



**Barnard College  
Department of Biological Sciences  
Program Planning Packet  
Spring 2022**

## Upcoming Events & Announcements

To receive recordings of our upcoming events, email the department administrator, Melissa Flores ([mflores@barnard.edu](mailto:mflores@barnard.edu)).

### Events

Program Planning (Spring 2022)

Fri, Nov 5<sup>th</sup> | 12 pm ET | Zoom

Seminar & Coffee Hour with Dr. Bianca Jones Marlin

Mon, Nov 8<sup>th</sup> | 12 pm ET | Zoom

To join us in person [RSVP](#) by 5 pm on Fri, Nov 5<sup>th</sup>

Workshop: How to Contact a PI with Professor Jon Snow

Tues, Nov 30<sup>th</sup> | pm ET | Zoom

Student Panel: Undergraduate Research

Wed, Dec 1<sup>st</sup> | 3 pm ET | Zoom

More details will be available on how to RSVP/whether we can hold this event in person

Annual Honey Extraction with Professor Jon Snow

Information TBA

More details will be available on how to RSVP to attend this event in person

This fall, the Barnard Biology Anti-Racism Working Group has been meeting on a semi-monthly basis. To join the working group and/or sign up for our listserv, fill out our [Working Group Interest Form](#).

### Student Employment Opportunities

The following courses are seeking Teaching and/or Lab Assistants!

- BIOL BC1502 Introduction to Cellular & Molecular Biology
- BIOL BC1503 Introductory Lab in Cellular & Molecular Biology
- BIOL BC2100 Molecular & Mendelian Genetics
- BIOL BC3303 Lab in Molecular Biology
- BIOL BC3321 Lab in Microbiology
- BIOL BC3363 Lab in Molecular and Cellular Neuroscience

Once the job listings have been posted on our [Student Employment](#) page, you'll be able to submit an application through [BarnardWorks](#), so check this page frequently! We will aim to have listings up the week after early class registration closes.

## BIOLOGY MAJORS-LEVEL COURSES OFFERED SPRING 2022

Visit the [CU Directory of Classes](#) for course descriptions, caps, and pre-requisite information

COURSE NO.	COURSE TITLE	PROFESSOR	TIME(S) OFFERED
<i>INTRODUCTORY BIOLOGY &amp; GENETICS</i>			
BIOL BC1502	Introduction to Cellular & Molecular Biology	Jon Snow	M W F 9:00 - 9:50 am
BIOL BC1503	Introductory Lab in Cellular & Molecular Biology (14 sections)	Jessica Goldstein Multiple instructors	M T TH 1:10 - 4:00 pm T TH 9:10 am - 12:00 pm W F 10:10 am - 1:00 pm
BIOL BC1512	BIOL BC1502 Discussion Section (13 sections; online only)	Jon Snow Multiple instructors	M 10:10 - 11:00 am T 12:10 - 1:00 pm W 3:10 - 4:00 pm TH 12:10 - 1:00 pm F 1:10 - 2:00 pm
BIOL BC1513	BIOL BC1503 Lab Recitation (online only)	Jessica Goldstein	Asynchronous
BIOL BC2100	Molecular & Mendelian Genetics	Brian Morton	T TH 10:10 - 11:25 am
<i>UPPER - LEVEL ELECTIVES</i>			
BIOL BC2272	Ecology	Hilary Callahan	TTH 2:25 - 3:40 pm
BIOL BC3352	Development	Rishita Shah	TTH 10:10 - 11:25 am
BIOL BC3360	Physiology	John Glendinning	TTH 11:40 am - 12:55 pm
<i>UPPER - LEVEL LABS</i>			
BIOL BC3303	Lab in Molecular Biology	Stephen Sturley	T 1:10 - 6:00 pm
BIOL BC3306	Project Lab in Molecular Genetics	Jennifer Mansfield & Brian Morton	W 1:10 - 6:00 pm
BIOL BC3308	Introduction to Microbial Genomics	Allison Lopatkin	T 1:00 - 4:00 pm
BIOL BC3321	Lab in Microbiology	Gabrielle Corradino	TH 1:10 - 6:00 pm
BIOL BC3363	Lab in Molecular & Cellular Neuroscience	Elizabeth Bauer	TH 1:10 - 6:00 pm
BIOL BC3592	Guided Research & Seminar***	Jessica Goldstein, JJ Miranda, & Jordan Balaban	M 1:10 - 3:00 pm
<i>SENIOR CAPSTONE REQUIREMENT</i>			
BIOL BC3590	Senior Seminar: Regenerative Biology	Rishita Shah	F 12:10 - 2:00 pm
BIOL BC3594	Senior Thesis Research & Seminar*** (2 sections)	JJ Miranda, Jordan Balaban, & Jessica Goldstein	M 1:10 - 3:00 pm

