Biology explores the structure, function, and evolution of diverse living systems. It addresses some of the most important issues of our time—genetic engineering, stem cell research, obesity, cancer, and the effects of global warming. Majoring in Biology prepares students to pursue a career in research, teaching, or the allied health sciences. It is also relevant to careers as diverse as environmental policy, law, public health, creative writing, and textbook development.

Mission
The mission of the Biology major is to provide students with a broad education in biology. To this end, students are offered a range of lecture courses that span the molecular, physiological, and ecological levels of organization. Students also complete laboratory courses that help them learn how to design and test hypotheses, use modern scientific equipment, and interpret data. Finally, students learn scientific communication skills by critiquing research articles, writing laboratory reports and research papers, and participating in oral presentations and debates. The department encourages students to become involved in a research project under the guidance of a faculty member at Barnard or elsewhere in New York City.

Student Learning Outcomes
Students graduating with a major in Biology should be able to attain the following outcomes:

• Demonstrate an appreciation of the many different life forms on planet Earth.
• Have the ability to discuss a biological phenomenon from many different levels of organization (e.g., discuss HIV from the perspective of structure to host immune response to evolutionary and epidemiological issues).
• Describe the basic features of Mendelian genetics and the central dogma of molecular biology; understand the basic physiological processes of at least one organism; and demonstrate an understanding of population-level processes.
• Make an oral presentation on either an original research project or a published primary research paper.
• Generate a testable hypothesis and develop and execute a controlled experimental design.
• Write an original scientific paper and/or a review article.

Research
Students are strongly encouraged to engage in research at Barnard. Either or both year-long courses, BIOL BC3591 Guided Research and Seminar-BIOL BC3592 Guided Research and Seminar or BIOL BC3593 Senior Thesis Research & Seminar-BIOL BC3594 Senior Thesis Research & Seminar, may be used to fulfill major requirements while the variable-credit semester-long course, BIOL BC3597 Guided Research, may be used for degree credit.

In addition to conducting research during the academic year, students are encouraged to pursue summer research internships. Barnard faculty engage many students in paid research projects during the summer through the Summer Research Institute (SRI) (https://barnard.edu/summer-research-institute/) at Barnard. The departmental office also has information about summer internships outside of Barnard. In addition, the department awards funds on a competitive basis to support summer research not otherwise funded by internships.

Introductory Course Selection
The Biology Department offers several options at the introductory level; students should select courses on the basis of their preparation and background in biology.

Students who took advanced biology in high school should enroll in the 1500-level sequence. This sequence can be started either in the fall (BIOL BC1500 Introduction to Organismal and Evolutionary Biology & BIOL BC1501 Introductory Lab in Organismal and Evolutionary Biology) or the spring (BIOL BC1502 Introduction to Cell and Molecular Biology & BIOL BC1503 Introductory Lab in Cell and Molecular Biology) and fulfills the science lecture and laboratory portion of the General Education Requirements, as well as the premedical requirement in biology. Please note that the Foundations distributional requirements for the sciences includes two science lecture courses, one of which must include a laboratory, but both of which do not necessarily need to be taken from the same scientific discipline.

Students with little or no experience in biology should enroll in the 1000-level sequence, which provides an appropriate introduction to important concepts in the field. Offered in the fall, BIOL BC1002 Global Health and Ecology includes a laboratory component, while BIOL BC1001 Revolutionary Concepts in Biology, offered in the spring, consists only of a lecture component. Taken together, these two lectures and laboratory fulfill the science General Education Requirement.

Students who wish to move on to the 1500-level courses are eligible to do so upon completion of BIOL BC1002 Global Health and Ecology with lab in the fall. Students must complete the entire 1500-level sequence (BIOL BC1500 Introduction to Organismal and Evolutionary Biology, BIOL BC1501 Introductory Lab in Organismal and Evolutionary Biology, BIOL BC1502 Introduction to Cell and Molecular Biology, and BIOL BC1503 Introductory Lab in Cell and Molecular Biology) for the Biology major or minor and for the biology premedical requirements.

AP Course Credit
Students who have passed the Advanced Placement examination in biology with a grade of 4 or 5 receive 3 points of credit toward their degree. However, AP credit neither goes toward fulfillment of the science GER nor does it exempt a student from any introductory course.

