Biology and the Biological Sciences

Program Overview
Welcome from the Director

The Undergraduate Program in Biology and Medicine (UPBM) combines the College of Arts and Sciences and the School of Medicine and Dentistry to offer courses for undergraduate students with lectures, laboratory work, specialty seminars and research experiences.

The UPBM was founded in the early 1980’s serves as a gateway for undergraduates studying at The College to gain research opportunities at the University of Rochester Medical Center. Since then the program has been accredited and is now one of the most popular undergraduate programs on campus.

The Biology Department together with Departments of Biochemistry, Microbiology & Immunology, and Neuroscience produce the framework of The UPBM.

The Program provides academic year opportunities to do independent research for credit as well as DeKiewiet Summer Fellowships, which support summer research by outstanding University of Rochester undergraduate students.

Approximately four hundred plus sophomores, juniors, and seniors belong to UPBM majors and one hundred biological science independent study courses are registered each semester.

Dr. Cheeptip Benyajati
Director for UPBM
Undergraduate Majors

Flexibility in Planning

Undergraduates may choose to obtain either a B.A. degree in biology or a B.S. degree in biological sciences with a specialization in one of six areas: biochemistry, cell and developmental biology, evolutionary biology and ecology, microbiology, molecular genetics, or neuroscience. Also, students may receive a Certificate in Biotechnology in conjunction with a degree upon completion of a prescribed set of courses.

Each of the curricula described below constitutes strong preparation for graduate or professional study. The combined curricula of the Undergraduate Program in Biology and Medicine offer more than 56 lecture and laboratory courses and additional seminars in specialized topics. In addition to formal coursework, the large number of faculty involved in the program provides an exceptional number and diversity of independent research opportunities.

Bachelor of Arts Majors in the Biological Sciences

The BA curriculum is intended to provide the student with a well-rounded introduction to the major areas of biology. This program offers the maximum freedom of course selection since, among the eight biology courses (minimum 32 credits) necessary to earn the degree, only the three core courses are specifically required. Students must also satisfy a laboratory requirement. For major requirements visit: http://www.rochester.edu/college/bio/undergraduate/academics/bio.html

 Bachelor of Science Majors in the Biological Sciences

The BS curriculum stresses theoretical and experimental approaches and the development of expertise in a focused fields of biology, including analysis of results in the current scientific literature. The breadth of background in biology is achieved through the three biology introductory courses, three to six advanced courses, and one to two additional biology diversification courses (depending on the concentration) selected from outside the area of specialization. A bachelor of science degree requires a total of 40 to 47 credits of coursework in the biological sciences.

 BS in Biochemistry: Studies include basic concepts of metabolism, protein structure and function, and experimental techniques. In the senior year, a wide variety of optional courses is offered to allow specialization in Enzymology, membrane biochemistry, DNA, and RNA structure and formation. For major requirements visit: http://www.rochester.edu/college/bio/undergraduate/academics/bbc.html

 BS in Cell and Developmental Biology: Studies include the analysis of the structure and function of cells, the organization and interaction of cells and tissues, and the processes of development responsible for cell and tissue differentiation and production of the adult form. Emphasis is placed on the molecular basis for cellular and developmental processes. For major requirements visit: http://www.rochester.edu/college/bio/undergraduate/academics/bcd.html

 BS in Computational Biology: Provides a rigorous quantitative approach to biological science and lays the foundation for students to acquire the computational skills that are necessary for contemporary biological research. Furthermore, this degree will provide a natural connection between the Department of Biology and the Institute for Data Science. http://www.rochester.edu/college/bio/undergraduate/academics/bbc.html

 BS in Evolutionary Biology and Ecology: Studies include evolution, ecology, animal behavior, population genetics, ecological genetics, and molecular evolution. The emphasis in all courses is on the dynamic processes influencing organisms and populations in nature. The subject matter presented concentrates on integrating comparative, experimental, and theoretical methods to study evolutionary and ecological processes. An emphasis in this program is the integration of behavioral, ecological, molecular, and genetic methods to investigate ecological and evolutionary questions. For major requirements visit: http://www.rochester.edu/college/bio/undergraduate/academics/beb-17.html