\*\*BC3305-BC3306 is a full-year course and counts as two upper level labs for the major; must be taken in fall to spring sequence. Enrollment in BC3305 was required in fall 2021.

\*\*\*Full-year courses; BC3591-BC3592 & BC3593-BC3594 can only be taken in a fall to spring sequence. Enrollment in BC3591 or BC3593 was required in fall 2021.

## BIOLOGY NON-MAJORS-LEVEL COURSES OFFERED SPRING 2022

Visit the [CU Directory of Classes](#) for course descriptions, caps, and pre-requisite information

COURSE NO.	COURSE TITLE	PROFESSOR	TIME(S) OFFERED
<i>L A B O R A T O R I E S</i>			
ANAT BC2574	Laboratory in Human Anatomy	Chisa Hidaka	M 1:00 - 5:00 pm
<i>R E S E A R C H F O R D E G R E E C R E D I T</i>			
BIOL BC3597	Guided Research*	Sign up for your internal advisor's section	N/A

\*In order to sign up for a section of Guided Research, you must submit a [Project Approval Form](#) by Jan. 31<sup>st</sup> for the spring semester.

# Program Planning Packet | Spring 2022

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We encourage students to frequently visit our [AY21–22 Course Offerings](#) page for the most up to date information on this year's courses.

## REQUIREMENTS FOR BIOLOGY MAJORS

There are five ways to complete a major in Biology. A student can obtain a General Biology Major or may complete one of the three major tracks that concentrate on a specific level of biological organization: Cellular and Molecular; Physiological and Organismal; or Ecological and Evolutionary. As of spring 2021, we are introducing a fifth track in Computational Biology that involves a distinctive mix of biology lecture and lab courses in addition to courses in computation. All tracks within the major must fulfill common foundational and senior capstone requirements outlined in this packet.

### ❖ Introductory Biology and Genetics

Students without a high-school biology background may begin the introductory sequence with BIOL BC1002 Global Health and Ecology and the co-requisite lab BIOL BC1012 in the fall of their freshman year followed by BIOL BC1502 in the spring and BIOL BC1500 in the fall of their sophomore year. All Biology majors must complete the 1500-level introductory sequence followed by a course in Genetics:

- 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\*
- BIOL BC1503 Introductory Lab in Cell and Molecular Biology\*\*
- BIOL BC 2100 Molecular and Mendelian Genetics (or BIOL UN3031 Genetics)

\*Beginning in fall 2020, all students enrolled in the 3-point BIOL BC1500 (fall) & BIOL BC1502 (spring) lectures will be required to enroll in a 0-point 50-minute discussion section (BIOL BC1510 for fall & BIOL BC1512 for spring). These weekly sessions will cover topics ranging from how to read a scientific journal article to how science impacts society. \*\*Enrollment in the asynchronous BIOL BC1511/1513 Recitation is mandatory to enroll in lab.

