Hood College Graduate School

Thesis Guidelines for BMS

INTRODUCTION

Thesis research is recommended as the capstone experience for students in BMS that want to pursue a research career. This document is prepared to guide the student in writing the thesis. The scope of work for a thesis is equivalent to a publishable paper in the field of expertise. Hood does not require publication of the data, but sets that as the quality standard. It is the responsibility of the thesis advisor, thesis reading committee and student to plan the project with suitable goals, collect, analyze, and interpret the results, prepare and orally defend the written document. It is wise, but not required, to have a committee meeting to agree to the project in the proposal phase and anytime during the research if directions change due to experimental glitches or exciting alternative paths. It is the responsibility of the student to adhere to Hood College deadlines for defense of the thesis and submission of the final approved document.

This document contains guidelines for students and thesis advisers in preparing the written thesis in the BMS Program. These guidelines include Graduate School administrative procedures, thesis proposal requirements, and stylistic information for the writing and organization of the thesis. The following guidelines take precedence over all guidelines for theses published prior to June 2019. This document is also available on the web at www.hood.edu.

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ADMINISTRATIVE PROCEDURES

General Information

A thesis is recommended but not required in the BMS degree program. Students should carefully review the most current Hood College Catalog (also available on the Hood College web site: www.hood.edu) and seek the advice of their academic advisor before beginning a thesis. For students working in positions of research with proprietary restrictions, the Hood librarian can arrange for the data to be secured until an agreed upon release date when approved by the program director. If a student begins research aimed at thesis and changes direction due to personal or professional circumstances, the non-thesis track requires the student to complete BMS 571. The thesis BMS 580 is 6 credits and can be taken in two parts (580 A and 580 B) for ease of payment. The M.S. in Biomedical Science is 33 credits for thesis and non-thesis students. With the 2019 academic year, BMS 570 is no longer offered or required for thesis track students, allowing one additional elective course.

Thesis Advisor

The student is responsible for submitting a thesis proposal approved by the Reading Committee (see below), and for securing a Thesis Advisor to oversee the project. If the proposed Thesis Advisor is not a member of the Hood College faculty, she or he must be approved by the Program Director. It is, in this case, the student's responsibility to forward a curriculum vita and three letters of recommendation in support of the Thesis Advisor to the Biomedical Science Program Director prior to registration for thesis. If the Thesis Advisor is a faculty member (adjunct included) of an accredited college or university engaging in research, the requirement for three letters of recommendation may be waived. The Program Director, with the advice and consent of the faculty, generally reviews the Thesis Advisor qualifications and gives final approval of the thesis proposal. It is expected that the Thesis Advisor will be a Ph.D., M.D., or D.V.M experienced in the topic of thesis research.

A Thesis Advisor who does not hold the Ph.D., M.D. or D.V.M degree must be approved by the Graduate Council of Hood College. In such a case, the sponsoring department will present the curriculum vita and three letters of recommendation in support of the Thesis Advisor to the Graduate Council for review. Both proposal and advisor must be approved before registering for the thesis.

Reading Committee

The approved Thesis Advisor serves as Chair of the Reading Committee. The Advisor and the student, in consultation, will identify at least two additional persons to serve on the Reading Committee. At least one member of the Committee must be a full-time faculty member in BMS program. Additional members of the Committee may be a faculty member in the degree program, or another professional familiar with the research topic. The Reading Committee should be kept informed of progress on the thesis project, and should meet as required to help guide the research. The Committee should meet at least once before the thesis defense.

Registering for Thesis Credits

The BMS Program requires registration in and completion of at least 21 credits prior to enrolling for BMS 580 (A+B).

Students writing a thesis must register during a regular registration period for graduate course number 580, *Master's Thesis Preparation*. Registration usually occurs prior to the beginning or early in the thesis research. The BMS Program requires, in addition to the Permission to Enroll form (www.hood.edu/gradforms), an approved thesis proposal and identified Thesis Advisor and will forward documents the Registrar's office for registration processing.

Laboratory Facilities

Hood College may not be able to provide laboratory facilities for students engaged in thesis research.

Oral Defense

An oral defense of the thesis is required and will be presented to the Reading Committee at an agreed upon date and at a specified location. Defense dates should not be set until the Thesis Advisor and the Reading Committee approve the thesis draft. Be aware that in order to meet the final submission date (set by the college and published in the Academic Calendar on the Hood Web Site), the defense should be scheduled a minimum of two weeks prior to the deadline. At least two weeks before the oral defense the student should submit the thesis to the advisor, Reading Committee members, the Program Director, and the Dean of the Graduate School. The Dean of the Graduate School and the Program Director should be invited to attend the defense, whether or not they are members of the Reading Committee.

