Registration Pointers for Fall 2017 from the Biology Faculty

Are you a first-year student? [Scroll down for sophomore & junior information]

If so, the first thing to consider is what your major will be. The Biology Department is home to three majors: Biology, Molecular and Cellular Biology (MCB), and Natural Sciences emphasis in Biology (NatSci Bio). Several other departments offer majors that might be of interest to you: Biochemistry (in Chemistry); Environmental Policy and Decision Making (EPDM); Exercise Science; Science, Technology & Society; and Psychology. The EPDM major is taken in conjunction with another major. There are also some minors and emphases that might be interesting to you: Bioethics, EPDM, and Neuroscience. Here we’ll limit our remarks to those majors housed in Biology, but you can read more about any of these majors, minors, and emphases at the advising webpage, https://www.pugetsound.edu/academics/departments-and-programs/.

Here’s what you should know about the majors available through the Biology Department. [About one half of our graduates choose to major in Biology, one-third choose an MCB major, and the rest choose the NatSci Bio option.]

The **Biology** major provides a broad introduction to all areas of Biology—ranging from cells, molecules, and genetics to whole organisms, their environment, and biodiversity, with the concept of evolution informing all levels. Students can tailor the major to their interests by choosing from a wide range of advanced biology classes, studying abroad, and carrying out independent research. Thus a Biology major interested in conservation biology might study abroad in Costa Rica and at Puget Sound take advanced electives in Marine Biology, Animal Behavior, Evolution, Vertebrate Biology or Conservation Biology. A different Biology major might take courses in Cancer Biology, Development, Neurobiology, Mammalian Microanatomy or Molecular Biology. Both students could do independent research with faculty.

The **Molecular and Cellular Biology** (MCB) major focuses on cells, molecules, chemistry, and genetics. Students who choose this major do not take the same depth of courses in whole animal/plant biology, ecology, and evolution as Bio majors do. Rather, students in this major take more chemistry courses than Biology majors, culminating in a year-long Biochemistry course and a class in Molecular Biology. MCB students take at least one advanced biology class (in addition to the required Biochemistry and Molecular Biology classes) and MCB majors often do independent research and study abroad. This major is quite similar to the Biochemistry major housed in Chemistry, but differs a bit in the amount of math required (the Biochemistry major requires 3 semesters) and Biochemistry majors take an additional upper division chemistry class rather than the Molecular Biology course.

The department’s third option is the **Natural Sciences emphasis in Biology** major. This major offers the greatest breadth across different sciences (e.g., NatSci Bio students not only take courses in biology and chemistry but are **required** to also take courses in geology or physics to complete their major). This major appeals to a variety of students for a variety of reasons. It has the fewest number of courses required, which sometimes makes it the most workable major for students with time constraints (e.g., students double majoring or wishing to pursue extensive coursework outside biology, students with major commitments to music or athletics, transfer students, or students who wish to study abroad for more than a single semester). Other students are drawn to this major because it allows them to prepare for a career as an elementary science teacher. For students who want to be middle school or high school science teachers we strongly recommend that they major in Biology. Also, it is very useful if they become involved in doing research (e.g., Directed Research or summer research), since this experience is essential for contemporary science teachers.
Your choice of major affects course selection.
Students majoring in Biology and NatSci Biology typically take two biology courses in their sophomore year -- Ecology (Biology 211) and Cell Biology (Biology 212). Each course is offered in both the fall and the spring semester and it does not matter which one you take first. Biology majors are also required to take at least one semester of Organic Chemistry (Chem 250, offered only in the fall). Students majoring in MCB generally take Cell Biology and the year-long Organic Chemistry course in the sophomore year. MCB majors may elect to take Genetics (Biology 311) in their sophomore year. This is possible, but note that the genetics professors have found that sophomore students struggle with some aspects of the course (reading primary papers, writing laboratory reports), especially if they have not already taken Cell Biology, Ecology, or both semesters of Organic Chemistry. If you are wondering what course to take to complement Organic Chemistry during the semester that you are not taking Cell Biology, there are several options. If you haven't done so, you might consider taking Biology 112 (Diversity of Life). Taking Biology 112 will allow you to keep your options open at several levels. First, you'll be making progress towards your degree (whichever one you choose). Second, you'll be taking a course that is required as a prerequisite for a number of upper division biology courses (Evolution, Vertebrate Zoology, Animal Physiology, Plant Molecular Biology and Physiology, Conservation Biology, Marine Biology and Animal Behavior). Thus, even if you end up majoring in MCB you'll have a broader range of options than an MCB major who foregoes Biology 112. Finally, taking Biology 112 may represent the only exposure that you get to whole organisms and some evolutionary biology questions; a basic understanding of evolution is of great importance as it presents many fundamental principles of life, which are necessary to understand why organisms respond to outside stimuli and develop the way they do.

