



2015-2016 Advising Booklet



Biomedical Engineering • Chemical & Physical Biology • Chemistry
Human Developmental and Regenerative Biology • Human Evolutionary Biology • Integrative Biology
Molecular & Cellular Biology • Neurobiology • Psychology (Cognitive Neuroscience and Evolutionary Psychology)

Welcome to the Life Sciences at Harvard!

The Life Sciences encompass a broad array of disciplines that share a focus on understanding living systems. Given the rapid pace of scientific discovery, the Life Sciences at Harvard is an exciting place to be. It's easy to be part of the excitement by getting involved in research opportunities, whether through courses or supervised projects in faculty labs. Students may choose between nine Life Sciences concentrations:

- Biomedical Engineering
- Chemical and Physical Biology
- Chemistry
- Cognitive Neuroscience and Evolutionary Psychology, a track in the Psychology concentration
- Human Developmental and Regenerative Biology
- Human Evolutionary Biology
- Integrative Biology
- Molecular and Cellular Biology
- Neurobiology

Life Sciences Education has a variety of advising resources. The Life Sciences Concentration Advisors provide students with advice on courses, concentration planning, and research opportunities. A faculty member called the Head Tutor oversees each concentration.

Additionally, a dedicated Life Sciences Undergraduate Research Advisor (see the last page of this booklet) helps students in all years and concentrations identify research opportunities and funding for life sciences research both at Harvard and outside Harvard. If you are interested in any of the Life Sciences concentrations, we encourage you to speak with at least one of the Advisors or Head Tutors. We look forward to talking with you!

Note to freshmen and their advisors: Pages 2 and 3 are especially important to freshmen. Students do not specialize during their first year, but instead take courses that provide a foundation for all of the Life Sciences concentrations.

For more information about the Life Sciences, please visit www.lifesciences.fas.harvard.edu

Advice for Freshmen

Students interested in concentrating in the Life Sciences are advised to take courses in Life Sciences, chemistry, and mathematics during their freshmen year and should take the corresponding placement exams.

PLACEMENT EXAM INFORMATION

Placement exams for incoming students are found online. All first-year students should have taken the math placement exam during the summer, and any student interested in the life sciences should have taken the biology and chemistry exams. Placement exam results and recommendations may be found on the Advising Network. For more information about the placement exams, see the Freshman Dean's Office website (<http://fdo.fas.harvard.edu/placement-exams>).

COURSE INFORMATION

All Life Sciences concentrations share a common foundation consisting of:

- **Life Sciences 1a (LS 1a) or Life and Physical Sciences A (LPS A) – Fall term**

- Life Sciences 1a (LS 1a) integrates chemical and biological concepts throughout the semester, and applies these concepts to issues of broad interest such as HIV and cancer. The semester culminates in a project in which students propose novel experimental directions for a scientific question of their choice.
- Life and Physical Sciences A (LPS A), which is aimed at students with less high school preparation in science, introduces topics in general chemistry in the first half of the semester, followed by topics in molecular and cellular biology.

- **Life Sciences 1b (LS 1b) – Spring term**

- LS 1b covers topics in genetics, genomics, and evolution. The semester culminates with symposia that draw together scientific and medical experts, patients, and patient advocates, who discuss genetic disorders that students investigated during the course.

This fall, Harvard will launch **Life Sciences 50ab (LS 50ab)**, an optional, alternative freshman life science curriculum offering early involvement in original research and incorporation of relevant concepts from math, physics, chemistry, and computer science. LS 50ab is equivalent to four semester-length courses; it substitutes for LS 1a/LPS A and LS 1b, as well as other requirements, in most life science concentrations. Enrollment is limited to twenty-five students and requires an application due before classes begin. More details and the application are available online at www.ls50.net.

Physical Sciences 1, which is offered in the **spring** term, is a course that treats topics in chemistry and the physical sciences. It is intended for students interested in the life and physical sciences.

Physical Sciences 10 (fall) and **Physical Sciences 11 (spring)** treat topics in chemistry and the physical sciences and are for students with strong placement scores in chemistry and math. Physical Sciences 10 is intended for those interested in concentrating in physical sciences; however, some life science concentrations accept this course for credit.

Students with an exceptionally strong chemistry background may begin with Physical Sciences 10 in the fall followed by Chemistry 20 or Physical Sciences 11 in the spring. Although freshmen may take either the Chem 17/27 organic chemistry sequence, which begins in the fall term, or the Chem 20/30 sequence, which begins in the spring term, Chemistry 20 is designed primarily for freshmen with an interest in Chemistry. Students considering enrolling in organic chemistry as a freshman are strongly encouraged to consult with the Co-Director of Undergraduate Studies in Chemistry, Dr. Gregg Tucci.

Math: Students begin studying mathematics in their first year according to their preparation and placement scores. Life Sciences 50ab fulfills a math requirement for some life science concentrations.

Most of the introductory life sciences, physical sciences, and math courses fulfill general education requirements.

Course Sequence Recommendations For Freshmen Considering the Life Sciences

The following course sequence is appropriate for most students who are interested in the Life Sciences, regardless of concentration. For more specific recommendations, please read the following pages and talk with a Life Sciences Concentration Advisor.

| First Semester | Second Semester |
|--|--|
| Life Sciences 1a or Life and Physical Sciences A (according to placement) or Life Sciences 50ab | Life Sciences 1b or Life Sciences 50ab |
| Math (according to placement) | Physical Sciences 1 or Physical Sciences 11 |

Advice for Sophomores

After the freshman year, students can further explore their interests by taking more specialized courses. If you are uncertain about which Life Sciences concentration you will choose, it is possible to take courses during the sophomore year that will keep your options open. We suggest that you read the course sequence recommendations in this booklet and that you consult with a Life Sciences Advisor or Head Tutor as you select your courses during the sophomore year.

Concentrating on your concentration?

Here we try to dispel some common myths and supply you with some tips for making a good decision.

Myth 1: High levels of stress are justified in the face of concentration selection.

Reality: You can relax. Selecting your concentration *is* a serious decision, and you should do plenty of research and thinking. But panic is not necessary! Keep in mind that (a) you can change your mind later; (b) you really can pursue what you feel passionate about; and (c) success in most careers does not require a specific undergraduate concentration.

Myth 2: I am the only one who hasn't yet planned a specific career path, and this is a good reason to feel nervous.

Reality: First, you are not alone: while they may not advertise it, many students are in the same boat. Second, your "boat" is an exciting place, and there is no need to be nervous! You will have ample time and freedom at Harvard to take risks, to learn about yourself and the world around you, and to adjust your goals. You can experiment with internships, electives, research and extracurricular activities to explore careers. Choose a concentration that you will enjoy, while realizing that regardless of your choice you will have unlimited career opportunities and options after you graduate.

Myth 3: A Life Sciences concentration is not good preparation for Wall Street/K Street/Madison Avenue.

Reality: Your undergraduate concentration does not dictate your career opportunities. Employers tend to place less emphasis on undergraduate majors and more on a candidate's skill set. Useful and desirable skills, such as the ability to learn quickly, think critically, solve complex problems, write and speak clearly and persuasively, or analyze information, are absolutely central to the Life Sciences.

Myth 4: If I want to go to medical school, I should choose a particular Life Sciences concentration.