The candidate should expect to present the thesis research and findings in a professional manner, similar to presentations at a professional meeting. The use of well-prepared graphs, charts, and other explanatory aids is encouraged in the PowerPoint presentation. The candidate will be expected to explain the research and to answer questions relating to the thesis topic. The oral defense may be attended by members of the sponsoring department, the Dean of the Graduate School, and others in the research group interested in the topic, subject to the approval of the candidate and Adviser. Normally, the presentation of the thesis data by the student is an open event to faculty, students, and other invitees. However, the question and answer session is closed and attended only by the student, the Reading Committee members, the Program Director, the Dean of the Graduate School.

Approval of Master's Thesis

The thesis is approved after the oral defense and after corrections recommended by the Thesis Advisor and Reading Committee, the Program Director, and the Dean of the Graduate School have been completed. The thesis adviser sends a grade of S to the registrar indicating a pass in the thesis course (see below). Since the document is electronically uploaded to MDSOAR and ProQuest, signatures on the title page are electronic as well. One bound paper copy is ordered through ProQuest for the department.

Grade for Thesis

The thesis is graded "S" (satisfactory) or "U" (unsatisfactory). After the first semester of thesis research, an interim grade of "IP" (in progress) is awarded by the Thesis Advisor. Students will continue to be enrolled as In Progress (IP) every Fall and Spring semester until the thesis is completed. As such, students will be responsible to pay the graduate comprehensive fee each Fall and Spring term of IP enrollment. The final grade is awarded by the Thesis Advisor. The grade of "S" has no effect upon the student's grade point average. The grade of "U" has the same effect as a grade of "F" (failure). A final grade of "U" on the thesis usually results in the student's dismissal from the Master's degree program. In case a student enrolls in 580A (3 credits) a grade of S after the first semester if the student has made progress and is ready to enroll in 580B. After the semester in 580B IP status will follow until the thesis is completed and the conditions described above apply.

An unsatisfactory performance on the oral defense of the thesis may result in the student's dismissal from the Master's Degree program or a repeated defense. The Program Director, in consultation with the Advisor, the Reading Committee, and the Dean of the Graduate School may allow the student one additional opportunity to defend the thesis. Unsatisfactory performance at the retake will result in dismissal with no additional opportunities to complete the degree.

THESIS PREPARATION

Introduction

Students whose theses are sponsored by the Biology Department will use the format and style found in the Council of Biology Educators (CBE) Style Manual, "Scientific Style and Format." Copies of the CBE Style Manual can be found in the reference section of the Hood College Beneficial-Hodson Library. An additional resource is Successful Scientific Writing: A step-by-step guide for the biological and medical sciences, by Janice Matthews, John Bowen and Robert Matthews, Cambridge University Press.

Copyright

Under the Copyright Act of 1976, the "copyright in the work of authorship" becomes the property of the author who created it. For further information, please refer to the Copyright Office, Library of Congress, Washington, D.C. 20559.

Students completing a thesis must take care to obtain permission before using copyrighted materials within their thesis. Permission to use copyrighted materials, tables, and figures for example, 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. The permission to use copyrighted materials should be

referenced in the thesis 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.

Copyright Waiver

Students completing a thesis are able to facilitate the use of their thesis research and findings by publishing to Hood's open access repository on MD-SOAR. Students can further facilitate the use of their work by attaching a creative comments license to their thesis in MD-SOAR.

Acknowledgement of Hood College in Publications of Thesis Work

The Graduate School of Hood College should be acknowledged in publications that result from the thesis research. A simple statement of acknowledgement is sufficient. An appropriate example would be "Research reported in this document was originally published in a Master's degree thesis sponsored by the Department of Biology and submitted to The Graduate School of Hood College in Frederick, Maryland." *This statement should not, of course, be included in the thesis itself.*

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 a left hand margin of 1.5 inches (3.8 cm.) and with right, top, and bottom margins of 1.0 inch (2.5 cm.). **Theses which violate these margin requirements will not be accepted by the Graduate School.**

The one exception to this is on a "facing" legend page where the right margin (adjacent to the spine) is 1.5 inches and the left margin (toward the outer edge) is 1 inch. The margin requirements apply to all tables and figures as well as pages with text. A facing figure legend page and the figure together have one page number.

Deadlines

The importance of observing published deadlines for final submission of the completed and approved thesis cannot be overemphasized. Students are urged to follow closely and carefully the published dates for thesis submission. Arrangements for the oral defense of the thesis should be made early enough to allow time for completed of required corrections. This will enable the candidate to earn the Master's Degree at the earliest possible date. Past experience has shown that the most common reason for thesis candidates to receive their diplomas later than anticipated is because of poor planning with respect to deadlines.

