BIOPHYSICS, PH.D.

The doctor of philosophy degree with a major in biophysics is an interdepartmental offering under the supervision of the Biophysics Graduate Degree Program. The biophysics degree is intended for those who wish to emphasize physical principles and methods in solving biological problems. By necessity, the interdisciplinary nature of biophysics generates interaction among, and expands the boundaries of, traditional areas of science. Persons with strong training in biophysics can be expected to be major innovators and contributors in research and applied technology. Biophysics graduates pursue careers in academic, industrial, and government research, and in teaching and administration.

The Biophysics Program consists of approximately 45 faculty members from 14 departments that span four colleges within the university. State-of-the-art facilities are available within the Biophysics Program for research in x-ray crystallography, nuclear magnetic-resonance spectroscopy, electron resonance spectroscopy, fluorescence spectroscopy, microscopy and imaging, and computational chemistry. Graduate students in biophysics can choose from an expansive range of research topics including, but not limited to, biomolecular structure and function interactions, protein engineering and biotechnology, virus structure and function, enzyme catalysis and kinetics, membranes, neurochemistry, and electrophysiology.

The program is flexible in its formal course requirements and emphasizes excellence in research. The candidate is encouraged to begin research as quickly as possible, since it is research experience that brings focus and meaning to classroom studies, and research progress that empowers critical judgment and self-confidence for independent work. To enhance self-confidence, students are expected to participate in weekly seminars and to present a seminar.

Financial assistance is available to support qualified graduate students throughout their graduate studies. Types of graduate appointments that may be awarded include research assistantships, fellowships, and traineeships. The stipends awarded provide financial support to students during their graduate work, permitting them to devote their efforts to coursework and research. In recognition of the leadership provided by scientists and researchers at University of Wisconsin—Madison, the National Institutes of Health (NIH) have funded a predoctoral training grant in molecular biophysics for the past consecutive 20 years.

For more information, see the Biophysics Handbook (http://www.biophysics.wisc.edu/handbook).

ADMISSIONS

Undergraduate preparation for the Biophysics Program can vary widely and will be evaluated by the admissions committee on an individual basis. Most applicants have taken courses in general, organic, and physical chemistry; introductory physics; cell and/or molecular biology; calculus through differential equations; and computer sciences. Students can generally make up any deficiencies in their undergraduate background within the first year of graduate study through a broad and flexible course curriculum. The normal undergraduate course prerequisites are:

- two semesters of physics with calculus
- two semesters of calculus

Exceptions to these requirements may be granted for incoming biophysics graduate students who otherwise have strong undergraduate training in physics, mathematics, computer sciences, biology, chemistry, or other fields related to biophysics. In such cases, each missing required course will be counted as a deficiency that the student must correct by obtaining a passing grade in an equivalent undergraduate or graduate course taken within the first two years of graduate study.

In addition, it is recommended for entering graduate students to have taken undergraduate courses in general biochemistry; general genetics and/or molecular biology; and biophysical chemistry. Students who have not taken courses in these subjects will be expected to do so as part of their formal graduate coursework.

Admission to the biophysics Ph.D. program is highly competitive. A committee of biophysics faculty trainers reviews each application and invites selected students for personal interviews in February. Outstanding international students will be offered video-conferencing interviews with members of the admissions committee. Final admissions decisions are made after all interviews are completed. An application for admission consists of:

1. A resume or CV
2. A personal statement that discusses a candidate's reasoning for pursuing a biophysics Ph.D. What initially drew you to the field? How will earning a Ph.D. help you accomplish your goals?
3. An official transcript of coursework from all undergraduate institutions attended
4. Three or more letters of recommendation
5. A report from the Educational Testing Service of scores received on the required GRE General Test
6. A report, if appropriate, of scores received on the TOEFL English language proficiency exam or an appropriate alternative (IELTS, MELAB)

The admissions committee highly weighs the personal statement and letters of recommendation when reviewing applicants. GPA values are evaluated to ensure they meet minimum graduate school requirements (https://grad.wisc.edu/apply/requirements).

GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further
funding information (https://grad.wisc.edu/funding) is available from the Graduate School. Be sure to check with your program for individual policies and processes related to funding.

**PROGRAM RESOURCES**

The Biophysics Graduate Degree Program offers stipends in the form of traineeships or research assistantships to all Ph.D. candidates, and assists those with outstanding records in competing for University and national awards (fellowships). The program guarantees a full stipend ($27,000 for 2017–18) for all its Ph.D. candidates who remain in good standing in the program. In addition to the stipend, all students receive tuition remission and are eligible for comprehensive health insurance.

**REQUIREMENTS**

**MINIMUM GRADUATE SCHOOL REQUIREMENTS**

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/#policiesandrequirementstext), in addition to the program requirements listed below.

**MAJOR REQUIREMENTS**

**MODE OF INSTRUCTION**

<table>
<thead>
<tr>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**Mode of Instruction Definitions**

- **Evening/Weekend:** These programs are offered in an evening and/or weekend format to accommodate working schedules. Enjoy the advantages of on-campus courses and personal connections, while keeping your day job. For more information about the meeting schedule of a specific program, contact the program.
- **Online:** These programs are offered primarily online. Many available online programs can be completed almost entirely online with all online programs offering at least 50 percent or more of the program work online. Some online programs have an on-campus component that is often designed to accommodate working schedules. Take advantage of the convenience of online learning while participating in a rich, interactive learning environment. For more information about the online nature of a specific program, contact the program.
- **Hybrid:** These programs have innovative curricula that combine on-campus and online formats. Most hybrid programs are completed on-campus with a partial or completely online semester. For more information about the hybrid schedule of a specific program, contact the program.
- **Accelerated:** These on-campus programs are offered in an accelerated format that allows you to complete your program in a condensed time-frame. Enjoy the advantages of on-campus courses with minimal disruption to your career. For more information about the accelerated nature of a specific program, contact the program.

**CURRICULAR REQUIREMENTS**

- **Minimum Credit Requirement:** 51 credits
- **Minimum Residence Credit Requirement:** 32 credits
- **Minimum Graduate Coursework Requirement:** Half of degree coursework (26 credits out of 51 total credits) must be completed graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university’s Course Guide.
- **Overall Graduate GPA Requirement:** 3.00 GPA required.
- **Other Grade Requirements:** Any grade of BC or lower will not count toward the Biophysics core course requirement. If a student receives a BC or lower, the student must repeat the course in order to receive a higher grade.
- **Assessments and Examinations:** Students take two rounds of exams in order to achieve dissertator status. At the end of students’ second year, they are required to take their written preliminary exam. Once this exam is passed, students must take their oral preliminary exam by the end of their third year.
- **Language Requirements:** No language requirements.
- **Doctoral Minor/Breadth Requirements:** No minor required.

**Required Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOCHEM/ CHEM 665</td>
<td>Biophysical Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 668</td>
<td>Biophysical Spectroscopy</td>
<td>2-3</td>
</tr>
</tbody>
</table>

**Students must take at least 2 additional classes from different categories from the following list of classes (alternative classes may be substituted with approval from the Biophysics Program Steering Committee):**

**Structure**

- BIOCHEM 601 Protein and Enzyme Structure and Function
- BIOCHEM/BMOLCHEM/MATH 606 Mathematical Methods for Structural Biology
- BIOCHEM 625 Mechanisms of Action of Vitamins and Minerals

**Modeling**

- CHEM 661 Chemical and Statistical Thermodynamics
- MATH/BMOLCHEM/BIOCHEM 609 Mathematical Methods for Systems Biology

**Molecular Biology**

- BIOCHEM/GENETICS/MICROBIO 612 Prokaryotic Molecular Biology
- BIOCHEM/GENETICS/MD GENET 620 Eukaryotic Molecular Biology

**Neuroscience**

- NTP/NEURODPT 610 Cellular and Molecular Neuroscience
**Prior Coursework**

The document mentions that coursework beyond the minimum required by the Graduate School lies with the general university policies. Program authority to set degree policies is handled by the degree program faculty. Policies set by the academic degree program can be found below. 