AP degree credit is granted regardless of which introductory courses are completed at Barnard.

Chair: Hilary Callahan
Professor Emeritus: Philip Ammirato
Professors: Hilary Callahan, John Glendinning, Paul Hertz, Jennifer Mansfield, and Brian Morton
Associate Professors: Elizabeth Bauer
Assistant Professors: Allison Lopatkin, JJ Miranda, Alison Pischedda, and Jonathan Snow
Lecturer: Rishita Shah
Senior Lecturer: Jessica Goldstein
Research Scholar: Stephen Sturley
Introductory Lab Associates and Staff: James Casey, Colin Flanagan, and Henry Truong

Requirements for the Major

There are four ways to complete a major in Biology. A student can obtain a general Biology Major or may complete one of the three majors that concentrate on a specific level of biological organization: Cellular and Molecular; Physiology and Organismal; or Ecology and Evolutionary.

Introductory Biology
You may begin the introductory sequence with BIOL BC1002 Global Health and Ecology and the co-requisite lab BIOL BC1012 in the fall of your freshman year, but for the major you must then complete the entire 1500-level sequence the subsequent spring and fall.

BIOL BC1500 Introduction to Organismal and Evolutionary Biology 3
BIOL BC1501 Introductory Lab in Organismal and Evolutionary Biology 2
BIOL BC1502 Introduction to Cell and Molecular Biology 3
BIOL BC1503 Introductory Lab in Cell and Molecular Biology 2

Genetics
BIOL BC2100 Molecular and Mendelian Genetics 3

It is recommended, but not required, that this be taken immediately following the completion of the 1500-level courses.

Five Upper Level Lecture Courses
All Biology majors must complete five upper-level courses, with category distribution requirements and the courses that fulfill each category listed below. To complete the Biology Major without a concentration, the five courses must include at least one course from each of the three categories. To complete one of the three concentrations, at least four courses must be from the appropriate category and at least one must be from another category. Although some courses are listed in multiple categories, a student can only use a course towards one of the categories. Additional Columbia courses that can be used to fulfill the major requirements are provided on the Biology website. If a student completes courses that make her eligible for more than one of the four majors, she may select which one is reflected on her transcript.

1. Cellular & Molecular Biology
BIOL BC2278 Evolution 3
BIOL BC2490 Coding in Biology 3
BIOL BC3304 Topics in Molecular Genetics 3
BIOL BC3308 Genomics and Bioinformatics 3
BIOL BC3310 Cell Biology 3
BIOL BC3320 Microbiology 3
BIOL BC3352 Development 3
BIOL BC3362 Molecular and Cellular Neuroscience 3
CHEM BC3282 Biological Chemistry 3
BIOL UN3034 Biotechnology 3
BIOL UN3073 Cellular and Molecular Immunology 3
BIOL UN3310 Virology 3

2. Physiology & Organismal Biology
BIOL BC2262 Vertebrate Biology 3
BIOL BC2280 Animal Behavior 3
BIOL BC2286 Statistics and Research Design 3

3. Ecology & Evolutionary Biology
BIOL BC2240 Plant Evolution and Diversity 3
BIOL BC2262 Vertebrate Biology 3
BIOL BC2272 Ecology 3
BIOL BC2278 Evolution 3
BIOL BC2280 Animal Behavior 3
BIOL BC2286 Statistics and Research Design 3
BIOL BC2851 Plants and Profits: The Global Power of Botany 4
BIOL BC3320 Microbiology 3
BIOL BC3380 Applied Ecology and Evolution 3
EEEB UN3087 Conservation Biology 3
EEEB W4110 Coastal and Estuarine Ecology 4

Three Upper Level Laboratory Courses
Students must complete at least three Biology laboratories beyond the 1500 level. Laboratories may require a lecture course as a co-prequisite or prerequisite; such requirements are specified in the Barnard catalogue. A year-long research-seminar course (BIOL BC3591 followed by BIOL BC3592) may substitute for lab courses. Students may also take lab courses at Columbia (or other institutions) to satisfy the lab requirement, with permission from the Co-Chair.

