

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 56 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 (<https://biophysics.wisc.edu/resources/>).

ADMISSIONS

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.

Graduate admissions is a two-step process between academic programs and the Graduate School. **Applicants must meet** the minimum requirements (<https://grad.wisc.edu/apply/requirements/>) **of the Graduate School as well as the program(s)**. Once you have researched the graduate program(s) you are interested in, apply online (<https://grad.wisc.edu/apply/>).

Requirements	Detail
Fall Deadline	December 1
Spring Deadline	The program does not admit in the spring.
Summer Deadline	The program does not admit in the summer.
GRE (Graduate Record Examinations)	Not required but may be considered if available.
English Proficiency Test	Every applicant whose native language is not English or whose undergraduate instruction was not in English must provide an English proficiency test score and meet the Graduate School minimum requirements (https://grad.wisc.edu/apply/requirements/#english-proficiency).
Other Test(s) (e.g., GMAT, MCAT)	n/a
Letters of Recommendation Required	3

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
- two semesters of organic chemistry
- one semester of physical chemistry
- one semester of computer sciences
- one semester of statistics
- introduction to biology

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, if submitting, from the Educational Testing Service of scores received on the 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/>).

FUNDING

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 restrictions 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 (\$33,000 for 2023–24) 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/#policiesandrequirements>), in addition to the program requirements listed below.

MAJOR REQUIREMENTS MODE OF INSTRUCTION

Face to Face	Evening/ Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	No

Mode of Instruction Definitions

Accelerated: Accelerated programs are offered at a fast pace that condenses the time to completion. Students typically take enough credits aimed at completing the program in a year or two.

Evening/Weekend: Courses meet on the UW–Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

Face-to-Face: Courses typically meet during weekdays on the UW–Madison Campus.

Hybrid: These programs combine face-to-face and online learning formats. Contact the program for more specific information.

Online: These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

CURRICULAR REQUIREMENTS

Requirement Detail	
Minimum Credit Requirement	51 credits
Minimum Residence Credit Requirement	32 credits
Minimum Graduate Coursework Requirement	26 credits must be graduate-level coursework. Details can be found in the Graduate School's Minimum Graduate Coursework (50%) policy (https://policy.wisc.edu/library/UW-1244) (https://policy.wisc.edu/library/UW-1244/).
Overall Graduate GPA Requirement	3.00 GPA required. This program follows the Graduate School's GPA Requirement policy (https://policy.wisc.edu/library/UW-1203) (https://policy.wisc.edu/library/UW-1203/).
Other Grade Requirements	Credits are not counted from courses in which a grade of BC or below is obtained for the Biophysics core courses. In the event of an unsatisfactory grade, the student must repeat the course and obtain a grade of B or better if they want to count the class towards their Biophysics GPA and course requirements.
Assessments and Examinations	Students are required to complete an oral preliminary exam. The oral exam should be completed no later than the end of the student's third fall semester in the program. This exam consists of an oral defense of a written research proposal. The format of the research proposal is based on the format for an NIH F31 predoctoral grant application. If the student feels they need more time to complete the oral exam, they must request an extension from the Biophysics Office.
Language Requirements	No language requirements.
Breadth Requirement	No doctoral minor or Graduate/Professional certificate required.

Required Courses

Code	Title	Credits
Required by the time oral prelim is taken:		
BIOCHEM/ CHEM 665	Biophysical Chemistry	4
CHEM 668	Biophysical Spectroscopy ¹	3
Biophysics Additional Courses²		6

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):

