2017-2018

HANDBOOK FOR

THE MASTER OF HEALTH SCIENCE (MHS) DEGREE

THE DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOLOGY,
JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH

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I. Credit numbers and academic performance requirements

• Must have a **minimum of 16 credits per term** for full-time status, and **64 total credits** to graduate. Please refer to the webpage [http://www.jhsph.edu/academics/calendar/](http://www.jhsph.edu/academics/calendar/) for the exact start and end dates of each academic term.

• Of the 16 credits per term, **up to four credits each term can be BMB Special Studies (120.840, listed as "Special Studies and Research Biochemistry")**. This means that a **minimum of 12 credits** must be non-Special Studies courses. Part of the purpose of Special Studies (120.840) credits is to give you credit for the time you spend in various activities, even though these activities are not formal specific courses for which you get grades (e.g., seminars, meetings, other enrichment activities; see page 23).

• Taking more than one online course per term is discouraged; permission from the program director (Dr. Janice Evans, jevans6@jhu.edu) is required to take more online courses in a given term. Also be advised that many medical schools do not accept online courses.

• An MHS student must have a minimum cumulative G.P.A. of **2.75** to graduate.

• Maintaining a cumulative GPA of 2.75 is required to remain in good academic standing for the purposes of receiving federal financial aid.

• A D or F in any class or failure to have a cumulative GPA of 2.25 is **grounds for dismissal**. Also be advised that that no credits are received for a course in which a student receives an F, and therefore a course in which a student receives an F will not count toward the 64 credits one needs to graduate.

II. Course requirements

A. School-wide course requirements

• **Public Health Perspectives on Research**, 550.865 (an online, 2 credit pass/fail course in 2nd term, required of all BSPH students, except those in the MPH program)

• A **minimum of three credits of basic epidemiology** – The courses that satisfy this school-wide epidemiology requirement are:
  o **340.688, Practical Epidemiology for Basic Scientists** (3 credits), 4th term – a somewhat shorter version of an introductory epidemiology course, designed with basic scientists in mind (e.g., examples of studies that come up in class are relevant to biological/biomedical science students).
  o **340.721, Epidemiologic Inference in Public Health I** (5 credits), 1st term or online 3rd term – This is a good "all-purpose" epidemiology course, designed for a wide audience of SPH students.
  o **340.751, Epidemiologic Methods** (5 credits), 1st term – This course is more advanced than 340.688 and 340.721 in terms of the statistics background that is expected.
Waivers from the School's epidemiology can be granted in the following circumstances:

- If you took Course 280.350, Principles of Epidemiology (offered at the Homewood campus), you can be granted a waiver from the School's requirement to take an epidemiology course. Please contact Mystee Edmonds or Shannon Gaston and they will arrange with the Registrar's office to have this noted in your records. However, be advised that no course credit is given.

- If you have previously taken epidemiology at a U.S.-based, accredited school of public health, you can be granted a waiver from the School's requirement to take an epidemiology course. Please contact Mystee Edmonds or Shannon Gaston and they will arrange with the Registrar's office to have this noted in your records. However, be advised that no course credit is given.

- If you have previously taken an epidemiology course but not at a U.S.-based, accredited school of public health, then the Department of Epidemiology offers a waiver exam. The contact for information about this exam is Allyn Arnold, instructor in the Department of Epidemiology (aarnold2@jhu.edu). If the student passes the waiver exam, the student is waived of the requirement to take basic epidemiology, and this waiver is noted in the student's academic record with Records and Registration (however, no course credit is given for passing the waiver exam).

B. Departmental course requirements

Required courses:

- Concepts of Molecular Biology, 120.602, 1st term
- Fundamentals of Reproductive Biology, 120.620, 1st term
- Special Studies - Current Topics in BMB, 120.872 (pass/fail)
- Cancer Biology, 120.624, 4th term

At least five of the following upper-level BMB courses, while also taking at least one BMB course each term:

- Molecular Biology of Pandemic Influenza, 120.603, 2nd term
- Principles of Cell Biology, 120.626, 2nd term
- Genetics and Gene Therapy, 120.608, 3rd term
- Nucleic Acids Chemistry, 120.613, 3rd term
- Stem Cells and the Biology of Aging and Disease, 120.627, 3rd term
- Cellular Stress in Physiology and Disease, 120.606, 4th term
- Molecular and Cellular Mechanisms of Reproduction, 120.622, 4th term
- Genome Integrity, 120.605, 4th term

For the MHS thesis requirement, BMB MHS students complete:

- MHS Thesis Preparation, 120.860, 3rd term (pass/fail)
- Master's of Health Science Thesis, 120.870, 4th term

Optional: The two introductory biochemistry classes, Biochemistry I and II (120.600, 120.601), are not required but are recommended for certain students who would benefit from taking this material (e.g., students who would like a biochemistry refresher for taking/re-taking the MCAT).
Term by term breakdown of course requirements:

1st term
Required:
• Special Studies - Current Topics in BMB, 120.872 (pass/fail)
• Concepts of Molecular Biology, 120.602
• Fundamentals of Reproductive Biology, 120.620
Optional:
• Biochemistry I, 120.600 (usually required for 120.601, below)
  o Biochemistry I and II are fundamental biochemistry courses and are excellent options for students who would like a biochemistry refresher for taking/re-taking the MCAT.

2nd term
Take at least one BMB course:
• Molecular Biology of Pandemic Influenza, 120.603
  o Satisfies the MHS degree requirement as one of the five upper-level courses
  o Literature-based course addressing one of the most interesting examples of the intersection of public health and the basic biomedical sciences.
• Principles of Cell Biology, 120.626
  o Satisfies the MHS degree requirement as one of the five upper-level courses
  o Topics-based cell biology course; good choice for students who will be taking/re-taking the MCAT.
• Biochemistry II, 120.601
  o Second half of Biochemistry, continues from Biochemistry I (although it is not a strict requirement to take Biochemistry I in order to take Biochemistry II)

3rd term
Required:
• MHS Thesis Preparation, 120.860 (pass/fail)
Plus take at least one BMB course:
• Genetics and Gene Therapy, 120.608
  o Satisfies the MHS degree requirement as one of the five upper-level courses
  o Addresses the genetic basis of health and disease, from gene discovery (how does one determine gene(s) associated with a certain physiological or pathophysiological process?) to treating conditions with gene therapy or cutting-edge genome editing techniques.
• Nucleic Acids Chemistry, 120.613
  o Satisfies the MHS degree requirement as one of the five upper-level courses
  o Good choice for students with a strong chemistry background or seeking to build on their chemistry background; addresses the syntheses and chemical modifications of nucleotides, oligonucleotides, and nucleic acids, and in the application of oligonucleotides to solving problems in biology.
• **Stem Cells and the Biology of Aging and Disease**, 120.627
  - *Satisfies the MHS degree requirement as one of the five upper-level courses*
  - Covers topics in this cutting-edge area of biomedical science relevant to regenerative medicine, and reproductive and cancer biology.

