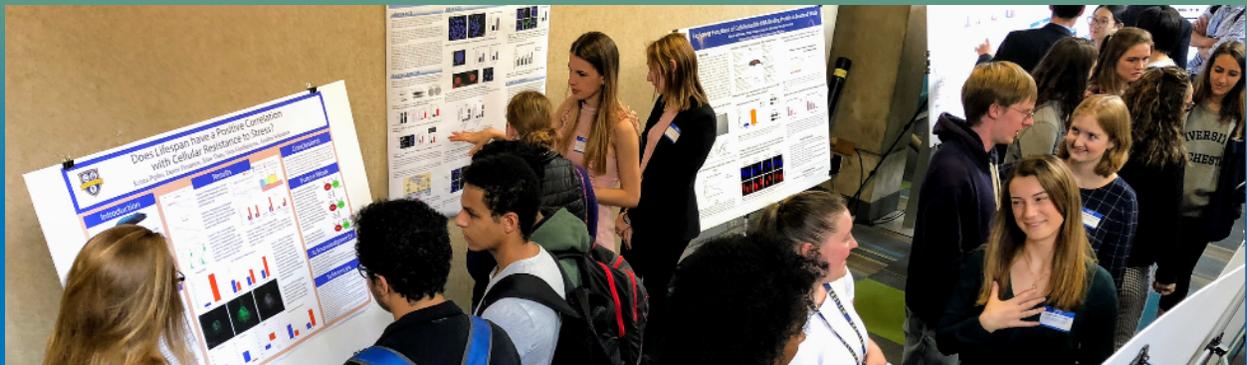
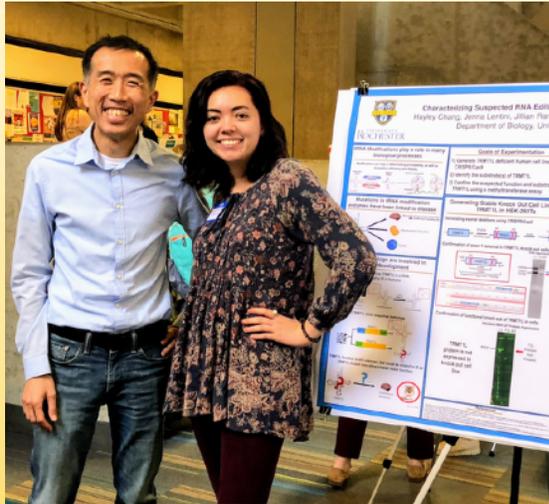


Prospective Student UPBM Curricular Brochure Undergraduate Program in Biology and Medicine



Welcome from the Director

Program Overview



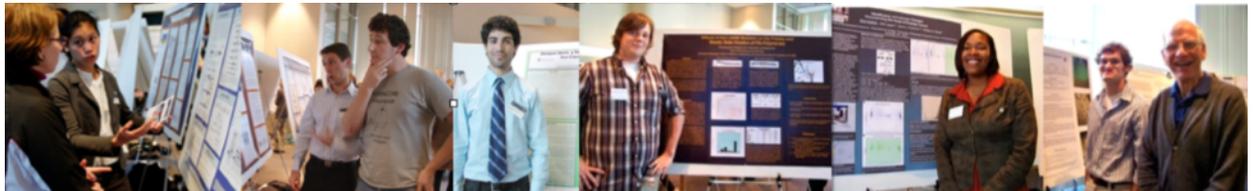
Dr. Cheeptip Benyajati
Co-Director for UPBM

“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 and 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 for UPBM.

The program provides academic year opportunities to do independent research for credit as well as de Kiewiet Summer Fellowships, which supports 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 student courses are registered each semester.”



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Thank You for Your Interest!

Undergraduate Majors

Flexibility in Planning

Undergraduates may choose to obtain either a bachelor of arts (BA) degree in biology or bachelor of science (BS) degree in biological sciences with a specialization in one of the seven areas: biochemistry, cell and developmental biology, evolutionary biology and ecology, microbiology, molecular genetics, or neuroscience. Students may also 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 offers 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 opportunity for diverse or independent research.

