JOHNS HOPKINS
UNIVERSITY

The David S. Olton

Behavioral Biology

Undergraduate Program

Undergraduate Handbook

http://krieger.jhu.edu/behavioralbiology



Table of Contents

Program Description

The Behavioral Biology Program seeks to establish a greater understanding of the relationships among brain, behavior and evolution through an interdisciplinary program of study. Students in the David S. Olton Behavioral Biology Program examine the processes and mechanisms that underlie behavior in animals, including humans. This program seeks to teach students how to integrate scientific discoveries from a broad array of scientific fields of inquiry that contribute to the study of behavioral biology, from sociology to molecular biology. This major is particularly well suited to students wishing to study the fields of organismal or integrative biology.

The Behavioral Biology Program awards the degree of a Bachelors of Arts (B.A.), Students from our programs pursue a variety of career paths following graduation, including graduate, medical or veterinary school. For those interested in the health professions, behavioral biology can be integrated into a pre-medical curriculum that will provide a broad understanding of biology, with a humanistic perspective, or a pre-veterinary curriculum that explores neural and physiological systems and behaviors in a broad range of species. For those who wish to pursue scientific careers, especially in behavioral ecology, behavioral neuroscience, or physiological psychology, the program provides excellent preparation.

Many students have questions about the similarities and differences between the behavioral biology and neuroscience programs. Both of these programs are interdepartmental, and a majority of professors teach courses that are listed for both programs. The behavioral biology program, however, examines neural systems within a broad evolutionary and functional context, challenging students to think critically and scientifically. The program also has fairly liberal course requirements so that students can tailor the degree to their specific interests, including courses from psychology, neuroscience, biology, philosophy, earth and planetary science, and environmental engineering.

Program Administration

The Behavioral Biology Program is administered by a Director and Program Committee who are responsible for coordinating course offerings, overseeing the program's interdepartmental course work, and approving changes to the curriculum. The current Program committee:

Dr. Christopher Honey, *Director*
Professor, Department of Psychological and Brain Sciences Krieger School of Arts & Sciences (PBS)

Dr. Kirsten Bohn, *Director of Undergraduate Studies*
Research Assistant Professor, PBS

Dr. Cynthia Moss
Chair and Professor, PBS

Dr. Amy Balanoff
Research Assistant Professor, PBS

Faculty Advisors

At the end of freshman year each student is assigned a faculty advisor whose area of expertise corresponds to the student's own focus area. Advisors will help students navigate through the program and prepare them for life after Hopkins.

Dr. Kirsten Bohn 410-516-8876, 414 Dunning, kbohn1@jhu.edu

Dr. Amy Balanoff 410-516-8878, 418 Dunning, abalano2@jhmi.edu

Administrative Staff (Dunning Hall 434)

Linda M. White, Academic Program Administrator
410-516-6196, Linda.m.white@jhu.edu

Kelly Thammavong. Academic Program Coordinator
410-516-6436, KellyT@jhu.edu

Amelia Dizo Administrative Secretary
410-516-8878, adizo1@jhu.edu

Behavioral Biology Degree Requirements

A. Basic Mathematics and Science Courses

1) Calculus I & II
2) Introductory Chemistry I & II and lab
3) General Physics I & II and lab
4) For Biology, any two of the following:
   - AP Bio – must be with a 5
   - The following courses **with lab**, Gen Bio I, Gen Bio II, Biochemistry[a], Genetics, Cell Biology or Comparative Physiology[b] [c]

B. Introductory Statistics - One of the following options:

- Probability and Statistics for the Life Sciences
- Probability and Statistics for Biology and Engineering
- Statistical Analysis I and II

C. Core Courses (offered "F" = fall, "S" = spring)

1) Foundations of Brain, Behavior and Cognition (F & S)
2) Human Origins (S)
3) Animal Behavior (F)
4) Neuroscience Lab (F & S)

D. Behavioral Biology Upper Level Courses

1) Three courses designated "biobehavioral" (BIOBEH)
2) Two courses designated "social science" (SOCSCI)
3) Senior seminar (F & S, senior year or previous spring for December graduates).

BIOBEH and SOCSCI courses are listed here:
https://krieger.jhu.edu/behavioralbiology/academics/courses/

E. Behavioral Biology Research/Internship Courses

1. Three credits (one semester) of Research, Internship or Intersession Galapagos trip (see page 6)
2. One semester of Connections in Behavioral Biology (290.500, 0.5 credit)

---

[a] Requires organic chemistry
[b] Requires biochemistry
[c] Can only count once – with lab for biology req. ***or*** the lecture as a BB upper level.