Students pursuing a Computational Biology track have the additional pre-requisite requirements of one introductory course to learn a coding language and one introductory course in statistics, balanced by an exemption from the chemistry requirements detailed below. The courses that can fulfill these requirements include:

### Introductory Computing Courses:

- COMS W1004 Introduction to Computer Science and Programming in Java
- COMS BC1016 Introduction to Computational Thinking and Data Science
- ENGI E1006 Introduction to Computing for Engineers and Applied Scientists (taught in Python)

### Introductory Statistics Courses:

- STAT UN1010 Statistical Thinking for Data Science with Python Labs
- STAT UN1101 Introduction to Statistics
- STAT UN2102 Applied Statistical Computing
- NSBV BC2002 Statistics and Experimental Design
- EEEB UN3005 Introduction to Statistics for Ecology and Evolutionary Biology

It is recommended, but not required, that Genetics be taken immediately after completing the 1500-level introductory sequence, as it is a pre-requisite for many upper-level lectures & laboratories, particularly those in the Cellular & Molecular track. However, there are many courses, such as BIOL BC2280 Animal Behavior, BIOL BC2272 Ecology, or BIOL BC3360 Physiology, that do not require Genetics, which a student may take as early as their sophomore year.

### ❖ Five Upper-level Elective Courses

All Biology majors must complete five upper-level courses, with category distribution requirements listed in the table below, followed by courses that fulfill each category.

- To complete the General Biology Major, the five courses must include at least one course from each of the three categories (C&M, P&O, and E&E); including a course in computation is recommended, but not required.
- To complete one of the four tracks, at least four courses must be from the appropriate category and, as a breadth requirement, at least one must be from another category.

Although some courses are listed in multiple categories, a student can only use a course toward one of the categories. Additional [Columbia Biological Sciences](#) and [Ecology, Evolution, and Environmental Biology \(E3B\)](#) courses that can be used to fulfill the major requirements are provided on the [Course Listings page](#). If a student completes courses that make them eligible for more than one of the five major tracks, then they may select which one is reflected on their transcript.

Major	Course Selection
General Biology (GB)	Five courses with at least one course from <u>each</u> of the three categories (C&M, P&O, <u>and</u> E&E) + any three upper-level biology labs (two of which can be fulfilled with a yearlong Research & Seminar course)
Cell & Molecular Biology (C&M)	Four courses from the C&M category + one from another category (P&O <u>or</u> E&E) + any three upper-level biology labs (two of which can be fulfilled with a yearlong Research & Seminar course)
Physiology & Organismal Biology (P&O)	Four courses from the P&O category + one from another category (C&M <u>or</u> E&E) + any three upper-level biology labs (two of which can be fulfilled with a yearlong Research & Seminar course)

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Ecology & Evolutionary Biology (E&E)	Four courses from the E&E category + one from another category (C&M <u>or</u> P&O) + any three upper-level biology labs (two of which can be fulfilled with a yearlong Research & Seminar course)
Computational Biology (CB)	Four computing courses from the CB-COMP category + one course from the CB-BIOL category + one upper-level biology lab listed in the following section

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### **Categories of Upper-level Elective Courses in the Biology Major**

(See pages 3–4 of this packet for Biology courses offered in Spring 2022)

Visit our [Columbia & E3B Course Listings](#) for a comprehensive list of Columbia Courses that count toward the major.

#### **Cellular & Molecular Biology (C&M):**

BIOL BC2278	Evolution
BIOL BC2490	Coding in Biology
BIOL BC3308	Microbial Genomics (formerly called Genomics and Bioinformatics)
BIOL BC3304	Topics in Molecular Genetics
BIOL BC3310	Cell Biology ( <u>or</u> BIOL UN3041 Cell Biology)
BIOL BC3320	Microbiology
BIOL BC3352	Development ( <u>or</u> BIOL UN3022 Developmental Biology)
BIOL BC3362	Molecular and Cellular Neuroscience
CHEM BC3282	Biological Chemistry ( <u>or</u> BIOL UN3300 Biochemistry <u>or</u> BIOC UN3511 Biochemistry I: Structure & Metabolism)
BIOL UN3004	Neurobiology I: Cellular & Molecular Neurobiology
BIOL UN3034	Biotechnology
BIOL UN3073	Cellular and Molecular Immunology
BIOL UN3310	Virology
BIOL UN3512	Molecular Biology