Reality: All of the Life Science concentrations allow you to fulfill your pre-med course requirements while leaving significant room for electives and Gen Ed requirements. You may be surprised to learn that when it comes to medical school admissions, no concentration – either within the Life Sciences or outside of science altogether – will give you an advantage. The Office of Career Services' publication, "Medical School Admissions Data," contains information about admissions rates according to undergraduate concentration, as well as other helpful information for pre-med students.

Myth 5: (a) I didn't enjoy an introductory course in X, so won't enjoy being in concentration X. (b) I loved an introductory course in Y, so concentration Y is the one for me.

Reality: Introductory courses may not be the best or only way to get a feel for the courses in a given concentration. They should provide insight into the types of questions being asked and approaches to finding answers, and you may discover whether you feel drawn to and excited by these issues and modes of analysis. But remember that many of your concentration courses will be upper-level — smaller and more focused — and they may be significantly different in teaching style, the level of student participation, and the material covered. To get a better idea of classes in a given concentration, talk with upperclass concentrators, professors and advisors, and consult the course catalog.

Myth 6: I will not change my mind about my academic interests and career plans.

Reality: We hope that when you graduate from Harvard, you will have changed significantly from the time you entered! Many students change their minds at least once about their concentration, and most people change careers several times. Within the Life Sciences, changing concentrations is relatively easy, because all the concentrations require similar foundation courses. However, if you're not certain about your concentration choice, make sure you discuss with the appropriate advisors the steps you would need to take in order to switch concentrations after the initial declaration deadline during your Sophomore fall.

Tips for choosing a concentration

1. Familiarize yourself with the Life Sciences concentrations.

In addition to reading this booklet, consult department websites and the Courses of Instruction to gain an understanding of each concentration, even if you are fairly certain of what your decision will be. You may come across a research question or class description that unexpectedly sparks your interest. While the Life Sciences concentrations share broad intellectual goals and foundation courses, they vary in important ways, such as the specific intellectual focus, the type of required courses, and honors requirements.

2. Reflect on your interests and talents.

Make a list of topics that you find interesting and exciting: situations that compel you to discover more; assignments that have energized you; classes you've loved; types of books/magazines you like to read, and how you spend your leisure time. Consider your talents. What comes easily to you? In what areas do you perform significantly above average? What do you struggle with?

What are the common threads? Which concentration(s) best reflect these? Bring this list with you to advising discussions.

3. Consider whether you want to do research and how the opportunities vary by concentration.

What are your goals for conducting research? Be sure to speak with students who are engaged in research that you find interesting, and find out how they got started. Does one concentration offer more of the kinds of research opportunities in which you're interested? If you're interested in research, but are unsure of where to start, schedule an appointment with Margaret Lynch, the Life Sciences Undergraduate Research advisor. (See the last page of this booklet.)

4. Ask questions — of yourself, fellow students, faculty, family and others.

Ask upperclass concentrators in the fields you are considering about their impressions on classes, research, flexibility, and requirements. Talk with older college graduates about their undergraduate majors and careers, consult family and friends of family, and, at Harvard, speak with teachers, researchers, administrators, advisors and alumni. What were their interests as an undergraduate? What are they doing for work? How is their career related to their undergraduate major? What advice do they have for you?

5. Take advantages of the resources available to you at Harvard.

Attend advising events, speak with advisors (Freshman/Sophomore and concentration), your Resident Dean, and professors in the concentrations in which you're interested. **Be sure to meet with the advisor(s) in the concentration(s) in which you find yourself most interested, earlier rather than later in the process** (i.e., by the end of your Freshman year). Don't worry if you have absolutely no idea of what your academic focus should be! The Life Science advisors are happy to meet with you to discuss your interests and help you make the best choice. The more we know about you, and the more research you've done ahead of time, the better we can help you to make the most appropriate choice.

Come and talk to any of the Life Sciences advisors if you'd like more help with your decision!

Biomedical Engineering

The Biomedical Engineering concentration lies at the intersection of the engineering school and the life sciences cluster. The mission for this concentration can be summarized as follows:

In recognition of the pivotal importance of the life sciences and the technologies they inspire to our society, Harvard is committed to broadly educating engineers who will become leaders in the developing field of Biomedical Engineering. The objectives of this concentration include providing students a solid foundation in engineering, particularly as applied to the life sciences, within the setting of a liberal arts education. The concentration is flexibly structured for a diversity of educational and professional objectives. It enables the acquisition of a broad range of skills and attitudes drawn from the humanities, social sciences and sciences, in addition to engineering, which enhance engineering knowledge and which will contribute to future leadership and technical success.

Biomedical engineering lies at the intersection of the physical and life sciences, incorporating principles from physics and chemistry to understand the operation of living systems. As in other engineering fields, the approach is highly quantitative: mathematical analysis and modeling are used to capture the function of systems from subcellular to organism scales. An education in Biomedical Engineering enables students to translate abstract hypothesis and scientific knowledge into working systems (e.g., prosthetic devices, imaging systems, and biopharmaceuticals). This enables one to both test the understanding of basic principles and to further this knowledge, and it places this understanding in the broader context of societal needs. This new concentration complements the scientific goals of knowledge discovery embodied in the other life science concentrations.

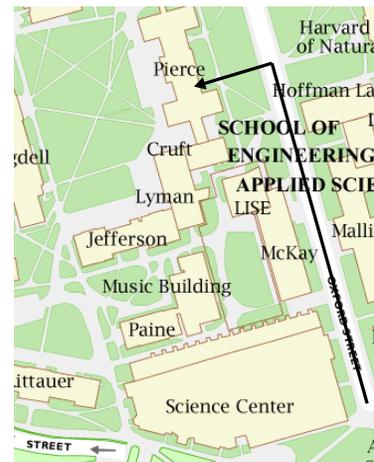
Contact Information and Advising:

Director of Undergraduate Studies: Professor David Mooney

Assistant Director of Undergraduate Studies / Concentration Advisor:

Dr. Sujata K. Bhatia (sbhatia@seas.harvard.edu)

Office: Pierce Hall 206C



Course Sequence Recommendations For Students Considering the Biomedical Engineering Concentration

Below is a suggested path through the first two years, although there are many possible pathways through the degree.

| First Semester | Second Semester | Third Semester | Fourth Semester |
|--|-------------------------------|--|--|
| Life Sciences 1a or Life and Physical Sciences A | Life Sciences 1b | Physical Sciences 2 or Physical Sciences 12a or AP 50a | Physical Sciences 3 or Physical Sciences 12b or AP 50b |
| Math (according to math placement) | Math (according to placement) | ES 53 | |

- Freshmen should enroll in Life Sciences 1a or LPS A (fall semester, according to placement) and Life Sciences 1b (spring semester).
- In their first two years, students enroll in mathematics courses according to their preparation and placement scores. Concentrators in Biomedical Engineering must complete either Math 21a and 21b, Math 23a and 23b, or Applied Math 21a and 21b.
- During the sophomore year, students ordinarily enroll in ES 53 (Quantitative Physiology as a Basis for Bioengineering). Students subsequently enroll in four additional courses in engineering sciences: BE 110; ES 123; one of the following: ES 181, ES 164, or MCB 199; and one of the following: BE 91r, BE 121, BE 125, BE 191, ES 221, or ES 227; as well as one approved elective.
- Students must also complete two semesters of physics, one semester of statistics, and one semester of organic chemistry.