 BS in Microbiology: The introductory course considers how micro-organisms are adapted to their environment. In advanced courses, the emphasis is placed on the molecular functioning of microorganisms, covering such topics as microbial physiology, microbial genetics, industrial microbiology, immunology, virology, and pathogenic microbiology. For major requirements visit: http://www.rochester.edu/college/bio/undergraduate/academics/bmb.html

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BS in Molecular Genetics
Studies include chromosome structure, the molecular mechanisms of DNA replication, DNA mutations and repair, DNA recombination, and the regulation of gene expression. Emphasis is placed on experimental approaches, including recombinant DNA technology. For major requirements visit: http://www.rochester.edu/college/bio/undergraduate/academics/bmg.html

BS in Neuroscience: Neuroscience, which is an interdisciplinary pursuit, deals with the mechanics by which nervous systems mediate behavior. A combination of coursework and laboratory experience gives students a firm understanding of brain function from the molecular to the behavioral levels. Topics covered include biochemical, anatomical, physiological, and medical aspects of neurobiology. For major requirements visit: http://www.rochester.edu/college/bio/undergraduate/academics/bns.html

Certificate in Biology Technology: The program for the Certificate in Biotechnology is designed to give students the specialized background needed for entry into biotechnology jobs or advanced study in the field. Requirements for the certificate complement the B.A. or B.S. tracks in biological science; students in other degree programs may also be eligible. The certificate is administered through the Undergraduate Program in Biology and Medicine Office. Interested students should contact this office for further information. For certificate requirements visit: http://www.rochester.edu/college/bio/undergraduate/academics/certificate.html

One particular advantage of the program is that the student need not make a premature choice between the degrees offered. The B.A. and B.S. degrees require a common core of courses. The student may then sample several gateway courses in the specific areas of the six B.S. curricula; these courses may be used as part of a B.S. program as required or as diversification courses or may become part of a B.A. curriculum. Also, most of the courses require in the allied fields (chemistry, mathematics, and physics) are the same for both of the degrees offered.

Getting Started
How Students Prepare to Major in the Biological Sciences

Students preparing to major in the biological sciences typically follow the same course schedule the first year and a half. Please note that coursework taken in the spring semester of sophomore year may vary slightly depending on which track in biology is pursued. Please consult the UPBM major requirements website prior to planning course schedules: http://www.rochester.edu/college/bio/undergraduate/academics/majors.html

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<td>FALL</td>
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<tr>
<td>Biology Introductory Course I (select one)</td>
<td>Biology Introductory Course II (select one)</td>
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<td>- BIO 110 Principles of Biology I</td>
<td>- BIO 111 / 117P Principles of Biology II with Lab</td>
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<td>- BIO 112 Perspectives in Biology I</td>
<td>- BIO 113 / 117P Perspectives in Biology II with Lab</td>
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<td>- BIO 115 / 117P Intro to Organismal Evolutionary Bio with Lab</td>
<td>- BIO 115 / 117P Intro to Organismal Evolutionary Bio with Lab</td>
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<td>CHM 131 General Chemistry I</td>
<td>CHM 132 General Chemistry II</td>
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<td>WRT 105 College Level Writing Course</td>
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<tr>
<td>Genetics (select one)</td>
<td>* Biochemistry Introductory Course (select one)</td>
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<tr>
<td>- BIO 190 / 198P The Human Genome with Lab</td>
<td>- BIO 250 Introduction to Biochemistry</td>
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<td>- BIO 198 / 198P Principles of Genetics with Lab</td>
<td>- BIO 252 Principles of Biochemistry</td>
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<td>CHM 203 / 207 Organic Chemistry II with Lab</td>
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*Bio 250 and CHM 204/208 are required for most BS majors. Visit the UPBM major requirement website before planning course schedules for spring of sophomore year. http://www.rochester.edu/college/bio/undergraduate/academics/majors.html

Undergraduate Research Opportunities
Independent Research Courses, deKiewiet Fellowship, Honors in Research

The facts, theories, and principles taught in our formal courses ultimately derive from research in the laboratory or the field. Students are encouraged to experience the challenges, successes, frustrations, and excitement of research by arranging independent research in the laboratories of individual members of the faculty in the Undergraduate Program in Biology and Medicine and faculty in various departments at the nearby University of Rochester School of Medicine and Dentistry.