**4th term**

*Required:*

- **Cancer Biology**, 120.624
- **MHS Thesis**, 120.870

*Plus, if still need to take additional upper-level BMB courses (a minimum of five are required):*

- **Genome Integrity**, 120.624
  - Examines topics such as DNA repair, chromosome maintenance, and cell cycle control as these apply to cancer and other diseases.
- **Cellular Stress in Physiology and Disease**, 120.606
  - Addresses the emerging, hot area of biomedical science on the "cell biology of stress" – events like cellular stress sensing pathways and stress response pathways, pertinent to many diseases and pathological states, such as neurodegeneration. Feedback from recent MHS alums is that this course material on oxidative stress is highly relevant to medical school!
- **Molecular and Cellular Mechanisms of Reproduction**, 120.622
  - For students interested in reproductive biology and health; this course builds on 120.620, Fundamentals of Reproductive Biology in 1st term.

The **required BMB courses must be taken for a grade** (not Pass/Fail or for Audit credit):

- Concepts of Molecular Biology, 120.602 (1st term)
- Fundamentals of Reproductive Biology, 120.620 (1st term)
- Cancer Biology, 120.624 (4th term)
- MHS Thesis in Reproductive and Cancer Biology, 120.870 (4th term)

You must take a **minimum of four of the upper-level BMB courses for a letter grade** (and you are urged to take all for a letter grade, as P/F in a letter-graded course really doesn't do your credentials much good!).

**NOTE:** If you have previously taken any of these BMB courses (e.g., in satisfaction of your undergraduate degree or as a special student at Hopkins):

- If you have previously taken any of BMB courses and received a B or better, you do not have to re-take the course (nor are you allowed to take the course over again and have it count toward your Master's degree). If you are placing out of a BMB course, then you satisfy your requirement for BMB-based courses by taking one **additional BMB course for each course that you placed out of. You should take a minimum of eight BMB classes over the four terms of the academic year.**
- If you have previously taken one of these BMB courses and received a C or lower, you are **my consider re-taking the course**, particularly if you feel do not know the material well and the material may serve as the foundation for a later course.
III. Thesis requirements

The independent study M.H.S. thesis is completed by BMB MHS students. This thesis is a literature review (see details below), and there are two components:

• You must complete and receive a P (Pass) in Course # 120.860, MHS Thesis Preparation, in 3rd term.
• You must receive a grade of B or better on the thesis to be eligible for the MHS degree. The grade you receive on the thesis will show in your transcript for Course # 120.870 in 4th term, and will figure in to your cumulative GPA.
TERM BY TERM REQUIRED AND OTHER COURSES

Notes:
(1) Please be aware that course information can and does change (e.g., days/times, instructors, sometimes even if the course is going to be offered at all – and sometimes with little notice). We unfortunately cannot control courses in other departments. For the most up-to-date information on course times, instructors, prerequisites, requirements for instructor permission, etc., go to the School's course search engine: www.jhsph.edu/courses

(2) Many of the courses listed here have been recommended by previous MHS students or are noted here for various reasons of interest to BMB MHS students (e.g., relevance to medicine and/or public health and/or MCAT, biological areas of interest, etc.). But this is by no means a comprehensive list! There are hundreds of great courses in the School of Public Health -- feel free to shop around with the course search engine to see the many other options.

FIRST TERM (before Labor Day to late October)

BMB required courses
120.602 Concepts of Molecular Biology (4 credits); T Th, 1:30-2:50
120.620 Fundamentals of Reproductive Biology (3 credits); T Th, 3:30-4:50
120.872 Special Studies – Current Topics in BMB (1 credit, Pass/Fail); W F, 12:00-12:50

BMB optional 1st term course
120.600 Biochemistry -- An Introductory Course I (5 credits); M W F 10:30-11:50

Courses that satisfy the BSPH epidemiology requirement:
340.721 Epidemiologic Inference in Public Health I (5 credits)
340.751 Epidemiologic Methods (5 credits)

Various 1st term courses of interest
120.821 MHS Student Research (research in a BMB faculty member's lab; 3 credits, P/F)
140.611 Statistical Reasoning I (3 credits)
140.621 Statistical Methods in Public Health I (4 credits)
180.609 Principles of Environmental Health I (4 credits)
    continues in second term, 180.610 *consent of instructor required
180.611 The Global Environment and Public Health (4 credits)
187.610 Public Health Toxicology (4 credits)
221.613 Introduction to Humanitarian Emergencies (2 credits)
260.611 Principles of Immunology I (4 credits) - prerequisite: course in advanced biology
    continues in second term, 260.612
260.623 Fundamental Virology (4 credits)
260.636 Evolution of Infectious Disease (3 credits)
300.651 Introduction to the U.S. Healthcare System (4 credits)
330.662 Public Mental Health (2 credits)
380.604 Life Course Perspectives on Health (4 credits)
410.600 Fundamentals of Health, Behavior and Society (4 credits)
410.612 Sociological Perspectives on Health (3 credits)
550.630 Public Health Biology (3 credits)
SECOND TERM (late October to just before the December holiday season)

Required course (school-wide requirement for all BSPH students not in the MPH program)

550.865 Public Health Perspectives on Research (2 credits), online, Pass/Fail

BMB courses

120.601 Biochemistry -- An Introductory Course II (5 credits)
   M W F, 10:30-11:50
120.603 Molecular Biology of Pandemic Influenza (3 credits)
   Tu Th, 2:00-2:50
120.626 Principles of Cell Biology (3 credits)
   W F, 9:00-10:20