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

Bachelor of Arts

The bachelor of arts 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. It is necessary to take a minimum of 32 credits for the degree, and only three courses are specifically required. Students must also satisfy a laboratory requirement.

BA in Biology

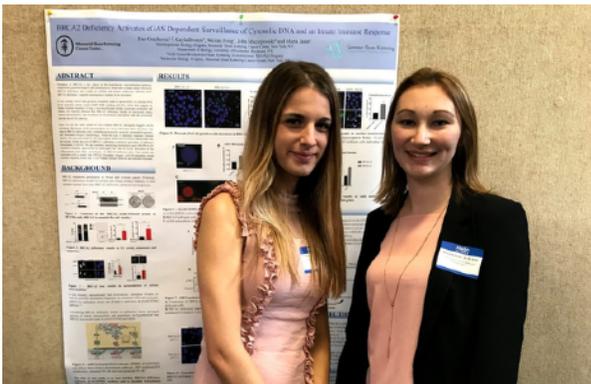
From cells to ecosystems, cancer therapies to climate change, biology is the study of life and living things—all in an effort to understand our world. For major requirements visit the [BA in Biology Webpage](#).

Bachelor of Science Majors

The BS curriculum stresses theoretical and experimental approaches and the development of expertise in a focused field 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 in the biological sciences.

BS in Biology

Allow students to pursue a major with a research emphasis without having to specialize in one particular field of study. Students have more flexibility to customize their program to accommodate individual needs and interests while retaining the rigors of a bachelor of science degree. For major requirements visit the [BS in Biology Webpage](#).



Undergraduate Majors

Continued

BS in Biochemistry

Biochemistry is the study of chemical processes relating to and occurring within living organisms. By combining resources and faculty from across the University, our biochemistry students access the best courses, seminars, and research opportunities available. Studies include basic concepts of metabolism, protein structure and function, and experimental techniques. In the senior year, a wide variety of optional courses are offered to allow specialization in Enzymology, membrane biochemistry, DNA, and RNA structure and formation. For major requirements visit the [BS in Biochemistry Webpage](#).

BS in Cell and Developmental Biology

In cell and developmental biology, our students study the structure, function, and organization of the cell as well as its development and evolution from single-celled organisms to complex life forms. 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 the [BS in Cell and Developmental Biology Webpage](#).

BS in Computational Biology

Computational biology combines biology with computer science, math, and more to study biological systems. With the advent of big data, this field of biology is more exciting and relevant than ever. This specialization 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. For major requirements visit the [BS in Computational Biology Webpage](#).

BS in Evolutionary Biology and Ecology

In this specialization, topics 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 focuses on integrating comparative, experimental, and theoretical methods to study evolutionary and ecological processes. An emphasis in this program is the integration of behavioral, ecological, and evolutionary questions. For major requirements visit the [BS in Evolutionary Biology and Ecology Webpage](#).

BS in Microbiology

Microbiology is the study of microorganisms, viruses, microbial pathogens, and the host immune defenses that protect against these organisms. The introductory course considers how microorganisms adapt 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 the [BS in Microbiology Webpage](#).

BS in Molecular Genetics

Molecular genetics is one of the specialties within UR's biological sciences degree offerings. Combining molecular biology and genetics, our students study the structure and function of genes at a molecular level. 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 the [BS in Molecular Genetics Webpage](#).

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 biochemical, anatomical, physiological, and medical aspects of neurobiology. For major requirements visit the [BS in Neuroscience Webpage](#).

Certificate in Biotechnology

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 compliment the BA or BS 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 the [Biotechnology Certification Webpage](#).

Do you have AP or Transfer Credits?