Behavioral Biology Course Descriptions

All are three credits unless stated otherwise.

Human Origins (290.101)
A. Balanoff
This course examines the origin of the human species through a lens constructed by a diverse set of evolutionary phenomena playing out across a variety of timescales. We will draw from a wide array of disciplines to formulate a link between microevolutionary process and macroevolutionary pattern. We will focus extensively on the evolution of primates including humans as products of these processes with the goal of establishing both an integrative view of what makes us uniquely human and an appreciation for the wealth of features we share with the immense biological diversity on earth.

Foundations of Brain, Behavior & Cognition (200.141)
D. Smith
A survey of neuropsychology that relates the organization of behavior to the integrative action of the nervous system. Cross-listed with Neuroscience.

Animal Behavior (200.208)
K. Bohn
This introductory course examines how and why animal behaviors are produced across the animal kingdom. Neurobiological, hormonal and developmental features are examined in an evolutionary context. Behaviors include survival, acquiring food, reproduction, communication, parental care, and cooperation. Students will also learn how to develop hypotheses and predictions for scientific questions and interpret graphical results.

Neuroscience Lab (080.250)
J. Trageser & S. Sterbing-D'Angelo
This course will give students the "hands-on" experience of the interdisciplinary nature of neuroscience. Being able to visualize neuroanatomical structures in relation to behavioral functions and learning electrophysiological techniques to understand neuronal communication in the context of behavior are just some of the goals of this laboratory course. Cross-listed with Neuroscience.

Senior Seminar: Behavioral Biology (290.490)
C. Honey & A. Balanoff
This seminar is intended as a capstone course for senior behavioral biology majors. We will consider Great Ideas in all areas of behavioral biology through readings of both classic and cutting-edge articles in the original literature. After consultation with the instructor, students will select many of the discussion topics. Enrollment is limited to 12. Registration limited to senior behavioral biology majors. (1 credit)

Connections in Behavioral Biology (290.500)
K. Bohn
The goal of this course is for students to gain experience communicating and for students to learn about each other's' activities. The class meets twice during the semester. An organizational meeting and a meeting at the end of the semester where each student gives a 5 – 7 minute oral presentation about their research, internship/volunteer, or field experience (see below). Students will also write a short paper, news piece or webpagethat can be shared with other Behavioral Biology majors.

Optional: Field Experience in Tropical Biology, Winter Intersession
360.236 Ecuador and the Galapagos Islands
K. Bohn
This course is in an introductory field tropical biology course held in Ecuador and on the Galapagos Islands. The course will concentrate on the flora and fauna of the Amazon rain forest, Ecuador, and the Galapagos Islands. Special attention will be given to the consideration of the behavioral adaptations exhibited by various animal taxa. Final grade will be based on a field notebook that the student keeps and a final paper due in late January. There are no prerequisites other than a valid passport and approval of instructors. Spanish-speaking students are especially encouraged to apply. Students are selected on a competitive basis by instructors. Application required. For internship credit, students are required to write an additional paper and present
(3 credits)

****You should attempt to complete your lower-level prerequisites early in your education, and 100 levels before 200 levels.** Lower-level courses are often prerequisites for upper-level courses. Major requirements CANNOT be taken on a pass/fail basis.

General University Requirements

In addition to the specific degree requirements, all students must fulfill the Arts & Sciences division requirements for graduation. The relevant requirements are for students entering into the program in Fall 2019:

- 120 total credits, 100 in must be in residency at JHU, including the final semester prior to graduation
- Only 12 transfer credits allowed
- 12 W credits writing intensive courses – ***multiple BB upper levels are writing intensive***
- 9 credits in the Humanities (H)
- 9 credits in the Social Sciences (S) – ***usually included in BB upper levels***
- 9 credits in Natural Science (N), Quantitative (Q), or Engineering (E) – ***included in BB major requirements***

Other Notes

Premed Students

In addition to our requirements and University requirements, premed students must take two semesters of organic chemistry and an organic chemistry lab, two biology courses with labs, and biochemistry. If you use AP Biology for your biology requirement for Behavioral Biology, you will still need to take two biology courses with lab for med school requirements. **See pre-health advising for the most up to date recommendations for medical school. For example, Genetics may be recommended as well as a sociology course.**

Writing Requirement

Some upper-level electives that have the "W" designation can be double-counted; however, **it is highly recommended that students complete a minimum of two classes in English Writing/Literature if considering applying to medical school.**

Foreign Language

Students who take the first semester of an elementary language must complete the second semester course as well or lose the credit from the first term.