Various 2nd term courses of interest

120.821 MHS Student Research (research in a BMB faculty member’s lab; 3 credits, P/F)
120.720 Applying Reproductive Biology Literacy Through Service-Learning (3 credits)
   prerequisite: course # 120.620, and consent of instructor
140.612 Statistical Reasoning II (3 credits)
   continuation from Statistical Reasoning I, 140.611, in 1st term
140.622 Statistical Methods in Public Health II (4 credits)
   continuation from Statistical Methods in Public Health I, 140.621, in 1st term
180.650 Fundamentals of Clinical Oncology for Public Health Practitioners (3 credits)
180.610 Principles of Environmental Health II (4 credits)
   continuation from first term * consent of instructor required
183.631 Fundamentals of Human Physiology (4 credits)
187.632 Molecular Toxicology (4 credits)
   prerequisite: course # 187.610, a basic course in molecular biology, or consent of instructor
187.610 Public Health Toxicology (online, 4 credits)
223.662 Vaccine Development and Application (3 credits)
260.612 Principles of Immunology II (4 credits)
   continuation from first term
260.631 Immunology, Infection, and Disease (3 credits)
260.635 Biology of Parasitism (4 credits)
380.720 Masculinity, Sexual Behavior & Health: Adolescence & Beyond
410.611 Health, Poverty and Public Policy in the U.S.
THIRD TERM (mid-January to mid-March)

BMB required courses
120.860 MHS Thesis Preparation (2 credits, pass/fail)

Additional BMB courses
120.608 Genetics and Gene Therapy (3 credits)
   Tu Th, 1:30-2:50
120.613 Nucleic Acids Chemistry (3 credits)
   M W 3:30-4:50
120.627 Stem Cells and the Biology of Aging and Disease (3 credits)
   M W 10:30-11:50

Course that satisfies the BSPH epidemiology requirement:
340.721 Epidemiologic Inference in Public Health I (5 credits, online)

Various 3rd term courses of interest
120.821 MHS Student Research (research in a BMB faculty member's lab; 3 credits, P/F)
140.615 Biostatistics for Lab Scientists I (4 credits)
182.640 Food- and Water-Borne Diseases (3 credits)
183.638 Mechanisms of Cardiopulmonary Control (2 credits)
187.630 Xenobiotic Metabolism And Biomarker Development (4 credits)
221.640 Children in Crisis: An Asset-Based Approach to Working With Vulnerable Youth
   (3 credits) – also has an optional, complementary practicum component
   in 3rd and 4th term
221.635 Advances in Community-Oriented Primary Health Care (4 credits)
223.687 Vaccine Policy Issues (3 credits)
   (Recommended prerequisite: course # 223.622)
260.627 Pathogenesis of Bacterial Infections (4 credits)
260.635 Biology of Parasitism (4 credits)
260.650 Vector Biology and Vector-Borne Diseases (3 credits)
260.656 Malariology (4 credits)
260.665 Biological Basis of Aging (3 credits)
308.610 The Political Economy of Social Inequalities and Its Consequences of Health and
   Quality of Life (3 credits) (consent of instructor required)
330.661 Social, Psychological, and Developmental Processes in the Etiology of Mental
   Disorders (3 credits)
340.607 Introduction to Cardiovascular Disease Epidemiology (4 credits)
380.665 Family Planning Policies and Programs (4 credits)
380.760 Clinical Aspects of Reproductive Health (3 credits)
410.610 Health and Homelessness (3 credits)
410.613 Psychosocial Factors in Health and Illness (3 credits)
410.651 Health Literacy: Challenges and Strategies for Effective Communication (3 credits)
FOURTH TERM (mid/end of March to mid/end of May)

BMB required courses
120.624 Cancer Biology* (3 credits)
   M W, 3:30-5:00
120.870 Master's of Health Science Thesis (5 credits; this is how you get your grade for the MHS thesis)

Additional BMB courses (if still need courses for the minimum of five upper-level BMB courses)
120.606 Cellular Stress in Physiology and Disease (3 credits)
   Tu Th, 10:30-11:50
120.622 Molecular and Cellular Mechanisms of Reproduction (4 credits)
   Tu Th, 3:30-5:00
120.605 Genome Integrity * (2 credits)

Course that satisfies the BSPH epidemiology requirement:
340.688 Practical Epidemiology for Basic Scientists (3 credits)
   M W F, 1:30-2:20

Other 4th term courses of interest
120.821 MHS Student Research (research in a BMB faculty member's lab; 3 credits, P/F)
140.616 Biostatistics for Lab Scientists II (4 credits)
183.631 Fundamentals of Human Physiology (online, 4 credits)
183.642 The Cardiopulmonary System Under Stress (2 credits)
187.661 Environmental Health in Neurological & Mental Disorders (3 credits)
   (prerequisite: 187.610 or instructor consent required)
223.682 Clinical Aspects of Tropical Disease (3 credits)
260.622 Principles of Bacterial Infection (3 credits)
260.656 Malariology (online; 4 credits)
260.712 Clinical Immunology (3 credits; instructor consent required)
260.655 Protein Bioinformatics and Structure (3 credits; not offered every year)
260.608 Advanced Topics in AIDS Research (4 credits)
   (prerequisite: 260.623 or instructor consent required)
223.689 Biologic Basis of Vaccine Development (3 credits)
   (prerequisite: 260.611-112 or equivalent knowledge of principles of modern immunology)
300.651 Introduction to the US Healthcare System (online, 4 credits)
380.671 Adolescent Pregnancy - Causes, Consequences, and Interventions (3 credits)
   (instructor consent required)
380.667 Women's Health Policy (3 credits)
380.762 HIV Infection in Women, Children, and Adolescents (4 credits)
410.652 Interpersonal Influence in Medical Care (2 credits)
THE M.H.S. THESIS

The M.H.S. thesis is the culminating experience of the degree, and should "provide new knowledge and/or a critical synthesis and integration of existing knowledge" (as described by the Policy and Procedure manual of the Bloomberg School of Public Health). This is a library-based thesis – meaning the thesis does not involve independent research in a laboratory, but instead requires a synthesis of the scientific literature, in the style of a review article. It is also possible that the thesis could take on elements of a research proposal.