**GRADUATE SCHOOL POLICIES**

The Graduate School's Academic Policies and Procedures (https://grad.wisc.edu/acadpolicy) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

**MAJOR-SPECIFIC POLICIES**

The Graduate Program Handbook (http://www.biophysics.wisc.edu/handbook) is the repository for all of the program’s policies and requirements.

**Graduate Work from Other Institutions**

With program approval, students are allowed to count no more than 9 credits of graduate coursework from other institutions.

**Professional Development**

Take advantage of the Graduate School’s professional development resources (https://grad.wisc.edu/pd) to build skills, thrive academically, and launch your career.

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### Additional Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOCHEM 729</td>
<td>Advanced Topics (Ethics) ²</td>
<td>1-3</td>
</tr>
<tr>
<td>CHEM/BIOCHEM 872</td>
<td>Selected Topics in Macromolecular and Biophysical Chemistry ³</td>
<td>1-3</td>
</tr>
<tr>
<td>990 Seminar ⁴</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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1. Because CHEM 668 Biophysical Spectroscopy is only offered every other year, students will be advised upon joining the program in which semester they must complete the course.

2. Students are also required to take an ethics course that covers all of the items considered necessary by the NIH for ethical and professional scientific training. It is strongly recommended that students take the ethics course during their first year. The recommended ethics course is: BIOCHEM 729 Advanced Topics. The Biophysics Program also conducts a mandatory ethics refresher seminar for all students that is held at the end of every spring semester.

3. Additionally, students are required to participate in seminar courses for the duration of their studies. Initially, all students are required to enroll in CHEM/BIOCHEM 872 Selected Topics in Macromolecular and Biophysical Chemistry for both fall and spring semesters. Once a student has successfully achieved dissertator status, they are eligible to enroll in alternative seminars with permission from the program.

4. Finally, all students are expected to register for 990 research credits every semester. These are the courses in which students will be conducting their independent research. First semester students will register for 990 research credits in the department of the Biophysics Program Chair, Meyer Jackson. Once a thesis lab is chosen, these credits will be conducted in the thesis advisor’s home department.
LEARNING OUTCOMES

1. Articulates challenges, frontiers and limits with respect to theory, knowledge or practice within the field of study.

2. Formulates ideas, concepts, designs, and/or techniques beyond the current boundaries of knowledge within the field of study.

3. Creates research, scholarship or performance that makes a substantive contribution.

4. Demonstrates breadth within their learning experiences.

5. Communicates complex or ambiguous ideas in a clear and understandable manner.

6. Evaluates the implications of the discipline to broader social concerns.

7. Fosters ethical conduct and professional guidelines.

PEOPLE

Faculty:

Chair: Professor Meyer Jackson (Neuroscience Department) Website (https://neuro.wisc.edu/staff/jackson-meyer)

Paul Ahlquist (Oncology) Website (https://mcardle.wisc.edu/who-we-are/mcardle-faculty/paul-g-ahlquist-phd)

Tom Brunold (Chemistry) Website (http://brunold.chem.wisc.edu)

Judith Burstyn (Chemistry) Website (http://burstyn.chem.wisc.edu)

Sam Butcher (Biochemistry) Website (https://biochem.wisc.edu/faculty/butcher)

Silvia Cavagnero (Chemistry) Website (http://cavagnero.chem.wisc.edu)

Baron Chanda (Neuroscience) Website (http://bclab.neuro.wisc.edu)

Ed Chapman (Neuroscience) Website (https://chapman.neuro.wisc.edu)