Students interested in attending medical school can complete the following premedical requirements with the biomedical engineering concentration:

- General chemistry with a lab (one year): Life Sciences 1a/LPS A and ES 181
- Biology with a lab (one year): Life Sciences 1b and ES 53
- Organic chemistry with a lab (one year): Chem 17 and Chem 27
- General physics with a lab (one year): Physical Sciences 2 and 3

If you have any questions about Biomedical Engineering, please contact the Director of Undergraduate Studies or a Concentration Advisor.

Chemical and Physical Biology

The CPB concentration emphasizes a quantitative approach to the life sciences that involves using tools, approaches and methodologies from mathematics, chemistry, and physics to study biology. It is ideally suited for students who are interested in applying the knowledge they gain from in higher-level coursework work in mathematics, chemistry, and physics to current research in the Life Sciences.

Harvard has tremendous strength in biology, chemistry, and the physical sciences, with renowned teachers and researchers in each of these areas. Students are taught by leading experts in these disciplines and are encouraged to get involved in faculty laboratories. Harvard fosters interdisciplinary research through the departments on the Cambridge and Medical School campuses, as well as through the affiliated Centers (such as the Center for Systems Biology, the Center for Brain Science, and the Harvard Stem Cell Institute). Most CPB concentrators choose to write a senior thesis, and the concentration provides strong support for thesis writers to make it an enriching experience.

Most CPB graduates pursue careers in research. Others have applied their quantitative training and critical thinking skills to pursue careers and further education in fields including business/finance, computer programming, education, engineering, law, and medicine.

Tutorial: Shortly after declaring the concentration, students are assigned a tutor from the Board of Tutors in Biochemical Sciences. Concentrators typically meet with their tutor every two weeks to discuss primary research literature in a small group or one-on-one setting. Mentoring on career choices, the research experience, and other academic issues is a logical extension of the tutorial. The tutorial is not taken for credit and therefore does not appear on the study card or transcript.

Contact Information and Advising:

Co-Head Tutors: *Professor Adam Cohen*
 Professor Rachelle Gaudet

Concentration Advisor/ Assistant Director of Undergraduate Studies: *Dr. Martin Samuels*
email: msamuels@fas.harvard.edu

Map to the CPB Concentration Office:

Marty is available to provide pre-concentrators guidance on course selection, laboratory research, and fulfilling concentration requirements. Visit the Life Sciences webpage (lifesciences.fas.harvard.edu) and click on the “advising” tab for advising hours, or call (617) 495-4106 to set up an appointment.

More information about CPB concentration can be found at lifesciences.fas.harvard.edu.



Course Sequence Recommendations

For Students Considering the Chemical and Physical Biology Concentration

Ordinarily, students should plan on enrolling in two science courses per semester in the freshman and sophomore years as follows:

| First Semester | Second Semester | Third Semester | Fourth Semester |
|---|---|----------------|------------------|
| Life Sciences 1a or Life and Physical Sciences A or LS 50ab | Life Sciences 1b or Life Sciences 50ab | MCB 60 | MCB 64, 65 or 68 |
| Math (according to math placement*) | Physical Sciences 1 or Physical Sciences 11 | Chem 17 | Chem 27 |

- Freshmen should enroll in LS 1a or LPS A (fall semester, according to placement) and Life Sciences 1b (spring semester) as well as math. Alternatively, LS 50ab will fulfill the LS 1a, LS 1b, Math 19a, and research course requirement.
- Ordinarily, freshmen take Physical Sciences 1 or Physical Sciences 11 in the spring semester; however, students with an exceptionally strong chemistry background may instead begin with Physical Sciences 10 in the fall semester or organic chemistry (Chem 20) in the spring semester. Freshmen considering enrolling in organic chemistry should read the section regarding chemistry on page 2 of this booklet and consult with Martin Samuels, Assistant Director of Undergraduate Studies in CPB, or Gregg Tucci, Co-Director of Undergraduate Studies in Chemistry.
- In the third semester, students ordinarily enroll in organic chemistry (Chem 17). Students with an exceptionally strong chemistry background who took Chem 20 in the spring of their first year typically enroll in Chem 30 in their third semester.
- In the third semester, most MCB concentrators take MCB 60, which provides an integrated introduction to molecular, cellular and developmental biology with an emphasis on biological mechanisms and their frequent connections to medicine.
- In the fourth semester, many MCB concentrators take a second intermediate course, chosen from MCB 64 (The Cell Biology of Human Life in the World), MCB 65 (Physical Biochemistry), or MCB 68 (Cell Biology Through the Microscope). MCB 63 (Biochemistry and Molecular Medicine), a fall course, is another option. MCB 63, 64, 65 and 68 do not require MCB 60 as a prerequisite.
- * In their first two years, students enroll in mathematics courses according to their preparation and placement scores. Concentrators in Chemical and Physical Biology must complete either Math 19a and 19b, Math 21a and 21b, or Applied Math 21a and 21b. Math 1b (Calculus) or the equivalent is required for each of these courses.

This suggested course sequence also fulfills requirements for students who decide to concentrate in Chemistry, Human Developmental and Regenerative Biology, Molecular and Cellular Biology, Neurobiology, or Integrative Biology.

Freshmen interested in studying the Life Sciences should take the online Biology and Chemistry placement exams. If you have any additional questions about the Life Sciences, please contact a Concentration Advisor.

Chemistry

Chemistry is both a basic science, fundamental to an understanding of the world we live in, and a practical science with an enormous number and variety of important applications. Knowledge of chemistry is fundamental to an understanding of biology and biochemistry and of certain aspects of materials science/nanotechnology, astronomy, physics, and engineering. Students concentrating in Chemistry can do research in Chemistry laboratories as well as in laboratories in Physics, Engineering Sciences, MCB, Harvard Medical School and the Broad Institute. Because of the diverse interests of prospective chemistry concentrators, the Department of Chemistry and Chemical Biology has a very flexible set of requirements that allows each student to select an area of emphasis.

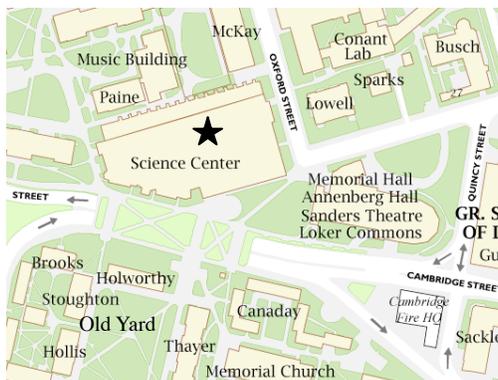
Previous students who earned a degree in Chemistry continued on to Ph.D. programs in Chemistry, Chemical Biology, and Chemical Engineering as well as to professional programs in Law, Business, and Medicine. Several students each year also begin careers in industrial research (biotechnology, pharmaceutical), government, consulting, and finance.