You get a grade for the M.H.S. thesis. Your thesis grade will show on your transcript and will figure in to your cumulative GPA, through a five-credit thesis 'course' listed for 4th term, 120.870. Although the grade is assigned in 4th term, you will be working on your thesis for significantly more than one term. (Indeed, if you only work on the thesis starting over spring break before 4th term, you are very likely not to get a passing grade.)

Procedure and rules for the MHS thesis:

1. A list of thesis topics will be distributed. You will select your top 3-4 topics from this list. The deadline for submitting your choices will be in 2nd term; you will receive email notifications to your JHU email account about this. (Note: There is no advantage to handing a list in sooner than this date, i.e., there is no "first come, first served.")

2. You will be assigned one of your topic choices, and a thesis supervisor to advise on this topic; you will know your topic and thesis supervisor by approximately midway through 2nd term.

3. You then should consult with their thesis supervisor regarding topic, tips for starting your work, etc. The MHS thesis is intended to be an independent study project in which you work one-on-one with your faculty supervisor to assist your research as needed. There are several important milestones and deadlines related to the MHS thesis:

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<tr>
<th>Milestone</th>
<th>Deadline</th>
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<tr>
<td>Organizational meeting with thesis supervisor before week of 2nd term final exams – overall thesis work plan, and specifically</td>
<td>No later than Friday, Dec. 8, 2017</td>
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<tr>
<td>Progress report meeting with thesis supervisor at least once by Week 2 of 3rd term - update on progress on general outline</td>
<td>No later than Wednesday Jan. 31, 2018</td>
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<tr>
<td>General outline due (~2-4 pages in length) – email to thesis supervisor, and also submit via CoursePlus website for 120.860</td>
<td>No later than Sunday Feb. 4, 2018, 11:59 PM</td>
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<tr>
<td>Progress report meeting with thesis supervisor at least once by end of Week 5 of 3rd term – get feedback on general outline</td>
<td>No later than Friday, Feb. 16, 2018</td>
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<tr>
<td>Secondary thesis reader name and contact information entered in CoursePlus</td>
<td>No later than Friday, March 16, 2018, 5:00 PM</td>
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<tr>
<td>Detailed outline OR partial rough draft due (consult your thesis supervisor on what s/he prefers), including references – email to thesis supervisor and also submit through CoursePlus website for 120.860</td>
<td>No later than Mon. March 19, 2018, 11:59 PM (sooner is encouraged)</td>
</tr>
<tr>
<td>Progress report meeting with thesis supervisor at least once by end of Week 2 of 4th term - feedback on detailed outline or partial draft</td>
<td>No later than Friday, March 30, 2018</td>
</tr>
<tr>
<td>FINAL THESIS DUE (20-30 pages long, not counting figures, references) – hard copy or e-copy to thesis supervisor and submit e-copy through CoursePlus website for 120.870</td>
<td>Sunday, April 22, 2018, 11:59 PM</td>
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4. You will document your meetings with your thesis supervisor through the Portfolio tool in CoursePlus. Document uploads will use dropboxes associated with the appropriate CoursePlus course site, for 120.860 in 3rd term and 120.870 in 4th term.

5. You are responsible for arranging for a secondary reader for the MHS thesis (the primary reader will be your thesis supervisor). The secondary reader can be anyone with a faculty appointment at Johns Hopkins (e.g., the secondary reader can be from outside the SPH, and the secondary reader can be a non-tenure track faculty member.) You may consult with your thesis supervisor for suggestions of secondary readers, and you may also consider your academic advisor, a faculty member with whom you have had a class or have worked, or a faculty member that you know has an interest in your thesis topic. Be advised that you may not have an idea of a good secondary reader until you have completed some of your thesis research and thus know what the content of the thesis will be.

   The role of the secondary reader is to provide help to the thesis supervisor (the primary reader) in assessing and assigning a grade for the thesis.

   ➔ You will submit the name and contact information for your secondary reader through CoursePlus. This information must be received by 5:00 PM on the last day of 3rd term to get a Pass for Course #120.860, MHS Thesis Preparation.

6. The work-in-progress document – i.e., the detailed outline OR partial rough draft due (depending on which your thesis supervisor on what s/he prefers), including references. This document must be submitted to your thesis supervisor by email AND submitted to the CoursePlus dropbox by 11:59 PM of the Monday of the week between 3rd and 4th terms to get a Pass for Course #120.860, MHS Thesis Preparation.

7. FINAL MHS thesis is due by Sunday, April 22, 2018, 11:59 PM.

   Communicate with your thesis supervisor and secondary reader to determine if they prefer a hard copy or an e-copy. You also must submit a PDF version to the CoursePlus website for 120.870, to be saved for departmental records. You may also use CoursePlus to upload your thesis to your academic portfolio.

8. Thesis grade: You must receive an A or B on the MHS thesis to be eligible for the MHS degree. As noted above, your grade on your thesis will show on your transcript and figure in to your cumulative GPA, for the five-credit course # 120.870. The grade you get on the thesis that you hand in on April 22, 2017 is the FINAL grade that goes and stays on your transcript, and figures in to your cumulative GPA.

   If you receive a C or D on the thesis, you are not eligible for the MHS degree for May graduation. However, you have the option to re-write the thesis if you still wish to be eligible for the MHS degree. Re-written theses must be submitted to your thesis supervisor, your secondary reader, and the BMB academic affairs office (Mystee Edmonds and Shannon Gaston); the absolute last date that the re-written thesis can be submitted is August 1. This re-written thesis must be of A or B grade quality to make you eligible for the MHS degree. Although the grade of C or D will stay on your transcript, the department will submit a letter to Records and Registration to note that you have satisfactorily completed the thesis requirement.

   If you receive an F on the MHS thesis, you will be permanently ineligible for the MHS degree; there is no rectifying this deficiency (theses that receive an F are not eligible
for a re-write). The draft that you hand in on April 22, 2017 must get a D or better for you to have any hope of receiving the MHS degree.

9. Theses handed in after the due date of April 22, 2017: Students handing in the thesis late automatically receive a D for Course # 120.870. This grade will stay on your transcript and will figure in to your cumulative GPA.