If you haven’t fulfilled your math requirement, sophomore year is a good year to do that. Some MCB students have elected to take Statistics (Math 260; the R programming component of the course is very useful for those planning on doing research or going to grad school), fulfill a core or work towards the language requirement, carry out independent research for credit (Biology 290), or explore an interest in a related field (courses in Psychology, Environmental Policy and Decision Making, Math/CS, Neuroscience, STS, and Bioethics are popular choices).

No matter which of the three majors you are considering, the department encourages students interested in doing research to take Biology 201 (Colloquium) in the Fall. This 0.25 activity unit course meets for 1 hour each week; every week a different Biology faculty member talks about his/her research interests, including laying out the opportunities for students to get involved in the research. In the Spring term, those interested in research should consider taking Biology 392: Introduction to Biological Research. This 0.5 academic unit course focuses on writing research proposals and is highly advised for students who are thinking about applying for one of the university’s summer research fellowships. If you are interested in learning more about these research fellowships, go to the Summer Research Grants in Science and Mathematics webpage.

If you are hoping to study abroad, you should visit the Study Abroad website, https://www.pugetsound.edu/academics/international-programs/study-abroad/, for information and start talking with your advisor about this opportunity now! The deadline for applying to study abroad in 2018-2019 (your junior year) is January 31, 2018. Thus, even if you do not plan to go until Spring 2019, you should start looking at programs this semester. Students who have studied abroad have generally loved the experience; however, be aware that depending on your career goals and your study abroad locale, this decision may require some careful planning. There are a few programs that will provide an upper-level Biology elective. Biology majors must take two of their three upper-level electives at Puget Sound.
Are you a sophomore?
Up until this point it's probably been pretty obvious which courses to take each semester. In the junior year there starts to be more choice. If you are a Biology major chances are that you have the following courses remaining to complete the major requirements: (1) Genetics (Biology 311), (2) either Animal Physiology (Biology 334) or Plant Molecular Biology & Physiology (Biology 332), and (3) three upper division (300 or 400 level) biology courses, two of which must include a lab. Note – you can take both Animal Physiology and Plant MBP; if you do so, the second course will count towards requirement (3). It's a good idea to think about the remaining two years in putting together your schedule. The department offers Genetics each semester, but Animal Physiology is offered only in the fall and Plant MBP is offered only in the spring. In addition, deciding when to take Genetics may depend on which 300 and 400 biology electives you are hoping to take. Several courses require Genetics (e.g., Molecular Biology, Cancer Biology) and the course is recommended for Evolution, Biochemical Pathways and Processes, and Development.

Seven more things to keep in mind as you plan your schedule:
(1) Some upper level courses are "by permission of instructor." This means that you will need to get a permission code from the professor to register for the class. Without the code you will not be allowed to enroll in the class, even if there are open seats. In Fall 2017, Biology 434 (Neurobiology) taught by Professor Sue Hannaford requires filling out a request form to get a registration code. Chem 460 (Physical Biochemistry) requires a permission code and there is a form that you must fill out and submit to the Chemistry Department expressing interest.

(2) You can apply one unit of either directed research (Biology 390, Biology 490) or Thesis (Biology 491) towards your major. If you are interested in learning more about this option, please see the research options page on the Biology website.

(3) Two of the three upper division electives must be taken at Puget Sound. This becomes an issue if you are planning to study abroad and hope to transfer back courses to count towards the major.

(4) For the Biology major, 2 of the 3 upper division biology electives (300 or 400 level Bio classes) must have a lab to count towards the major. Bear this in mind as you plan your schedule for the coming two years. You can, of course, choose to take more than one course without a lab if they are of interest to you. But, after the first one, the others will count only as units taken towards graduation. In Fall 2017, Biology 376 (ONE: Our Symbiotic Planet—a new course!) and Biology 434 (Neurobiology) will not have a lab. In Spring 2018 there will be two courses without labs: Biology 360 (Evolution) and Biology 361 (Biochemical Pathways).

(5) If you are interested in graduate study in biology or a health related field (e.g. medicine, physical therapy, pharmacy, nursing, dentistry), please discuss this possibility with your advisor. Also, talk with a member of the Health Professions Advisory Committee if you are interested in a health related field. Many graduate programs in Biology require a full year of organic chemistry, a full year of calculus, and a full year of physics. Similarly, health related professional programs may require courses in math, physics, chemistry, anatomy and/or physiology, psychology, and/or sociology.

(6) Many courses are offered every year, but others are not. This means that if you are particularly interested in taking a class that is offered every other year, you should schedule your other courses so you can try to fit in the ones you are hoping for. The 300 and 400 course offered for the next two semesters are:

Fall 2017 -- Genetics, Animal Physiology, Microbiology, Nanobiology, Conservation Biology, ONE: Our Symbiotic Planet, Molecular Biology, Neurobiology, and Marine Biology.
Student are not always sure which upper division biology class is the best match for their interests. Here is a bit more information about the electives the department is offering this fall. The list includes a course in Chemistry, which also satisfies the Biology department’s upper division course requirement.