Sample Program 1

This is only *one of many* possible course sequences that students may elect to follow. BB upper level electives refer to BIOBEHAV and SOCSCI from previous page. Parentheses refer to credits and University Requirements on previous page: W = writing, H = humanities, S = social science. Note those *not* labelled all qualify for N, Q, E distribution

Freshman Year: Fall
Foundations of Brain, Behav & Cog (3)
Calculus I (4)
Intro. Chemistry & Lab I (4)
Elective in H (3)

Freshman Year: Spring
Human Origins (3)
Calculus II (4)
Intro. Chemistry II & Lab (4)
Writing intensive in H (3) (W) (H)

Sophomore Year: Fall
Animal Behavior (3) (S)
Genetics or Bio I & Lab (5)
Prob. Stats Life sciences (4)
Elective (3)

Sophomore Year: Spring
Cell Bio or Bio II & lab (5)
Writing intensive in H (3)(W)(H)
BB Upper level (3)(S)
Elective (3)

Junior Year: Fall
Neuroscience Lab (3)
Physics I & lab (5)
BB Upper level (3)(S)
Research (3)
Connections in Behavioral Biology (0.5)

Junior Year: Spring
BB Writing upper level (3)(W)(S)
Physics II& Lab (5)
BB Upper level (3)
Elective in H (3)
(Research/Elective)

Senior Year: Fall
BB Writing Upper level (3) (W)
Senior Seminar (1)
Elective in Any Area (3)
Elective in Any Area (3)
Elective in Any Area (3)
(or up to 3 credits research)

Senior Year: Spring
Elective in Any Area (3)
Elective in Any Area (3)
Elective in Any Area (3)
Elective in Any Area (3)
(or up to 3 credits research)

Information about courses and requirements are also located on the Behavioral Biology website: https://krieger.jhu.edu/behavioralbiology/

A degree audit checklist for Behavioral Biology can be found on the Academic Advising Office web site, https://advising.jhu.edu/completing-your-degree/degree- auditing.

Sample Program 2 Pre-Med/Vet

Freshman Year: Fall
Foundations of Brain, Behav & Cog (3)
Calculus I (4)
Intro. Chemistry & Lab I (4)
Elective in H (3)

Freshman Year: Spring
Human Origins (3)
Calculus II (4)
Intro. Chemistry II & Lab (4)
Expository Writing H (3) (W)

Sophomore Year: Fall
Animal Behavior (3)
Organic Chemistry I (4)
Prob. Stats Life sciences (4)
Writing intensive in H (W)

Sophomore Year: Spring
BB Upper Level (3)
Organic Chemistry II (4)
Organic Chemistry Lab (3)
(Elective)

Junior Year: Fall
Biochemistry & Lab (5)*
Physics I & lab (5)
Research (3)
Connections in Behavioral Biology (0.5)

Junior Year: Spring
Comparative Physiol. & Lab (4)
Physics II& Lab (5)
BB Upper level (3)(W)
(Research/Elective)

Senior Year: Fall
Neuroscience Lab (3)
BB Bioethics (3) (W)
BB Upper level (3)
Research/Elective (3)

Senior Year: Spring
Senior Seminar (1)
BB Upper level (3)
Elective (3)
Research/Elective (3)
Elective (3)

Information about courses and requirements are also located on the Behavioral Biology website: https://krieger.jhu.edu/behavioralbiology/

A degree audit checklist for Behavioral Biology can be found on the Academic Advising Office web site, https://advising.jhu.edu/completing-your-degree/degree- auditing.

* This is assuming the Biochemistry Project Lab (1 credit), the Protein Engineering and Biochemistry lab can also be used, it is 3 credits

Awards and Scholarships

David S. Olton Award

The David S. Olton Award will be given annually to support undergraduate research in the area of the biology of behavior, broadly defined. Undergraduate students from Johns Hopkins in any major but especially those in psychology, behavioral biology, and neuroscience are encouraged to apply. This award is designed to help students complete a project of their own in the field of Behavioral Biology, Neuroscience or Psychology that they might not otherwise be able to carry out due to financial limitations. It can cover a variety of costs, including stipend support (either during the academic year or the summer) or equipment and/or supplies essential to the project. An email announcement is sent to all students in mid-fall to provide information on applicable deadlines and requirements. More information can be found here, https://krieger.jhu.edu/behavioralbiology/research/research-awards.