If you wish to be eligible for the MHS degree, you will have to re-write the thesis; this must be handed in to your thesis supervisor, your secondary reader, the BMB academic affairs office (Mystee Edmonds and Shannon Gaston) by August 1. This re-written thesis must be an A or B grade quality to make you eligible for the MHS degree. Although the grade of D will stay on your transcript, the department will submit a letter to Records and Registration to note that you have satisfactorily completed the thesis requirement.

General guidelines for the MHS thesis:

• Length - 20-30 pages (not counting bibliography or figures)
  o Note: A thesis shorter than 20 pages typically will not provide sufficient depth and breadth to earn an A. If your thesis is going to be longer than 30 pages, you should discuss this with your thesis supervisor and either get approval for a longer thesis, or discuss how to shorten the thesis.

• Double-spaced with one-inch margins

• Must include an abstract of 250 words or less at the beginning.

• Font - Arial, Times, Times New Roman, etc. (i.e., nothing crazy looking), size 12 (nothing too tiny, nothing too large).

• For hard copies, binding is not necessary, but certainly welcome.

• Organization varies depending on topic, but a general format could include
  Introduction
  Background
  The state of the field currently -- including what's known, and what's controversial and/or unknown
  Where the field is going (to address controversies and unknowns)
  Conclusions/summary

Note: Headings and subheadings can be used to distinguish sections and subsections. A table of contents may be included to highlight these sections and subsections.

• References: ~40-100 referenced works (will vary widely, depending on the topic)

• Reference formats (for using RefWorks or other bibliographic software, you may select the Journal of Cell Biology as style)

(a) In-text citations (at the end of sentence or phrase needing a citation):

If one author:
  A monoclonal antibody that recognizes Protein X inhibits sperm fusion with eggs (Jones, 2003).

If two authors:
  A monoclonal antibody that recognizes Protein X inhibits sperm fusion with eggs (Jones and Smith, 2003).
If 3+ authors:
A monoclonal antibody that recognizes Protein X inhibits sperm fusion with eggs (Jones et al., 2003).

(b) **Bibliography list of references at the end of the thesis**
Alphabetical by first author's last name, formatted as follows:
Lastname1 A., Lastname2 B., Lastname3, C. (Year) Title of paper. *Journal name (or abbrev.)* Vol.#: page#-page#.

- You are strongly urged to use **bibliographic software**; this will be significantly easier for you than typing all your references into your outlines and thesis drafts, or trying to keep the papers you find and read organized without software. The web-based bibliographic software **RefWorks** is available free to JHU students through Welch Library. Other bibliographic software options include Reference Manager, EndNote, and Mendeley ([www.mendeley.com](http://www.mendeley.com)).

Links for various services available from Welch Medical Library ([http://welch.jhmi.edu](http://welch.jhmi.edu)):

**Welch Library classes and tutorials:**
[welch.jhmi.edu/welchone/Classes-and-Lectures](http://welch.jhmi.edu/welchone/Classes-and-Lectures)
Online tutorials and schedule of classes for using various services and databases

**Welch Library's information on RefWorks:**
Online tutorials available through:
[welch.jhmi.edu/welchone/Online-Tutorials-and-Guides](http://welch.jhmi.edu/welchone/Online-Tutorials-and-Guides)

**Portal for using RefWorks:** Under the "Services" tab at [welch.jhmi.edu/welchone/](http://welch.jhmi.edu/welchone/)

- **Illustrations:** Illustrations are allowed in the thesis. Figures must include a figure legend. You should consult with your thesis supervisor about including figures and in what format – particularly if your thesis supervisor is comfortable with you using a figure from a published work, or whether you should draw your own illustration (and provide attribution for the inspiration). If you do an exact duplication of a figure (by copy and paste) that was published somewhere, you must provide a citation, with some phrase in the figure legend like "taken from Smith et al., 2014." If you draw your own illustration that is roughly based on one or more figures that have been published, you should cite this as, "adapted from Smith et al., 2014 and Comnsnogle et al., 2010."

- **Working with others** – You should verify with your thesis supervisor, but in general, most thesis supervisors will be supportive of you working with your fellow MHS students, such as exchanging thesis drafts with a friend and checking each other's draft for readability, grammar, typos, etc.
Crucial issue with referencing and with illustrations –
**MUST AVOID PLAGIARISM!!!**

Information from the School's Policies and Procedures:
**POLICY AND PROCEDURE MEMORANDUM STUDENTS - 1**
SUBJECT: Academic Ethics
[https://my.jhsph.edu/Resources/PoliciesProcedures/ppm/Pages/default.aspx](https://my.jhsph.edu/Resources/PoliciesProcedures/ppm/Pages/default.aspx)

CONSTITUTION OF THE ACADEMIC ETHICS BOARD OF THE BLOOMBERG SCHOOL OF PUBLIC HEALTH

Article Two. Definitions

Section Two.
Plagiarism is defined as taking for one's own use the words, ideas, concepts or data of another without proper attribution. Plagiarism includes both direct use or paraphrasing of the words, thoughts or concepts of another without proper attribution. Proper attribution includes: (1) use of quotation marks or single-spacing and indentation for words or phrases directly taken from another source, accompanied by proper reference to that source, (2) proper reference to any source from which ideas, concepts, or data are taken even if the exact words are not reproduced.

