

**Environmental Biology Master's Independent Research Project
ENV 579/ENV 579G**

The Independent Research Project (ENV 579/ENV 579G) is a requirement of one non-thesis track in the Environmental Biology program. It is your opportunity to conduct a small research project from beginning to end. To begin an Environmental Biology Master's Project, you need to determine a topic and find an adviser to help you. If you are considering conducting the project at Hood, you need to find a research adviser among the faculty. This need not necessarily be the same person as your academic adviser. You could also do a project at an off-campus site, which is sometimes the student's work site, if that is a better match for you.*

In choosing a project you need to consider the following:

1. What topics are of interest to you? A project is way too much work to do if you do not have a sincere interest in the topic and the outcome of your study.
2. What skills do you know or will you need to develop to be able to study the topic(s) you have chosen? A good strategy is to have your project be a training ground that you can use to develop the skills and practical knowledge to make you more employable at your current job or open doors to new types of jobs now or in the future.
3. What are the time constraints? Can you work in the evenings and on weekends to finish your project or will it require larger blocks of time? Can you work on a project full time for a short period of time (e.g. a month in the summer)? Projects rarely fit into the neat 3-hour, 1-day-a-week schedules like your classes did, so you will need to make some adjustments for this.

Once you have given these questions some thought and arrived at less tentative answers, contact potential advisers and make appointments with them to talk about where your interests and theirs may overlap. You probably have some ideas about what topics most faculty study from having them as instructors in classes or talking with them informally. You can also do a literature search to see what they have published recently. Once you and an adviser have mutually agreed to work together, your next step is to write a proposal for the work you will do. An approved proposal is needed to allow you to enroll in ENV 579/ENV 579G.

* Proposed advisers who are not Hood College faculty or adjunct instructors must be approved. It is expected that the adviser will be a Ph.D., M.D., or D.V.M. experienced in the topic of the proposed research. In this case, the student should forward the adviser's curriculum vitae to the ENV Program Director. The Program Director reviews the project adviser qualifications and gives final approval.

Potential project advisers who do not hold the Ph.D., M.D. or D.V.M degree must be additionally approved by the Graduate Council of Hood College. In such a case, the Program Director is asked to submit the adviser's curriculum vitae and two supporting letters of recommendation to the Dean of the Graduate School. The Graduate Council will review the adviser's credentials and submit a recommendation to the Dean. Final approval of the project adviser is made by the Dean of the Graduate School.

Writing a Research Project Proposal for ENV 579/ENV 579G

To get the greatest educational value from the experience, it is essential that you produce a thoughtful, complete proposal before beginning your actual project. Your proposal is to be written in consultation with your Research Project Adviser. Before beginning your proposal, talk with your adviser to understand his/her expectations. Your adviser may want you to write the proposal in a specific format or style that is applicable to his/her sub-discipline. However, the following general guidelines can be employed in most instances:

Length: Aim for an 8 to 10-page, double-spaced document (not including tables, figures, and references) that outlines the project you propose. Past proposals range from 6-15 pages, usually depending on how much literature review has already been done. Think of the proposal as the first of many drafts of your final project report. This early version will be heavy on the literature review of the topic and rationale for the project and light on the data and analysis, but that will change as you produce future versions of the document. Through the revision process, the proposal sections will morph into a format similar to the standard scientific paper.

Organization: We suggest the following generic organization scheme. However, this can be modified in consultation with your adviser.

Background/Literature Review/Rationale: Use this section to set the context for the project and establish the importance of or the need to answer the question(s) you plan to address. This will form the bulk of your proposal.

Proposed Research: Most projects are comprised of one or two experiments, during which specific hypotheses are tested. If this is the case, use this section to clearly state the null and alternative hypotheses that you plan to test.

Materials and Methods: Use this section to lay out (as best you can) the details of how you will carry out the research. The methods and materials section should, at a minimum, address the following:

- Where and when will the study take place?
- What treatments will you employ? What are the controls? When and what will you sample? How many replicates will you include? Provide an overview of the design of your study.
- If samples will be subjected to further lab analysis, what analytical techniques will be employed? Explain them in sufficient detail to indicate your knowledge of the methods to be used.

Be as specific as possible; however, do not let the lack of some specific information keep you from your task of writing the proposal. For example, although you may not have specific research sites designated for your field study, you can at least provide an idea of the characteristics of the sites and possible general locations.