Contact Information and Advising:

Co-Director of Undergraduate Studies: Dr. Gregg Tucci (tucci@fas.harvard.edu)

Dr. Tucci is available to provide pre-concentrators guidance on course selection, laboratory research, and fulfilling concentration requirements. Students should feel free to email him at tucci@fas.harvard.edu to set up a time to meet. More information about the Chemistry concentration can be found at: lifesciences.fas.harvard.edu

Map to Dr. Tucci's Office, Science Center Room 114



Course Sequence Recommendations For Students Considering the Chemistry Concentration

Ordinarily, students should plan on enrolling in two sciences courses per semester in the freshman and sophomore years as follows:

| First Semester | Second Semester | Third Semester | Fourth Semester |
|--|---|----------------------|------------------------|
| Physical Sciences 10, Life Sciences 1a, LPS A or LS 50ab | Physical Sciences 1, Physical Sciences 11, or Chem 20 | Chem 17 or 30 | Chem 27 |
| Math (according to math placement *) | Life Science 1b, LS 50ab or Math 19a | MCB 60 or Physics | Chem 135 or CCB 100 |

- Freshmen should enroll in Physical Sciences 10, Life Sciences 1a or LPS A (fall semester, according to placement scores) and Physical Sciences 1, Physical Sciences 11, or Chemistry 20 (spring semester) as well as math (according to preparation and placement scores). Students completing LS 50ab will fulfill requirements for LS1a, LS1b, Math 19a and Chem 91r.
- In the third semester, students ordinarily enroll in organic chemistry (Chem 17 or Chem 30).

* In their first two years, students enroll in mathematics courses according to their preparation and placement scores. Students should try to complete Math 21a by the end of their sophomore year.

A student creating a carefully chosen program of study can simultaneously keep concentration options in Chemistry, Chemical & Physical Biology, Molecular & Cellular Biology and Chemistry & Physics. To do this, it is highly recommended that a student seek individualized advice in the departments of interest.

Freshmen interested in studying the Life Sciences should take the online Biology and Chemistry placement exams. If you have any additional questions about the Life Sciences, please contact a Concentration Advisor.

Cognitive Neuroscience & Evolutionary Psychology

(a track within Psychology, formerly *Social and Cognitive Neuroscience*)

Psychology is the scientific study of the mind. Observing, experimenting, and analyzing human and other minds is our focus. How we do this varies greatly. We can, of course, look at the brain itself to understand the mind and we increasingly do so. But the measure of behavior is our primary method to understand the mind. The kinds of questions psychologists attempt to answer are: How do we perceive the physical world? How do we make sense of the social world? Can we really understand the minds of others? Do the groups others belong to matter? How do memories form and how do we forget? What are the rules by which we reason and think? How much of our behavior is influenced by conscious mental processes? What's the role of emotion as expressed in the joy, surprise, sadness, anger and fear of everyday life as well as in depression, schizophrenia, and other disorders? What are the causes of these kinds of disorders, and how can they be treated? How do all these processes develop from infancy to adulthood, including the ability for language? To answer these and other questions about the mind, psychologists pay attention to evolutionary factors, the biological bases of behavior, cultural and social inputs, as well as the day-to-day situations in which individuals find themselves.

Cognitive Neuroscience & Evolutionary Psychology is one of the specialized tracks within the Psychology concentration and part of the Life Sciences cluster of concentration options (a General psychology track and an MBB track are also available). As such, it is one of the major paths toward bridging the Social and Life Sciences at Harvard. The track reflects the increasingly interdisciplinary nature of learning and research in psychology, emphasizing integration across the subdisciplines within psychology (social psychology, cognitive psychology, developmental psychology, abnormal psychology) as well as connections between psychology and the other Life Sciences. Students in this track have the opportunity to study the interplay between traditional interests in psychology such as vision, memory, language, emotion, intergroup relations, and psychological disorders, and recent developments in neuroscience and evolutionary science.

To support this learning, the track provides a strong foundation of knowledge in psychology and the Life Sciences, as well as analytical and quantitative skills scientists in these areas employ. A thesis option is available for students with strong interests in the research component of the program and requires both the advanced research methods course and a laboratory course. Students who are considering writing a thesis are strongly encouraged to get involved in a research laboratory as early as possible.

Contact Information and Advising:

Head Tutor: Professor Jill Hooley

Undergraduate Office: William James Hall, room 218; psychology@wjh.harvard.edu. Open office hours are available in the Undergraduate Office and are posted on the Undergraduate Program website: <http://undergrad.psychology.fas.harvard.edu/pre-concentrators>

Psychology Undergraduate Website for more information: <http://undergrad.psychology.fas.harvard.edu/home>

Research Adviser: Danielle Truxaw (truxaw@fas.harvard.edu) Danielle is available to answer questions about laboratory research opportunities and theses. Email Danielle for an appointment.

Program Coordinator: Melissa Dias (meslissadias@wjh.harvard.edu) Melissa is available for questions regarding fulfilling concentration requirements. Email Melissa for an appointment.

Advising Administrator: Laura Chivers (lchivers@wjh.harvard.edu) Laura is available to answer questions regarding laboratory research opportunities for Life Science concentrators. Email Laura for an appointment.

House Concentration Advisers: Students can meet with the adviser in their house about requirements and course selection (list available at <http://undergrad.psychology.fas.harvard.edu/advisers>).

Course Sequence Recommendations For Students Considering the Cognitive Neuroscience and Evolutionary Psychology Track (CN&EP)

Students who are considering the CN&EP track should plan on enrolling in the following:

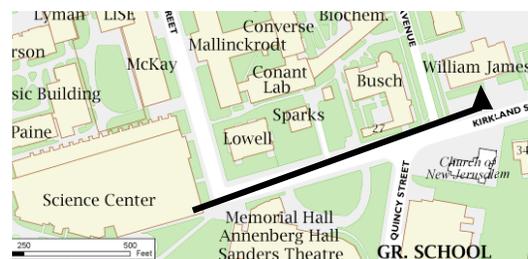
| First Semester | Second Semester | Third Semester | Fourth Semester |
|---|-----------------|---|-----------------|
| Science of Living Systems 20 (fall or spring) | | Psychology 975 (fall or spring) | |
| <i>Choose one of:</i> Fall: LPS A or Life Sciences 1a or LS 50ab Spring: Life Sciences 1b or LS 50ab | | Basic Methods (fall or spring) -choose from Stat 101 or Psychology 1900- | |
| At least one of these courses during first two years: Psychology 14, Psychology 15, Psychology 18, MCB 80, or Science of Living Systems 15. | | | |

- Freshmen should enroll in one of: Life Sciences 1a or Life and Physical Sciences A (in fall, depending on placement), Life Sciences 1b in spring, or LS 50ab in both. Students in CN&EP are *required* to take *one* of these courses, but may count more than one toward concentration requirements, and should take both if considering other Life Science concentrations.
- Freshmen should take SLS 20, Psychological Science, which is offered in fall and spring. Students with a score of 5 on the Psychology AP exam have met the SLS 20 prerequisite and may begin in Foundational Courses.
- Students should try to complete one Foundational Course no later than the end of the sophomore year if possible, and Freshmen are permitted to take Foundational Courses if they have completed SLS 20 or Psych AP=5. Students may choose from the following Foundational Courses: Psy 14, Cognitive Neuroscience; Psy 15, Social Psychology; Psy 18, Abnormal Psychology; MCB 80, Neurobiology of Behavior; or SLS 15, Developmental Psychology: Origins of Knowledge. MCB 80 OR Psy 14 and one other Foundational Course are required courses.
- In the third or fourth semester, students ordinarily enroll in Psy 975 (Sophomore Tutorial) and the required Basic Methods course (either Psy 1900 or Stat 101).