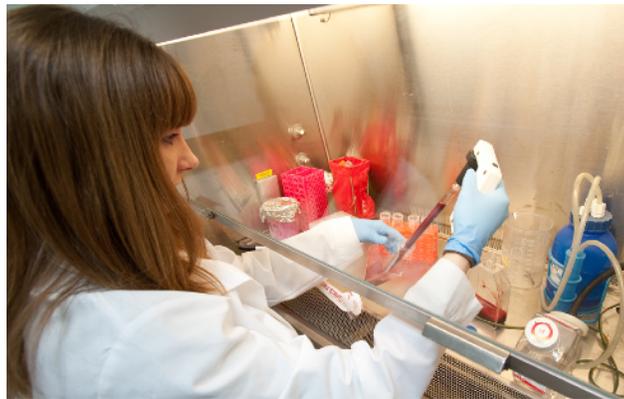
Find Out How It Applies to UR

Although the Biology Department does not approve Advanced Placement or International Baccalaureate biology credit to be used directly towards major requirements, there are still ways to get college credit.

Students who scored a 4 or 5 on AP biology exams can receive four general college credits. If a student scored a 6 or 7 on the IB exam, they can receive four general college credits. Also, students who earned credit for AP or IB biology scores are eligible to take BIO 112L and BIO 113L: Perspectives in Biology I and II.

Students may apply coursework completed at other institutions towards their biology degree as long as they meet the criteria for transfer credits.

Learn more about [AP/IB and Transfer Credits](#).



J. Adam Fenster / University of Rochester

Thinking of Going “Pre-Med”?

Read This!

Although the UPBM tracks closely mirror many of the medical school requirements, the “[Rochester Curriculum](#)” makes it easy for students to study other areas of interest while preparing for a career in the health professions. Having these options allow students to pursue majors that are guided by their passions and serves as a layer of back-up should their plans for medical school change.

There is also a department dedicated to helping students who plan to apply to pre-med programs called the Health Professions Advising Office. The office works with students throughout their years at the University to help them identify their goals and how best to reach them by offering services such as academic planning, gaining clinical and research experience, and applying to health profession programs. To learn about the advantages of preparing for a career in medicine at the UR visit the [Applying to Health Professions Programs webpage](#).

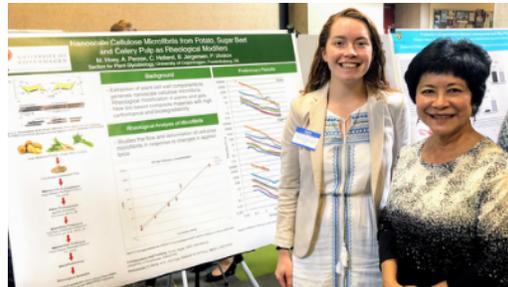
Getting Started

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. *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. For more details on the typical course schedule click [here](#).

First Year	
Fall	Spring
Biology Introductory Course I (select one) <ul style="list-style-type: none"> • BIO 110L: Principles of Biology I • BIO 112L: Perspectives of Biology I 	Biology Introductory Course II (select one) <ul style="list-style-type: none"> • BIO 111L: Principles of Biology II • BIO 113L: Perspectives I Biology II
CHM 131 General Chemistry I	CHM 132 General Chemistry II
Additional Course	Additional Course
Additional Course	Additional Course

*Intended biology majors are strongly recommended to take introductory biology and chemistry courses their first year.



Second Year	
Fall	Spring
Introductory Genetics (select one) <ul style="list-style-type: none"> • BIO 190/198P: The Human Genome • BIO 198/198P: Principles of Genetics 	Introductory Biochemistry <ul style="list-style-type: none"> • BIO 250 Introduction to Biochemistry • BIO 252 Principles of Biochemistry
CHM 203/207: Organic Chemistry I with Lab	CHM 204/208 Organic Chemistry II with Lab
Additional Course	Additional Course
Additional Course	Additional Course

- Majors are officially declared in spring of sophomore year.
- AP credit for chemistry, calculus, statistics, and physics may be used to satisfy allied requirements.