#### **Physiological & Organismal Biology (P&O):**

BIOL BC2262	Vertebrate Biology
BIOL BC2280	Animal Behavior
BIOL BC3320	Microbiology
BIOL BC3352	Development ( <u>or</u> BIOL UN3022 Developmental Biology)
BIOL BC3360	Physiology ( <u>or</u> BIOL UN3006 General Physiology)
BIOL W3005	Neurobiology II: Development & Systems
EEEE UN3011	Behavioral Biology of Living Primates (EEEE UN1011 is <u>NOT</u> equivalent)
EEEE UN3208	Explorations in Primate Anatomy
EEEE W4112	Ichthyology



**Ecological & Evolutionary Biology (E&E):**

BIOL BC2240	Plant Evolution and Diversity
BIOL BC2262	Vertebrate Biology
BIOL BC2272	Ecology
BIOL BC2278	Evolution
BIOL BC2280	Animal Behavior
BIOL BC2851	Plants and Profits: The Global Power of Botany
BIOL BC3380	Applied Ecology and Evolution
BIOL BC3320	Microbiology
EEEE UN3005	Introduction to Statistics for Ecology & Evolutionary Biology
EEEE UN3087	Conservation Biology
EEEE UN3220	The Evolution of Human Growth & Development
EEEE UN3970	Biological Basis of Human Variation
EEEE W4110	Coastal Estuarine Ecology
EEEE W4111	Ecosystem Ecology and Global Change

**Computational Biology—Computing (CB-COMP):**

EESC BC3050	Big Data with Python: Python for Environmental Analysis & Visualisation
EESC GU4050	Remote Sensing
COMS W3134	Data Structures in Java
CBMF W4761	Computational Genomics
BIOL BC2490	Coding in Biology
BIOL BC2500	MATLAB for Scientists
BIOL BC2841	Laboratory in Plant Evolution and Diversity
BIOL BC2851	Plants and Profits: The Global Power of Botany
BIOL BC3308	Microbial Genomics (formerly called Genomics and Bioinformatics)
BIOL BC3590	Senior Seminar: Bacteria by Design*

\*Different topics for this course are taught each semester. Only Bacteria by Design will fulfill this requirement. This class may count as either an upper-level elective course OR the senior capstone experience.

**Computational Biology—Biology (CB-BIOL)\*:**

BIOL BC3304	Topics in Molecular Genetics
BIOL BC3310	Cell Biology ( <u>or</u> BIOL UN3041 Cell Biology)
BIOL BC3320	Microbiology
BIOL BC3352	Development ( <u>or</u> BIOL UN3022 Developmental Biology)
BIOL BC3360	Physiology ( <u>or</u> BIOL UN3006 General Physiology)
BIOL BC3362	Molecular and Cellular Neuroscience
BIOL BC3380	Applied Ecology & Evolution

\*Ask an advisor about new or less frequently taught 3000-level courses at Barnard or Columbia, or about transfer or study-abroad credit.

**❖ Three Upper-level Laboratory Courses**

While students pursuing the Computational Biology track are required to take only one upper-level lab from the list on the following page, students pursuing any of the other four tracks are required to take three upper-level lab courses. Students in the General Biology, C&M, P&O, and E&E tracks may take any upper-level Barnard Biology lab courses for which they meet the pre- or co-requisites.



Often, a lab course requires that a student have taken a pre-requisite lecture offered in the opposite semester (though sometimes, the lecture may be offered as a co-requisite in the same semester). Many, of the upper-level labs frequently offered in the Barnard Biology Department are provided in the list below. A yearlong research & seminar course may substitute up to two lab courses, as described below. As is true for lectures, students may also take laboratory courses at Columbia (or other institutions) to satisfy the lab requirement, with permission from the Associate Chair.

➤ **Guided Research and Seminar (BIOL BC3591 & BIOL BC3592)**

Enrollment in the yearlong Guided Research and Seminar course can be used to fulfill up to two upper-level labs in all tracks except for Computational Biology. This course is only available as a fall to spring sequence. Seniors may not enroll in Guided Research and Seminar if they are enrolled in Senior Thesis Research and Seminar (see below). In Guided Research and Seminar, students complete an original research project in a lab, and both write a scientific paper and give a poster presentation of their work at the Annual Barnard Biology Research Symposium.