Curt Richter Award

The Curt P. Richter Award in Behavioral Biology Research is given in recognition of outstanding achievement in the David S. Olton Behavioral Biology Program. It is awarded to a selected graduating senior to recognize his/her dedication to excellence in academics and research. Dr. Richter was a JHU doctoral graduate and a former faculty member. He was a leader in the field of brain and behavior research.

Field Studies Fellowship (Study Abroad during Intersession)

The goal of the Field Studies Fellowship is to offset the cost of travel assessed to students for Johns Hopkins University undergraduate courses related to Behavioral Biology. If you are interested in applying for a Field Studies Scholarship visit the course website at https://studyabroad.jhu.edu/find-a-program/hopkins-intersession-abroad/ or contact Jessica Mervis jmervis1@jhu.edu

Research or Internship

Students are required to complete 3 credits (= 120 hours) of research, internship or the Galapagos field program. During fall and spring semesters this is equal to approximately 3 hours / week / credit. The School of Arts & Sciences stipulates that students may earn no more than three credits of research, independent study, or internship per semester, and no more than six credits per academic year (fall/intersession/spring/summer). **A three to five page paper describing your research must be submitted by the end of the semester for credit.**

How do I find an internship?

Most internships are off campus and student initiated. We are continuing to develop new opportunities for example the national aquarium in Baltimore has internships throughout the year (https://www.aqua.org/jobs) as does the Maryland Zoo (https://www.marylandzoo.org/about-us/internships/).

How do I find a research supervisor?

There are many opportunities to participate in research projects at Homewood or at the Johns Hopkins Medical Institutions. Supervised research should relate to behavioral biology.

Consult departmental web pages and other on-line information for research being conducted at the Homewood campus and the School of Medicine. Also check the Behavioral Biology website under student opportunities (https://krieger.jhu.edu/behavioralbiology/student-opportunities/).

The research interests of faculty members in each department are usually listed, along with selected bibliographies of published works. Students are encouraged to read a brief selection of the articles that have been published by the potential supervisors, to ensure that the nature of the research being conducted is understood, and can be intelligently discussed by the student. It is best to contact faculty via e-mail to discuss possible research opportunities, with students introducing themselves as undergraduate behavioral biology majors, and explaining their interest in working for credit in the faculty member's laboratory. Students are urged to make these arrangements well before the end of the semester ***prior*** to which they wish to begin work.

What do I do once I have found an internship or research position?

An agreement must be made between the student and the faculty member (if research) or internship leader with whom s/he wishes to work. The agreement specifies:

- What the student will be doing
- How much time and when (scheduling) the student will work
- What the student will receive from their mentor – supervision, readings, guidance, and how frequently they will meet.
- **To receive credit students must submit a paper on their research or internship to their supervisor by 4 PM the last day of the reading period.**

How do I enroll for credit?

Use the online forms dropdown menu on SIS to enroll.

- For research with a Behavioral Biology faculty member with a 290.5## section, enroll directly in that faculty member's section. Submit your paper directly to that faculty member.
- For internships you must meet with the Director of Undergraduate studies ("DUS", Dr. Bohn) and enroll in 290.59# "Behavioral Biology Internship". At the end of the semester have your supervisor forward your paper to the DUS and confirm the hours you worked. **Include information on your internship and your supervisor's name and email address on the enrollment form.**
- For research with a faculty member that does not have Behavioral Biology research sections, you must meet with the DUS (Dr. Bohn) and enroll in the DUS's section of 290.5## research. At the end of the semester have your supervisor forward your paper to the DUS and confirm the hours you worked. **You must include the lab name, the faculty member's name and email address and the name and email address of who you will be working under (often a graduate student or postdoc) on the enrollment form.**

Behavioral Biology Honors

Students receive recognition at graduation and notation on their JHU transcripts.

Requirements:

- Cumulative and Major GPA of at least 3.5
- Two semesters of research (6 credits).
- Presentation of research findings at the Undergraduate Research Symposium (Fall semester) or DREAMS (Spring semester).
- A letter of recommendation from the research mentor attesting to the student's significant contribution to the research process.

During the semester prior to graduation, students must submit verification of their research presentation, along with their research mentor's letter of recommendation, to Linda M. White, the Behavioral Biology Program Administrator in 434 Dunning Hall by 4PM on:.

Second Friday in October if graduating December.

Last Friday in February if graduating May.

The Program Office will submit your paperwork to Academic Advising.

