcorn, S.K., Urey, H.C. (Eds.), *Physics and Chemistry of the Earth*. Pergamon, Oxford, pp. 305–333.

***Do Not Use Footnotes!***

**J.      Student Acknowledgment of Original Work sentence:**

*This paper represents my own work in accordance with University regulations,” plus **your signature.***

**SAMPLE**  
**EVALUATION FORM FOR WRITTEN REPORT**

**Department of Geosciences**  
and **Geological Engineering Program**

**Undergraduate Independent Written Work Evaluation Form**  
**Fall / Spring 2010-2011 Junior Paper**

**Student Name:**

**Faculty Advisor:**

**Paper Title:**

I. Performance in Areas (5=outstanding, 1=unacceptable, na=not applicable)  
(Grade is not an equal-weight average of these marks)

A. **Intellectual Content**

Literature survey and summary	5	4	3	2	1	na
Critical evaluation and a synthesis	5	4	3	2	1	na
Original contribution, where appropriate	5	4	3	2	1	na

B. **Writing and Presentation**

Abstract	5	4	3	2	1	na
Proper headings	5	4	3	2	1	na
Style	5	4	3	2	1	na
Organization as scientific paper	5	4	3	2	1	na
References properly handled	5	4	3	2	1	na
Figures, clear, properly called in text, sources cited	5	4	3	2	1	na

II. **Faculty Comments:** (to be added to those made directly in the text)

Faculty Signature \_\_\_\_\_

(Do not write comments for students below this line)

Overall Grade (not given to student) \_\_\_\_\_

**SAMPLE**  
**EVALUATION FORM FOR ORAL PRESENTATION**  
Department of Geosciences  
And **Geological Engineering Program**

**Date:**

**Senior Theses**

**Junior Paper**

**Oral Presentation**

**Comment and Grade Sheet**

**Student Name:** \_\_\_\_\_

**Topic:** \_\_\_\_\_

**Oral Grade:** \_\_\_\_\_

Circle following (5 = most favorable; 1 = unfavorable)

delivery tone	5	4	3	2	1	organization of material	5	4	3	2	1
mannerisms	5	4	3	2	1	illustrations	5	4	3	2	1
"ums" and "ahs"	5	4	3	2	1	ability to evaluate data	5	4	3	2	1
reliance on notes	5	4	3	2	1	handling of questions	5	4	3	2	1

**Comments:**