For more information, visit our [Undergraduate Research](#) page.

➤ **Upper-level Lab Courses for Computational Biology Track:**

BIOL BC3303	Laboratory in Molecular Biology
BIOL BC3305–BC3306	Project Laboratory in Molecular Genetics (yearlong course)
BIOL BC3311	Laboratory in Cell Biology
BIOL BC3321	Laboratory in Microbiology
BIOL BC3361	Laboratory in Physiology
BIOL BC3363	Laboratory in Molecular and Cellular Neuroscience

➤ **Commonly Offered Upper-level Lab Courses for GB, C&M, P&O, and E&E Tracks:**

BIOL BC2281	Laboratory in Animal Behavior
BIOL BC2490	Coding in Biology*
BIOL BC2500	MATLAB for Scientists**
BIOL BC2801	Laboratory in Genetics
BIOL BC2841	Laboratory in Plant Evolution and Diversity
BIOL BC2873	Laboratory in Ecology
BIOL BC3303	Laboratory in Molecular Biology
BIOL BC3305–BC3306	Project Laboratory in Molecular Genetics (yearlong course)
BIOL BC3311	Laboratory in Cell Biology
BIOL BC3321	Laboratory in Microbiology
BIOL BC3354	Laboratory in Embryology
BIOL BC3361	Laboratory in Physiology
BIOL BC3363	Laboratory in Molecular and Cellular Neuroscience
BIOL BC3591–BC3592	Guided Research & Seminar

\*Coding in Biology can count either as an upper-level lab for the GB, C&M, P&O, and E&E tracks, or as an upper-level elective in the C&M or CB-COMP categories.

\*\*MATLAB for Scientists can count either as an upper-level lab for the GB, C&M, P&O, and E&E tracks, or as an upper-level elective in the C&M, P&O, E&E, and CB-COMP categories, but cannot fulfill a breadth requirement.

## Senior Capstone Experience

All Biology majors must complete the Senior Capstone Experience with either of the following two options:

1. One semester of **Senior Seminar (BIOL BC3590)**

In Senior Seminar, students participate in a seminar focusing on primary literature, and both compose and give a presentation on a senior thesis in the format of a literature review. Topics vary from semester to semester. To fulfill the Computational Biology track senior capstone requirement, you must enroll in Professor Lopatkin's Bacteria by Design topic.

**Fall 2021 Topic: *Bacteria by Design***

In this course, students will explore in-depth the field of synthetic biology with a focus on engineered bacteria. Topics include fundamental design principles, environmental and clinical applications, as well as ethical implications.

**Spring 2022 Topic: *Regenerative Biology***

This seminar will explore the cellular behavior that underlies complex tissue maintenance and repair. Student discussion and presentations will center on primary literature examining different regenerative model systems, such as zebrafish, salamander, and mouse. This course will explore topics in tissue homeostasis, injury repair, and organ regeneration. In addition, we will discuss new concepts in regenerative medicine including *in vitro* systems and stem cell applications for human disease therapies.

2. The year-long **Senior Thesis Research and Seminar (BIOL BC3593 & BIOL BC3594)**

In Senior Thesis Research and Seminar, students complete an original research project in a lab, and both write a scientific paper and orally present their work at the Barnard Biology Research Symposium. This course is only available as a fall to spring sequence. For more information, visit our [Undergraduate Research](#) page.

*Note:* Seniors enrolled in Guided Research and Seminar to fulfill two upper-level labs for their major cannot take Senior Thesis Research and Seminar at the same time. Instead, they must complete their senior capstone experience with BIOL BC3590 Senior Seminar.