As a general guideline, all theses are due in final form with signed cover pages to the Graduate School two weeks prior to the last day of classes in the Fall or Spring semester. However, be sure to check the Catalog or contact the Graduate School to confirm the assigned date each term. Instructions on how to upload to MD-SOAR and ProQuest are available on the Hood web site and can be obtained from the program director or the registrar's office.

GUIDELINES FOR BIOMEDICAL SCIENCE

Preliminary pages

1. Title page format should follow the example and guidelines found in this document.
2. Preliminary pages are presented in the following order:
    - Title Page
    - Statement of Use and Copyright Waiver (see copyright)
    - Dedication (optional)
    - Acknowledgements and Sponsorship
    - Table of Contents – should include the beginning page for each section
    - List of Tables – should include the page location of each Table, and short legends
    - List of Figures – should include the page location of each Figure, and short legends
    - List of Abbreviations (optional)
      All of the above sections should begin on separate pages and must be double-spaced. The pages should be numbered in lower case Roman numerals located at the bottom center of each page. The Title page is page I, but is not numbered.

Content Sections

Section headings should be centered, capitalized, and should begin on a new page.

Content sections are presented according to the following guidelines:

- *Abstract* – The abstract should be a short (1-2 pages), concise summary of the thesis project outlining the purpose of the work, the rationale and method, and highlighting the most significant findings.

- *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.

- *Materials and Methods* – This section should describe in detail all of the methods, protocols, reagents, etc. used to conduct the research. In a thesis, as contrasted 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 thesis available as an information source. Tables and figures may be included in this section (see next 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 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 is included in a thesis than in a 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 thesis 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 thesis document. Numbering for tables and figures is independent (start at Table 1 and Figure 1, etc.). Each table or figure has a legend and a title, and is listed by page number in the contents pages. 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 is interpreted and explained in the text. Do not expect the reader to look at numbers in a table and extrapolate. Write out descriptions of all 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 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.

REFERENCE FORMAT FOR THESES IN BIOMEDICAL SCIENCE

Journal Article:

Matus S, Glimcher LH, Hetz C. 2011. Protein folding stress in neurodegenerative diseases: a glimpse into the ER. Current Opinion in Cell Biology 23(2); 239-252. Doi:10.

1016/j.ceb.2011.01.003.[accessed 2018 Dec 13].
http://www.sciencedirect.com/science/article/pii/50955067411000056.

Oh S, Budzik HM, Garnfi G, Schneewind O. 2011. Two capsular polysaccharides enable Bacillus cereus G9241 to cause anthrax-like disease. Mol Microbiol 80(2): 455-470

O'Brien SJ, Joslin P, Smith GL, Wolfe R, Shaffer N, Heath E, Ott-Joslin J, Rawal PP, Bhatterachajee KK, Martenson JS. 1987a. Evidence for African origins of founders of the Asiatic lion species survival plan. Zoo Biol 6:99-116.

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.

Book Chapter:

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.

- *References Within the Text* – Reference citations within the text should be as follows: (Note that the year of publication is followed by small letter if more than one article is published in a single year.

    - Single author – (Smith, 1985)
    - Two authors – (Rossio and Hirschhorn 1991)
    - Multiple authors – (O'Brien et al. 1987a; O'Brien et al. 1987b)
- *References in Reference Section* – The list of references in the references 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.

- *Appendices* – Some data may be included in appendices if the data are (a) not original work of the candidate, but required to understand the thesis; (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 thesis. One common usage, however, is to place reprints of journal articles describing thesis research in an appendix.

COPYRIGHT LETTER EXAMPLE

September 30, 2019

Holder of Copyright

Address

City, State, Zip

Dear Holder of Copyright:

I am a graduate student in the biomedical science master's degree program at Hood College in Frederick, Maryland. My thesis is _____.

I am requesting permission to include my thesis in the following material"

Include all your 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 thesis document.

Sincerely,

Your Signature

A Majority of Clonally-Expanded CD4+ T Cells Containing Replication-Competent Proviruses are Transcriptionally Silent and Can Be Found in Effector Memory Cells

By

Andrew Musick

B.A. Biological Chemistry (Hood College) 2015

THESIS

Submitted in partial satisfaction of the requirements for the degree of

MASTER OF SCIENCE

In

BIOMEDICAL SCIENCE

In the

GRADUATE SCHOOL

Of

HOOD COLLEGE

May 2019

Accepted:

_____	_____
Ann Boyd, Ph.D.	Ann Boyd, Ph.D.
Committee Member	Program Director, Biomedical Science
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John Coffin, Ph.D.	
Committee Member	
_____	_____
Mary Kearney, Ph.D.	April Boulton, Ph.D.
Thesis Advisor	Dean of Graduate School