Research Option
A student may count two consecutive semesters of Guided Research and Seminar (BIOL BC3591 followed by BIOL BC3592) as a laboratory course for the major. Guided Research (BIOL BC3597) counts for degree credit but does not count toward the major. A student may not receive credit for research that is paid.

Senior Capstone Experience
Students must enroll in one section of Senior Seminar (BIOL BC3590) or complete two semesters of Senior Thesis Research Seminar (BIOL BC3593 followed by BIOL BC3594). A student cannot take both Senior Thesis Research and Guided Research and Seminar at the same time.

Chemistry Requirement
One semester of General Chemistry (with laboratory) and one semester of Organic Chemistry (with laboratory) are required.

Requirement for the Minor

A minor in biology includes:

BIOL BC1500 Introduction to Organismal and Evolutionary Biology 3
BIOL BC1501 Introductory Lab in Organismal and Evolutionary Biology 2
BIOL BC1502 Introduction to Cell and Molecular Biology 3
BIOL BC1503 Introductory Lab in Cell and Molecular Biology 2

Three additional lecture courses at the 2100 level or higher
Two additional laboratory courses **
BIOL BC1008 HEALTHIER LIFE. 3.00 points.
This is an introductory biology survey course which explores fundamentals of physiology in humans and other organisms, both in the context of global health and global ecological issues. It emphasizes reciprocal interactions between individual healthy humans and healthy societies, and the function of ecosystems in supporting humans and other biodiversity.

BIOL 1500 Introduction to Organismal and Evolutionary Biology. 3 points.
Prerequisites: This course is suitable for majors & fulfillment of pre-health requirements. A high school biology background or equivalent preparation is highly recommended. For those without this background seeking to major in biology, BIOL BC1002 & BIOL BC1012 are recommended in the fall of their freshmen year, followed by the year-long 1500-level lecture & lab sequence. BIOL BC1500 & BIOL BC1502 do not need to be taken in sequence. This course is part of a yearlong introductory sequence. BIOL BC1500 and BIOL BC1502 do not need to be taken in sequence.

BIOL BC1501 Introductory Lab in Organismal and Evolutionary Biology. 2 points.
Prerequisites: BIOL BC1500 lecture is a pre- or co-requisite (preferred). Students must also enroll for a section of BIOL BC1511 recitation. A high school biology background or equivalent preparation is highly recommended. This course is suitable for fulfillment of biology major and pre-health requirements. Enrollment is limited to 16 students per section. A laboratory-based introduction to the major groups of living organisms; anatomy, physiology, evolution, and systematics; and laboratory techniques for studying and comparing functional adaptations.

BIOL BC1502 Introduction to Cell and Molecular Biology. 3 points.
Prerequisites: BIOL BC1002 or equivalent preparation. Course suitable for fulfillment of premedical requirements. Together with BIOL BC1500 this course is part of a yearlong introductory sequence. BIOL BC1500 and BIOL BC1502 do not need to be taken in sequence.

Detailed introduction to cellular and subcellular biology; cell structures and functions, energy metabolism, biogenesis of cell components, biology of inheritance, molecular genetics, regulation of gene expression, and genes in development.
BIOL BC1503 Introductory Lab in Cell and Molecular Biology. 2 points.
Prerequisites: BIOL BC1502 lecture is a pre- or co-requisite (preferred).
Students must also enroll for a section of BIOL BC1513 recitation. A high school biology background or equivalent preparation (such as BIOL BC1002 & BIOL BC1012) is highly recommended. This course is suitable for fulfillment of biology major and pre-health requirements. Enrollment is limited to 16 students per section; must attend first lab to hold place. A laboratory-based introduction to cell and molecular biology. Both classic and modern approaches are used to investigate principles of heredity as well as the structure and function of cells and their molecular components. Lab exercises introduce practical techniques and data analysis.

BIOL BC1599 Science Journal Club. 1 point.
Prerequisites: ) Limited to 16 students who are participating in the Science Pathways Scholars Program.
Students in this seminar course will be introduced to the scientific literature by reading a mix of classic papers and papers that describe significant new developments in the field. Seminar periods will be devoted to oral reports, discussion of assigned reading, and student responses.