Resources

Behavioral Biology Website

Our website provides detailed and up-to-date information on the program. Please check regularly on such topics as: course information, major checklists, contact information, research, events, resources, jobs/internships, grants/funding opportunities. http://krieger.jhu.edu/behavioralbiology

Office of Pre-Professional Advising

https://studentaffairs.jhu.edu/preprofadvising/

The Office of Pre-Professional Advising provides guidance to students interested in pursuing graduate education in the fields of health care, graduate studies, law, or business. This includes individual advising, general information sessions, program presentations, and information about internship and volunteer opportunities. The Pre-Health section has complete advising guides for medical school. They also offer workshops on the application process, essay writing, and interview techniques. The office also coordinates the work of the Health Professions Recommendation Committees. Members of these committees act as interviewers and writers for Johns Hopkins University students/alumni in the application process. It is **highly recommended** that students interested in these career paths contact the office of Pre-Professional Advising during their sophomore year and sign up to receive their emails

Life Design Lab (formerly Career Center)

https://studentaffairs.jhu.edu/life-design/
389 Garland Hall
410-516-8056

The Life Design Center provides students with information/resources about the types of careers that are most suitable to the student interests, and the steps one should take to get ready for those careers. The very first thing you should do is register for handshake a platform that connects JHU students with jobs and alumni (https://jhu.joinhandshake.com/login). All students are encouraged to consider speaking with a career advisor as soon as their sophomore year to discuss their future plans and options. The Career Center provides students with information about the types of careers that may be of interest to individuals, and the steps that should be taken to prepare for those careers. It is **highly recommended** that students start working with the Career Center as soon as the beginning of their junior year to obtain more information on various options related to their major. The office offers students a central

location for information about graduate programs, finding internships, test preparation, interview techniques, and learning about professional schools. The Career Center website provides a place to schedule an appointment with a counselor as well as a list of career links ranging from geo- graphic location to professional associations.

Academic Advising

Upon entering the university, freshmen are assigned an academic advisor by the Office of Academic Advising. Only after students declare their major (as rising sophomores) are they assigned to a faculty advisor. Students are still required to meet with their regular academic advisor to ensure that all university requirements are being fulfilled prior to the students' anticipated graduation. Students who switch to Behavioral Biology are highly advised to discuss their intentions with the Director of Undergraduate Studies and have a "Change of Major" form completed by the Behavioral Biology Office.

During the spring semester of their junior year, students are required to complete a major degree audit and verify their progress with their Behavioral Biology faculty advisor. This audit is then shared electronically with Academic Advising.

More resource links and information is available on our website at https://krieger.jhu.edu/behavioralbiology.

Course Numbers

This alphabetical list includes most of the course numbers discussed in this handbook. If it is listed here it is acceptable for meeting the program's requirements. When one option is recommended it is *'d.

	Course	Number
Core	Animal Behavior	200.208
	Foundations Brain Behavior Cognition	200.141
	Human Origins	290.101
	Neuroscience Lab	080.250
	Senior Seminar: Behavioral Biology	290.490
	Connections in Behavioral Biology	290.500
Math	Calculus I (Biological and Social Science)*	110.106
	Calculus I (Physical Sciences and Engineering)	110.108
	Calculus II (Biological and Social Science)*	110.107
	Calculus II (Physical Sciences and Engineering)	110.109
Biology	Biochemistry	020.305
	Biochemistry Project Lab*	020.315
	Biochemistry (Protein Engineering and Biochemistry) Lab	250.253
	Biology I (General)	020.151
	Biology Lab I	020.153
	Biology II (General)	020.152
	Biology Lab I	020.154
	Cell Biology	020.306
	Cell Biology Lab	020.316
	Comparative Physiology	020.374
	Comparative Physiology Lab	020.377
	Genetics	020.303
	Developmental Genetics Lab	020.340
Chemistry	Chemistry I (introductory)	030.101
	Chemistry Lab I	030.105
	Chemistry II	030.102

	Course	Number
Chemistry	Chemistry Lab II	030.106
	Organic Chemistry I (Introductory) (premed)	030.205
	Organic Chemistry II (premed)	030.206
	Organic Chemistry Lab (premed)	030.225
Physics	Physics I (General, Biological Science Majors)*	171.103
	Physics I (General, Physical Science Major, active learning)	171.107
	Physics I (General, Physical Science Major)	171.101
	Physics I Lab	173.111
	Physics II (General, Biological Science Majors)*	171.104
	Physics II (General, Physical Science Major, active learning)	171.108
	Physics II (General, Physical Science Major)	171.102
	Physics II Lab	173.112
Statistics Prefix EN	Probability and Statistics for the Life Sciences*	553.211
	Probability and Statistics for the Biological Sciences and Engineering	553.311
	Statistical Analysis I	553.111
	Statistical Analysis II	553.112

NOTES: