August 2018

Dear Graduate Students,

Greetings and welcome to the Graduate Program in Molecular and Integrative Physiology (MIP). MIP has over a century of tradition as one of the country’s premier graduate programs. Our graduates have gone on to become leaders in academic research, industry, education, and medicine. To give yourself an idea of the range of careers that are open to those that excel in our Ph.D. program, we invite you to browse Appendix 2 of this handbook, which provides a list of some alumni along with their present positions.

You were chosen for admission because we value you as students and colleagues, and we expect that you will add your successes to this illustrious list. Yes, you will work hard, but you will also have a great deal of fun and develop relationships that will last a lifetime. Indeed, your time in graduate school will forever be marked as a period in life with great challenges and achievement; we are proud to be a part of it.

This Handbook will help you navigate graduate school and make the most of your opportunities within the MIP Graduate Program. As you know, first year Ph.D. students here at UofM are officially under the umbrella of PIBS, in which you are free to explore opportunities in each of the 14 member Graduate Programs. For those of you with strong interests in MIP, we and other members of the department will serve as mentors during the first year to answer questions and provide guidance. This Handbook will help during this time by providing important information related to MIP program policies, course requirements, academic standards, and student activities. After your first year of classes, you will select a Ph.D. mentor and a program for continued pursuit of your degree, and the Handbook will continue to be useful to you by providing critical information as you progress into candidacy, execute your dissertation research, and prepare and defend your thesis.

We encourage all of you to get to know MIP, discover your research passion, become part of our program and let us help begin to develop your scientific career and help you reach your career goals and aspirations. Engage your fellow students and explore involvement in departmental functions, our elementary school outreach program “SEEK” and policy-making. We value student input tremendously and at all levels. Such experiences enrich and diversify the Program as well as promote professional development and leadership skills in our students. As leaders of the MIP Graduate Program, we encourage you to embrace your opportunities to the fullest.

Welcome!

Dan Michele
Sue Brooks
MOLECULAR & INTEGRATIVE PHYSIOLOGY PhD GRADUATE STUDENT HANDBOOK

SECTION PAGE
DIRECTORY 4
KEY MIP GRADUATE PROGRAM PERSONNEL 5
LIST OF CURRENT GRADUATE STUDENTS BY YEAR 6
Ph.D. DEGREES AWARDED IN 2017-2018 ACADEMIC YEAR 7
CALENDAR OF MIP ACTIVITIES 7

GENERAL
    What makes me a physiologist? 8
    Opportunities for Students in MIP 9
    Basic Information and Time Table 9
    Financial Support 10
    Sources of Fellowship Support 10
    Departmental Seminars 11
    MIP Candidate Seminar Series 11

ACADEMICS
    Academic Advice 11
    Course Selection 11
    Required Courses 12
    Electives 12
    Research Responsibility and Ethics (PIBS 503) 13
    Laboratory Rotations (PIBS 600) 13
    MIP Student Seminar (Physiol 606) 13
    Graduate student instructor (GSI) requirement 13
    Sample Curricula 14
    Academic Standards 15
    Rackham Continuous Enrollment Policy 15
    Vacation Policy 15
    Michigan and Trinity College Physiology Join Forces 15

PRELIMINARY EXAMINATION
    Purpose 16
    Timing 16
    Process 16
    Input from Mentor 17

THIRD YEAR SEMINAR 17
<table>
<thead>
<tr>
<th>SECTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANDIDATE STUDENT RESEARCH EXPECTATIONS AND MONITORING PROGRESS</td>
<td></td>
</tr>
<tr>
<td>Selection of a Dissertation Mentor</td>
<td>18</td>
</tr>
<tr>
<td>Dissertation Research</td>
<td>18</td>
</tr>
<tr>
<td>Dissertation Committee</td>
<td>18</td>
</tr>
<tr>
<td>DISSEPTION</td>
<td></td>
</tr>
<tr>
<td>Dissertation Preparation, Deadlines and Resources</td>
<td>20</td>
</tr>
<tr>
<td>Electronic Submission of Dissertation</td>
<td>21</td>
</tr>
<tr>
<td>Steps for Completing Doctoral Requirements</td>
<td>21</td>
</tr>
<tr>
<td>STUDENT PROGRESS AND CAREER DEVELOPMENT</td>
<td></td>
</tr>
<tr>
<td>Student Progress – CV and NIH-Style Biosketch Requirement</td>
<td>21</td>
</tr>
<tr>
<td>Career Development</td>
<td>21</td>
</tr>
<tr>
<td>CERTIFICATE PROGRAMS AND TRANSLATIONAL RESEARCH</td>
<td></td>
</tr>
<tr>
<td>Science, Technology, and Society Certificate Program</td>
<td>22</td>
</tr>
<tr>
<td>Science, Technology and Public Policy Certificate Program</td>
<td>22</td>
</tr>
<tr>
<td>University of Michigan Graduate Teaching Certificate</td>
<td>22</td>
</tr>
<tr>
<td>Training Opportunities in Translational Research</td>
<td>22</td>
</tr>
<tr>
<td>ENTREPRENEURSHIP</td>
<td>23</td>
</tr>
<tr>
<td>STUDENT AWARDS</td>
<td></td>
</tr>
<tr>
<td>MIP Awards</td>
<td>23</td>
</tr>
<tr>
<td>MIP ACTIVITIES</td>
<td>25</td>
</tr>
<tr>
<td>SUMMARY OF REQUIREMENTS OF THE MIP PROGRAM</td>
<td>28</td>
</tr>
<tr>
<td>RESPONSIBILITIES OF STUDENTS FOR THEIR PROGRESS</td>
<td>28</td>
</tr>
<tr>
<td>APPENDICIES</td>
<td></td>
</tr>
<tr>
<td>1. Policies for maintaining academic standing, dismissal and requesting leave</td>
<td>30</td>
</tr>
<tr>
<td>2. List of MIP Alumni and Current/Recent Positions</td>
<td>32</td>
</tr>
<tr>
<td>3. Example of CV format and NIH Biosketch Form</td>
<td>37</td>
</tr>
<tr>
<td>4. List and Description of MIP Courses</td>
<td>41</td>
</tr>
</tbody>
</table>
DIRECTORY

MOLECULAR & INTEGRATIVE PHYSIOLOGY PhD GRADUATE PROGRAM

MIP Office
7744 Medical Science Building II
734-936-2355 office
734-936-8813 fax
physioinfo@umich.edu

Websites
MIP Department
http://medicine.umich.edu/dept/molecular-integrative-physiology
MIP PhD Program
http://medicine.umich.edu/dept/molecular-integrative-physiology/education/phd-program
PIBS
http://medicine.umich.edu/medschool/education/phd-programs/phd-admissions

Program Chair:
Daniel Michele
NCRC Bldg 26, Rm 207S
Alternate advising office: 6811E Med Sci 2
734-764-5738
dmichele@umich.edu

Associate Chair:
Sue Brooks
2029 BSRB
734-936-2147
svbrooks@umich.edu

Student Services:
Michele Boggs
(Program Coordinator)
7744E Medical Science Building II
734-936-2355
mboggs@umich.edu

PIBS Office:
2nd Floor Taubman Library
1135 E Catherine St
Ann Arbor, MI 48109
734-647-7005
PIBS@umich.edu

MSTP Office:
2nd Floor Taubman Library
1135 E Catherine St
Ann Arbor, MI 48109
Phone: 734-764-6176
Fax: 734-764-8180
MSTP@umich.edu
KEY MIP GRADUATE PROGRAM PERSONNEL

MIP Graduate Committee (2017-2018)
Daniel Michele, Ph.D., Director 764-5738 dmichele
Sue Brooks, PhD, Associate-Director 936-2147 svbrooks
Yatrik Shah, Ph.D. 615-0567 shahy
Costas Lyssiotis, Ph.D. 615-9133 clyssiot
Dan Beard, PhD 763-8040 beardda
Scott Leiser, PhD 647-9746 leiser
Lisa Larkin, PhD 936-8161 llarkin

Present and Past Student Members on Graduate Committee

2018-present
  Joseph “Rudi” Starrett 647-1750 jstarret
  Brenda Cisneros 647-3875 bcisne

2017-2018
  Liz Ronan 615-9547 lizronan
  Daniel Torrente-Quintero 615-5548 torrente

2016-2017
  Allison Kowalsky(Ho) 764-6795 allho
  Jacob Johnson 764-5742 johjac
  Andrew Schwartz 615-5041 andrschw

2015-2016
  David Bushart 615-5634 dbushart
  Eden Dulka 647-1750 edulka

2014-2015
  Luhong Wang 647-1750 wanglh
  Surojit Sural 935-2169 ssural
  Amelia Glazier 763-5115 glaziera

Student Representatives to MIP Faculty Meetings

Ben Abdon 936-8761 babdon
Steven Romanelli 647-7721 smroma

Student Representatives serving as PIBS Peer Mentors

Natalie Warsinger-Pepe 615-7692 nwarsing
Lindy Jensen 615-7692 ljense

MIP TRAINEE SERVICE BY YEAR

2nd year class  Fall Picnic
3rd year class  Graduate committee/faculty meeting representative
4th year class  Organize and lead Candidate Seminar Series, pub nights
All years     Graduate Student Recruiting, Outreach, PIBS service
CURRENT GRADUATE STUDENTS BY YEAR

1st Year PIBS students with a primary interest in MIP and 1st year MSTP students
Johanna Fleischman (johf), Megan Schaller (menschall), Steve Guzman (sdguzman), Ashley Melnick (amelnic), Hancheng Mao (hancheng), Nick Glynos (nglynos)

2nd year
Jonathan Herrera (MSTP jonjoe)
Elissa Hult (emhult)
Rachel Lopez (ralopez)
Kevin McGowan (kpmcg)
Sierra Nance (sanance)
Shuangcheng “Alivia” Wu (scalivia)
Kelly Young (MSTP kzyoung)

Mentor
Sharlene Day
Beth Moore/Howard Crawford
Dan Beard
Linda Samuleson
Carey Lumeng
Ling Qi
Michael Wang

3rd year
Benedict Abdon (babdon)
Judy Baek (judybaek)
Hyo Sub Choi (choihp)
Brenda Cisneros Larios (bcisne)
Kristina Holme (kjweaver)
Lindy Jensen (ljense)
Edith Jones (jonesedi)
Andrew Marquis (admarqui)
Steven Romanelli (smroma)
Joseph Starrett (jstarret)
Vi To Ba Tang (tvi)
Huilun Wang (huilunw)

Mentor
Ling Qi
Subramanian Pennathur
Scott Leiser
Carol Elias
Scott Pletcher
Yukiko Yamashita/Scott Pletcher
Dan Beard
David Pinsky
Ormond MacDougald
Sue Moenter
David Ginsburg/Sharlene Day
Eugene Chen

4th year
Devika Bagchi (MSTP dpbagchi)
Ally Cara (acara)
Jon Dean (jgdean)
Ian Gonzalez (igonzale)
Wenyi Liang (weningl)
Elizabeth Ronan (lizronan)
Daniel Torrente-Quintero (torrente)
Thomas Vigil (thvigil)
Natalie Warsing-Pepe (nwarsing)

Mentor
Ormond MacDougald
Carol Elias
George Mashour/Jimo Borjigin
Dave Olson/Martin Myers
Eugene Chen
Shawn Xu
Dan Lawrence
Rick Mortensen
Yukiko Yamashita/Jun Wu

5th year
Megan Hoffman (mthoff)
Jacob Johnson (johjacob)
Allison Kowalsky (allho)
Haocheng Lu (haochen)
Chayarimdorn “Jeff” Phumsatitpong (chphum)
Jeanine Ruggeri (rugerij)
Andrew Schwartz (andschw)
Kevin Swift (swiftke)

Mentor
Howard Crawford
Scott Pletcher
Jun Hee Lee/Santiago Schnell
Eugene Chen
Sue Moenter
Howard Crawford
Yatrik Shah
Gina Poe

6th year
Matthew Taylor (motay)