Section 1: Limited to students in the Science Pathways Scholars Program.
Section 2: Limited to first-year students who received a 4 or 5 on the AP Program.

Fall 2020: BIOL BC1599

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BIOL BC2100 Molecular and Mendelian Genetics. 3 points.
Prerequisites: BIOL BC1500, BIOL BC1501, BIOL BC1502, BIOL BC1503 or the equivalent. This course is a pre-requisite for most 3000-level courses. Mendelian and molecular genetics of both eukaryotes and prokaryotes, with an emphasis on human genetics. Topics include segregation, recombination and linkage maps, cytogenetics, gene structure and function, mutation, molecular aspects of gene expression and regulation, genetic components of cancer, and genome studies.

Fall 2020: BIOL BC2100

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<td>Brian Morton</td>
<td>3</td>
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BIOL BC2272 Ecology. 3 points.
Prerequisites: BIOL BC1500, BIOL BC1501, BIOL BC1502, BIOL BC1503 or the equivalent. This course is a pre- or co-requisite for BIOL BC2873 Laboratory in Ecology.
Introduction to evolutionary ecology; life history strategies, population growth, competition, predator-prey interactions, population regulation, species diversity, community organization, and biogeography. Lectures integrate theory with empirical studies.

BIOL BC2280 Animal Behavior. 3 points.
Prerequisites: BIOL BC1500, BIOL BC1501, BIOL BC1502, and BIOL BC1503 or the equivalent. This course is a pre-requisite for BIOL BC2281 Laboratory in Animal Behavior.
This introduction to animal behavior takes an integrative approach to understand the physiological and genetic basis of behavior, the ecological context of behavior, and the evolutionary consequences of behavior. This course focuses on the process of scientific research, including current research approaches in animal behavior and practical applications of these findings.

BIOL BC2281 Laboratory in Animal Behavior. 3 points.
standard for lab courses in Biology

Prerequisites: (BIOL BC1500) and (BIOL BC1501) and (BIOL BC2280) and (BIOL BC1503)
This lab provides an introduction to animal behavior research, including current research approaches and practical applications of these findings. Students will complete two main projects. The first is a group project using the fruit fly, Drosophila melanogaster, which will involve observing, recording, and analyzing reproductive behaviors. The second is an independent project that will be designed, conducted, and analyzed by students using publicly available animal behavior resources and/or data. Both projects will incorporate critical thinking, problem solving and experimental design, with an emphasis on scientific writing and oral presentation skills.

Fall 2020: BIOL BC2281

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<td>Alison Pischedda</td>
<td>3</td>
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BIOL BC2490 Coding in Biology. 3 points.
Prerequisites: BIOL BC1500, BIOL BC1501, BIOL BC1502, BIOL BC1503, BIOL BC2100
An introduction to the basics of Python and R coding in the context of solving basic problems in molecular biology. Python will be used to write programs that analyze various features of DNA sequence data and R will be used to analyze output from RNA-seq experiments. No prior programming experience is necessary. The work will involve modifying existing code as well as developing simple programs from the ground up.

BIOL BC2500 MATLAB for Scientists. 3 points.
Prerequisites: BIOL BC1500, BIOL BC1502, and MATH UN1101
Introduction to MATLAB programming and numerical methods applied to the analysis of biological data. Topics range from foundational programming concepts and algorithms and an introduction to MATLAB, to more advanced concepts such as data visualization, curve fitting and data interpolation, basic statistical methods, modeling biological systems of ordinary differential equations, and image analysis.

Fall 2020: BIOL BC2500

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<td>Allison Lopatkin</td>
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ANAT BC2574 Laboratory in Human Anatomy. 3 points.
Corequisites: ANAT BC2573
This new interdisciplinary laboratory course will introduce students to the practices of creative and scientific research in anatomy. The laboratory course will offer students "hands-on" opportunities to view cadaveric specimens, to collect, analyze and communicate scientific information/data related to anatomy and to explore the use of anatomical information to generate creative movement and choreography.