Anticipated Results and Methods of Analysis: Use this section to explain the results you may see and how you plan to analyze the results. Note that students pursuing ENV 579 are required to complete both ENV 505 and ENV 515; draw on information you learned/used in these courses as you consider your project analysis. You may have a good idea of the anticipated results since you have already been studying this topic. Aim to convince the reader that you know what kind of data your research will produce/obtain and that you understand how to analyze the data statistically to evaluate the hypotheses.

References Cited: Any information in your proposal that is used/learned from a source should be cited in the text. Follow a consistent format from one particular journal that is chosen by your adviser and is appropriate to the sub-discipline of your research. A [Name-Year](#) format well or you could use the [numbered format](#) if that corresponds to the format of the journal that you have chosen; the numbered format is also useful if many of your sources are government/public documents with unclear or organizational authorship. The Hood College library website gives information on [citing sources](#), including instructions on how to use a reference manager like [Zotero](#). Using a reference manager is highly recommended, especially if you have a lot of sources, to ensure consistency in formatting and correspondence between all of your in-text citations and the references listed in this section of your proposal.

Note that a proposal will often go through several revisions with your adviser before he/she approves of its content and format. Once you have reached that point, you should obtain a "[Permission to Enroll](#)" form from the Graduate School, complete it, and email it to your advisor. This form and copy of the proposal will be sent to the Director of the Environmental Biology program. After the Director's review and approval, the form and proposal will be submitted to the Graduate School and you will be enrolled in ENV 579/ENV 579G. The sooner you have completed the proposal and have approval in hand, the sooner you can start collecting data.

Data collected prior to having an approved proposal is considered preliminary and, as such, may or may not be part of the finished report. This determination is at the discretion of the Project Adviser and the Program Director.

If you plan to register for ENV 579/579G (3 credits) in a given semester, the process of proposal submission and enrollment must be completed before the end of that semester's drop/add period (typically within the first week of the semester). If you plan to graduate in a given semester, note that the deadline for submission of the final report to the ENV Director is typically five weeks before the last day of classes in that semester. It is unusual for a student to complete ENV 579/579G within a single semester; your status will be rolled over as "In Progress" (IP) until your project is completed. The fee for the three credits is only paid once at the original registration date. If "IP" status occurs for this course in any given semester, the student only pays Hood's comprehensive fee.

Writing the Final Research Project Report for ENV 579

Below are detailed guidelines to assist you in writing and organizing your final project report. As with the project proposal, the organization of the completed report is determined in consultation with the student's research project adviser. Typically, it takes the form of a scientific manuscript with content sections similar to those of a thesis. However, some latitude is possible in this regard if there are sound reasons for an alternative organizational scheme.

Headings, Spacing, and Margins

Section headings should contain all uppercase letters, be boldface, and centered at the top of a new page. All text should be **double-spaced** with 1 inch margins all around. The recommended font is 12 pt Times New Roman.

Copyright

Under the Copyright Act of 1976, the "copyright in the work of authorship" becomes the property of the author who created it. Students completing a ENV 579/579G document must take care to obtain permission before using copyrighted materials within their project. Permission to use copyrighted materials, for example, tables and figures, must be obtained from the holder of the [copyright](#). The student needs to search carefully for the source of the copyright and obtain permission to use the copyrighted materials in the thesis document. See p. 12 for a sample letter that you could use to request permission to use copyrighted material. This permission should be referenced in the paper at the point where such materials are presented. The student must retain copies of the copyright permissions and supply them to Hood College upon request. Students are able to facilitate the use of their own research and findings by including a copyright waiver (p. 8) as part of the final report.

Preliminary pages

All of the below-named sections should begin on separate pages and must be double-spaced. The preliminary pages should be numbered in lower case Roman numerals located at the bottom center of each page. The title page is counted as page "i" but is not numbered. The preliminary pages should appear in the order specified below.