Students who are choosing between several life science concentrations or are pre-med are advised to take the following sequence of courses:

| First Semester | Second Semester | Third Semester | Fourth Semester |
|---|------------------|---|-----------------|
| Science of Living Systems 20 (fall or spring) | | Psychology 975 (fall or spring) | |
| LS 1a or LPS A or LS 50ab | LS 1b or LS 50ab | Basic Methods (fall or spring) -choose from Stat 101 or Psychology 1900- | |
| Math (according to math placement) | PS 1 | Chem 17 | Chem 27 |

Directions to William James Hall: From the Science Center, walk across the intersection of Oxford Street and Kirkland Street and continue to the right along Kirkland Street. William James Hall is at 33 Kirkland St, and is the 15-story, white building on the left just beyond Annenberg/Memorial Hall. Take the elevators to the 2nd floor and turn right for the Undergraduate Office, room 218.



Human Developmental and Regenerative Biology

Human Developmental and Regenerative Biology (HDRB) is a life science concentration that educates students on how human beings develop from a fertilized egg, are maintained and repaired throughout adulthood, and age till life's end. Students will be given a broad education in modern life sciences by studying important biological principles within the specific rubric of the developing and regenerating body. By adding an explicit and heavy emphasis on hands-on research opportunities in all four undergraduate years, HDRB will engage students with an interest in research and take advantage of Harvard's special strengths as a teaching college and research university.

To the extent that “translational” or “applied” research focuses on the application of discoveries made in model systems to humans, the HDRB concentration will embrace the opposite approach. Its emphasis will be on rigorous basic science with a focus on what the study of humans reveals about fundamental biology and reciprocally, what a greater understanding of biology teaches us about ourselves. We believe that a fundamental understanding of how the human organism develops and maintains itself requires foundational knowledge in life sciences, chemistry, and physical sciences, which are in turn dependent on a fundamental knowledge of mathematics. The requirements for the concentration reflect this view.

The framework of the concentration takes advantage of faculty strength in both the Faculty of Arts and Sciences, and Harvard Medical School. HDRB concentrators will focus on human biology with significant emphasis on hands-on research. The curriculum provides a range of courses that will benefit students interested in medicine and biomedical research, as well as other fields in which a comprehensive understanding of human biology is needed.

Contact Information and Advising:

Co-Head Tutors: *Professor Kevin Eggan* (hdrb_conc@lsdiv.harvard.edu)
 Professor Doug Melton (hdrb_conc@lsdiv.harvard.edu)

Concentration Advisor: *Dr. Bill Anderson* (wanders@fas.harvard.edu)

Dr. Anderson is available to provide pre-concentrators with guidance on course selection, laboratory research, and fulfilling concentration requirements. Please visit the Life Sciences webpage (lifesciences.fas.harvard.edu) and click on the “advising” tab to see Dr. Anderson’s advising hours, or e-mail him to set up an appointment.

More information on the Human Developmental and Regenerative Biology concentration can be found at: lifesciences.fas.harvard.edu

Course Sequence Recommendations For Students Considering the Human Developmental and Regenerative Biology Concentration

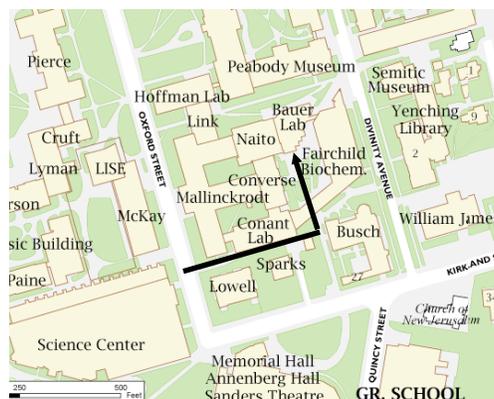
Ordinarily, students should plan on enrolling in two science courses per semester in the freshman and sophomore years as follows:

| First Semester | Second Semester | Third Semester | Fourth Semester |
|---|---|----------------|----------------------|
| Life Sciences 1a or LPS A or Life Sciences 50ab | Life Sciences 1b or Life Sciences 50ab | SCRB 10 | SCRB 20 or Elective‡ |
| Math (according to math placement)† | Physical Sciences 1 or Physical Sciences 11 | Chem 17 | Chem 27 |

- Freshmen should enroll in Life Sciences 1a or Life and Physical Sciences A (fall semester according to placement) and Life Sciences 1b (spring semester), as well as Math (according to preparation and placement scores). Alternatively, students may take LS 50ab in fall and spring.
 - Ordinarily, freshmen take Physical Sciences 1 (PS 1) or PS 11 in the spring semester; however, students with an exceptionally strong chemistry background may instead begin with organic chemistry, and may take either the Chem 17/27 sequence (which begins in the fall term) or the Chem 20/30 sequence (which begins in the spring term). Students considering beginning with organic chemistry are strongly encouraged to consult with the HDRB Concentration Advisor and/or with the Co-Director of Undergraduate Studies in Chemistry, Dr. Gregg Tucci.
 - In the third semester, students ordinarily enroll in human developmental and regenerative biology (SCRB 10) and organic chemistry (Chem 17). Students with an exceptionally strong chemistry background who took Chem 20 in the spring of their first year typically enroll in SCRB 10 and Chem 30 in their third semester.
- † HDRB concentrators must complete one half course in math at the level of Math 1b (calculus) or above.
- ‡ Students have no rigid course requirements to be taken in the fourth semester. This elective space can be used for SCRB 20, HDRB concentration elective requirements or General Education requirements.

Freshmen interested in studying the Life Sciences should take the online Biology and Chemistry placement exams. If you have any additional questions about the Life Sciences, please contact a Concentration Advisor.

Directions to Bill Anderson's office – Bauer Laboratory, Room 204: Enter through the Fairchild /Bauer courtyard entrance (see map) via revolving doors. Go up two floors using glass-enclosed staircase ahead on the right. Turn right at the top of the stairs and you will see Dr. Anderson's office ahead of you.



Human Evolutionary Biology (HEB)

Overview: Evolutionary theory is a pillar of modern science and provides a powerful framework for investigating questions about why humans are the way they are. Human evolutionary biologists seek to understand how evolutionary forces have shaped our design, our physiology, and our patterns of behavior. Research in human evolutionary biology profoundly influences medical science and the practice of medicine, and also impacts economics, psychology, political science, religion and literature.

Examples of questions in which we are interested:

- Why do humans walk upright?
- Are humans adapted to eating cooked food?
- How do biology and environment interact to affect the timing of puberty?
- Why do human males invest in their offspring?
- Are culture and language uniquely human?
- What are the genetic bases for uniquely human traits?
- When, where, how and why did *Homo sapiens* evolve?
- What has been the impact of environmental change on our human ancestors?