The diversity of the faculty’s research interests gives students the opportunity to select projects from a wide variety of fields. Work in a laboratory provides an inside view of science and scientists that cannot be gained through lectures or reading and is particularly valuable for undergraduates who contemplate careers in research. Occasionally students’ contributions to research are incorporated into published journal articles, and the students are listed as coauthors of these papers.

Students gain biological research experience through different means. Some enroll in independent research courses or apply to the de Kiewiet summer fellowship, or work as a student employee, or volunteer in the labs of faculty on campus or at the medical center. Success in research at the College relies upon the student’s scientific curiosity and their ability reach out to their advisors and faculty who conduct research in their area of interest. The College continuously works to create new resources through the River Campus Libraries and Office of Undergraduate Research to help students take control of their research path.

Students have the opportunity to earn academic credit through independent study courses instructed by members of the teaching faculty at the University of Rochester. Each semester approximately 100 students register independent research courses with UPBM Faculty located on campus or in the medical center. For more information on independent study courses visit: http://www.rochester.edu/college/bio/undergraduate/research/independent/index.html

Research projects can also be conducted during the summer through the de Kiewiet Summer Research Fellowship Program, awarded on a competitive basis to students in program tracks. For more information on the deKiewiet fellowship visit: http://www.rochester.edu/college/bio/undergraduate/research/deKiewiet/index.html

Students who have demonstrated ability and initiative in an independent research project may be recommended to receive Honors in Research after successful completion and defense of a written dissertation. A minimum BIO GPA of 2.7 is required. The deadline for applying for honors in research is the first Monday in March of senior year. However, it is necessary to plan the research project well in advance. For more information on obtaining honors in research visit: http://www.rochester.edu/college/bio/undergraduate/research/honors.html

There is also the potential to gain research experience through undergraduate employment. The biology department alone hires nearly fifty students each semester for lab technician positions that sometimes develop into research opportunities. Undergraduate jobs are advertised on-line through the https://faonline.rochester.edu/Logon.aspx?ReturnUrl=%2f

Students are encouraged to read up on the research profiles of UR Faculty to help identify potential areas of interest. Listed below are a few of many biological science departments undergraduates have access to:
Department of Biology: http://www.rochester.edu/college/bio/people/faculty/
Department of Biochemistry and Biophysics: https://www.urmc.rochester.edu/biochemistry-biophysics/people/faculty.aspx
Department of Microbiology and Immunology: https://www.urmc.rochester.edu/microbiology-immunology/our-team.aspx
Department of Pathology and Physiology: https://www.urmc.rochester.edu/urmc-labs/pathology/faculty.aspx
Department of Pharmacology: https://www.urmc.rochester.edu/pharmacology-physiology/faculty.aspx

Related Links:
Independent Research Courses Registered since 2008: http://www.rochester.edu/college/bio/undergraduate/research/independent/course-history.html

For more information on all research at the UR visit the Office of Undergraduate Research website at: http://www.rochester.edu/college/ugresearch

For more information on workshops available through the Campus Library system visit: https://rcld7.lib.rochester.edu/csrs/taking-control-pilot-2015.
**Workshop Program**

Cooperative Active Learning / Leadership Opportunities

To help meet the challenges associated with larger classes the biology department has implemented the College's Workshop program into their introductory level course curriculum.

The workshop program is designed to alleviate the passive role of students and their consequent disengagement in lecture by providing an opportunity for active learning in a team setting.

In supplement to weekly lectures students are broken down into groups of six to ten who meet with a workshop leader for two hours each week to discuss recent lessons.

Workshop leaders are a faculty-lead team of select, highly-trained, undergraduate students who have had previous success in program courses. Workshop leaders then meet with faculty each week for training and exchange student feedback.

The Workshop program is mutually beneficial to both students and faculty as it encourages students to receive individual attention, provide well qualified students the opportunity to gain leadership and pedagogical experiences, and allow faculty to gather student feedback for continuous course improvements.

The workshop program is coordinated by Biology faculty in conjunction with the Center for Excellence in Teaching and Learning. For more information on the Workshop Program and the Center for Excellence in Teaching and Learning visit: [http://www.rochester.edu/college/cetl/undergraduate/workshops.html](http://www.rochester.edu/college/cetl/undergraduate/workshops.html).