Mentor
William Rainey

7th year
Amelia Glazier (glaziera)
Surojit Sural (ssural)

Mentor
Sharlene Day/Daniel Michele
Allen Hsu/Scott Pletcher
Ph.D. DEGREES AWARDED IN 2017-2018 ACADEMIC YEAR

<table>
<thead>
<tr>
<th>Student</th>
<th>Present position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margo Emont</td>
<td>Postdoctoral fellow, Harvard Medical School</td>
</tr>
<tr>
<td>Xi Chen</td>
<td>Postdoctoral fellow, University of Michigan</td>
</tr>
<tr>
<td>Tamara Stevenson</td>
<td>Postdoctoral fellow, University of Michigan</td>
</tr>
<tr>
<td>Luhong Wang</td>
<td>Postdoctoral fellow, University of Michigan</td>
</tr>
<tr>
<td>Caroline Adams</td>
<td>MSTP Program, University of Michigan</td>
</tr>
<tr>
<td>David Bushart</td>
<td>Postdoctoral fellow, University of Michigan</td>
</tr>
<tr>
<td>Daniel Triner</td>
<td>MSTP Program, University of Michigan</td>
</tr>
<tr>
<td>Fangyun Tian</td>
<td>Postdoctoral fellow, Harvard Medical School</td>
</tr>
<tr>
<td>Keita Uchida</td>
<td>Postdoctoral fellow, University of Pennsylvania</td>
</tr>
<tr>
<td>Tova Berg</td>
<td>MSTP Program, University of Michigan</td>
</tr>
</tbody>
</table>

CALENDAR OF MIP ACTIVITIES: 2018/2019 (not all inclusive)
– see description of MIP activities later in this handbook

All year       Monthly MIP Pub Night        Times and location to be announced
Sept 5         MIP Fall Welcome            4-5 p.m.  7745 Med Sci II
Sept 30        MIP Fall Picnic           Noon   Delhi Metropark shelter
Oct 2           Annual student meeting  12pm  3813/3817 Med Sci II
                  Decide on student activity budget
                  Nominate speakers for 2020 research forum
TBD            MIP Holiday Party          afternoon   TBA
Jan 25,26      PIBS Recruiting Weekends All Day
Feb 1,2        Annual MIP Research Forum all day BSRB and Kahn Auditorium

Speaker: Leslie Vosshall
Host(s): Liz Ronan and Ally Cara
GENERAL

What makes me a Physiologist?
In today’s scientific world, the distinctions between disciplines are often hard to discern. Just walk into any research lab on the medical campus and you will likely see a lot of similarities: lab benches, micro-centrifuges, gel electrophoresis units, plasmid maxi prep kits, etc. Almost all laboratories do some molecular biology, some biochemistry, or some cell biology. So, what makes a Ph.D. in Physiology different? Is that difference important?

Physiology is the study of how organisms function in an integrative sense. This means physiologists study how molecules, cells and organs interact together to produce wonderfully complicated and intricately woven functions in the whole animal, such as muscle contraction producing movement, digesting a meal into fuels that sustain body function, responding to a stressful situation, or regulating and accomplishing reproduction. Naturally, this leads to the important study of conditions where physiology goes wrong, causing significant disorders such as cardiovascular disease, obesity, diabetes, and infertility. As a result, the approach of a modern physiologist is both molecular and integrative. The modern physiologist must master and take advantage of molecular approaches that have driven research of the past decade and blend with it integrative knowledge of what these molecules, their functions and their interactions mean in terms of how organisms function normally, and how their dysfunction causes disease.

The MIP Graduate Program is designed to make you become a modern physiologist. We will provide you with academic training in the integrative functioning of living organisms and how molecular, cellular and whole animal approaches can be used to study these functions. Our research labs will give you the opportunity to develop a thesis project that utilizes molecular tools and cellular or animal models to understand normal physiological functions or study mechanisms of human disease. You will be surrounded by faculty, students and staff who share your curiosity for what makes animals and humans work the way they do.

Modern physiologists have a bright future. The technical advances in genomics, proteomics metabolomics and cell biology have resulted in an explosion of available research tools. But without integrative context, the significance of these areas falls short. It is the modern physiologist that puts these tools and the data they generate into a context that enables us to understand the importance and significance of the molecule’s contribution to cell function, the cell’s contribution to organ function, and the organ’s contribution to the overall life and health of living organisms. In essence, we put it all together!

So, do you want to become a physiologist? Join the MIP and give us a try!
Opportunities for Students in MIP

- Broad-based training in modern physiology with emphasis on integrating cell and molecular processes with coordinated systems physiology.
- Affiliation with a program that has a tradition of excellence in preparing young investigators for a variety of productive careers.
- A faculty and program dedicated to graduate student education and career development.
- A chance to conduct research in a wide variety of areas ranging from cell and molecular biology to whole animal integrative physiology.
- Development of teaching skills as part of the curriculum.
- A seminar course for training in critical thinking and presentation skills and a special seminar series presented by students who have achieved candidacy.
- Participation in administration and policy setting within the MIP Graduate Program.
- Leadership training with opportunities to serve as graduate student representative to faculty meetings, student member of the MIP Graduate Committee, host keynote speaker of Research Forum and outside seminar speakers, host visits of graduate student recruits, service on PIBS Committees, etc.
- Interaction with visiting scientists and MIP seminar speakers at student luncheons.
- Opportunities to invite and host external seminar speakers.
- Widespread recognition by departmental, university and external awards.
- A wide variety of informal social activities involving students and faculty.

Basic information and Time Table

This Handbook outlines steps needed to complete the requirements for the Ph.D. degree in Molecular and Integrative Physiology. Students may select MIP at the start of their graduate training, during the 1st year in the Program in Biomedical Sciences (PIBS), or after the 2nd year of course work in the Medical Scientist Training Program (MSTP). A typical timetable for the Ph.D. is provided below. Students are encouraged to discuss any aspect of this Handbook with the Graduate Chair or other members of the Graduate Committee.

**Milestone**

**Pre-Candidate:**

1st Year (PIBS)

Plan overall program; select courses for current year

Lab Rotations (2 mandatory; additional rotations possible)

Complete required course work

Select dissertation mentor/lab

May 1st for July start

July 1st for Sept start

Pass preliminary exam (candidacy achieved)

4 mo after selecting dissertation lab

MSTP students complete prelim

Apr 15th of 1st year in MIP

**Candidate:**

2nd Year (MIP)

Graduate Student Instructor (GSI)

Conduct research

Additional elective courses

Form dissertation committee

Winter term of 2nd year

Conduct dissertation research

Third Year Seminar

Hold regular committee meetings

Twice a year

Complete degree requirements

Usually 4th – 6th year
Financial Support – PIBS, MIP Training Grant, Other Sources
During the first 10 months of their graduate program, students receive financial support from PIBS. Thereafter, students in good standing are supported by research grants, endowment funds, institutional training grants (see below), and individual fellowships available from the University and individual fellowships from outside sources (e.g., NIH, American Heart Association, NSF, HHMI). A portion of student support in the second year is derived from GSI funding during their teaching experience.

Training grant opportunities at the University. Numerous NIH training grants are available to support research in targeted areas. Currently NIH accepts applications only from US citizens and permanent residents, but some foundations accept applications from all students. MIP students have been successful in receiving fellowships from these training grants and are encouraged to apply to those that match their interests. Each training grant has individual rules on course requirements and when during training they provide support so students are encouraged to investigate these sources early to be aware of deadlines and other application details (training grants).

Training grants of interest to MIP students include:
- Biology of Aging
- Cancer Biology
- Career Training in Reproductive Biology
- Cellular Biotechnology
- Chemistry Biology Interface
- Genetics
- Genome Science
- Hearing and Chemical Senses
- Molecular Biophysics
- Neuroscience
- Organogenesis
- Pharmacological Sciences
- Systems and Integrative Biology
- Tissue Engineering and Regeneration
- Training in Basic and Translational Digestive Science
- Training program in translational cardiovascular research and entrepreneurship
- Vision Research

Sources of Fellowship Support
Rackham Information about fellowships is available through the Rackham Graduate School at http://www.Rackham.umich.edu/funding/. MIP students have been successful in obtaining the following awards from Rackham:
- Rackham Merit Fellowship
- Rackham Predoctoral Fellowship
- Barbour Scholarship
- Rackham Graduate Student Research Grant (precandidate and candidate)

External fellowship support. Many external fellowships are available from private and government organizations. These fellowships are often targeted toward specific areas of study or diverse groups depending upon ethnicity, sex, nationality, etc. A listing of potential sources is provided by Rackham at the above fellowships link.
Departmental Seminars

MIP Seminar Series. The MIP Department offers a weekly seminar series in which scientists from outside the University, as well as faculty within the University of Michigan, present and discuss their research findings. The seminars are held every Wednesday at 4 p.m. in the MIP seminar room (7745 Med Sci II). The MIP seminar series provides a highly valuable learning experience and all MIP graduate students are expected to attend seminars on a regular basis unless extenuating circumstances prevent them from doing so. The seminars are important to professional development because they update students on the latest developments within their own field as well as outside their field of research, they introduce new techniques and experimental approaches, and they increase breadth of knowledge and overall understanding. Attending seminars not only can have direct benefits on a student’s own research project, but it is also enormously important when applying for postdoctoral fellowships or jobs, because it enables one to converse intelligently with others, even those outside one’s own area of research. MIP sponsors student luncheons with seminar speakers from outside the University on Wed at noon, which provides a great opportunity for networking and scientific discussion. Third-year seminars for MIP students (see below) will be held during this time. Note that the Student Seminar Course (Physiol 606, described below under Academics) is a requirement taken by first year students. It is separate from, and not to be confused with, the departmental seminars.

Student-Hosted Seminars. This seminar program, which was inaugurated in 2007, provides MIP students the opportunity to invite and host seminar speakers from outside the University. This enables our students to interact extensively with world-renowned scientists, to gain first-hand knowledge with new techniques and approaches, to develop collaborative ties and initiate a dialogue with potential post-doctoral mentors or employers. Students meet as a group to discuss potential speakers and select invitees.

MIP Candidate Seminar Series. This is an initiative that was launched in the 2008-09 academic year. Once a month during the academic year two Ph.D. candidates in MIP present a public seminar on their thesis research. The primary goals of the MIP Candidate Seminar Series are to provide an opportunity for our Ph.D. candidates to present an organized and formal summary of their research to the public, and to give MIP students an opportunity to learn and ask questions about their fellow students’ research in a formal seminar setting. Each student seminar session is one hour long, with two students presenting 20 min talks followed by a 10 min question and answer period. This seminar series is planned and organized by the fourth year MIP students.

ACADEMICS

Academic Advice
Each pre-candidate (PIBS, MIP, MSTP) student meets with the Graduate Program Chair at least twice a year, before the Fall and Winter Terms, to discuss course work, lab rotations, student seminars, preparations for the Preliminary Exam and overall performance. These meetings facilitate initial course selection as well as smooth and efficient transition into the MIP Program and into candidacy for the Ph.D. The flexibility and individualized nature of MIP training allows some overlap with courses required by other PIBS programs. At least once a year, the MIP Graduate Program Chair meets with all MIP students who have achieved candidacy to review research progress, dissertation committee reports, and to discuss overall progress, career preparation and any issues students wish to speak about.

Course Selection
Courses are selected for each student in consultation with the MIP Graduate Chair. To provide each MIP student with common background, we require coursework in the areas of cell physiology and signaling (fall), and systems and integrative physiology (winter). Elective courses in a variety of areas are chosen according to each student’s interests and research specialization. Through PIBS, all students do at least two research rotations, receive important training in the responsible conduct of research, and participate in PIBS seminar. Before
candidacy, each student enrolls for a minimum of 9 credits (formal coursework plus research credits) in both Fall and Winter terms. After candidacy, each student enrolls for a minimum of 8 research credits in both Fall and Winter terms until completion of degree requirements. Students should consult the MIP Graduate Coordinator with questions.