Research: This is an exciting time to tackle questions of how evolution made us human, and research in HEB provides you the opportunity to learn and contribute. HEB faculty lead projects spanning a spectrum of interests and methods, ranging from research in the high-tech labs in the Peabody Museum, to field-based research in the rainforests of Western Uganda, to work requiring sample collection in the field and analysis in the lab. Our faculty work closely with undergraduates on research projects of all kinds, for senior theses, research seminars and tutorial classes. Examples of research opportunities in HEB include:

- human and primate nutrition
- reproductive and behavioral endocrinology
- dental histology
- evolutionary genetics and phylogenetics
- human anatomy
- primatology
- paleoanthropology
- human behavioral ecology

Options: HEB provides a general foundation in human and organismic biology as part of the Life Sciences cluster of concentrations. Students interested in addressing questions about human and non-human primate cognition from the perspective of human evolutionary biology may pursue a Mind/Brain/Behavior track.

We offer students three options: the basic non-honors degree, thesis honors, and non-thesis honors. All students take the LS 1a/LPS A, LS 1b sequence (or LS 50ab), a sophomore tutorial, and a junior research seminar.

Contact Information and Advising:

Assistant Director of Undergraduate Studies/Advisor: Dr. Carole Hooven (hooven@fas.harvard.edu)

Associate Concentration Advisor: Dr. Brenda Frazier (bfrazier@fas.harvard.edu)

Head Tutor: Professor David Pilbeam (pilbeam@fas.harvard.edu)

Course Sequence Recommendations For Students Considering the Human Evolutionary Biology Concentration

Students should aim to complete either the LS 1a/LPS A and LS 1b sequence or LS 50ab in the Freshman year. Concentrators are required to complete the Sophomore Tutorial in HEB, usually taken during Sophomore Spring. In the Junior year, students take a Junior Research Seminar that aligns with their interests (see [website](#) for course listings).

Required Courses:

| Fall Semester Freshman | Spring Semester Freshman | Spring Semester Sophomore | Junior Year |
|---|--|------------------------------|------------------|
| LS 1a or LPS A, Or first semester of LS 50ab | LS 1b, Or second semester of LS 50ab | Sophomore tutorial | Research Seminar |

Along with the above required courses, students must take nine additional courses. Five of these courses must be HEB courses (see note below), and the remaining four are approved courses in either HEB or related fields, such as Math/Statistics, Physical Sciences, Organic Chemistry, Anthropology, Psychology, Organismic & Evolutionary Biology, Molecular & Cellular Biology, etc. See the HEB website (below) for more detailed information on qualifying courses.

*Note: three of the HEB courses must fulfill distribution requirements for Evolution, Anatomy/Physiology, and Behavior. Qualifying courses can be found on the HEB website.

Freshmen should take the online Biology and Chemistry placement exams for placement recommendations.

See the HEB section of the Life Sciences website for more information:

<http://lifesciences.fas.harvard.edu/heb>

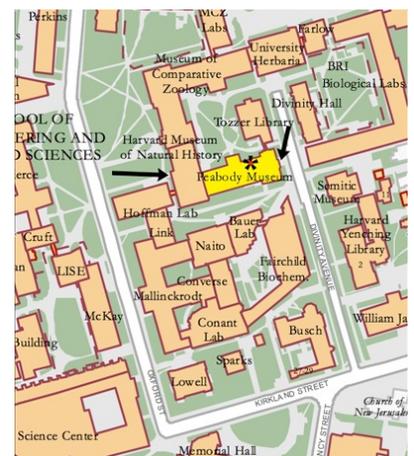
Directions to the HEB advisor's office.

To Dr. Carole Hooven's office, Room 52-F:

- If you enter from Oxford Street elevator, take a left down the hall, and then another left through an open doorway. Room 52-F is down the hallway, through the lounge on your left.
- If you enter from Divinity Avenue, turn left out of the elevator, and left again. Room 52-F will be on the other side of the main lounge, on the right.

To Dr. Brenda Frazier's Office, Room 56-G:

- If you enter from Oxford Street elevator, take a left down the hall, and then another left through an open doorway. Room 56-G is located down the hallway, inside the office marked "56 B-G, Reproductive Ecology." Brenda's name is on the door.
- If you enter from Divinity Avenue, turn left out of the elevator, and left again. Go past the common area and down a long hallway. Room 56-G is located inside the office marked "56 B-G, Reproductive Ecology." Brenda's name is on the door.



Integrative Biology

In Fall 2014, the Organismic & Evolutionary Biology concentration (OEB) changed its name to Integrative Biology (IB). Courses, however, are still listed as OEB, because the Department's name is not changing. The reason for the concentration name change is simple: we feel that IB is a better description of what we do, and of what students in the concentration do.

IB takes as its guiding principle the maxim that "nothing makes sense in biology except in the light of evolution." Evolution is the strand that ties together all of biology: from the adaptive specifics of a membrane pore to grand events in the history of life, such as the Cambrian Explosion, when, 540 million years ago, life went in a single bound from simple to complex. IB therefore is inherently interdisciplinary, encompassing mathematical and computational biology, functional and genetic approaches to morphology and development, as well as genetics, evolution, and ecology.

IB asks questions about the function, evolution, and interaction of organisms, both now and in the past. What kinds of organisms are there and how are they related? How is an organism's functional design and behavior related to its environment? What are the genetic and developmental mechanisms underlying an organism's morphology, or how is evolution influenced by development and vice versa? The study of IB can be approached in many ways, reflecting primary interest in specific groups (e.g., plants, animals, micro-organisms); in a particular level of organization (e.g., ecological systems, evolutionary genetics); in an approach (e.g., biomechanics, developmental biology); or even in a desire to sample broadly across many topics.

From the firm foundation of a series of introductory courses, students explore one or more areas in depth by taking upper-level courses. Students are encouraged to choose their own pathway through the concentration. Some "designated pathways" (i.e., recommended combinations of mid-level and upper-level courses) for perennially popular areas are:

- Plant Sciences
- Marine Biology & Biological Oceanography
- Vertebrate anatomy & physiology
- Mathematical & Computational Biology
- Evolutionary Genetics

For many students, the concentration will culminate in independent research leading to a senior thesis, but a thesis is not the only means by which a student may participate in research. In particular, the concentration provides opportunities for students to study biological diversity in the field. Over recent Spring Breaks, for example, these OEB courses took students to the field:

- OEB 51 (Biology and Evolution of Invertebrate Animals): Panama
- OEB 167 (Herpetology): Costa Rica
- OEB 190 (Biology & Diversity of Birds): Panama

Contact Information and Advising:

Head Tutor: Professor Gonzalo Giribet (ggiribet@oeb.harvard.edu)

Concentration Advisor/ Assistant Head Tutor: Dr. Andrew Berry (berry@oeb.harvard.edu)

Dr. Berry is available to provide pre-concentrators guidance on course selection, laboratory and field research, and fulfilling concentration requirements. Students should email for an appointment. More information about the IB concentration can be found at lifesciences.fas.harvard.edu.

Course Sequence Recommendations For Students Considering the Integrative Biology Concentration

IB recommends that students have completed Life Sciences 1a (or Life & Physical Sciences A), Life Sciences 1b, and OEB 10 by the end of their Sophomore year. Ordinarily, students enroll in two science courses per semester. A typical sequence looks like this, but many permutations are possible.