- a. **Title page** (see sample on p. 7)
- b. **Statement of Use and Copyright Waiver** (see example on p. 8)
- c. **Abstract** – this should be a short, concise summary of the project outlining the purpose of the work, the rationale and method, and highlighting the most significant findings. The maximum length of the abstract is 150 words.
- d. **Dedication** (optional)
- e. **Acknowledgements and Sponsorship** – thank and/or give credit to individuals and funding sources that made your project possible. If you received Graduate Research Funds to support your work, this should include the Graduate School of Hood College.
- f. **Table of Contents** – include the beginning page for each section (see example on p. 9)
- g. **List of Tables** – include the page location of each table and short titles (see example on p. 10)
- h. **List of Figures** – include the page location of each Figure and short legends (follow example for List of Tables on p. 10)
- i. **List of Abbreviations** (optional)

Main body of the text

The main body of the text should be numbered in Arabic numerals located at the bottom center of each page. The first page is counted as page “1” but is not numbered. If you use chapters, each chapter should begin on a new page, but the numbering is continuous from pages 1-XX for the entire report.

Content Sections

Section headings should be centered, capitalized, and should begin on a new page. Content sections are presented according to the following guidelines:

Introduction -- This section is used to describe the rationale for the project and to provide an overview of previously published relevant work that serves as a foundation and prelude to the thesis. Thus, it encompasses the introduction, rationale, and review of the primary literature often used in grant proposals and publications. If a hypothesis is being tested, it is often stated explicitly in the introduction. The introduction should make clear the significance of the research in the context of the wider body of scientific knowledge, and it should have a clear statement of purpose. The review of the literature should be current and thorough, encompassing all pertinent references. Subheadings may be used and are helpful for organizing the information. In general, it is better to err in favor of excess length than to abbreviate this section. Tables and figures may be used in the introduction; if they are not your own, be sure to include the citation for a table/figure’s source. You will also have to acquire [copyright permissions](#) if the material is copyrighted and not in the public domain.

Materials and Methods -- This section should describe in detail all of the methods, protocols, reagents, etc. used to conduct the research. In a project report, in contrast to a journal article, the purpose of this section is to provide enough information so that another scientifically knowledgeable person could duplicate your data with only the report available as an information source. Tables and figures may be included in this section. This section should make clear all of the procedures performed by the candidate, as well as sources of reagents not prepared by the candidate. This section should describe data collection and analysis methods (e.g. description of statistical analyses). Use of abbreviations is acceptable, but they must be used consistently. Abbreviations should be tabulated in the preliminary pages (see above). Numbers should be spelled out only if they begin a sentence.

Results -- This section presents a comprehensive picture of all the research results and data. More data are included in a project report than in a published scientific paper. The supporting data, e.g., toxicity curves with neomycin-resistance, are included -- whereas in a paper the results would be described briefly. Preliminary standardization of an assay, e.g., ELISA, would be incorporated so that someone reading the paper would be instructed and fully informed. This section usually contains tables and figures, **which should be on the page immediately following their first mention in the text**. It is also permissible to incorporate tables and figures into the text at the point where they are mentioned. Tables and figures are numbered consecutively (Arabic numerals) throughout the report. Numbering for tables and figures is independent (start at Table 1 and Figure 1, etc.). Each table should have a descriptive title

above, and each figure should have a descriptive legend below; each will be listed by page number on the contents page(s). If space for the legend is a problem, the facing page method can be used. In this case, the figure and its legend *share one page number*. Each figure or table should be referenced, interpreted, and explained in the text. Do not expect the reader to look at numbers in a table and extrapolate. Write out descriptions of key trends in the tabular and figure data as part of the text, along with appropriate comments and observations relating to collection of the data.

Discussion -- Having presented the actual data in the results section, this section is for critique and interpretation. Describe conclusions, determine how/if they support or do not support your hypothesis/hypotheses, and compare findings with other reported data. Where there is agreement, use it for validation. Where there is disagreement, suggest reasons and explanations. Suggest future directions for research.

References cited – All sources cited in your text should be listed here, and all sources listed here should be cited in your text. Cross check carefully; refer back to p. 3 for more information on in text citations and using a reference manager. The list of references in this section should be single spaced and arranged alphabetically by first author. No numbering should be used. Include the names of all authors and editors, as well as full titles, and starting and ending page numbers. See p. 11 for an example of a reference list.

Internet references -- References to pages on the World Wide Web should not normally be used, since such references often change or become unavailable. In certain cases, e.g., GenBank references, where it is likely that the cited material will be continuously available, such references are permitted.

Appendices -- Some data may be included in appendices if the data are (a) not original work of the candidate, but required to understand the project, (b) useful, but not results of research (tables of common data), or (c) so extensive it may interrupt the flow of the thesis (e.g., many photographs or specialized graphics). It is unusual to use an appendix in a project report.