**Required Courses** [more complete listing/description of MIP courses in Appendix 4] Students interested in MIP are encouraged to take as many requirements as is feasible in the first year to allow more time for focused research and course selection in the second year.

**PIBS Courses:**
- PIBS 503 – Research Responsibility and Ethics
- PIBS 600 – Laboratory Rotations (minimum of two) (PIBS only)
- PIBS 800 – PIBS seminar series

**Required Physiology Courses**
- PHYSIOL 576 – (Cellular Physiol I) Signal Transduction
- PHYSIOL 577 – (Cellular Physiol II) Membrane and Cell Physiology
- PHYSIOL 510 – Principles of Systems and Integrative Physiology
- PHYSIOL 606 – Student Seminar – Current Topics in Physiology (first year)

**Electives**  
PhD students in MIP must complete at least six credit hours of elective coursework (minimum 2 credit hours each with exception of the Neuroscience 611-616 series). Preapproved electives are listed below. Additional electives can be substituted with approval of the graduate committee. To petition the committee, please send the course syllabus with a brief justification/rationale for why it is a good fit to your educational program to the graduate program director. Almost all petitions are approved. Note, after prelims, students may only register for four credit hours per semester on top of the 8hr of dissertation research.

**End Summer**  
- NEUROSCI 510 – Lecture only for Molecular Neuroscience Lab

**Fall**
- PHRMACOL 502 – Into to Scientific Communications
- PHYSIOL 591 – Advanced Topics in Signal Transduction
- HUMGEN 541 – Molecular Genetics
- CDB 530 – Cell Biology
- CDB 581 – Developmental Genetics
- BIOCHEM 550 - Macromolecular Structure and Function
- BIOINF 527 – Intro to Bioinformatics and Computational Biology
- BIOSTAT 501 – Into to Biostatistics
- MATH/BIOINF 463 – Math Modeling in Biology
- *NEUROSCI 611, 612, 613 – Neuropharmacology, Neural Development, Circuits and Computational Neuroscience

**Winter**
- PHYSIOL 555 – Method and Logic in Biomedical Science
- PHYSIOL 520 – Computational Systems Biology in Physiology
- PHYSIOL 541 – Mammalian Reproductive Endocrinology
- BIOCHEM 673 – Kinetics and Mechanism
- BIOINF 525 – Foundations of Bioinformatics and System Biology
- NEUROSCI 570/571 – Human Neuroanatomy and Human Neuroanatomy Lab
- *NEUROSCI 614, 615, 616 – Sensory Systems, Neurobiology of Rhythms & Sleep, Neuropathology
- KINESLGY 545 – Metabolic Responses to Exercise
*For Neuroscience electives, completion of two from the six available modules (see both Fall and Winter Term) will count as one elective. More than one pair of modules may be taken.

Students entering through MSTP. MSTP students have already taken courses as part of their medical curriculum that meet many of the MIP course requirements indicated above, and they already have conducted laboratory rotations. Thus, the course requirements are reduced accordingly. Those courses that remain a requirement are as follows.

- PIBS 503 – Research Responsibility and Ethics
- PHYSIOL 606 – Student Seminar (2 semesters)
- BIOCHEM 552 – Biochem MD Scientist
- TWO ELECTIVES
- GSI teaching requirement

Research Responsibility and Ethics (PIBS 503)
PIBS 503 is offered every Fall term. Students sign up for 1hr discussions in each of 8 topics mandated by the National Institutes of Health as well as have a one-on-one discussion with their research mentor.

Laboratory Rotations (PIBS 600)
Students begin their research immediately upon entering the program and complete at least two laboratory rotations. Students interested in MIP must complete at least one rotation with an MIP faculty member. Rotations last either a half or a full term, and will begin in Summer for students choosing to begin 1 July. Rotations and duration are arranged with permission of the mentors. Shorter rotations allow students to sample a greater number of labs before selecting a research mentor. Students receive academic credit by enrolling in PIBS 600 for a number of hours arrived at in consultation with the mentor and Graduate Program Chair. Rotations should be completed during the first 10 months of enrollment, leading to the selection of a dissertation mentor.

New students are urged to become acquainted with research interests of the MIP faculty. These are detailed on the MIP and PIBS websites. Students also learn about MIP faculty research in private discussions, public seminars, research presentations, student presentations in PHYSIOL 606, and in literature surveys.

MIP Student Seminar (PHYSIOL 606)
The MIP Student Seminar (aka Current Topics in Physiology) is held in both Fall and Winter terms. These meetings help to bring the Program together each week. The goals of the Student Seminar are to improve critical thinking, to help identify and solidify a research focus, to obtain experience in developing presentations in PowerPoint, and to develop and practice skills in public speaking in a non-threatening and informal setting. This course gives students the opportunity to present data, critique the scientific literature, and develop the ability to provide constructive criticism to their peers. Students present a critical review of a topic from the current scientific literature or from their own research once each term.

Graduate student instructor (GSI)
All MIP students are required to participate as a graduate student instructor (GSI) for one term. Since teaching and effective presentations of research are vital components of a career in biomedical science, all students are mentored in methods of teaching. Graduate students run weekly conference sections for an undergraduate physiology course (PHYSIOL 201). This involves explaining challenging concepts, answering questions, and developing and reviewing practice exams. Beth Rust serves as the MIP faculty Teaching Coordinator. Students receive evaluation and feedback from Dr. Rust and from an additional MIP faculty member. GSIs are also evaluated by the undergraduate students within their section. Students are expected to attend lectures, prepare material to present in review sessions, and participate in exams. The GSI teaching requirement should be completed in the winter term of the second year and must be fulfilled prior to completion of the degree.
Additional teaching opportunities. Students wishing to gain additional teaching experiences are encouraged to consider completing the University of Michigan Graduate Teaching Certificate (see page 22). Dr. Beth Rust has mentored numerous students through this program and MIP faculty are highly supportive of career development activities. Additional teaching opportunities have included leading small group discussions to medical students, teaching several lectures or entire sections in various courses, being a teaching assistant in courses in MIP or other departments, teaching in a summer lecture series for undergraduates working in MIP labs, teaching entire courses at the University of Michigan or other local institutions such as Washtenaw Community College. Students wishing to obtain such opportunities should speak to their mentors, faculty who direct courses and the Graduate Chair.

Sample 1st year curriculum schedule for students who begin with a primary interest in MIP
(suggested elective in italics)

<table>
<thead>
<tr>
<th>Year 1 Fall</th>
<th>Year 1 Winter</th>
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<tbody>
<tr>
<td>PIBS 503 Responsible conduct research</td>
<td>PIBS 600 Research rotation</td>
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<td>PIBS 600 Research rotation</td>
<td>PIBS 800 PIBS seminar series</td>
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<td>PIBS 800 PIBS seminar series</td>
<td>Physiol 510 Systems/Integrat Physiol</td>
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<tr>
<td>Physiol 576 Signal Transduction</td>
<td>Physiol 606 Student Seminar</td>
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<tr>
<td>Physiol 577 Membrane &amp;Cell Physiol</td>
<td>Physiol 555 Methods and Logic</td>
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<td>Physiol 606 Student Seminar</td>
<td>Elective</td>
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<td>Elective</td>
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Common electives for students with general physiology interest
Fall
CDB 530 Cell Biology
CDB 581 Developmental Genetics
HUMGEN 541 Molecular Genetics
Winter
PHYSIOL 520 Computational Systems Biology in Physiology
PHYSIOL 555 Method and Logic in Biomedical Science

Common electives for students with neurophysiology interest
Fall
NEUROSCI 611 Neuropharmacology (1st 5 weeks of term)
NEUROSCI 612 Neural Development (2nd 5 weeks of term)
NEUROSCI 613 Circuits and Computational Neuroscience (3rd 5 weeks of term)
Winter
NEUROSCI 614 Sensory Systems (1st 5 weeks of term)
NEUROSCI 615 Neurobiology of Rhythms & Sleep (2nd 5 weeks of term)
NEUROSCI 616 Neuropathology (3rd 5 weeks of term)

Common electives for students with systems biology interest
Fall
HUMGEN 541 Molecular Genetics
Winter
PHYSIOL 520 Computational Systems Biology in Physiology
PHYSIOL 555 Method and Logic in Biomedical Science

Common electives taken after completion of prelims
Fall
BIOSTAT 501 – Intro to Biostatistics

Preliminary exams for most students will be complete by the end of August of the 1st year (see below for details on the exam)
In the 2nd year, students will choose one semester in which to serve as a Graduate Student Instructor (GSI), continue research (Physiol 995 Candidate Research or for students joining labs 1 July Physiol 990 plus prelim) and take additional elective courses (up to 4 credits/term) that the student is interested in.

**Academic Standards**
MIP graduate students are required to satisfy the standards of academic performance established by the Rackham School of Graduate Studies. Students should consult the Rackham Graduate Student Handbook to become familiar with those standards. Rackham standards include maintaining an overall average grade of B. In addition, the MIP Graduate Program has established the following policy regarding academic standards: students must obtain a grade of B or better in courses required by the MIP Graduate Program. Obtaining a grade lower than B will require remedial action as determined by the course director and/or the Graduate Committee. Required courses are specified earlier in this Handbook.

**Rackham Continuous Enrollment Policy**
Beginning with the Fall Term 2010, Ph.D. students will register for each fall and winter semester from matriculation to degree completion, unless on an approved Leave of Absence or with Extramural Study status. Students who do not register will be presumed to have withdrawn and enrollment will be discontinued. [https://rackham.umich.edu/academic-policies/](https://rackham.umich.edu/academic-policies/)
Michele Boggs can assist with enrollment questions.

**Vacation Policy**
Following the University’s holiday schedule and NIH regulations, students will receive two weeks of vacation per year in addition to the designated holiday closures of the medical school. To arrange vacation time, all students must receive permission from their advisor. Students need to contact the Graduate Program Coordinator if they will be on vacation for longer than 10 business (M-F) days. Approval is automatic as long as the mentor has given permission. The judgment and flexibility of the mentor can be exercised. Circumstances such as family death, illness, or other crisis events will be handled on a case–by–case basis.

**Trinity College Physiology Join Forces**
The Program in Biomedical Sciences (PIBS) has an academic collaboration with Trinity College School of Medicine, Dublin, Ireland ([www.medicine.tcd.ie](http://www.medicine.tcd.ie)). This collaboration, initiated by MIP, enables post-candidate PhD students and post-doctoral fellows from both institutions to conduct research at the partner university as part of their training, facilitating the pooling of intellect and the creation of centers of excellence in the international arena.

Trinity College School of Medicine has celebrated its 300th anniversary in 2011, and has a proud tradition of scholarship and research. Trinity College School of Medicine is an international leader in postgraduate education and is involved in a number of multifaceted research programs involving many disciplines, and in some cases collaborations with other Universities. Research activities within the School are focused in four major thematic areas: Neuroscience, Infection & Immunity, Cancer and Population Health, and research is conducted in a state of the art facilities on the main Trinity campus, and it affiliated teaching hospitals. There is a major emphasis on Translational Research in the School, where research discoveries made in the laboratory can be advanced to a clinical setting to benefit human health. Below are the Research Institutes to which academic staff from the School contribute:
- Institute of Molecular Medicine (IMM)
- Institute for Neuroscience (TCIN)
- Trinity Centre for Bioengineering (TCBE)
- Centre for Research on Adaptive Nanostructures and Nonodevices (CRANN)
PRELIMINARY EXAM POLICIES
Approved by Department of Physiology Faculty January 10, 2002
Timeline revised by the Graduate Committee September 9, 2002
2014, December 2016

Purpose
The Preliminary Examination (Prelim) must be passed before a student achieves candidacy for
the Ph.D. degree.
Objectives of the Prelim in MIP:
• To evaluate a student’s knowledge of physiology in the student’s general area of interest
and to test the student’s ability to integrate this knowledge with other areas of physiology;
• To evaluate the student’s capacity to think creatively and communicate effectively in both
oral and written presentations;
• To provide students with a unique learning experience in written and oral communication
and to foster development and expression of scientific creativity.
• To jump-start student-mentor interaction on a possible dissertation project

Timing
• Prelim exam will occur within 4 calendar months of joining the lab. To facilitate this, the
following deadlines have been set.
• 4 weeks after joining: Identify, committee chair and members, and set date for exam.
• 8 weeks after joining: Submit draft of aims page to chair
• 14 weeks after joining: Submit proposal
Proposal must be submitted to committee at least 10 calendar days prior to the scheduled
Oral Defense.
MSTP students must complete prelims by April 15th of their first graduate year in MIP.