<i>Structure</i>	
BIOCHEM 601	Protein and Enzyme Structure and Function
BIOCHEM 625	Mechanisms of Action of Vitamins and Minerals
CHEM 622	Organic Analysis
CHEM 675	Introductory Quantum Chemistry
ONCOLOGY 673	Purification and Characterization of Protein and Protein Complexes
<i>Modeling</i>	
CHEM 661	Chemical and Statistical Thermodynamics
MATH/B M I/ BIOCHEM/ BMOLCHEM 609	Mathematical Methods for Systems Biology
<i>Molecular Biology</i>	
BIOCHEM/ GENETICS/ MICROBIO 612	Prokaryotic Molecular Biology
BIOCHEM/ GENETICS/ MD GENET 620	Eukaryotic Molecular Biology
<i>Neuroscience</i>	
NTP/ NEURODPT 610	Cellular and Molecular Neuroscience
<i>Spectroscopy/Microscopy</i>	
B M E/ MED PHYS/ PHMCOL- M/PHYSICS/ RADIOL 619	Microscopy of Life
B M E 751	Biomedical Optics and Biophotonics
CHEM 860	Selected Topics in Physical Chemistry (Topic: Spectroscopy of Individual Molecules and Particles)
BIOCHEM 729	Advanced Topics (Topic: Advanced Topics in NMR)
<i>Computational Courses</i>	
ONCOLOGY 778	Bioinformatics for Biologists
B M I/ COMP SCI 776	Advanced Bioinformatics
Ethics Course 1-3	
BIOCHEM 729	Advanced Topics (Ethics) ³
Seminar Courses	
CHEM/ BIOCHEM 872	Selected Topics in Macromolecular and Biophysical Chemistry

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 (Topic: 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.

Speciality Courses

To fulfill the remainder of required credits, students can take specialty courses. It is recommended to take courses in areas such as biotechnology, computer science, electrical and computer engineering, molecular biology, or physics. Students should consult with their Thesis Advisor and thesis committee members about appropriate specialty courses to take pertaining to individual training goals.

Research Credits

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. Once a thesis lab is chosen, these credits will be conducted in the thesis advisor's home department.

Total Credits

51

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. This course must be taken for 3 credits.

2

To meet the 6 credit minimum, all elective courses must be at least 2 credits. That means that students can, for example, take two 3-credit courses, three 2-credit courses, or one 2-credit and one 4-credit course to satisfy this requirement. The above list of courses have all been approved as elective courses by the Biophysics Steering Committee. If you are interested in a different course, in order for it to count as an elective course towards your Biophysics graduate degree, the course needs to be approved by the Steering Committee. Please email the coordinator at biophysics@bocklabs.wisc.edu a syllabus from the course and a short paragraph detailing why the class is relevant to your research.

3

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.

POLICIES

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

PRIOR COURSEWORK

Graduate Work from Other Institutions

This program follows the Graduate School's policy for Satisfying Requirements with Prior Graduate Coursework from Other Institutions. (<https://policy.wisc.edu/library/UW-1216/>)

UW–Madison Undergraduate

This program follows the Graduate School's policy for Satisfying Requirements with Coursework from Undergraduate Career at UW–Madison. (<https://policy.wisc.edu/library/UW-1216/>)

UW–Madison University Special

This program follows the Graduate School's policy for Transfer from UW–Madison University Special Student Career at UW–Madison. (<https://policy.wisc.edu/library/UW-1216/>)

PROBATION

This program follows the Graduate School's Probation policy. (<https://policy.wisc.edu/library/UW-1217/>)

ADVISOR / COMMITTEE

All students are required to have an advisor by the end of their first semester in the program. Thesis committees must be formed at the end of a student's first year in the program. The committee consists of at least four other faculty members and the student's advisor and faculty must represent at least two different departments on campus. After gaining dissertator status, students are required to hold yearly progress report meetings with their committee until graduation.

CREDITS PER TERM ALLOWED

15 credits

TIME LIMITS

This program follows the Graduate School's Time Limits policy. (<https://policy.wisc.edu/library/UW-1221/>)

GRIEVANCES AND APPEALS

These resources may be helpful in addressing your concerns:

- Bias or Hate Reporting (<https://doso.students.wisc.edu/bias-or-hate-reporting/>)
- Graduate Assistantship Policies and Procedures (<https://hr.wisc.edu/policies/gapp/#grievance-procedure>)
- Hostile and Intimidating Behavior Policies and Procedures (<https://hr.wisc.edu/hib/>)
 - Office of the Provost for Faculty and Staff Affairs (<https://facstaff.provost.wisc.edu/>)
- Dean of Students Office (<https://doso.students.wisc.edu/>) (for all students to seek grievance assistance and support)
- Employee Assistance (<http://www.eao.wisc.edu/>) (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
- Employee Disability Resource Office (<https://employeedisabilities.wisc.edu/>) (for qualified employees or applicants with disabilities to have equal employment opportunities)

- Graduate School (<https://grad.wisc.edu/>) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
- Office of Compliance (<https://compliance.wisc.edu/>) (for class harassment and discrimination, including sexual harassment and sexual violence)
- Office of Student Conduct and Community Standards (<https://conduct.students.wisc.edu/>) (for conflicts involving students)
- Ombuds Office for Faculty and Staff (<http://www.ombuds.wisc.edu/>) (for employed graduate students and post-docs, as well as faculty and staff)
- Title IX (<https://compliance.wisc.edu/titleix/>) (for concerns about discrimination)

Students should contact the department chair or program director with questions about grievances.