Undergraduate Research Opportunities

Independent Research Courses, de Kiewiet 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 readings 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 co-authors 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. Others work as student employees or volunteer in the labs of faculty on campus or the medical center. Success in research at the College relies upon the student's scientific curiosity and their ability to 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 the [Office of Undergraduate Research](#) to help students take control of their research path.

Independent Research Course

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 for the course with a number of UPBM faculty members located on campus or in the medical center.

[More Information](#)

de Kiewiet Summer Fellowship

Research projects can also be conducted during the summer through the de Kiewiet Summer Research Fellowship Program. The highly competitive program allows fellows to work for ten weeks during the summer in the labs of their research mentors.

[More Information](#)

Honors in Research

Students who have demonstrated the ability and initiative in an independent research project may be recommended to receive Honors in Research after successfully completing and defending a written dissertation. A minimum biology 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.

[More Information](#)

Student Employment

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 sometime develop into research opportunities. Undergraduate jobs are advertised online.

[More Information](#)



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 undergrads have access to:

- [Department of Biology](#)
- [Department of Biochemistry & Biophysics](#)
- [Department of Pathology](#)
- [Department of Pharmacology & Physiology](#)

Workshop Program

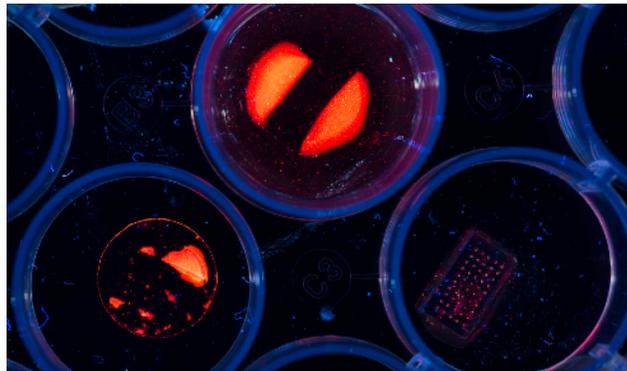
Cooperative Active Learning/Leadership Opportunities

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-led 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 their [website](#). For information on the undergraduate workshop leader and teaching assistant opportunities within the Biology department click [here](#).



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Biology Major Career Planning Resources

The Gwen M. Greene Center

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

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

- [Greene Center Website](#)
- [What can I do with a major in Biological Science?](#)
- [Internship Resources](#)
- [Graduate School Resources](#)

Helpful Links

Links to Other UR Departments

Admissions

<https://enrollment.rochester.edu>

Admissions Fast Facts

<https://enrollment.rochester.edu/wp-content/uploads/2018/04/University-of-Rochester-Fact-Sheet-2017-18.pdf>

Biology Department Course Schedule

<http://www.sas.rochester.edu/bio/courses/index.html>

Biology Department Website

<http://www.sas.rochester.edu/bio/index.html>

Center for Excellence in Teaching and Learning

<https://www.rochester.edu/college/cetl/>

Gwen M. Greene Center

<https://www.rochester.edu/careercenter/>

Health Professions Advising

<http://www.rochester.edu/college/health/index.html>

Office of Undergraduate Research

<https://www.rochester.edu/college/ugresearch/>

Society for Undergraduate Biology Students

<https://ccc.rochester.edu/organization/societyofundergraduatebiologystudents>

UPBM e-Newsletters

<http://www.sas.rochester.edu/bio/undergraduate/e-news.html>

UPBM Peer Advising

<https://www.rochester.edu/college/ccas/peer-advisors/index.html#bio>

UPBM Undergraduate Teaching Assistant Opportunities

<http://www.sas.rochester.edu/bio/undergraduate/ta/application.html>

Writing, Speaking, and Argument Program

<https://writing.rochester.edu>

Thank You for Your Interest!

Contact Us

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<http://www.sas.rochester.edu/bio/undergraduate/index.html>

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