Process
Prelim Committee. The student establishes a Prelim Committee consisting of at least three
faculty members:
• Chair; member of the MIP graduate committee in the past five years
• One MIP faculty member
• One faculty member from any Rackham PhD-granting biomedical sciences program
(including MIP)
The student’s mentor or co-mentor cannot be a member of the Prelim Committee.

Research Proposal and Oral Defense. The student writes a research proposal following the
guidelines of the specific aims and research strategy sections of an NIH predoctoral NRSA
fellowship. Its scope and area should be suitable for a Ph.D. thesis. The selected topic may
represent the student’s planned Ph.D. thesis research, although there are restrictions as to the
specific focus of the proposal to ensure originality of the student.

Research proposals must be built on a scientific rationale. They must address hypothesis-based
questions and show a logical progression from preliminary data (from the literature, the lab or the
student's own work) to hypothesis generation, to approach for testing the hypothesis, expected
results and interpretation, limitations and alternatives. Implicit in this sequence is understanding
of the controls required, and of likely modifications to approach and generation of new
hypotheses that may be needed as new data shift the understanding of the question.
Experiments may be either laboratory-based (“wet”) or modeling studies that generate testable
hypotheses (“dry”). Regardless of the primary experimental approaches planned, all physiology
students are expected to have a conceptual understanding of the types of experiments needed
to test predictions made. Students are expected to address elements of rigor and reproducibility
required in the approach section of an NIH style proposal including sample sizes, control of
genetic or environmental background, consideration of sex as a biological variable, and appropriate statistics. Note preliminary data do not have to have been generated by the student but may be used with attribution from other sources.

The oral defense consists of a research seminar based on the written proposal that is presented by the student to the Prelim Committee. The presentation should be planned to last 40-45 minutes. During the presentation, the Prelim Committee will ask questions that address the student's general knowledge of physiology, including molecular and integrative aspects, using the research proposal as a point of departure. The committee also evaluates the quality of the written proposal and the quality of the oral presentation.

Outcome. After evaluating the students written proposal, oral presentation and ability to answer the committees questions, the Prelim Committee then determines the overall outcome: Pass, Conditional Pass (which requires remedial action), or Fail. A failing grade implies that the student will no longer be able to continue with the program. A student that receives a failing grade may submit an appeal to the Graduate Committee for permission to retake the exam as outlined in the dismissal policy.

Input from Mentors on Prelim Proposals
The student should exercise originality and independence in preparing the research proposal. Traditionally, the “culture” of the MIP graduate program is for faculty to be available and helpful to our students. Although proposed experiments and designs should originate with the student, each student is encouraged to seek critical input from the student’s mentor, committee members, other faculty and students. It is appropriate for the mentor to work with the student on the specific aims page. Mentors providing guidance in areas of hypothesis formation and testing, suitability of potential approaches and specific techniques, and identification of strengths and weaknesses are all appropriate. It is appropriate for others to comment on the rationale and justification of the hypothesis, the clarity of the writing, as well as the feasibility of the proposed experimental design, techniques and interpretation of the results.

It is not appropriate for a student to copy or include specific aims and experiments that are part of a grant proposal developed previously by the mentor. It is not appropriate for the mentor to attend practice oral presentations.

Our hope is that each student will develop a research proposal that is suitable to submit for extramural funding. After completion of the preliminary examination, mentors should actively engage their students to refine the proposal for submission and use it to as an important teaching tool for their academic and career development.

Before the exam, the mentor provides the committee chair with a brief (typically 1 paragraph) written summary of the student’s progress and the mentor’s involvement in the development of the proposal.

THIRD YEAR SEMINAR
During the third year, MIP graduate students will present a research seminar to the department during the normal Wednesday 4pm time period. This gives the student the opportunity to share their research progress with the department, and also to receive valuable feedback on both the path of their research and their presentation skills.
Candidate Student Thesis Research Expectations and Monitoring Progress

Selection of a Dissertation Mentor
Each student selects a dissertation mentor from the MIP faculty to guide his or her dissertation research. As soon as possible after completion of laboratory rotations, the student should inform PIBS and the MIP Graduate Chair of the student's choice of mentor. The selection of the dissertation mentor should occur by the end of the first academic year of study. Selection of the mentor is one of the most important decisions a graduate student must make. Students and mentors should have common interests, and students should be knowledgeable and comfortable with the mentoring style and overall atmosphere of the laboratory. The mentor must have a faculty appointment in MIP and must agree to the mentoring relationship. In very special circumstances, a student in MIP may petition the Graduate Committee to select a mentor who does not have an MIP faculty appointment. Such requests must be fully justified, and the student must select a co-mentor who has a faculty appointment in MIP and who agrees to work closely with the student as the student progresses toward the Ph.D. degree. The Graduate Committee must approve these arrangements.

Dissertation Research
The dissertation research should make an original and significant contribution to the student's field of research. The overall scope of the work will vary depending on the research area but it should be of sufficient quality, depth and originality to be published in peer reviewed scientific journals. The dissertation committee together with the student and mentor determine when the research is of sufficient quality and quantity to be appropriate for the Ph.D. dissertation.

Dissertation Committee
It is the responsibility of the student to set up a dissertation committee and organize meetings every 6mo. This committee will monitor progress and help the student in several ways: 1) Develop a research program suitable for obtaining the Ph.D. degree. 2) Provide guidance during the course of the research and offer suggestions for future directions. 3) Ensure that the quality and quantity of research is suitable for obtaining the Ph.D. 4) Help the student and mentor determine when sufficient research has been completed to prepare the dissertation. The committee should be formed and meet within six months of passing the Preliminary Exam.

Forming the committee. The committee must be formally established with Rackham prior to the first meeting. The Graduate Program Administrator (Michele Boggs) will enter members into the online system and the Graduate Program Director will approve the committee. Students are encouraged to discuss membership with their mentor and the Director before entering the information. Rules for committee membership are set by Rackham and can be viewed here http://www.rackham.umich.edu/current-students/dissertation/committees and committee members must be officially submitted to Rackham at least 6 months prior to the defense for approval (although recommended to be completed as soon as you form the committee).

Role of the mentor and the committee. Mentoring styles vary tremendously amongst faculty and depending on the student, but a few general comments may be helpful. The Ph.D. research may be considered a collaboration between the student and mentor. It is appropriate for the mentor to provide substantial input and advice regarding development of the research plan, interpretation of results, and determination of next steps. Although this is a collaborative effort, the student should be the driving force. The committee should provide oversight and feedback, and should help the student and mentor in development and subsequent modification of the overall research plan. The committee should not force the student and mentor to conduct specific experiments; rather it should serve in an advisory capacity, and ultimately pass judgment as to whether the research and written dissertation are sufficient for the Ph.D. The student is encouraged to seek input from individual committee members outside the scheduled committee meetings.
Committee meetings. The first meeting must be held within six months of passing Prelims. The student should prepare a short written proposal, which should describe a potential line of dissertation research. This need not be a formal proposal in NIH style (as was prepared for Prelims) but it should contain at least one hypothesis and set of specific aims, sufficient background and preliminary data to justify the work, and a general outline of the experimental plan to accomplish the aims. Although the format and length will vary depending on the student and the project, 2 or 3 pages should generally be sufficient. The proposal should be distributed to the committee one week before the meeting to allow time for committee members to digest the information. The student should begin the meeting with an oral presentation (30-40min) describing the proposal and pertinent research conducted thus far. This is followed by discussion and suggestions from committee members, and ultimately committee members expressing their view as to whether the proposed research would be sufficient for obtaining the Ph.D. The committee report status form should be completed by the student and mentor and submitted to Michele Boggs.

Subsequent committee meetings must be held every six months for students to remain in good standing in the program. The Academic Standing Policy details are provided in Appendix 1. The goal of these meetings is for the student to present recent progress and for the committee to provide input to the student and mentor as to whether satisfactory progress is being made, if the student is on course, and ultimately to help the student and mentor decide when sufficient research has been conducted for writing the Ph.D. dissertation. Committee meetings should be strongly focused on accomplishments from the previous six months and goals for the following six months. They should last roughly one hour and only rarely continue as long as 90 minutes.

Research Report: At least five days prior to the thesis committee meeting, the student will submit to all members of the thesis committee a succinct written summary of their accomplishments since the last committee meeting, including significant experimental findings, results and/or difficulties with an experimental approach, and the status of any publications. The research report should also include a brief (up to 3 pages) description of plans for experiments in the coming six months. For meetings held during the spring of the student’s fourth year and thereafter, a timeline (see below) must be submitted with the Status Report and reviewed by the advisory committee. Keep your status reports! The text and figures in the research reports will be valuable sources of information when writing your Ph.D. thesis.

Progress Report: The Status Report, which must be submitted electronically after the completion of the committee meeting, includes a research report (completed by the student) and a completed report form. The mentor must fill this form out at the end of the meeting and include written comments. If the committee meeting goes well, no additional information is required. If the committee identifies one or more areas of weakness, the mentor should include a brief summary of those concerns on the report form. Status Reports must be submitted twice per year, with the deadlines of June 1 and December 1 pertaining to meetings within the previous six-month period. Reports may be turned in at any point during the year. Students are encouraged not to schedule their committee meetings near the deadlines but instead to spread them over the period. Students that have difficulty assembling a quorum before the deadline may contact the Graduate Director for advice.

Timeline: The thesis committee should help ensure that the student is continuing to make timely progress toward the degree. By the spring meeting of the fourth year of enrollment, the student, mentor and thesis advisory committee members must evaluate the student’s progress and future plans for completion of the Ph.D. Before the meeting, the student, in consultation with the mentor, should prepare a timeline that lists graduation requirements and estimated dates of completion, if possible. The timeline, which must be included with the Status Report Form, is intended to represent the best estimates at the time it is written. The timeline should be revised and updated each subsequent status report meeting.
Permission to write the Ph.D. dissertation: By granting "permission to write," the student's thesis committee acknowledges that all key experiments have been completed and that a thesis outline was presented and reviewed that described a sufficient body of work to merit a Ph.D. if the dissertation and defense are satisfactorily completed. The student, in consultation with the mentor, must present a detailed outline of the thesis to the committee at least one week before the meeting. The outline should present sufficient detail to judge the completeness of the experimental work with a clear indication of which portions of the experimental work are finished and which remain to be completed. The committee expects that the student will complete all requirements and defend the thesis before the next status report deadline (i.e., within the next six months), and a timeline for completion of the written thesis and the oral defense should be set at the time permission to write is granted. If the oral defense is not held within 6 months, committee members must be notified and must agree to an extension. Otherwise a normal committee meeting must be held, and permission to write must be discussed again.

Graduation Requirements. In addition to the Rackham requirements, the expectation is that the student will have at least one published, peer-reviewed manuscript detailing her/his original research as first author or co-first author (a literature review alone does not satisfy this requirement). The dissertation committee, with permission of the program director, is given the authority to waive this rule if the situation requires it. It is expected that students be allowed permission to write when manuscripts have been submitted or have received initial, favorable reviews.

WRITING AND DEFENDING YOUR DISSERTATION

Dissertation Preparation, Deadlines and Resources
The final step in obtaining the Ph.D. is writing the dissertation, defending it in front of the dissertation committee, and revising it as specified by the committee. Students must adhere to specified formats and timelines in preparing and defending the dissertation. They should understand these policies before writing the dissertation. Deadline details are provided in the Rackham Student Handbook and the Dissertation Handbook, which is available online at https://rackham.umich.edu/navigating-your-degree/#phd
Students may phone the Office of Academic Records and Dissertations with specific questions (734-763-0171).