BIOL BC3303 Laboratory in Molecular Biology. 3 points.
Prerequisites: BIOL BC2100 (which can be taken as a pre- or co-requisite). Enrollment is limited to 16; must attend first lab to hold place.
Introduction to the use of molecular techniques to answer questions about subcellular biological phenomena. Techniques include isolation of genomic and plasmid DNAs, restriction enzyme analysis, DNA and protein electrophoresis, bacterial transformation, and plasmid subcloning.

BIOL BC3305 PROJECT LAB IN MOLECULAR GENETICS. 3.00 points.
Prerequisites: BIOL BC1500, BIOL BC1501, BIOL BC1502, BIOL BC1503, and BIOL BC2100 or permission of instructor. Enrollment limited to 16.
Prerequisites: BIOL BC1500, BIOL BC1501, BIOL BC1502, BIOL BC1503, and BIOL BC2100 or permission of instructor. Enrollment limited to 16. Laboratory course in which students conduct original research projects in molecular genetics. Students will participate in experimental design, conduct and data analysis, and work with key techniques for studying gene structure, expression and function such as nucleic acid extraction and synthesis, cloning, bioinformatics analysis, PCR and qPCR. Students will present their results orally and in writing. Enrollment in both semesters (BIOL BC3305 and BIOL BC3306) of this full-year course is required, and fulfills two upper-level lab courses for the Barnard Biology major. Must be taken in sequence, beginning in the fall. -B. Morton - J. Mansfield

BIOL BC3306 Project Laboratory in Molecular Genetics. 3 points.
Prerequisites: BIOL BC2100 or permission of the instructors. Enrollment is limited to 16; must attend first lab to hold place.
Laboratory course in which students conduct original research projects in molecular genetics. Students will participate in experimental design, conduct data analysis, and work with key techniques for studying gene structure, expression, and function including nucleic acid extraction and synthesis, cloning, bioinformatics analysis, PCR, and qPCR. Students will present their results orally and in writing. Enrollment in both semesters (BIOL BC3305 and BIOL BC3306) of this full-year course is required, and fulfills two upper-level lab courses for the Barnard Biology major. Must be taken in sequence, beginning in the fall.

BIOL BC3310 Cell Biology. 3 points.
Prerequisites: (BIOL BC1500)(BIOL BC1501)(BIOL BC1502)(BIOL BC1503) and BIOL BC2100 or equivalent.
This course explores the components, systems, and regulatory mechanisms involved in eukaryotic cellular function. Topics include: signal transduction, translational and protein quality control, organelar and cytoskeletal dynamics, and some coordinated responses such as proliferation and programmed cell death. Throughout the course we will see how general cell biology can be specialized to achieve specific cellular functions through regulation of the basic machinery. We will also explore the cellular and molecular bases for a variety of human pathologies, with an emphasis on cancer. In addition to lecture, we will spend some time discussing the material, including selected articles from the primary literature, and learning through group presentations.

BIOL BC3311 Laboratory in Cell Biology. 3 points.
Prerequisites: BIOL BC3310 (which can be taken as a pre- or co-requisite). Enrollment is limited to 16; must attend first lab to hold place.
Introduction to cell biological techniques used to investigate structural, molecular, and physiological aspects of eukaryotic cells and their organization into tissues. Techniques include light and electron microscopy, cell culture, isolation of cellular organelles, protein electrophoresis, and Western Blot analysis.

BIOL BC3320 Microbiology. 3 points.
Prerequisites: BIOL BC1500, BIOL BC1501, BIOL BC1502, BIOL BC1503, and BIOL BC2100 or the equivalent. This course is a prerequisite for BIOL BC3321 Laboratory in Microbiology.
Survey of the diversity, cellular organization, physiology, and genetics of the major microbial groups. Also includes aspects of applied microbiology and biotechnology, the function of microorganisms in the environment, and the role of microbes in human diseases.