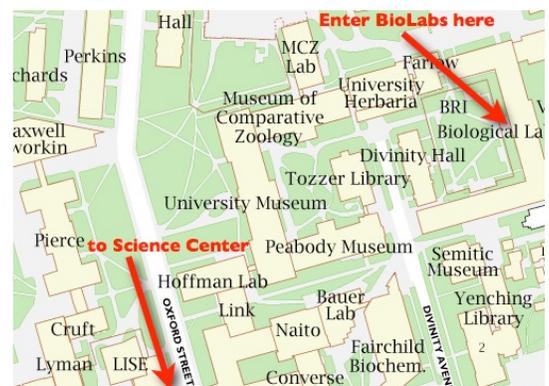
| First Semester | Second Semester | Third Semester |
|--|---|-----------------------------------|
| Life Sciences 1a or Life & Physical Sciences A or Life Sciences 50ab | Life Sciences 1b or Life Sciences 50ab | OEB 10 |
| Math (according to placement) | Physical Sciences 1 or Physical Sciences 11 | Chem 17 or MCB 60 or OEB 54 or... |

- Freshmen should enroll in Life Sciences 1a or LPS A (fall semester, according to placement) and Life Sciences 1b (spring semester) as well as math (according to preparation and placement scores). Alternatively, they may enroll in Life Sciences 50ab, which IB will provisionally consider equivalent to Life Sciences 1a, Life Sciences 1b, and two 'related field' courses (i.e. courses in math, physics, chemistry, etc.)
- Freshmen usually take Physical Sciences 1 or Physical Sciences 11 in the Spring semester; this is required for more advanced physics and chemistry courses. IB only requires a total of four courses in math (above the level of 1a), physics, chemistry, and statistics. If, however, you are pre-med, you would typically do a full year of Organic Chemistry (usually Chem 17, 27) as a Sophomore.
- OEB 10 is required for IB concentrators and is a pre-requisite for many advanced IB classes.

If you are uncertain about which Life Science concentration you will choose -- Chemistry, Chemical and Physical Biology, Human Evolutionary Biology, Cognitive Neuroscience & Evolutionary Biology, Neurobiology, Molecular & Cellular Biology or IB – it's possible to design a Sophomore year track that keeps your options open, allowing you to switch among concentrations at a later date.

Students considering concentrating in IB are *strongly* encouraged to schedule a meeting with Dr. Berry, the IB pre-concentration advisor.

Directions to Dr. Berry's Office, BioLabs 1082: Enter the BioLabs via the main entrance (aka The Rhinos; see map); turn left down the hallway; first office on your right.



Molecular and Cellular Biology

Molecular and Cellular Biology (MCB) concentrators are interested in understanding the intersection of modern research in cellular biology with medicine and society. MCB is therefore ideally suited for students who wish to study cellular processes at the heart of both normal physiology and molecular medicine. It focuses on fundamental principles of modern biology at the hub of nearly all life science subdisciplines, and integrates many different methodologies ranging from chemistry and genetics to computer science and engineering, as well as fundamental concepts in physics and mathematics.

Through coursework and hands-on research, MCB concentrators have the opportunity to explore many of the central questions in biology and medicine and will acquire an understanding of scientific methods as they explore a wide range of contemporary subjects, including genomics, systems biology, immunology, cancer biology, the microbiome, global health and infectious disease. Students will also have the opportunity to tackle subjects of a more applied nature, such as drug design, personalized medicine and biotechnology. The MCB faculty is dedicated to supporting undergraduate research, and we encourage students to get involved in an MCB faculty lab, in one of the affiliated Centers, or at Harvard Medical School and affiliated institutes. We consider the senior thesis to be a capstone academic experience, and the concentration provides a lot of support to thesis writers to make it an enriching experience.

MCB graduates will be informed citizens who can understand and evaluate the impact of new research discoveries in the life sciences, discoveries that are unfolding at a breathtaking and accelerating pace. They will stand poised to pursue a wide range of careers, including biological and medical research, public and global health, medicine, science policy, law and intellectual property, business, education, and science writing.

Tutorial: Shortly after declaring the concentration, students are assigned a tutor from the Board of Tutors in Biochemical Sciences. Concentrators typically meet with their tutor every two weeks to discuss primary research literature in a small group or one-on-one setting. Mentoring on career choices, the research experience, and other academic issues is a logical extension of the tutorial. The tutorial is not taken for credit and therefore does not appear on the study card or transcript.

Contact Information and Advising:

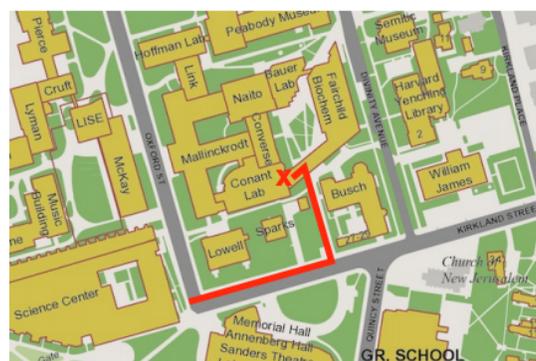
Co-Head Tutors: Professor Vladimir Denic

Concentration Advisor / Assistant Director of Undergraduate Studies: Dr. Martin Samuels

email: msamuels@fas.harvard.edu

Marty is available to provide pre-concentrators guidance on course selection, laboratory research, and fulfilling concentration requirements. Visit the Life Sciences webpage (lifesciences.fas.harvard.edu) and click on the “advising” tab for advising hours, or call (617) 495-4106.

Map to the MCB Concentration Office:



Course Sequence Recommendations For Students Considering Molecular and Cellular Biology

Ordinarily, students should plan on enrolling in two science courses per semester in the freshman and sophomore years as follows:

| First Semester | Second Semester | Third Semester | Fourth Semester |
|---|---|----------------|---------------------------|
| Life Sciences 1a or Life and Physical Sciences A or Life Sciences 50ab | Life Sciences 1b or Life Sciences 50ab | MCB 60 | MCB 64, 65 or 68 |
| Math (according to math placement*) | Physical Sciences 1 or Physical Sciences 11 | Chem 17 | Concentration Elective |

- Freshmen should enroll in Life Sciences 1a or LPS A (fall semester, according to placement) and Life Sciences 1b (spring semester) as well as math (according to preparation and placement scores). Alternatively, LS 50ab will fulfill the LS 1a, LS 1b, Math 19a, and research course requirement.
- Ordinarily, freshmen take Physical Sciences 1 or Physical Sciences 11 in the spring semester; however, students with an exceptionally strong chemistry background may instead begin with organic chemistry. Freshmen considering enrolling in organic chemistry should consult the section regarding Physical Sciences 1 on page 2 of this booklet.
- In the third semester, most MCB concentrators take MCB 60, which provides an integrated introduction to molecular, cellular and developmental biology with an emphasis on biological mechanisms and their frequent connections to medicine.
- In the third semester, students ordinarily enroll in organic chemistry (Chem 17). Students with an exceptionally strong chemistry background who took Chem 20 in the spring of their first year typically enroll in Chem 30 in their third semester.
- In the fourth semester, many MCB concentrators take a second intermediate course, chosen from MCB 64 (The Cell Biology of Human Life in the World), MCB 65 (Physical Biochemistry), or MCB 68 (Cell Biology Through the Microscope). MCB 63 (Biochemistry and Molecular Medicine), a fall course, is another option. MCB 63, 64, 65 and 68 do not require MCB 60 as a prerequisite.
- * MCB concentrators must either complete Mathematics 1b and either Mathematics 19a, Statistics 102 (or 110 or 111), or CS 50. Alternatively, students may demonstrate competency beyond Math 1b by taking Mathematics 19a (or higher) or an approved calculus-based statistics course (such as Statistics 110 or 111).