**Tips for working on the MHS thesis:**

- **Meet with your thesis supervisor** and get tips on how where to get started. There are many different ways, based on you, the topic, and your thesis supervisor. Examples include:
  - Use PubMed or other literature database search (e.g., Google Scholar) with keywords related to your topic.
  - Use PubMed to search for a few authors' names to PubMed, to see what leaders in the field are doing
  - Thesis supervisor might assign a couple review articles for overview
  - Thesis supervisor might assign 2-5 research papers to get you started on a few key issues in the field.
- Start collecting papers, review and original research – and dive in and start reading.
- Start jotting down ideas, key concepts, important issues, etc. that come up in these papers.
- Continue meeting with your thesis supervisor and feedback during your regular progress report meetings.
- As your ideas of thesis content start coming together, start working on an **OUTLINE**. A short outline is part of the required work in third term on the thesis. It is highly recommended that you include references during your outlining, both to organize your thoughts and to keep track of citations.
- Make modifications/additions in response to thesis supervisor's comments.
- Start writing from your outline. Text can be broken into sections and subsections, with headings for each section / subsection.
THE MASTER OF SCIENCE (Sc.M.) PROGRAM

Overview

The Department of Biochemistry and Molecular Biology offers two different master's degrees: The Master of Health Science (MHS) and the Master of Science (ScM). For the ScM degree, MHS students transfer to the ScM program and continue in a second year after completion of the first year coursework. In this second year, you do laboratory research in one of the BMB primary appointment faculty members. The active labs with available space and appropriate projects for ScM students will vary from year to year, but can include Drs. Bailey, Culotta, Drummond-Barbosa, Evans, Jordan, Kavran, Leung, Matunis, McMacken, Wan, Wang, Wright, and Zirkin, as well as joint BMB appointees with training privileges, Marsha Wills-Karp (EHE), Photini Sinnis (MMI), Sabra Klein (MMI), and Sean Prigge (MMI). The ScM degree work culminates in the writing of an ScM thesis (literature review and research report). Students start their research in June after the MHS coursework year, and then complete their research and thesis in the next spring-summer (~12-13 months). Tuition is reduced for the ScM year as compared to what students pay for the MHS coursework year. This typically is ~25% of the MHS year tuition. Questions about the ScM program can be directed to Dr. Janice Evans, Dr. Phil Jordan (director of the ScM program), and/or Mystee Edmonds or Shannon Gaston.

The first step – is the ScM right for you?

Among the reasons an MHS student might consider transferring to the ScM:

- You are interested in learning more about a research topic in more depth, with your own hands-on lab research.
- You might be interested in a career in some aspect of biomedical research, but would like to gain more exposure and/or practical experience in this area before you make a career choice.
- You are interested in a career in biomedical research, and would like the ScM degree as a means of preparing for a research job or for a PhD program.
- You are interested in an MD-PhD (MSTP) or similar graduate program, and would like more research experience to improve your competitiveness for these programs.
- You are planning to start the application process for medical/dental/vet/graduate school in the upcoming summer for study starting next fall, and you want to have an strong educational background and research experience to add to your credentials.

What to expect in the ScM experience

Your year as an ScM student is likely to be different from other academic experiences that you've had to date. You will have the interesting experience of chatting with someone, explaining that you're going for your Master's of Science degree, but you're not taking any classes, to which this someone will reply, "If you're not taking classes, then what do you do??" In your ScM research, you will be doing research side-by-side with other lab trainees and employees – meaning doctoral students, post-doctoral fellows, lab technicians, etc. The time is largely unstructured, except for things like lab meetings, research seminars, journal clubs, and one-on-one meetings with your advisor. Otherwise, the time is spent in the lab doing experiments.

You will have your own research project. This project is designed largely by your ScM advisor; you will meet with your advisor for guidance on how to move the research forward, but the work
is your own. The ScM research project culminates in the writing of an ScM thesis. The ScM thesis is very different from the MHS thesis. The ScM thesis includes sections that are similar to a research paper (literature review, materials and methods, results, discussion). The ScM thesis is reviewed by two thesis readers, including the research advisor. Ultimately, the thesis must be accepted by both readers for the student to earn the ScM degree. The ScM thesis does not receive a letter grade.

ScM students are paid in their research year for hours worked up to 19 hours per week up to a maximum of 987 total hours or up to 13 months on payroll, whichever comes first. (Exception to this is when a student is has a grant, fellowship, or other financial support that pays a student stipend.) *This does not mean that you only work in lab 19 hr per week.* You are likely to find that lab time will be highly variable; some days might be longer, some might be shorter, depending on the lab work that you are doing that day. In general, **your research time will be a 40+ hours per week commitment** (with some variation from day to day, week to week). This means that you will have some time, but not lots of time, for other activities. Activities such as MCAT studying, medical/graduate school applications, volunteer work, and the like, need to be worked around your primary time commitment to lab research.

**It is unusual and not recommended for an ScM student to take a significant number of classes in the research year.** The main mission of the research year is completing the ScM research project and writing the ScM thesis. **An ScM student must get permission from the ScM advisor to take any class** (including online classes). If you take a class, you are responsible for managing your time around class time and study time to make sure your research continues to make progress.

**How the transfer to the ScM program works**

If you are interested in the ScM program, you will be making arrangements starting in 1st term and through 3rd term. The process is as follows:

1. **Consider your research interests – 1st to 2nd term, into winter break**

MHS students who are interested in the ScM degree should get informed about faculty research in the department. **The Current Topics in BMB (course # 120.872) in 1st term is a key opportunity for MHS students to hear research talks by departmental faculty.** Interested students can also look over synopses of the research interests of BMB faculty members at [http://www.jhsph.edu/departments/biochemistry-and-molecular-biology/faculty/](http://www.jhsph.edu/departments/biochemistry-and-molecular-biology/faculty/). The labs with available space and appropriate projects for ScM students will vary from year to year, but can include Drs. Bailey, Culotta, Drummond-Barbosa, Evans, Jordan, Kavran, Leung, Matunis, McMacken, Wan, Wang, Wright, and Zirkin, as well as specific joint BMB appointees with training privileges, Marsha Wills-Karp (EHE) Photini Sinnis (MMI), Sabra Klein (MMI), and Sean Prigge (MMI).

You are encouraged to talk with faculty members about their research interests and potential ScM projects, and asking them if they have space, funding, and an appropriate project for an ScM student. When you get to the point where you are meeting one-on-one with faculty members, **treat your meetings with a prospective ScM advisor as an interview!** You should be prepared to talk about why you are interested in the faculty member’s lab. Be prepared for questions about your research background, your academic performance, your reasons for wanting the ScM, your short-term and long-term goals, and your reasons for being interested in that particular lab.
Arranging to volunteer in a lab or doing the MHS Student Research course (course #120.821) is highly recommended. Some faculty will actually require that you come work in their lab for a period of time, so that they can get to know you, and assess your skill and interest in research.