According to Rackham policy, students are expected to complete all requirements for the degree within five years of achieving candidacy, but no more than seven years from the date of first enrollment in their Rackham doctoral program. Students may request an extension for extenuating circumstances such as pregnancy, childbirth, dependent care, medical problems, etc. Further details are provided in the Rackham Academic Policies website.
https://rackham.umich.edu/academic-policies/

The oral defense begins with the student presenting a seminar describing the dissertation research. The seminar is presented to the dissertation committee as well as MIP faculty, and it is open to students and other interested parties within and outside the University. This is followed by a question and answer session of all in attendance and then by another session of questioning before the committee. Committee members then vote on the outcome and indicate revisions to be made before the dissertation is acceptable in its final form. The mentor, who generally is chair of the dissertation committee, is present for the entire oral defense.

Students must be enrolled during the term of their oral defense. They should be aware that Rackham has strict deadlines for the last date in each term by which students must meet all degree requirements without registering for a new term, which requires payment of additional tuition. These deadlines and degree conferral dates for each term can be found at
Commencement exercises are held twice each year, at the end of the fall and winter terms. Students’ attendance at their graduation exercise is optional.

Electronic Submission of Dissertation
Beginning with the 2012-13 academic year, all dissertations will be submitted electronically to Rackham during the post-defense meeting. The final digital copy will be the copy of record. To submit your dissertation, you will access the Rackham dissertation online submission website. You will be asked to provide bibliographic keywords, or tags, that describe the content of your dissertation, including subject, concepts, theory and methods. These will help others to find and retrieve your dissertation. You will copy your abstract to the website and upload a PDF of the final digital copy of your dissertation. The staff of Rackham’s Academic Records and Dissertations will review your submission, and may require you to make final changes before the submission is approved. No further changes will be allowed once the dissertation is approved and submitted. Rackham will hold your dissertation until your degree is conferred (which happens three times a year in April, August, and December). After your degree is conferred, Rackham will forward your dissertation as the copy of record to Deep Blue, the permanent digital repository of the University Library. Beyond the electronic submission to Rackham, students may wish to bind a copy for their records or for their mentor. Neither MIP nor the Graduate Program is able to provide costs for copying and binding.

Steps for Completing Doctoral Requirements
The Rackham Graduate School has prepared a useful guide titled Dissertation Timeline. https://rackham.umich.edu/navigating-your-degree/dissertation-timeline

STUDENT PROGRESS AND CAREER DEVELOPMENT

Student Progress – CV and NIH-Style Biosketch Requirement
Each MIP student is required to prepare a CV (Curriculum Vitae). (Note, this does not include first year PIBS students with an interest in MIP.) These materials are to be updated at least once a year and submitted as part of the student’s annual review. This document serves as an indicator of student progress and will help establish whether a student is developing a portfolio suitable for specific career trajectories. In addition, developing and updating the CV is a valuable learning experience in itself, and the information contained in them is useful to the graduate program in preparing reports, providing data for programmatic evaluation and training grant applications. An example for the format of a CV and biosketch is provided in this Handbook as Appendix 3.

Career Development
From the beginning of their graduate program of study, students should be considering career options and how best to position themselves for different career trajectories once their graduate work is completed. For example, students interested in teaching ought to seek teaching opportunities beyond the MIP GSI teaching requirement (see previous section, Teaching) and they should consider obtaining a University of Michigan Graduate Teaching Certificate (see next section). Students interested in public policy should look into the new Rackham certificate program on Science Technology and Public Policy (see next section). Students interested in clinical translational research should take the PIBS 507/508 course and look into new training initiatives at the University in translational research (see next section). Students interested in research careers should work with their mentors and others to develop networking skills for identifying laboratories and fellowship opportunities for postdoctoral training and subsequent employment. All students are encouraged to pursue opportunities for developing their public speaking skills through oral presentations at scientific meetings, presenting at local symposia, and participating in journal clubs. PIBS also offers a course in formal scientific presentation called PIBS 721 Professional Research Presentation which is available to students who have achieved candidacy, the mentor and Graduate Chair are valuable resources for
consultation related to career development, and the MIP Graduate Program has helped to facilitate periodic presentations on various career options (special seminars, visiting speakers in Physiology 606, fall Research Forum, etc.). In addition, career-counseling resources are available at the University; students are encouraged to consult the following web sites and links:

https://careercenter.umich.edu
https://rackham.umich.edu/rackham-life/

CERTIFICATE PROGRAMS AND TRANSLATIONAL RESEARCH

Several graduate certificate programs in areas outside the biomedical curriculum as well as opportunities for translational research are available for students who have an interest in using their training in physiology to follow a non-traditional career path. These may be pursued simultaneously with graduate programs that lead to the Ph.D. A brief description of four certificate programs that have been of interest to MIP students, and an overview of the new UM initiative for training in translational research, are provided below. Further details about the program can be obtained from the web sites indicated.

Science, Technology, and Society Certificate Program
The STS Graduate Certificate Program is designed for students already enrolled in a graduate degree program at the University of Michigan. This 15-credit certificate program helps students to: 1) understand the social dynamics of science, technology, and medicine; 2) explore these dynamics across world societies and cultures; 3) develop a sensitivity to issues of gender, race, and class in science technology, and medicine; 4) employ STS approaches as scholars or practitioners (e.g., engineers or scientists).

Science, Technology and Public Policy Certificate Program
The Graduate Certificate Program in Science, Technology, and Public Policy (STPP) is designed for students already enrolled in a graduate degree program at the University of Michigan and can be combined with a Master’s or a doctoral degree in any field. Applications are welcomed from students in both LS&A departments and the professional schools. The certificate requires 15 credit hours of course work, including electives designed to teach students: 1) how science and technology are influenced by politics and policy; 2) the role of science and technology in the policymaking process; 3) methods and tools for science and technology policy analysis; 4) the political and policy landscape of specific science and technology areas such as biotechnology, information and communication technology, and energy policy.

University of Michigan Graduate Teaching Certificate
This program offers graduate students an opportunity to document professional development as college-level instructors and prepare for the faculty job search. The U-M Graduate Teacher Certificate documents one's professional development in five areas:
1. orientation to college-level teaching and learning
2. exposure to new teaching strategies through seminars and courses
3. experience as a Graduate Student Instructor, including a consultation on teaching
4. mentorship on teaching from a faculty member
5. preparation of a teaching philosophy statement
Participants who complete all program requirements receive a U-M Graduate Teacher Certificate. The Certificate does not appear on official U-M transcripts, but may be included on one’s curriculum vitae.

Translational Research Education Certificate
The Translational Research Education Certificate (TREC) is designed for doctoral students in basic research programs as a complement to their graduate studies. The program provides students with an overview of the principles of translational research and will help prepare them to become the next generation of translational researchers performing bench to bedside
investigations in multidisciplinary, collaborative research settings. Students enroll in specialized courses in translational research, gain the expertise of a co-mentor who is a clinical/translational researcher, and take advantage of an optional clinical or health outcomes research experience. Students seeking admission to the program are required to discuss the option with their PhD mentor and identify a faculty member to work with who is engaged in clinical/translational or health outcomes research. The certificate is awarded by the Rackham School of Graduate Studies with faculty lead Donna Shewach, PhD

In addition, The University of Michigan recently received a Clinical and Translational Sciences Award (CTSA) as part of a national initiative to encourage interdisciplinary research and development of therapies that improve human health. This grant builds on previous NIH investments to expand programs and services in clinical research infrastructure and education. The program places the University of Michigan with 23 other academic medical centers around the country that are members of a national CTSA consortium. Its mission is to transform how clinical and translational research is conducted, ultimately enabling researchers to provide new treatments more efficiently and quickly. The grant is under the umbrella of the Michigan Institute for Clinical and Health Research (MICHR). A variety of training opportunities are already in place for undergraduate, graduate and postdoctoral students. For example, a PIBS course has been established to provide learning experiences in translational research: Introduction to Translational Research (PIBS 507/508). In addition, the Masters of Science in Clinical Research gives doctoral students in medicine, dentistry, nursing and pharmacy the basics of clinical research, and it provides students the option of various research experiences. The program implements novel, flexible institutional clinical research training and provides efficient entry of students into clinical research careers. Interested students can obtain more information at: https://www.michr.umich.edu/rdc/2015/9/18/master-of-science-in-clinical-research

ENTREPRENEURSHIP
There are many opportunities for training and experience in research entrepreneurship including the above translational research certificate, as well as workshops and seminars provided by MICHR and the training program. PIBS 550 and 750 is a new set of courses on Biomedical Innovation and Entrepreneurship that combine both lecture and workshop focused on biomedical commercialization. MILead (http://www.milead.org) is a non-profit group of postdoctoral fellows, PhD and MBA students that provide consulting for clients seeking to commercialize a new research product and discovery and can provide experience in biomedical research consulting and commercialization. The Zell Luri Institute (http://zli.umich.edu/) is the world’s leading academic resource for entrepreneurs and student innovators. They have numerous educational opportunities and also grants and access to venture capital for students interested in commercializing a discovery, an idea, or trying to start a business.

STUDENT AWARDS

Graduate Education Fund Travel Awards
MIP has established an endowment fund to help support career development and training opportunities for MIP PhD Graduate students. Currently, the fund is supporting several travel grants to MIP students each year who are attending and presenting research at scientific conferences, or travelling to conferences for career development opportunities. To request travel support for the Graduate Education Fund, typically students should first apply for a Rackham Travel Award and then submit a copy of the student’s Rackham application to the graduate program director requesting additional support. The Rackham Travel Award in formation is here: http://www.rackham.umich.edu/funding/conference-travel-grant

MIP Graduate Student Awards
Each year, MIP recognizes student accomplishments in four areas considered to be highly important in graduate education and professional growth: academic achievement, teaching, research and service. The Graduate Program has established student awards in these areas, each in the name of a distinguished faculty member of this Department at the University of Michigan. Full lists of awardees are on the MIP web site

Bean Award for Academic Excellence. Professor John Bean was one of our first graduate students and he obtained his doctorate in 1930. Dr. Bean went on to have a long and successful career in the Physiology Department at Michigan, reaching the rank of professor in 1944. This award was made possible by Dr. Bean and is given to the second year MIP student who has attained the best academic record during the pre-candidate years. A $250 honorarium accompanies this award.

Recipients (past 5 years):  
2018 Alivia Wu  
2017 Joseph Starrett  
2016 Ian Gonzalez  
2015 Andrew Schwartz  
2014 Keita Uchida

Vander Teaching Award. This award was established in recognition of Professor Arthur Vander, a former member of the departmental faculty and widely known as an outstanding teacher, mentor and scholar. It is awarded each year to an MIP student in recognition of outstanding teaching in the Physiology 201 course, as determined by student evaluations and comments of faculty observers. A $250 honorarium accompanies this award.

Recipients (past 5 years):  
2018 Kristy Holme and Lindy Jensen  
2017 Devika Bagchi  
2016 Meggie Hoffman  
2015 Tova Berg  
2014 Caroline Adams

Davenport Research Award. This award was established in 2005 in the name of Horace W. Davenport who was internationally recognized for his research and scholarship on gastric physiology, the gastric mucosal barrier, and ulcerative diseases of the stomach. He was also an outstanding teacher, historical scholar, author of textbooks and mentor. He is recognized for helping to establish the high profile recognition of the Department of Physiology at the University of Michigan. This award recognizes outstanding research performed by an MIP student or a student supported by the Systems and Integrative Biology Training Grant. Recipients are determined by relevance, quality and presentation of their work as judged from research publications, a scientific abstract describing the work and its relevance, and a platform talk at the Fall Research Forum. A Honorariums for the Davenport Award are $500 to the Davenport Award winner and $100 to each finalist.