Electronic Archiving and Distribution of ENV 579/579G Documents

After your final document for ENV 579/579G has been completed and approved by the Graduate Dean, you should submit it to MD-SOAR, a Shared Open Access Repository. This will require registration and approval from the Library before you can submit your project so please allow for that time. The student is responsible for all fees associated with the archiving and electronic publishing of their project.

1. Go to <https://mdsoar.org/>
2. Under the **Submit** heading, click on “Submit Item to MD-SOAR”
3. Log in to the system.
4. Insert metadata, upload file, choose a Creative Commons License, agree to the MD-SOAR license.

Sample Title Page

IMPACT OF HOOD COLLEGE ON THE FREDERICK COUNTY ECONOMY

by

Marjorie Smith

B.A. (University of Maryland) 1983

Independent Research Project

Submitted in partial satisfaction of the requirements

for the degree of

MASTER OF SCIENCE

in

ENVIRONMENTAL BIOLOGY

in the

GRADUATE SCHOOL

of

HOOD COLLEGE

May 2010

Accepted:

(Type Name)
Project Adviser

Susan L. Carney, Ph.D.
Director, Environmental Biology Program

April M. Boulton, Ph.D.
Dean of the Graduate School

STATEMENT OF USE AND COPYRIGHT WAIVER

I authorize Hood College to lend this project report, or reproductions of it, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

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- Bechinher C, Sciortino F, Zihelr P. 2013. Physics of complex colloids. Washington (DC): IOS Press; [accessed 2015 Aug 27]. <https://ebookcentral.proquest.com/lib/hood-ebooks/reader.action?ppg=3&docID=1441803&tm=1496853977000>. E-book
- Boyd A, Glaser R. 1987. Mapping EBV early antigens in human cells after microinjection of subgenomic DNA clones. In: Levine P, Glaser R, editors. Epstein-Barr and Human Diseases. Clifton, NJ: Humana Press. p 145-149. Section of a Print Book
- Chiuchiolo AL, Dickhut RM, Cochran MA, Ducklow HW. 2004. Persistent organic pollutants at the base of the Antarctic marine food web. Environ Sci Technol [accessed 2006 Sep 5]; 38(13):3551-3557. <http://pubs.acs.org/doi/full/10.1021/es0351793>. Journal Article - online
- O'Brien SJ, Joslin P, Smith GL, Wolfe R, Shaffer N, Heath E, Ott-Joslin J, Rawal PP, Bhatlachajee KK, Martenson JS. 1987a. Evidence for African origins of founders of the Asiatic lion species survival plan. Zoo Biol 6:99-116. Journal Articles - print
- O'Brien SJ, Martenson JS, Packer C, Herbst L, Devos L, Joslin P, Ott-Joslin J, Wildt D, Bush M. 1987b. Biochemical genetic variation in geographic isolates of African and Asian lions. Natl. Geog Res 3:114-124.
- Rossi AMK, Hirschhorn RR. 1991. Expression of growth-regulated genes in normal and SV40-transformed hamster fibroblasts. J Cell Biochem 47:165-173.
- Vessey SH, Meikle DB. 1984. Free-living rhesus monkeys: Adult male interactions with infants and juveniles. In: Taub D, editor. Primate Paternalism. New York: Van Nostrand Reinhold Company, Inc. p 113-126.
- White J, Boyd AL, Carter S, Ozer H. 1992. Cooperativity of SV40 T antigen and RAS in progressive stages of transformation of human fibroblasts. Exp Cell Res 203:157-163.
- Working Group on Diversity in the Biomedical Research Workforce (US). 2012. Draft report diversity in the biomedical research workforce [Internet]. Bethesda (MD): National Institutes of Health (US); [cited 2013 Sep 12]. Available from <http://acd.od.nih.gov/Diversity%20in%20the%20Biomedical%20Research%20Workforce%20Report.pdf> Government document

Copyright Letter Example

Date

Holder of Copyright
Street Address
City, State Zip

Dear Holder of Copyright:

I am a graduate student in the Environmental Biology Master's degree program at Hood College in Frederick Maryland. My project is _____. I am requesting permission to include in my Independent Project the following material:

(Include all relevant information about your request: title, page numbers, year of publication, etc.)

If permission is granted, proper acknowledgement and credit will be incorporated in the final report.

Sincerely,

Your Name
Contact Information