(2) Preparing your credentials for review by faculty – winter break to 3rd term

There is no formal application or admissions process for transfer to the ScM program. Instead of a formal application, a student submits credentials that then are available for review by your prospective ScM advisor(s).

The main thing for you to prepare is a personal statement (1-3 pages long) that addresses:

- Summary of your research experience – past to present, up to your time in the MHS program, including work in a BMB lab(s) if applicable.
- Interest in ScM experience in general – what are your career goals, and how does the ScM help with these goals?
- The lab(s) that you are interested in, and briefly stating why you are interested in those lab(s).
  - Please note if you have volunteered in a particular BMB lab(s) and how that is part of the basis of your interest in that lab.
  - If you are in the early stages of investigating possible ScM labs and have not volunteered in a BMB lab, then we recommend that you list at a minimum of two different PIs/labs that you are interested in (and 3+ would be even better). In addition to BMB primary faculty appointees, you may also consider the faculty affiliated with BMB who have what we call ‘training privileges’ (noted above).

This personal statement is due by February 1 at the latest. Shannon and Mystee then will prepare your MHS application materials and SPH transcripts (through 2nd term), to be available for faculty review. An important aspect of your preparation for the ScM is your MHS coursework; some faculty members will review your academic performance in the MHS program as part of their consideration of you as an ScM student in their lab. Shannon and Mystee will ensure that the faculty that you are interested in will receive your materials.

Faculty are supposed to respond to your inquiries for an interview, either agreeing to meet and discuss the possibility of a position in their lab, or at least the courtesy of declining, saying that they are not able to consider you as an ScM student. If you do not get a response from a faculty member, please let Shannon and Mystee know, as they can help to nudge the faculty to get them to meet with you. As noted above, treat this meeting like an interview.

(3) Finalizing your lab assignment – sometimes as early as 2nd term, usually in 3rd term, sometimes into 4th term

Decisions about lab choice are made jointly by the student and the faculty member. Lab assignments are not arranged for prospective ScM students; it is up to the student to find a lab. If you have questions during the process, you are encouraged to contact Dr. Phil Jordan, director of the ScM program.
It is possible that a faculty member will offer you a position as an ScM student. It is also possible for the student to initiate this conversation, telling the faculty member that their lab is the first choice, and asking to join the lab in coming year as an ScM student. The faculty member could respond in a few different ways:

- S/he’ll say yes, you may join the lab.
- S/he’ll say thanks, but no thanks – in which case you consider who your other choices.
- S/he might say s/he is still considering his/her options for taking an ScM student, and will wait to get back to you. (This might happen for a variety of reasons, including the faculty member is waiting to hear about funding, or needs more information to make these sorts of decisions about personnel decisions; this could include looking at your application materials and meeting with other ScM prospects.) This type of response is rather common -- don’t take it personally. You may consider other labs if you wish. Alternatively, you also may wait for the faculty member to make a decision. In this instance, be sure to stay in touch with the faculty member, so that they know you are still interested in joining their lab.

At some point, you and your advisor-to-be are in agreement -- you say you want that lab, and the PI says you can join. There is a form to be signed by you and your ScM advisor-to-be that is be submitted to Shannon Gaston or Mystee Edmonds, ideally by the registration deadline for 4th term.

**4th term of the MHS / preparation for the ScM research year**

- Students transferring to the ScM program should look to take the MHS Research Course (120.821) in 4th term with their ScM advisor-to-be. This 4th term course is not strictly required (especially in circumstances when lab placement is taking longer), but is strongly encouraged, as a way to give you a jump start in your research.
- In special circumstances, a student transferring to the ScM with lab placement secured might be granted a waiver from doing 4th term research. If you have certain academic reasons for why you do not wish to take this course, you should explain your reasons to your ScM advisor-to-be, and your ScM advisor-to-be can agree to exempt you from this course. You both also must come to an agreement about what activities you will do in 4th term to prepare you for starting your ScM research.

**FAQs about the Master of Science**

**Is previous research experience required for the ScM?**

Any MHS student is eligible for the ScM; there is no programmatic/departmental requirement to have prior lab experience to join the ScM program. That said, some faculty will prefer or require that a student joining their lab have past lab experience.

**Is there a minimum GPA to be eligible to transfer to the ScM program?**

You have to be on target to graduate by having the minimum cumulative GPA to earn a master's degree from the BSPH (GPA of 2.75). Some faculty will want to see how you did in your coursework here (and possibly, how you did in your undergraduate coursework), and may use this as a consideration about taking you into their lab. It is generally advantageous to have done well in your coursework, and especially your science courses.

**Do I get two degrees, the MHS and also the ScM?**

No, the coursework in the MHS year is part of the requirement for the ScM degree. The process is a transfer from the MHS program to the ScM program.
I haven't taken the MHS Research Course (120.821) and haven't been volunteering in a BMB lab – does that mean I can’t do the ScM?

Any MHS student is eligible for the ScM; there is no programmatic/departmental requirement to work in a lab here prior to joining the ScM program. That said, it is common for faculty to request that you do a short 'tour of duty' in their lab so that they can get to know you, check out your lab skills, and gauge your interest in their lab's research, and commitment to research in general.

Can I do my ScM research in any lab at JHU?

The ScM degree is based in the Department of Biochemistry and Molecular Biology, and therefore, ScM research must be done with a BMB primary faculty appointee, or with one of the faculty affiliated with BMB who have what we call 'training privileges' (Wills-Karp, Sinnis, Klein, Prigge). However, it is possible that some of your research time could be with a faculty member that your BMB-based ScM advisor collaborates with.

Can I take courses during my research year in the ScM program?

It is unusual and not recommended for an ScM student plan to take a significant number of classes in the research year. The reason for this is the purpose of the research year is completing the ScM research project and writing the ScM thesis. The coursework that you do in Year 1 is a required part of the ScM degree.

If an ScM student wants to take a class in any term (even an online course), the ScM student must get permission from the ScM advisor – namely, to take time off from research for coursework. If you take a class, you are responsible for managing your time around class time and study time to make sure your research continues to make progress. You are also advised that 4th term of the research year will be especially busy, with wrapping up your research and writing up the ScM thesis.

If I transfer to the ScM, when do I start?  Can I take the summer off?