Recipients (past 5 years):  
2018 David Bushart  
2017 Daniel Triner  
2016 Jonathan Gumucio  
2015 Amy Sutton  
2014 Kristen Ruka

Williams Service Award. This award was established in the name of Professor John Williams who served as Chair of the Department from 1987 to 2008. This award recognizes outstanding student participation and service to MIP, the University, and science on a broad scale. Service and development of a sense of community are highly important to professional growth and MIP provides opportunities for students to gain experience in this arena. An honorarium of $250 accompanies this award.
Recipients (past 5 years): 2018 Ally Cara and Liz Ronan  
2017 Devika Bagchi  
2016 Joanne Garbincius  
2015 Kristen Ruka  
2014 Alexis Carulli

MIP ACTIVITIES

The MIP Graduate Program and Department, and the Systems and Integrative Biology Training Grant, sponsor a wide variety of activities. These not only enhance professional development and promote leadership skills, they also provide opportunities for recreation and informal social interactions among students, faculty and staff. They are an important aspect of the overall MIP experience. The specific activities vary each year; those listed below are the activities last year.

SEEK Science Education and Engagement for Kids.
SEEK is an MIP student-led outreach program. The goal is to give our students the chance to help bridge the gap in science education by providing hands-on learning for kids in local high-need, low-resource schools lacking a science curriculum. SEEK grew out of the belief that it is our responsibility to help provide all kids with the access to opportunities that will empower them to reach for their dreams. There are levels of volunteering in the program:

1. Curriculum Team – developing and implementing a year-long curriculum for Eastbrook school which currently has no science curriculum. The lessons will be taught by graduate students, 1.5 hours once every two weeks to over 100 students
2. Backyard Brains Team – Support from the Office of Health Equity and Inclusion allowed SEEK to purchase five Backyard Brains mobile neuroscience labs. These labs will be developed and taught on off-weeks in the year-long curriculum
3. Physiology Fun Day Event – Two single day events per year focused on exposing 3rd and 4th graders to the various organ systems with active learning experiments and activities

MIP Monthly Pub Nights
Roughly monthly, MIP students, faculty and postdocs are invited to gather at a local pub at the end of the day. These gatherings encourage social interactions and unstructured scientific and academic discussions in an informal and relaxed atmosphere.

MIP Sports Teams (all year)
MIP students organize an MIP sports team (the “Phizz”) for various intramural sports: softball, volleyball, broomball, mini-soccer and wallyball (several new sports teams will be organized in the current year). All students are welcomed and encouraged to participate in a team and to organize an MIP sports team. Everybody has fun, no matter what the skill level.

Student Luncheons
MIP hosts student lunches for a number of different occasions. These include: meetings with the Chair of the Department or Graduate Chair to discuss policy and developments or to budget the use of the Graduate Program discretionary fund; to plan MIP recruiting activities for graduate student applicants; to discuss and select student-hosted seminar speakers and the keynote speaker for the Fall Research Forum. In addition, when the speaker for the MIP seminar series is from outside of the University, he or she is invited to have lunch with the students. The MIP Graduate Program expects students to make every effort to attend these lunches as it provides opportunity to interact with speakers as well as for the visitors to learn more about the Department and Graduate Program. In addition, students are invited to have lunch with faculty recruits during their visits to MIP; this allows the candidate to gain appreciation for the quality and vitality of the MIP Graduate Program and for students to voice their views on the candidate.

Fall Welcome (Sep)
Early in September, MIP holds an assembly to introduce the 2nd year students matriculating from PIBS as well as the new recruits entering PIBS who are interested in MIP, new faculty members, master’s students and others who are new to MIP. Three MIP awards are presented (Bean Award for Academic Excellence, Vander Teaching Award, Williams Service Award) and other achievements of MIP students are recognized.

**Fall Picnic (Sep/Oct)**
Second-year students, together with the Graduate Program Coordinator, organize the annual MIP departmental picnic, usually held at one of the local Metro Parks on a weekend in late September. All faculty, students, staff, families and guests are invited. The Department provides some food and beverages and everyone is asked to bring a dish to pass. The annual faculty versus student softball game is the highlight of this event.

**Spring Research Forum (March, April)**
This event is held in March or April each year. It is sponsored by the MIP Graduate Program and the Systems and Integrative Biology Training Grant. Planning begins in the previous academic year when the students nominate and select a keynote speaker. Generally, a student in the 3rd year or above coordinates this event with the assistance of the Graduate Program Coordinator and the Graduate Chair. The student host is responsible for extending an invitation to the keynote speaker, organizing the visit, arranging faculty interviews, and escorting the visitor while in town. Other graduate students are generally invited to attend a dinner and to have breakfast with the speaker, and all graduate students attend a lunch with the speaker. Selected 10-min presentations are given by finalists for the Davenport Research Award (winner announced at the session of the keynote address). All students are strongly encouraged to participate in the poster session, but graduate students currently or previously funded by the Systems and Integrative Biology Training Grant are required to submit an abstract and present their research.

**Holiday Party (Dec)**
The Department hosts a holiday party for all faculty, students and staff (and their families and guests) in December. This event is coordinated by the office staff. Students and faculty frequently provide ‘entertainment’.

**Recruiting Weekends (Jan, Feb)**
Recruitment of incoming students to MIP is coordinated by PIBS. PIBS offers two recruiting weekends one in January and one in February. MIP faculty and students on the Graduate Committee serve on the PIBS Admissions Committee, and MIP students host applicants invited during the recruiting weekend. All MIP students are heavily involved in recruiting weekend; this is highly important in helping our visitors to capture the spirit of MIP. Events of this weekend currently include a welcome dinner on Thursday evening with the visitors and their host student, one-on-one interviews with MIP faculty members, a Friday luncheon attended by all students in the Graduate Program, and a dinner reception Friday evening followed by a social outing organized by MIP graduate students. Saturday morning includes a combination brunch/faculty poster session/open house and from here the recruits leave for the airport.

**Spring BBQ (May, Jun)**
This is an informal gathering in a relaxed setting (currently the back yard of the Graduate Chair) at the end of the academic year to enjoy each other’s company and to recognize the accomplishments of MIP students. The BBQ is held in the late spring, and includes the undergraduate summer research fellows.

**A Night at the Academy**
MIP hosts an evening at a faculty house a couple times a term that features a catered dinner and speaker from outside physiology. This provides an opportunity to interact socially as well as to
take advantage of the breadth of the University community to stimulate conversations on a variety of topics.

**Whirlyball**
Whirlyball is best described as a combination of basketball, lacrosse, and bumper cars. The best thing about this game is that everyone is equally bad at it, which is why MIP students enjoy playing it at least twice a year—once during the recruiting weekend with PIBS applicants interested in MIP, and another time with students, post-docs, and friends of the Physiology department. Whirlyball has proven to be a favorite activity of MIP students and a memorable activity for our recruits.

**Canoeing/Kayaking**
In the past MIP graduate students have put together a two-hour canoe trip down the Huron River. It has been a great success with minor splashing and an occasional canoe capsizing. We now plan to make it an annual event at the end of spring or beginning of summer.
SUMMARY OF REQUIREMENTS OF THE MIP PROGRAM

1. Successful completion of coursework as indicated in the section on Coursework, Grading, and Academic Standing, and Doctoral Degrees as specified in the Rackham Student Handbook of Policies and Procedures.
2. Obtaining a minimum grade of B in MIP required courses and an overall grade average of B.
3. Complete PIBS 503, Research Responsibility and Ethics and all required “refresher” courses on the responsible conduct of research.
4. Participation in at least two semesters of the MIP Student Seminar (PHYSIOL 606).
5. Serve as a GSI for at least one term to gain teaching experience.
6. Completion of at least two research rotations.
7. Successful completion of the Preliminary Examination.
8. Timely meetings of the dissertation committee (twice per year).
9. Preparation of a CV and NIH-style biosketch, updated yearly.
10. Presentation of dissertation work in progress during the third-year seminar.
11. Successful completion of a research project and preparation and defense of a dissertation.

RESPONSIBILITIES OF STUDENTS FOR THEIR PROGRESS

1. Ensure that course work satisfies the requirements of both the MIP Graduate Program and the Rackham School of Graduate Studies.
2. Maintain the academic standards set by the MIP Graduate Program and Rackham.
3. Ensure that the prelim committee is formed and the exam taken in timely fashion.
4. Ensure that the thesis advisor and dissertation committee are chosen in a timely manner and according to the guidelines set forth in this Handbook.
5. Schedule dissertation committee meetings twice per year.
6. Work together with mentor to apply for fellowship support.
7. Make timely progress toward completion of the Ph.D. and give careful and timely consideration to further career goals (postdocs, jobs, etc.).

MIP students also participate in policy decisions as part of the Graduate Committee, engage in recruiting new students, volunteer for various Program-related functions, and participate in a wide variety of MIP-sponsored activities as described earlier in this Handbook.
Appendices

1. Policies for Maintaining Academic Standing, Dismissal and Requesting Leave

2. List of MIP Alumni and Current/Recent Positions

3. Example of CV and NIH Biosketch Format

4. List and Description of MIP Courses
Appendix 1. Policies for maintaining academic standing, dismissal policy and requesting leave.

Academic Standards for Pre-Candidate Students
MIP graduate students are required to satisfy the standards of academic performance established by the Rackham School of Graduate Studies and additional requirements set by the department. Students should consult the Rackham Academic Policies (https://rackham.umich.edu/academic-policies/) to become familiar with those standards. Rackham standards include maintaining an overall average grade of B. In addition, the MIP Graduate Program has established the following policy regarding academic standards: students must obtain a grade of B or better in courses required by the MIP PhD Graduate Program. Obtaining a grade lower than B in required courses will require remedial action as determined by the course director and/or the Graduate Committee. Elective courses contribute to the overall average grade and must meet the academic standards of the Rackham School of Graduate Studies where grades of D or E cannot be used to fulfill degree requirements. MIP required courses are specified earlier in this Handbook.

Precandidate students also must pass their preliminary examination as outlined in this handbook according the timeline stated. As stated in the preliminary exam guidelines, a failing grade will result in the student being dismissed from the program. A student that receives a failing grade may petition the Graduate Committee for permission to retake the exam and a timeline for the retake will be set by the Graduate Committee. There is no probationary period for students who receive a failing grade.

Academic Standards for Candidate Students
After candidacy, progress toward degree is monitored by the advisor, the dissertation committee and the graduate program director. To maintain good academic standing, students are expected to meet the graduate program expectations for committee meetings, submitting progress reports and annual review as outlined in this handbook as well as be responsive to communications and information requests from the program. Students are also expected to meet the professional work expectations of the mentor, as head of the research laboratory, as well as any additional expectations that are required by their source of funding.

Probation and Dismissal Policy
If a student’s GPA falls below 3.0 on a 4.0 scale at the end of the term, the Graduate School will place a notation of unsatisfactory academic standing on the academic record. In addition, if a student fails to meet the MIP Graduate Program requirements for Academic Standing, the MIP graduate program will notify both the student, in writing, and Rackham that the student is in unsatisfactory academic standing. A student with unsatisfactory academic standing may not advance to candidacy and will not be awarded a degree or graduate certificate, and may change programs and transfer credits only with permission of the admitting program.

If the advisor or program chair recommends the student be placed on probation, which is required before a dismissal decision, the following steps will be taken

1. The graduate chair, the advisor and at least one other member of the graduate committee will review the student’s standing and decide as a committee whether or not to place the student on probation, the corrective actions needed, and the length of the probationary period needed for the corrective actions to return to good standing.

2. The probationary period will extend for a minimum of two months and typically up until the end of the next term, with Spring/Summer half terms together equating to one Fall or Winter term. If the probationary begins within the last two months of the term, it will continue into the next term until the minimum of two months is achieved and to the time specified.
3. The student and Rackham OARD will be notified before the probationary period begins in writing including the reasons for probation, the start and end dates of the probationary period, the corrective actions and conditions for returning to good standing and the options for appeal.

4. The student's funding will be maintained during the probationary period.

At the end of probationary period, and upon the recommendation of the graduate chair and the consent of the Graduate School, a student may either be returned to good academic standing or dismissed from the program. The decision to dismiss will be made by a committee that includes the graduate program director, the advisor and one graduate committee member. The graduate chair will notify Rackham OARD of the recommendation for dismissal.