## ❖ Chemistry Requirement

Majors in all tracks must complete at least one semester of General Chemistry (with laboratory) and at least one semester of Organic Chemistry (with laboratory). Students pursuing a major in the Computational Biology track are exempt from these requirements to balance their required introductory courses in computing and statistics. To see which courses will be offered in fall 2021, we encourage students to visit the [CU Directory of Classes](#) pages for Chemistry at Barnard and at Columbia. Equivalent courses at Columbia may be taken in lieu of the Barnard Chemistry CHEM BC2001 + CHEM BC2012 General Chemistry lecture + lab (offered in the fall only) and CHEM BC3230 + CHEM BC3328 Organic Chemistry lecture + lab (offered in the spring only) courses.

This is an important topic to discuss early with your advisor.

## REQUIREMENTS FOR BIOLOGY MINORS

### A minor in biology includes:

- One year of introductory biology (BIOL BC1500, BC1501, BC1502, BC1503).
- Three biology lecture courses at the BIOL BC2100 level or higher.
- Two biology laboratory courses. The lab courses may be replaced by two semesters of Guided Research and Seminar (BIOL BC3591 & BIOL BC3592).

*Note:* Chemistry, environmental science, physics, and psychology majors need to take only one advanced laboratory instead of two. Check with your major advisor in order to determine whether a guided research course is a suitable selection for your major's requirements.

To declare a minor in biology, a student must submit their [Minor Declaration form](#) to be signed by the Associate Chair using Slate.

## MAJOR ADVISING POLICY

In the Barnard Department of Biological Sciences, students select their advisors rather than having them assigned. Students should contact prospective advisors *directly*. After a faculty member has agreed to be your advisor, a student's choice must be approved and their [Major Declaration](#) form signed by the Associate Chair using Slate. Any biology faculty member can serve as an advisor in the GB, C&M, P&O, and E&E tracks. In computational biology, Professors Brian Morton, JJ Miranda, and Allison Lopatkin can serve as advisors. Switching advisors as a student develops new relationships with faculty in the department can easily be done by submitting a [Change in Major Advisor form](#) in Slate.

To learn more about our faculty and to find contact information, visit our [Faculty & Staff](#) and [Major Advising](#) pages to view advisor profiles.

## ENVIRONMENTAL BIOLOGY

*(Potential advisor in the Biology Department is Professor Callahan)*

This major is run jointly by faculty in the Departments of Biological Sciences and Environmental Science. It examines the interactions between living and non-living components of the environment, and how human activities alter these interactions. For more information, visit: [envsci.barnard.edu/environmental-biology-major](http://envsci.barnard.edu/environmental-biology-major)

## RESEARCH OPPORTUNITIES

We strongly encourage students to get involved in research during the summer, academic year, or both. For many students, research is one of the most intellectually rewarding experiences at Barnard. When unpaid research is conducted during the academic year, students can receive academic credit for working in a laboratory at Barnard or anywhere else in New York City. Research can be conducted during any (or all) semesters of the major, and during the summer. You may not receive credit for research that is paid.

Three courses provide credit for research during the academic year. Before signing up for any of these courses, you should examine the [Checklist for Enrollment](#) located on the Biology website:

1. **Guided Research (BIOL BC3597):** This is a variable-credit (1-4 credits) one-semester course, which can be taken during any fall or spring semester as early as your freshman year. This course counts toward degree credit but does not fulfill major requirements, and may be taken in multiple semesters.
2. **Guided Research & Seminar (BIOL BC3591-2):** This is a yearlong 8-point (4 pts/semester) course that begins in the fall and can be taken starting in your sophomore year. This series fulfills two upper-level lab courses toward the major.
3. **Senior Thesis Research (BIOL BC3593-4):** This is a yearlong 8-point (4 pts/semester) course, beginning in the fall of your senior year. This series fulfills the senior capstone requirement.

To be fully enrolled in any of these courses, a student must submit a [Project Approval Form](#) to the department administrator. Students enrolled in yearlong courses need only submit one form in the fall; those taking BIOL BC3597 Guided Research should resubmit this form each semester. For AY21–22, this form is due Sept. 20<sup>th</sup> for the fall semester and Jan. 31<sup>st</sup> for the spring semester.