BIOL BC3321 Laboratory in Microbiology. 3 points.
Prerequisites: BIOL BC3320 (which can be taken as a pre- or co-requisite). Enrollment is limited to 16; must attend first lab to hold place.
Provides experience in the isolation, cultivation, and analysis of pure cultures of microorganisms. Methods used for the study of cell structure, growth, physiology, and genetics of microbes will be incorporated into laboratory exercises.
BIOL BC3360 Physiology. 3 points.
Prerequisites: BIOL BC1500, BIOL BC1501, BIOL BC1502, and BIOL BC1503 or the equivalent.
This course examines how mammals carry out basic functions like manipulating objects, sensing the external world, oxygenating tissues, and processing food. Emphasis is placed on (a) how the body regulates itself through the integrated action of multiple organ systems and (b) what goes awry in disease.

Fall 2020: BIOL BC3360
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<td>John Glendinning</td>
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BIOL BC3362 Molecular and Cellular Neuroscience. 3 points.
Prerequisites: (BIOL BC1500)(BIOL BC1501)(BIOL BC1502)(BIOL BC1503) and CHEM BC3230 or the equivalent.
Structure and function of neural membranes; ionic basis of membrane potential and action potential; synaptic transmission and neurochemistry; sensory transduction and processing; reflexes and spinal cord physiology; muscle structure and function; neuronal circuitry; and nervous system development.

Fall 2020: BIOL BC3362
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<td>Elizabeth Bauer</td>
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BIOL BC3363 Laboratory in Molecular and Cell Neuroscience. 3 points.
Prerequisites: BIOL BC3362 (which can be taken as a pre- or co-requisite). Enrollment is limited to 16; must attend first lab to hold place.
Introduction to techniques commonly used in current neurobiological research, including intracellular and extracellular recording of action potentials, neuroanatomical methods, and computer simulation of the action potential.

BIOL BC3590 Senior Seminar. 4 points.
Prerequisites: BIOL BC1500, BIOL BC1501, BIOL BC1502, BIOL BC1503, and BIOL BC2100 or the equivalent. Enrollment is limited to 12; must attend first class to hold place.
Required for all majors who do not select the year-long Senior Thesis Research & Seminar (BIOL BC3593 & BC3594) to fulfill their senior capstone requirement. These seminars allow students to explore the primary literature in the Biological Sciences in greater depth than can be achieved in a lecture course. Attention will be focused on both theoretical and empirical work. Seminar periods are devoted to oral reports and discussion of assigned readings and student reports. Students will write one extensive literature review of a topic related to the central theme of the seminar section. Topics vary per semester and include, but are not limited to: Plant Development, Animal Development & Evolution, Molecular Evolution, Microbiology & Global Change, Genomics, Comparative & Reproductive Endocrinology, and Data Intensive Approaches in Biology.

Fall 2020: BIOL BC3590
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<td>M 4:10pm - 6:00pm</td>
<td>Rishita Shah</td>
<td>4</td>
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</table>

BIOL BC3591 Guided Research and Seminar. 4 points.
Per Semester
An independent research project in Biology under the guidance of a faculty member and suiting the needs of the individual student. A Barnard research mentor (if your lab is at Barnard) or internal adviser in the Biology Department (if your lab is elsewhere) must approve your planned research before you enroll in this year-long course. A Project Approval Form (https://forms.gle/mDNyT5CaEjkJMMWC15/) must be submitted to the department in the fall.

Attendance at a weekly seminar is required. By the end of the year, students enrolled in BIOL BC3591-BIOL BC3592 will write a scientific paper and give a poster presentation of their work at the Barnard Biology Research Symposium. Completion of this year-long course fulfills two upper-level laboratory requirements for the major. Must be taken in sequence, beginning in the fall.

Fall 2020: BIOL BC3591
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<td>Alison Pischedda, JJ Miranda</td>
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BIOL BC3592 Guided Research and Seminar. 4 points.
Per Semester
An independent research project in Biology under the guidance of a faculty member and suiting the needs of the individual student. A Barnard research mentor (if your lab is at Barnard) or internal adviser in the Biology Department (if your lab is elsewhere) must approve your planned research before you enroll in this year-long course. A Project Approval Form (https://forms.gle/mDNyT5CaEjkJMMWC15/) must be submitted to the department in the fall.