OTHER

Fall semester enrollment only. First semester, program-sponsored lab rotations lead to thesis lab selection and research assistantship through the thesis advisor.

PROFESSIONAL DEVELOPMENT

GRADUATE SCHOOL RESOURCES

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

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 Trainers:

Alessandro Senes – Program Director (Biochemistry) Website (<https://biochem.wisc.edu/faculty/senes/>)

Silvia Cavagnero – Program Assistant Director (Chemistry) Website (<http://cavagnero.chem.wisc.edu/>)

Paul Ahlquist (Oncology) Website (<https://mcardle.wisc.edu/faculty/>)

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

Andrew Buller (Chemistry) Website (<https://www.chem.wisc.edu/users/abuller/>)

Mark Burkard (Medicine) Website (https://www.medicine.wisc.edu/people-search/people/staff/703/Burkard_Mark/)

Briana Burton (Bacteriology) Website (<https://burtonlab.bact.wisc.edu/>)

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

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

Josh Coon (Chemistry) Website (<https://www.chem.wisc.edu/users/jcoon/>)

Scott Coyle (Biochemistry) Website (<https://biophysics.wisc.edu/staff/coyle-scott/>)

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

Katrina Forest (Bacteriology) Website (https://bact.wisc.edu/people_profile.php?t=rf&p=kforres1)

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

Pupa Gilbert (Physics) Website (<https://home.physics.wisc.edu/gilbert/>)

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

Tim Grant (Biochemistry) Website (<https://biophysics.wisc.edu/staff/grant-timothy/>)

Aviad Hai (Biomedical Engineering) Website (<https://biophysics.wisc.edu/staff/hai-aviad/>)

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

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

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

Xuhui Huang (Chemistry) Website (<https://biophysics.wisc.edu/staff/huang-xuhui/>)

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

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

Robert Kirchdoerfer (Biochemistry) Website (<https://biophysics.wisc.edu/staff/kirchdoerfer-robert/>)

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

Ci Ji Lim (Biochemistry) Website (<https://biophysics.wisc.edu/staff/lim-ci-ji/>)

Megan McClean (Biomedical Engineering) Website (<http://mccleanlab.bme.wisc.edu/>)

Matthew Merrins (Biomolecular Chemistry) Website (<https://bmolchem.wisc.edu/staff/merrins-matthew/>)

Jacob Notbohm (Engineering Physics) Website (<http://notbohm.ep.wisc.edu/>)

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

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

Chad Rienstra (Biochemistry) Website (<https://biophysics.wisc.edu/staff/rienstra-chad-m/>)

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/>)

Nate Sherer (Oncology) Website (<https://mcardle.wisc.edu/faculty/>)

Raunak Sinha (Neuroscience) Website (<https://neuro.wisc.edu/staff/sinha-raunak/>)

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

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

Aussie Suzuki (Oncology) Website (<https://mcardle.wisc.edu/faculty/>)

Reid Van Lehn (Chemical and Biological Engineering) Website (<http://vanlehngroup.che.wisc.edu/>)

Ophelia Venturelli (Biochemistry) Website (<https://biochem.wisc.edu/faculty/venturelli/>)

Amy Weeks (Biochemistry) Website (<https://biophysics.wisc.edu/staff/weeks-amy/>)

Liz Wright (Biochemistry) Website (<https://biophysics.wisc.edu/staff/wright-elizabeth/>)

Yongna Xing (Oncology): Website (<https://mcardle.wisc.edu/faculty/>)

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

Martin Zanni (Chemistry) Website (<https://zanni.chem.wisc.edu/>)

Please consult our faculty trainer site (<https://biophysics.wisc.edu/labs/>) as new faculty are added to the program each year.