Gheorghe Craciun (Mathematics) Website (http://www.math.wisc.edu/~craciun)

Cindy Czajkowski (Neuroscience) Website (https://neuro.wisc.edu/staff/czajkowski-cynthia)

Katrina Forest (Bacteriology) Website (https://bact.wisc.edu/people_profile.php?i=rfl&page=torres)

Brian Fox (Biochemistry) Website (https://biochem.wisc.edu/faculty/fox/default.aspx)

Sam Gellman (Chemistry) Website (http://gellman.chem.wisc.edu)

Pupa Gilbert (Physics)

Randy Goldsmith (Chemistry) Website (https://goldsmith.chem.wisc.edu)

Jeff Hardin (Zoology) Website (http://worms.zoology.wisc.edu)

Katie Henzler-Wildman (Biochemistry) Website (https://biochem.wisc.edu/faculty/henzler-wildman)

Hazel Holden (Biochemistry) Website (https://biochem.wisc.edu/faculty/holden/default.aspx)

Aaron Hoskins (Biochemistry) Website (https://biochem.wisc.edu/faculty/hoskins/default.aspx)

Mathew Jones (Neuroscience) Website (https://neuro.wisc.edu/staff/jones-mathew-2)

Jim Keck (Biomolecular Chemistry) Website (https://bmlolchem.wisc.edu/staff/keck-james)

Bob Landick (Biochemistry) Website (https://landick.wisc.edu)

John Markley (Biochemistry) Website (https://biochem.wisc.edu/faculty/markley)

Megan McLean (Biomedical Engineering) Website (http://mccleanlab.bme.wisc.edu)

Matthew Merrins (Biomolecular Chemistry)

Julie Mitchell (Mathematics) Website (https://biochem.wisc.edu/faculty/mitchell/default.aspx)

Regina Murphy (Chemical and Biological Engineering) Website (http://murphygroup.che.wisc.edu)

Vatsan Raman (Biochemistry) Website (https://biochem.wisc.edu/faculty/raman)

Ivan Rayment (Biochemistry) Website (https://biochem.wisc.edu/faculty/rayment/default.aspx)

Tom Record (Biochemistry) Website (https://biochem.wisc.edu/faculty/record)

Gail Robertson (Neuroscience) Website (https://neuro.wisc.edu/staff/robertson-gail)

Phil Romero (Biochemistry) Website (https://biochem.wisc.edu/faculty/romero)

Kris Saha (Biomedical Engineering) Website (http://sahalab.bme.wisc.edu)

David Schwartz (Chemistry) Website (https://www.chem.wisc.edu/users/schwartz)

Alessandro Senes (Biochemistry) Website (https://biochem.wisc.edu/faculty/senes/default.aspx)

Nate Sherer (Oncology) Website (https://mcardle.wisc.edu/who-we-are/faculty/nathan-m-sherer-phd)

Melissa Skala (Biomedical Engineering) Website (https://morgridge.org/research/medical-engineering/multiscale-imaging)

Lloyd Smith (Chemistry) Website (https://www.chem.wisc.edu/users/smith)

Daniel van der Weide (Electrical and Computer Engineering) Website (http://vdw.ece.wisc.edu)

Reid Van Lehn (Chemical and Biological Engineering) Website (http://vanlehngroup.che.wisc.edu)
Ophelia Venturelli (Biochemistry) Website (https://biochem.wisc.edu/faculty/venturelli)

Doug Weibel (Biochemistry) Website (https://biochem.wisc.edu/faculty/weibel/default.aspx)

James Weisshaar (Chemistry) Website (https://www.chem.wisc.edu/users/weisshaa)

Yongna Xing (Oncology): Website (https://mcardle.wisc.edu/who-we-are/mcardle-faculty/yongna-xing-phd)

John Yin (Chemical and Biological Engineering) Website (https://yin.discovery.wisc.edu)