**Animal Physiology (Biology 334)**  This course examines how animals deal with the challenges posed by their environment. The focus is on systems (organs, tissues) and cellular levels in a variety of animal forms with emphasis on physiological adaptation to different habitats. Laboratory involves application of various experimental techniques. Student teams carry out and write a report on an independent lab project of their own design. Some labs require the dissection of earthworms, the use of crab blood, and may require the use of live tissue preparations. Prerequisite: BIOL 112, 212; one year college chemistry; BIOL 211 or MATH 160 recommended.

**Microbiology (Biology 350)** Microbiology is the biology of two of the three Domains of life (the bacteria, the archaea, and the viruses of both) as opposed to eukaryotic organisms, which remain the focus of other courses in the Biology curriculum. Biology 350 explores three aspects of microbiology—diversity, ecology, and interactions with other organisms (including pathogen/host relationships in medical microbiology and more mutualistic associations such as symbioses). A term paper exploring the natural history of a particular microbe or related topic is required for this course. The laboratory includes basic microbiological techniques, classic experiments, and introduces current paradigm shifts in microbiology, including sociomicrobiology, microbial genomics, quorum sensing, and biofilms. Student teams carry out and write a report on an independent lab project of their own design. Students also read and discuss “cutting edge” journal articles showcasing recent advances in microbiology, and present those papers to their peers. Prerequisite: BIOL 212, one year college chemistry, and CHEM 250.

**Nanobiology (Biology 362)** This course offers students an introduction to the field of nanobiology. Nanotechnology is becoming a new frontier in biological explorations and manipulation. Engineering tools and techniques have been used to expand biological research, enrich the medical field, as well as alter food and materials. Fast expanding, nanobiology is becoming a part of the cultural lexicon with ramifications in both ethical and cultural aspects of everyday life. This course explores these themes, with overviews of methodologies and future technology. Prerequisite: BIOL 101, 111, or 112; CHEM 110 or 115; PHYS 111 or 121.

**Conservation Biology (Biology 370)** This course focuses on biological concepts and techniques fundamental to the science of conservation biology. To understand mechanisms that drive the loss of biological diversity and approaches to address those threats, the course explores a variety of topics including extinction processes, population dynamics, population genetics, habitat fragmentation, invasive species, protected area design, and restoration ecology. The laboratory component involves field work, including a full weekend field trip, and quantitative computer simulations. Prerequisite: BIOL 211 and junior or senior standing.

**New Course: ONE: Our Symbiotic Planet (Biology 376)** This course is designed for juniors and seniors interested in learning more about the diversity, depth, and breadth of associations between organisms. Such associations and their study range from mutualism to parasitism, from viruses to cetaceans, from biochemical to ecological approaches. The first part of the course explores the history and paradigms in the study of symbioses, using specific case studies and journal articles. The second part of the course involves critical analysis of current peer reviewed journal articles by experts in the field, who will “tele-visit” the classroom to discuss their work with students. Finally, there will be
individual and group projects exploring a student-chosen specific association of particular interest. There is no laboratory associated with this course. Prerequisites: BIOL 111, 212, and one year of college chemistry, or permission of instructor; BIOL 112 and 311 are recommended.

**Molecular Biology (Biology 404)** This course, required for MCB majors, is a good choice for Biology majors who are interested in the cellular and molecular levels of biology. The course focus is the structure, organization, and regulation of genetic material at the molecular level. The laboratory covers the techniques used to study single genes. Prerequisite: BIOL 212 and 311; one year of college chemistry.

**Neurobiology (Biology 434)** An examination of the biology of nerve cells and nervous systems through lectures and discussion of recent research. Topics include cell biology of the neuron, synaptic interactions and the neural bases of learning and memory, the neural circuitry underlying behavior, and developmental neurobiology. Emphasis is placed on students’ oral and written evaluations of scientific literature. Prerequisite: BIOL 212; one year of college chemistry; junior or senior standing; permission of instructor.

**Marine Biology (Biology 477)** The marine environment encompasses 99% of the Earth's biosphere and contains an incredible diversity of microbial, algal, and animal life forms. This course examines the biology of these organisms and the abiotic (e.g., salinity, nutrients, water currents and tides) and biotic factors (e.g., competition, predation, symbiosis) that influence their distribution and abundance. Specific topics include primary and secondary production, rocky intertidal biodiversity, estuaries, subtidal communities, coral reefs, pelagic and deep sea communities, impacts of humans on the ocean, and conservation. Lecture periods include discussions of primary literature and student presentations. Laboratory sessions involve field work, laboratory analyses, report writing, and multimedia presentation of project results. Prerequisite: BIOL 211. GEOL 105 recommended.

**Physical Biochemistry (Chem 460)** This course applies concepts of physical chemistry to the study of biological processes. The topics covered include protein and nucleic structure and stability, thermodynamics of protein folding, enzyme kinetics and instrumental techniques such x-ray crystallography, NMR and mass spectrometry. Prerequisite: CHEM 251 and permission of instructor.

*Are you a junior?*
Review pointers 1-7 above (under "Are you a sophomore?").