Options to Appeal Academic Probation or Dismissal: Students who wish to appeal may request, in writing, a review of the probation or dismissal decision. The appeal committee will include two faculty members of the MIP graduate program, and the department chair or associate chair. Students may use the Graduate School’s Academic Dispute Resolution Policy (https://rackham.umich.edu/policy/section9/) process only for procedural issues of fair and equal treatment under the policy of the program, and not to appeal the academic reasons for the decision.

Students who fail to meet standards of academic or professional integrity or who have been found responsible for violations of other University standards of conduct may be dismissed in accordance with separate procedures described in Rackham Academic and Professional Integrity Policy (section 11).

Requested Leave from the Ph.D. Program
The graduate program will work with the student and her/his mentor to discuss options for a leave of absence. An explicit plan for re-entry is required upon requesting a leave of absence, which should outline the status of the student upon re-entry (candidate, etc.) as well as the expectations for continued involvement in the program. Leaves must be approved by the mentor, MIP graduate director, and Rackham. Applications for leave are completed online at https://rackham.umich.edu/policy/section2/#2-2-2. A student on probation can also request for a leave of absence and this leave will stop the clock on the stated probationary period.
## Appendix 2: List of MIP (formerly Physiology) alumni since 1975 and current or recent positions (partial update August 2018)

<table>
<thead>
<tr>
<th>Year</th>
<th>Name</th>
<th>Chair or Co-Chair</th>
<th>Most recent known position</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>Tami Stevenson</td>
<td>Lawrence</td>
<td>Postdoctoral Fellow, University of Michigan</td>
</tr>
<tr>
<td>2018</td>
<td>Tova Berg</td>
<td>Moenter</td>
<td>MSTP Program, University of Michigan</td>
</tr>
<tr>
<td>2018</td>
<td>Keita Uchida</td>
<td>Lopatin</td>
<td>Postdoctoral Fellow, University of Pennsylvania</td>
</tr>
<tr>
<td>2018</td>
<td>Daniel Triner</td>
<td>Shah</td>
<td>MSTP Program, University of Michigan</td>
</tr>
<tr>
<td>2018</td>
<td>Fangyun Tian</td>
<td>Borjigin</td>
<td>Postdoctoral Fellow, Harvard Medical School</td>
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<tr>
<td>2018</td>
<td>David Bushart</td>
<td>Shakkotai</td>
<td>Postdoctoral Fellow, University of Michigan</td>
</tr>
<tr>
<td>2018</td>
<td>Caroline Adams</td>
<td>Moenter</td>
<td>MSTP Program, University of Michigan</td>
</tr>
<tr>
<td>2018</td>
<td>Luhong Wang</td>
<td>Moenter</td>
<td>Postdoctoral Fellow, University of Michigan</td>
</tr>
<tr>
<td>2017</td>
<td>Margot Emont</td>
<td>Wu</td>
<td>Postdoctoral Fellow, Harvard Medical School</td>
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<tr>
<td>2017</td>
<td>Xi Chen</td>
<td>Valdivia</td>
<td>Postdoctoral Fellow, University of Michigan</td>
</tr>
<tr>
<td>2017</td>
<td>Francisco Alvarado</td>
<td>Valdivia</td>
<td>Research Scientist, University of Wisconsin</td>
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<td>2017</td>
<td>Joanne Garbincius</td>
<td>Michele</td>
<td>Postdoctoral Fellow, Temple University</td>
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<tr>
<td>2017</td>
<td>Chanisa Thonusin</td>
<td>Burant</td>
<td>Postdoctoral Fellow, University of Michigan</td>
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<tr>
<td>2017</td>
<td>Kris Sugg</td>
<td>Mendias</td>
<td>Resident, University of Michigan</td>
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<td>2017</td>
<td>Jon Gumucio</td>
<td>Mendias</td>
<td>Senior Scientist, Merck</td>
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<td>2016</td>
<td>Amy Sutton</td>
<td>Olson/Myers</td>
<td>Postdoc Fellow, Picower Institute for Learning and Memory</td>
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<td>2016</td>
<td>Mark Bolinger</td>
<td>Antonetti</td>
<td>Doctoral Student, Indiana University School of Business</td>
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<td>2016</td>
<td>Zachary Harvanek</td>
<td>Pletcher</td>
<td>Psychiatry Resident, Yale – New Haven Hospital</td>
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<td>2016</td>
<td>Gail Gifford</td>
<td>Samuelson</td>
<td>Technology Associate, The Fred Hutchinson Cancer Research Center</td>
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<td>2015</td>
<td>Kristen Ruka</td>
<td>Moenter</td>
<td>WISYS Regional Associate, University of Wisconsin-Madison</td>
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<td>2015</td>
<td>Margaret Allison</td>
<td>Myers</td>
<td>Internal Medicine Resident, Massachusetts General Hospital</td>
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<tr>
<td>2015</td>
<td>Jun Young Hong</td>
<td>Hershenson</td>
<td>Postdoctoral Fellow, Yale University</td>
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<td>2015</td>
<td>Abigail Renoux</td>
<td>Sutton</td>
<td>Research Scientist, Proclara Biosciences</td>
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<td>2015</td>
<td>Maeran Uhm</td>
<td>Saltiel</td>
<td>Currently looking for job opportunities</td>
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<td>Amy Baek</td>
<td>Pinsky</td>
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<td>O’Connell, Ryan</td>
<td>Anumonwo</td>
<td>St. Jude Medical Tampa Florida</td>
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<td>McDade, Joel</td>
<td>Michele</td>
<td>Applications Scientist, Essen Biosciences/Sartorius</td>
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<td>Anyanwu, Anuli Caroline</td>
<td>Pinsky/Hershenson</td>
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<td>Wright, Jordan</td>
<td>Arvan</td>
<td>Internal Medicine Resident, Vanderbilt University</td>
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<td>2013</td>
<td>Chiang, Wei-Chung</td>
<td>Hsu</td>
<td>Postdoctoral Fellow, UT-Southwestern Medical Center</td>
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<td>2013</td>
<td>Campbell, Matthew</td>
<td>Michele</td>
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<td>Campbell, Katherine</td>
<td>Jalife</td>
<td>Postdoctoral Fellow, University of Michigan</td>
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<td>2013</td>
<td>Mackrell, James</td>
<td>Cartee</td>
<td>Postdoctoral Fellow, Eli Lily &amp; Co., Indiana</td>
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<td>Hou, Luqia</td>
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<td>Chkourko, Halina</td>
<td>Delmar/Martens</td>
<td>Scientist, Diapin Therapeutics</td>
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<td>Mowers, Jonathan</td>
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<td>Pathology Medical Resident, University of Michigan</td>
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<td>2012</td>
<td>Sequea, Donel</td>
<td>Cartee</td>
<td>Physical Medicine Resident, Northwestern, Chicago, IL</td>
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<td>2012</td>
<td>Xiong, Tingting</td>
<td>Saltiel</td>
<td>Physician, UofM</td>
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<td>Year</td>
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<td>Title</td>
<td>Department/Institution</td>
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<td>Piggott, Beverly</td>
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<td>Gumerson, Jessica</td>
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<td>Al Menhali, Asma</td>
<td>Samuelson</td>
<td>Teaching, University of the United Arab Emirates</td>
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<td>Wang, Qiong</td>
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<td>Buller, Carolyn</td>
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<td>Business Development Manager, UT Health Science Center San Antonio</td>
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<td>Louis, Gwen</td>
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<td>Nagarkar, Deepti</td>
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<td>Villanueva, Eneida</td>
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<td>Senior Scientist, F. Hoffman-LaRoche Ltd</td>
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<td>2009</td>
<td>Palpant, Nathan</td>
<td>Metzger Westfall</td>
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<td>2009</td>
<td>Salazar, Jay</td>
<td>Brooks</td>
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<td>Associate Staff, Cleveland Clinic</td>
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<td>Morris, David</td>
<td>Rui</td>
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<td>Leshan, Rebecca</td>
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<td>East Coast Regional Director, British Consulate-General Boston</td>
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<td>Usher, Michael</td>
<td>Mortensen</td>
<td>Assistant Professor, University of Minnesota</td>
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<td>2009</td>
<td>Hyman, Matthew</td>
<td>Pinsky</td>
<td>Assistant Professor, Philadelphia VA Medical Center</td>
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<td>2009</td>
<td>Vesely, Eileen</td>
<td>Brosius</td>
<td>Assistant Professor, DeSales University</td>
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<td>2008</td>
<td>Oakley, Amy</td>
<td>Karsch</td>
<td>Lecturer III, Univ. Michigan</td>
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<td>VanDort, Christa</td>
<td>Lydic</td>
<td>Instructor of Anaesthesia, Harvard Medical School</td>
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<td>Merrins, Matthew</td>
<td>Stuenkel</td>
<td>Assistant Prof., Univ. of Wisconsin-Madison</td>
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<td>2008</td>
<td>Gurda, Gregory</td>
<td>Williams</td>
<td>Staff Physician, Gundersen Health System</td>
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<td>2008</td>
<td>Guo, Lili</td>
<td>Williams</td>
<td>Scientist, Janssen Biotechnology</td>
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<td>Panama, Brian</td>
<td>Lopatin</td>
<td>Research Scientist, Masonic Med. Research Lab</td>
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<td>Assistant Professor, Peking University</td>
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<td>Faulkner</td>
<td>Associate Professor, Weill Cornell</td>
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<td>2007</td>
<td>Davis, Jennifer</td>
<td>Metzger</td>
<td>Assistant Professor, University of Washington</td>
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<td>Ivaschenko, Christine</td>
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<td>Family Medicine, Banner Good Samaritan Medical Center Family Practice Center, Associate Professor of Family Medicine, Univ of Arizona College of Medicine</td>
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Appendix 3. Example of CV and NIH biographical sketch

Curriculum Vitae

Note:
• This is presented as an example of one potential CV format; there are multiple possible formats. There may be other categories that are appropriate to you, but the ones below should cover most students/postdocs. Some key things are: 1) Keep the format simple. 2) Include things that would be pertinent to individuals evaluating your overall academic preparation and professional development and achievement. 3) Exclude things that are relatively minor in the big picture of things (like giving presentations in Physiol 606) or not relevant the above (like being an Eagle Scout). Avoid padding; this will be transparent and look bad.

Curriculum Vitae

PERSONAL DATA:

Name
Professional address
Email
Phone #

EDUCATION:

Date, undergrad degree, major and institution for each degree
Date, graduate degree, major and institution, mentor for each degree

POSTDOCTORAL TRAINING:

Date, institution, mentor for each postdoctoral experience

ACADEMIC APPOINTMENTS: This category will not apply to most students or postdocs, but it could and the following format is a good way to list the appointments in chronological sequence.

Dates, position title, department, institution for each appointment

SERVICE AND SCIENTIFIC ACTIVITIES:

Being a ‘good citizen’ and demonstrating a sense of community is important to most potential employers. Include professional activities such as membership on MIP Graduate Committee, MIP student representative faculty meetings, membership on Rackham or other University committees, membership in committees of scientific societies, organizer/coordinator of journal clubs, etc.

FELLOWSHIP OR GRANT SUPPORT:

Fellowships include training grant within the University and ones awarded specifically to you from outside agencies such as AHA, NIH, NSF, etc. Grants could include travel grants, dissertation grants, or anything related to research or teaching.

HONORS AND AWARDS:

Include MIP awards, University or Medical School awards, awards from scientific societies, and any other special recognition awarded to you as an individual or member of a small group.
MEMBERSHIPS AND OFFICES IN PROFESSIONAL SOCIETIES:

It is a good idea to become a student member of one or more national professional societies activity in the scientific community in a broader sense (i.e., beyond the University).

TEACHING ACTIVITIES:

This is especially important for students who wish to pursue a career in teaching. You want to develop a portfolio of your teaching activities. Include courses in which you did classroom teaching, tutoring, mentoring of undergraduates, etc.