For information on the undergraduate workshop leader and teaching assistant opportunities within the Biology department visit: [http://www.rochester.edu/college/bio/undergraduate/ta/application.html](http://www.rochester.edu/college/bio/undergraduate/ta/application.html)

**Going “Pre-Med”?**

An Interest Not a Major...

There is no formal “premed major” or “program” at Rochester; it’s simply a matter of taking courses in Biology, Chemistry, Physics and Mathematics in conjunction with the major(s) of your choice. Medical schools have no preference for certain majors over others.

The choice of major should be guided by a student’s academic interests and strengths as well as an alternative career field(s) should a student choose not to pursue medical school.

For more information on the advantages of preparing for a medical career at the University of Rochester visit the Pre-Med and Allied Health Professions Advising Office website at: [http://www.rochester.edu/college/ccas/health/](http://www.rochester.edu/college/ccas/health/)

**Biology Major Career Planning Resources**

The Gwen M. Green Career and Internship Center

The Gwen Green Career Center has developed several resources that are helpful in assisting students and alumni with academic/professional choices and post baccalaureate planning.

Students are encouraged to develop a relationship and utilize The Gwen M. Green Career and Internship Center in addition to consulting their academic advisors when investigating possible career choices.

For placement statistics please contact the GMG Career and Internship Center Directly: [http://www.rochester.edu/careercenter/about/contact.html](http://www.rochester.edu/careercenter/about/contact.html)

**Related Links:**

Gwen M. Greene Career & Internship Center Website: [http://www.rochester.edu/careercenter/](http://www.rochester.edu/careercenter/)


Internship Resources: [http://www.rochester.edu/careercenter/undergraduates/internships.html](http://www.rochester.edu/careercenter/undergraduates/internships.html)

Graduate School Resources: [http://www.rochester.edu/careercenter/undergraduates/grad-school.html](http://www.rochester.edu/careercenter/undergraduates/grad-school.html)
Other Helpful Links

Links to Other UR Departments

Admissions
http://enrollment.rochester.edu/admissions/

Admissions Fast Facts
https://enrollment.rochester.edu/admissions/res/pdf/factsheet.pdf

Biology Department Course Schedule
http://www.rochester.edu/college/bio/courses/index.html

Biology Department Website
http://www.rochester.edu/college/bio/index

Biology Department Newsletter
http://www.rochester.edu/College/BIO/newsletter.html

Center for Excellence in Teaching and Learning
http://www.rochester.edu/college/cetl/

College Center for Academic Advising
http://www.rochester.edu/college/CCAS/

Gwen Green Career and Internship Center
http://www.rochester.edu/careercenter/

Health Professions Advising
http://www.rochester.edu/college/CCAS/health/

Office of Undergraduate Research
http://www.rochester.edu/college/ugresearch/

Society for Undergraduate Biology Students
https://ccc.rochester.edu/organization/societyofundergraduatebiologystudents

UPBM Alumni - Where Are they Now
http://www.rochester.edu/college/bio/undergraduate/alumni

UPBM e-Newsletter Website
http://www.rochester.edu/college/bio/undergraduate/e-news

UPBM Peer Advising
http://www.rochester.edu/college/bio/undergraduate/pdf/PeerAdvisers

UPBM Undergraduate Teaching Assistant Opportunities
http://www.rochester.edu/college/bio/undergraduate/ta/application

Writing Speaking and Argument Program
http://writing.rochester.edu/

Contact Us

Program Information

Address: The Undergraduate Program in Biology and Medicine
University of Rochester
Hutchison Hall Room 488, P.O. Box 270211
Rochester, NY 14627

Website Address: http://www.rochester.edu/college/bio/undergraduate/index.html

Director: Dr. Cheeptip Benyajati
Email: cheeptip.benyajati@rochester.edu
Phone: 585.275.8040

Administrator: Marianne Arcoraci
Email: marianne.arcoraci@rochester.edu
Phone: 585.275.3850

To Book Appointments Visit: http://www.rochester.edu/college/bio/undergraduate/PUGS.php