Attendance at a weekly seminar is required. By the end of the year, students enrolled in BIOL BC3591-BIOL BC3592 will write a scientific paper and give a poster presentation of their work at the Barnard Biology Research Symposium. Completion of this year-long course fulfills two upper-level laboratory requirements for the major. Must be taken in sequence, beginning in the fall.
BIOL BC3593 Senior Thesis Research & Seminar. 4 points.
Per Semester

Prerequisites: Permission of a faculty sponsor and the department. Cannot be taken concurrently with BIOL BC3591 or BIOL BC3592.
Same as BIOL BC3591-BIOL BC3592, including attendance at a weekly seminar. By the end of the year, students enrolled in BIOL BC3593-BIOL BC3594 will write a scientific paper and orally present their work at the Barnard Biology Research Symposium.

A Barnard research mentor (if your lab is at Barnard) or internal adviser in the Biology Department (if your lab is elsewhere) must approve your planned research before you enroll in this year-long course. A Project Approval Form (https://forms.gle/mDNyT5CaEJkMMWcT5/) must be submitted to the department in the fall. Completion of this year-long course fulfills the senior capstone requirement for the major; it cannot be taken at the same time as BIOL BC3591-BIOL BC3592. Must be taken in sequence, beginning in the fall.

Fall 2020: BIOL BC3593

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BIOL BC3594 Senior Thesis Research & Seminar. 4 points.

Prerequisites: Permission of a faculty sponsor and the department. Cannot be taken concurrently with BIOL BC3591 or BIOL BC3592.
Same as BIOL BC3591-BIOL BC3592, including attendance at a weekly seminar. By the end of the year, students enrolled in BIOL BC3593-BIOL BC3594 will write a scientific paper and orally present their work at the Barnard Biology Research Symposium.

A Barnard research mentor (if your lab is at Barnard) or internal adviser in the Biology Department (if your lab is elsewhere) must approve your planned research before you enroll in this year-long course. A Project Approval Form (https://forms.gle/mDNyT5CaEJkMMWcT5/) must be submitted to the department in the fall. Completion of this year-long course fulfills the senior capstone requirement for the major; it cannot be taken at the same time as BIOL BC3591-BIOL BC3592. Must be taken in sequence, beginning in the fall.

Fall 2020: BIOL BC3597

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<th>Course Number</th>
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<th>Times/Location</th>
<th>Instructor</th>
<th>Points</th>
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<tr>
<td>BIOL 3597</td>
<td>001/00103</td>
<td>M W 6:10pm - 7:25pm</td>
<td>Jonelle White</td>
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Cross-Listed Courses

Chemistry (Barnard)

CHEM BC3282 Biological Chemistry. 3 points.

Prerequisites: (CHEM BC3230) and (CHEM BC3231) BIOL BC1502.
Lecture: MWF 9:00-9:50.
CHEM BC3355 Biochemistry Laboratory Techniques. 5 points.
Prerequisites: Organic II lab (CHEM BC3333, BC3335, or equivalent); Quantitative analysis lab (BC3338, BC3340, or equivalent); Biochemistry (CHEM BC3282y, CHEM C3501, or equivalent). Lecture: T 1:10-12:50; Laboratory two afternoons: T 2:10-6:00 / TH 1:10-5:00.
Theory and application of fundamental techniques for the isolation, synthesis and characterization of biological macromolecules including proteins, lipids, nucleotides and carbohydrates. Techniques include spectroscopic analysis, gel electrophoresis, chromatography, enzyme kinetics, immunoblotting, PCR, molecular cloning and cell culture, as well as modern laboratory instrumentation, such as UV-Vis, GC-MS and HPLC.

CHEM BC3357 Biochemistry Laboratory Techniques. 3 points.
Fee: $45.
Prerequisites: four terms of chemistry and biology laboratory.
Corequisites: BIOC C3501 or BCHM G4021.
Lecture and lab. Same course as BC3355, but only one section of lab hours required.

Neuroscience and Behavior (Barnard)
NSBV BC2002 Statistics and Experimental Design. 4 points.
This course is for students interested in learning how to conduct scientific research. They will learn how to (i) design well-controlled experiments and identify “quack” science; (ii) organize, summarize and illustrate data, (iii) analyze different types of data; and (iv) interpret the results of statistical tests.

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<td>John Glendinning</td>
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<td>M W 1:10pm - 2:00pm</td>
<td>John Glendinning</td>
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