ScM students start in June (a few weeks after 4th term exams wrap up) and then typically finish by the next June. This is because the typical ScM research experience take ~13 months, from starting your project to completing your research, writing up your ScM thesis, and having it approved by your thesis readers. There are several reasons that it is advantageous to start in June and wrap up by the next June (this includes financial advantages, with the possibility of having your ScM research covered by tuition for terms 1-4, and thus not having to pay an additional term of tuition for the following summer).

Most faculty expect ScM students to start in June. If you are not willing to work in lab over the summer, this possibly will limit your options for finding a lab. Deviations from this schedule of starting in the lab in June, or taking part of the summer off, are allowable under certain circumstances, but must be discussed with and approved by your ScM advisor.

If you are applying to medical/graduate school during your ScM year, with plans to start in the fall after you finish the ScM, then you will want to be sure you are done with your ScM over the summer, in time to start your next program in the fall.
MISCELLANEOUS RESOURCES

MHS study room and mailboxes – Room W8517

Your JHU email account
These mailboxes and your JHU email account will be the main way that we communicate with you about all MHS-related matters. Please be sure to make it a habit to check your physical and e-mail boxes!

Welch Library classes and tutorials: welch.jhmi.edu/welchone/Classes-and-Lectures
Online tutorials and schedule of classes for using various services and databases

Welch Library’s information on RefWorks:
Online tutorials available through:
welch.jhmi.edu/welchone/Online-Tutorials-and-Guides

RefWorks is bibliographic web-based software available through the library; very helpful for organizing references for the MHS thesis.

Portal for using RefWorks: Under the "Services" tab at welch.jhmi.edu/welchone/

SPH Career Services: www.jhsph.edu/Student_Affairs/career/index.html

Sampling of services for students:
• Many workshops and info sessions throughout the year
• CV/resume preparation
• eRecruiting - submit a resume online, employers can search/interview
• Public Health Career Fairs – usually in March

JHMI SOURCE (Student Outreach Resource Center):
www.jhsph.edu/offices-and-services/source/

Provides academic, professional and personal development opportunities through community outreach and service-learning partnerships with community-based organizations.
• Plan to attend the Community Involvement Fair in September!
• Sign up to receive the SOURCE Weekly Service Scoop in your email inbox to hear about opportunities - send an email to SOURCE@jhu.edu with "subscribe" in the subject line. Include your JHU status (i.e., student) and your JHU affiliation (BSPH).

JHMI Professional Development and Career Office: https://pdco.med.jhmi.edu/

Many career resources for the biomedical sciences, with workshops on interviewing, writing your CV/Resume and job search letters, etc. The PDO also hosts an annual Biomedical Career Fair, and their website includes job listings.

Hopkins Biotech Network: hopkinsbio.org

Periodically hosts helpful workshops open to all members of the Hopkins community, primarily focused on entrepreneurship and the biotech industry. Their website includes job listings.
Things beyond the SPH:

Various volunteer opportunities:

- Charm City Clinic: [http://charmcityclinic.wordpress.com](http://charmcityclinic.wordpress.com)
- Johns Hopkins Hospital: [http://www.hopkinsmedicine.org/volunteer_services/](http://www.hopkinsmedicine.org/volunteer_services/)
- Univ. Maryland Hospital - GBMC Hospital:  
  - http://umm.edu/ways-you-can-help/volunteer  
  - http://www.gbmc.org/volunteer
- Shepherd's Clinic: [http://shepherdsclinic.org/how-you-can-help/volunteering/](http://shepherdsclinic.org/how-you-can-help/volunteering/)

(Googling with "Baltimore hospital volunteer opportunities" also will identify many more)

Johns Hopkins Pre-Professional Office (at the Homewood undergraduate campus)

This office hosts a large number of informational events, open to the JHU community.  
Stay updated so that you can attend events of interest:  
Sign up for their listserv: [web.jhu.edu/prepro/signup.html](http://web.jhu.edu/prepro/signup.html)  
Follow them on Facebook:  
[www.facebook.com/pages/Johns-Hopkins-Pre-Professional-Programs-Advising/141462842557621](http://www.facebook.com/pages/Johns-Hopkins-Pre-Professional-Programs-Advising/141462842557621)

Pre-Prof Office Website: [web.jhu.edu/prepro/](http://web.jhu.edu/prepro/)

Other pre-med advising – BMB has partnered with Dr. David Verrier, the former director of the John Hopkins Pre-Professional Office, to provide pre-med advising services to BMB master's students. Dr. Verrier will lead periodic meetings through the academic year, including an overview on applying to medical school, and a workshop on writing personal statements. Be sure to check your JHU email account for announcements of these events!
OTHER DEPARTMENTAL ACTIVITIES

Your participation in this degree program constitutes more than simply taking courses. You are a graduate student in and a member of the Department of Biochemistry and Molecular Biology and in the School of Public Health, and we encourage your participation in as many of our departmental activities as your class schedule allows. Part of the purpose of Special Studies (120.840) credits for which you register each term is to give you credit for the time you spend in these special activities, even though these activities are not formal courses for which you get grades. More importantly, these activities are intended to enrich your knowledge of biology, and biomedical and public health research. Some of our own intradepartmental events:

**M.H.S. Group Meetings** – periodically through the academic year, times/places TBA

**Departmental seminars**: Regular seminars are weekly on Mondays at 12:00, Room W1020 (Becton-Dickinson Auditorium). There also are special named lectures on various dates/times. There are also seminar series for many different departments and research groups throughout the School; virtually all are open to anyone who wants to attend.

**Departmental colloquia**: These are informal talks by members of the research labs, typically on Fridays approximately once a month, 8:30-10:30 AM. Breakfast provided!

*Be sure to check your mailbox in W8517 and your JHU email account for announcements of these and other events!*
CONTACT INFORMATION

BMB MHS program faculty director:
Janice Evans; Room W8508, 410-614-5557, jevans6@jhu.edu
BMB Academic Administrator:
Shannon Gaston; Room W8503, 410-955-3672, sgaston1@jhu.edu
(on leave of absence through December 2017)
BMB Senior Academic Coordinator:
Mystee Edmonds, Room W8503, 410-955-3671, medmon14@jh.edu

BMB departmental faculty

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