BIBLIOGRAPHY:  This is the area that documents your research accomplishments. List the following categories under separate headings. The main things are publications and abstracts of presentations (if abstracts are published be sure to provide the reference citation). If there are no book chapters or invited talks, simply omit those categories from the listing.

SEPARATE GROUPINGS FOR THE FOLLOWING
Publications in Scientific Journals
Abstracts
Books, Chapters in Books, Editing
Invited Lectures and Presentation
Use only for individual predoctoral and postdoctoral fellowships, dissertation research grants (R36), and Research Supplements to Promote Diversity in Health-Related Research (Admin Suppl). DO NOT EXCEED FIVE PAGES.

NAME OF APPLICANT:

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE:

EDUCATION/TRAINING (Most applicants will begin with baccalaureate or other initial professional education, such as nursing. Include postdoctoral training and residency training if applicable. High school students should list their current institution and associated information. Add/delete rows as necessary.)

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>START DATE MM/YYYY</th>
<th>END DATE (or expected end date) MM/YYYY</th>
<th>FIELD OF STUDY</th>
</tr>
</thead>
</table>

NOTE: The Biographical Sketch may not exceed five pages. Follow the formats and instructions below.

A. Personal Statement
Briefly describe why you are well-suited to receive the award for which you are applying. The relevant factors may include aspects of your training; your previous experimental work on this specific topic or related topics; your technical expertise; your collaborators or scientific environment; and your past performance in this or related fields (you may mention specific contributions to science that are not included in Section C). Also, you may identify up to four peer-reviewed publications that specifically highlight your experience and qualifications for this project. If you wish to explain impediments to your past productivity, you may include a description of factors such as family care responsibilities, illness, disability, and active duty military service.

• **R36 Applicants (PD/PI) Only:**
In addition to the information outlined above, include a description of your career goals and intended career trajectory, as well as your interest in the specific areas of research designated in the FOA.

• **Diversity Supplement Candidates Only:**
In addition to the information outlined above, include a description of your general scientific achievements and/or interests, as well as your specific research objectives and career goals. Indicate any source(s) of current funding.

B. Positions and Honors
List in chronological order all non-degree training, including postdoctoral research training, all employment after college, and any military service. High school students and undergraduates may include any previous positions. Clinicians should include information on internship, residency and specialty board certification (actual and anticipated with dates) in addition to other information requested. This information is used in the reviewing the application and in determining the stipend level for Postdoctoral Fellowships. State the Activity/Occupation and include start/end dates, field, name of institution/company, and the name of your supervisor/employer. If you are not currently located at the applicant organization, include your projected position at the applicant organization as well.
Academic and Professional Honors
List any academic and professional honors that would reflect upon your potential for a research career and qualifications. Include all scholarships, traineeships, fellowships, and development awards. Indicate sources of awards, dates, and grant or award numbers. List current memberships in professional societies, if applicable.

C. Contributions to Science (for predoctoral students and more advanced candidates only; high school students, undergraduates, and postbaccalaureates should skip this section)
Considering your level of experience, briefly describe your most significant contributions to science. While all applicants may describe up to five contributions, graduate students and postdoctorates are encouraged to consider highlighting two or three they consider most significant. These may include research papers, abstracts, book chapters, reviews, as well as non-publication research products, such as materials, methods, models, or protocols. For each contribution, indicate the historical background that frames the scientific problem; the central finding(s); the relevance of the finding(s) to science, technology, or public health; and your specific role in the described work. For each contribution, you may reference up to four peer-reviewed publications or other non-publication research products (can list audio or video products; patents; data and research materials; databases; educational aids or curricula; instruments or equipment; models; protocols; and software or netware) that are relevant to the described contribution. The description of each contribution should be no longer than one half page including figures and citations. Please also provide a URL to a full list of your published work as found in a publicly available digital database such as SciENcv or My Bibliography, which are maintained by the US National Library of Medicine. Manuscripts listed as “pending publication” or “in preparation” should be included and identified. Indicate if you previously used another name that is reflected in any of the citations.

D. Scholastic Performance
Predoctoral applicants: Using the chart provided, list by institution and year all undergraduate and graduate courses with grades. In addition, in the space following the chart, explain any marking system if other than 1-100, A, B, C, D, F, or 0-4.0 if applicable. Show levels required for a passing grade.

Postdoctoral applicants: Using the chart provided, list by institution and year all undergraduate courses and graduate scientific and/or professional courses germane to the training sought under this award with grades. In the space following the chart, explain any marking system if other than 1-100, A, B, C, D, F, or 0-4.0 if applicable. Show levels required for a passing grade.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SCIENCE COURSE TITLE</th>
<th>GRADE</th>
<th>YEAR</th>
<th>OTHER COURSE TITLE</th>
<th>GRADE</th>
</tr>
</thead>
</table>

OMB No. 0925-0001 (Rev. 08/12 Approved Through 8/31/2015)
Appendix 4. List and Description of MIP Courses

The courses listed below are the Physiology courses from the full PIBS curriculum guide, a complete version of which can be found here.

Fall Term Only

**REQUIRED**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Term</th>
<th>Number Credits</th>
<th>Meeting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSIOL 576</td>
<td>Signal Transduction</td>
<td>F</td>
<td>1</td>
<td>MWF; 10:00-11:00 am</td>
</tr>
</tbody>
</table>

**Course content:**
An overview of hormone and neurotransmitter receptors as well as the cellular effectors that are regulated by receptor activation. Oncogene products as signal transducers and the interaction of the known signaling pathways will be covered. The various techniques used to study signal transduction as well as important experimental strategies employing these techniques will also be presented. This course is module I of Cellular Physiology (PHYSIOL 576, 577).

**Prerequisites:** None

**Course Directors:** Drs. Christen Carter-Su and Lei Yin

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Term</th>
<th>Number Credits</th>
<th>Meeting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSIOL 577</td>
<td>Membrane and Cell Physiology</td>
<td>F</td>
<td>2</td>
<td>MWF; 10:00-11:00 am</td>
</tr>
</tbody>
</table>

**Course content:**
Membrane and Cell Physiology specifically focuses on the molecular, structural and functional properties of membranes and of their relationship to cell physiology. Topics include membrane structure and trafficking, water and solute transport across membranes/cells, mechanisms of ion channel gating and conduction, the basis of membrane/cell electrical excitability, propagation of electrical signals through cell networks, and the activation and dynamics of calcium signaling. This course is module II of Cellular Physiology (PHYSIOL 576, 577).

**Prerequisites:** None

**Course Director:** Dr. Anatoli Lopatin

**ELECTIVE**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Term</th>
<th>Number Credits</th>
<th>Meeting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSIOL 591</td>
<td>Special Topics in Signal Transduction</td>
<td>F</td>
<td>2</td>
<td>TU; 2:00-4:00 pm</td>
</tr>
</tbody>
</table>

**Course content:**
Special Topics in Signal Transduction is a literature based discussion course that will cover both seminal discoveries in signal transduction as well as recent advances in the field. For each topic, the instructor will provide an overview. In addition, two to three research papers will be discussed each week. This is an upper level graduate course. Jointly sponsored by the Biochemistry, Physiology and Pharmacology Departments and is cross-listed as BCHM 591 and PHARM 591.

**Prerequisites:** Course work in biochemistry and signal transduction or permission of the course director

**Course Director:** Dr. Jun Hee Lee
Both Fall and Winter Term

**REQUIRED**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Term</th>
<th>Number Credits</th>
<th>Meeting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSIOL 606</td>
<td>Current Topics in Physiology (Student Seminar)</td>
<td>FA, WI</td>
<td>1</td>
<td>M; 4:00-5:00 pm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M; 4:00-5:00 pm</td>
</tr>
</tbody>
</table>

*Course content:*  
The goal of the Student Seminar is to improve the critical thinking and public speaking of graduate students in Molecular and Integrative Physiology. This course will provide students with the opportunity to present data, critique the scientific literature, and develop the ability to provide constructive criticism to their peers. Students present a critical review of a topic from the current scientific literature or from their own research once each term. Second year Physiology graduate students are required to enroll, first year PIBS students interested in a degree in Molecular and Integrative Physiology are invited to register or audit the course. The Physiology Graduate Student Representatives in consultation with the Physiology Graduate Chair coordinate the program, establish ground-rules and organize the schedule for each term. The Seminar is graded pass/fail on the basis of participation and presentations.

*Prerequisites:* None

*Course Director:* Dr. Sue Moenter

**ELECTIVE**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Term</th>
<th>Number Credits</th>
<th>Meeting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSIOL 699</td>
<td>Directed Readings</td>
<td>F,W</td>
<td>varies</td>
<td>Arranged</td>
</tr>
</tbody>
</table>

*Course content:*  
Student and faculty member select a topic of interest for literature review and one-to-one discussion.

*Prerequisites:* None

*Course Directors:* Physiology Faculty

**Winter Term Only**

**REQUIRED**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Term</th>
<th>Number Credits</th>
<th>Meeting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSIOL 510</td>
<td>Systems &amp; Integrative Physiology</td>
<td>W</td>
<td>4.5</td>
<td>MWF 9:00AM - 10:30 AM</td>
</tr>
</tbody>
</table>

*Course content:*  
This course addresses major principles of how the various physiological systems of the body function, both individually and as an integrated unit. This course is divided into three modules: Neural and Endocrine Communication: Cardiovascular, Respiratory and Renal Physiology; Gastrointestinal and Metabolic Physiology (512, 513 and 514, respectively; all MIP students are required to take all three modules and should register for 510). The class format consists of lectures, student/faculty discussions of primary research literature, and independent group projects covering aspects of physiology as well as developing other core skills such as presentation.

*Prerequisites:* None

*Course Directors:* Drs. Sue Moenter, Dan Michele, Yatrik Shah
**ELECTIVE**

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<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Term</th>
<th>Number Credits</th>
<th>Meeting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSIOL 520</td>
<td>Computational Systems Biology in Physiology</td>
<td>W</td>
<td>2</td>
<td>T 9-10 AM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TH 9-11 AM</td>
</tr>
</tbody>
</table>

*Course content:*  
This course is an introduction to dynamic modeling in physiology for both experimental and theoretical inclined students. We use selected physiological systems to introduce concepts in computational systems biology. This is done through the use of increasingly more complex cellular functions modeled with scientific software. Backgrounds in mathematics are not required. This course is cross-listed with BIOINF 520.

*Prerequisites:* None

*Course Director:* Dr. Dan Beard

**ELECTIVE**

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<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Term</th>
<th>Number Credits</th>
<th>Meeting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSIOL 541</td>
<td>Mammalian Reproductive Physiology</td>
<td>W</td>
<td>4</td>
<td>TTH; 1:30-3:00 pm</td>
</tr>
</tbody>
</table>

*Course content:*  
A study of the reproductive hormones, which are responsible for the regulation of the female and male reproductive systems. Topics include: the properties and mechanisms of action of pituitary gonadotropic and sex steroid hormones, the anatomy and endocrine regulation of the ovary and testis and of the male and female reproductive tracts, mechanisms of fertilization and implantation, contraception, and the endocrinology of pregnancy.

*Prerequisites:* Human Physiology (PHYSIOL 201) recommended.

*Course Director:* Dr. Carol Elias

**ELECTIVE**

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<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Term</th>
<th>Number Credits</th>
<th>Meeting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSIOL 555</td>
<td>Method and Logic in Biomedical Science</td>
<td>W</td>
<td>3</td>
<td>MWF; 11:00-12:00pm</td>
</tr>
</tbody>
</table>

*Course content:*  
The course will focus on developing skills for logical experimental design and analysis of data to rigorously test hypotheses in the biomedical sciences. Students will apply principles of logic to reading and evaluating the literature to discuss experimental approaches and appropriate conclusions. Capstone project will involve development of an NIH-style specific aim. There are no conventional tests in this class.

*Prerequisites:* Molecular Genetics (HUMGEN 541) recommended, Signal Transduction (PHYSIOL 576) recommended.

*Course Directors:* Drs. Scott Pletcher and David Antonetti