This suggested course sequence also fulfills requirements for students who decide to concentrate in Chemistry, Human Developmental and Regenerative Biology, Neurobiology, or Organismic and Evolutionary Biology.

Freshmen interested in studying the Life Sciences should take the online Biology and Chemistry placement exams.

Neurobiology

The goal of the Neurobiology concentration is to provide students with a strong foundation in the sciences and a deep understanding of how the nervous system works at the biological level.

Neurobiology students explore phenomena on vastly different scales – from molecules to societies – by studying individual nerve cells, connections and circuitry among neurons, and brain function. The only prerequisite for students concentrating in Neurobiology is an intense curiosity about how the brain works!

The typical curriculum begins with the foundation life science courses (LS1a/LPSA and LS1b) and an introductory course called “Neurobiology of Behavior” (MCB 80), which lays out the body of knowledge in neurobiology. Students then go on to take 3-4 courses on advanced topics in neurobiology, as well as 2-3 courses on related fields (physical, computer, and/or engineering sciences). We also offer a Mind, Brain, and Behavior track that allows students to look beyond the biology of the brain and to study how the brain impacts other disciplines (e.g. anthropology, linguistics, philosophy, and psychology) and vice versa. Additionally, as neuroscience is one of the most vibrant fields of research at Harvard, students will have many opportunities for hands-on laboratory experience and independent research projects during their studies

Contact Information and Advising

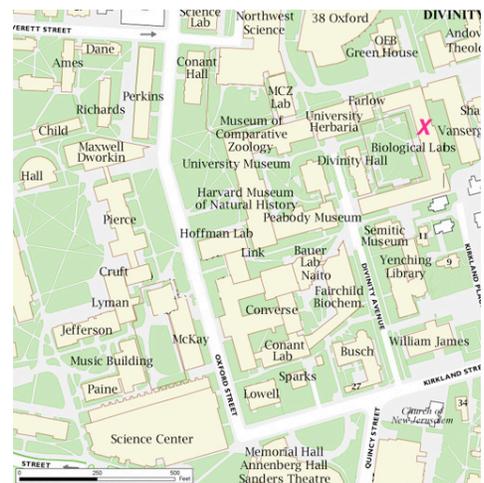
Head Tutor: Professor Venkatesh Murthy

Neurobiology Advisors: Dr. Ryan Draft (draft@fas.harvard.edu)

Dr. Laura Magnotti (magnotti@fas.harvard.edu)

Dr. Draft and Dr. Magnotti are both available to provide pre-concentrators with guidance on course selection, laboratory research, and fulfilling concentration requirements. Students should feel free to email draft@fas.harvard.edu or magnotti@fas.harvard.edu to set up a time to meet. For regular updates, advising hours, appointment sign-ups, and more information about the Neurobiology concentration, please visit lifescience.fas.harvard.edu and click on “Neurobiology.”

Directions to the offices of Dr. Draft and Dr. Magnotti, BioLabs 1082: Our offices are on the first floor of the Biological Labs Building. (See X on the map.) The offices are just inside the main courtyard entrance (in between the rhino statues), across from the sand volleyball court.



Course Sequence Recommendations For Students Considering the Neurobiology Concentration

Neurobiology recommends that students complete LS 1a/LPS A, LS 1b, and MCB 80 by the end of their sophomore year. Ordinarily, students enroll in no more than two science courses per semester.

| First Semester | Second Semester | Third Semester | Fourth Semester |
|---|--|---|--|
| LS 1a or LPS A or LS 50 ab (according to placement; see note #6 below) | LS 1b or LS 50ab | MCB 80 (see note #3 below) | Gateway Course (i.e. OEB 57, MCB 105, MCB 115 or MCB 125 see note #4 below) |
| Math (according to placement – see note #1 below) | Related Field Course (e.g. PS 1 or PS 11 - see note #2 below) | Related Field Course or Intermediate Biology (see note #5 below) | Related Fields Course or Intermediate Biology |

1. Neurobiology students must ultimately complete two math, applied math, and/or statistics courses, one of which must be at the level of Math 1b or higher (*e.g.*, 1b, 19a, 21a, AM 21a).
2. Neurobiology students complete 2-3 courses in ‘Related Field Courses’ (drawn from physics, chemistry, computer science, engineering, math, and other approved courses). These need not be taken in the sophomore year as shown.
3. MCB 80 is a prerequisite for all advanced Neurobiology classes and must be completed prior to enrolling in them (recommended freshman or sophomore year).
4. Neurobiology students must complete one ‘Gateway Course’ (recommended sophomore year). These include OEB 57, MCB 105, MCB 115 and MCB 125.
5. Neurobiology students must complete **one** ‘Intermediate Biology Course’ (LS 2, MCB 60, 63, 64, 65, 68, OEB 53, SCRB 20, or 25).
6. Students completing LS50ab will get credit for the equivalent of LS1a, Ls1b, Math 19a, and one ‘Related Fields’ course.
 - The Neurobiology concentration does not give AP credit. Students with very strong science backgrounds should meet with one of the neurobiology advisors for advice on courses.
 - The Neurobiology concentration does not accept summer school courses except for Chem S-20AB.

First-year students interested in studying the Life Sciences should take the online Biology and Chemistry placement exams. If you have any additional questions about the Life Sciences, please contact a Concentration Advisor.

Life Sciences Research Opportunities for Undergraduates: FAQs

<http://lifesciences.fas.harvard.edu/research>

Where can I do research?

There are over a thousand life science research labs at Harvard. They are located not only at the Cambridge campus (Faculty of Arts & Sciences and School of Engineering and Applied Sciences), but also at the Harvard Medical School, Harvard School of Public Health, and at Harvard-affiliated hospitals and research institutions.

When can I start an independent research project in a laboratory or research group?

Most students dedicate the first semester of their freshman year to getting acclimated to college life, academic courses and extracurricular activities. Some students join a lab the second semester of their freshman year or the summer after freshman year, while many others begin independent research during their sophomore year. Some students may start even later; however, if you intend to complete a senior thesis, plan to join a research group at the latest by the beginning of your junior year.

How can I find a lab research group to join?

Go to the Life Sciences Undergraduate Education Research web pages at <http://lifesciences.fas.harvard.edu/research>. Click on *Harvard-affiliated Labs* to find links to Harvard-affiliated research groups. For personalized advice, the Life Sciences Undergraduate Research Advisor, Dr. Margaret A. Lynch (margaretlynch@fas.harvard.edu) is here to help you define your research interests, find prospective labs, create a science-focused resume, contact faculty, prepare for meetings with professors, and investigate funding opportunities.

Do I need previous experience doing research?

No, you don't need previous experience to join many research labs. Most research groups are willing to train and mentor undergraduates who have no previous lab or field research experience. Over time you will gain the skills and knowledge you need for an independent project. Also, most students acquire basic laboratory skills in the laboratory sections of their science courses, and these help you transition into a research environment.

Can I earn course credit for term-time lab research?

Yes. The requirements for course credit vary among the different Life Sciences concentrations, so it's best to contact a Concentration Advisor for specific details. The contact information for each of the Concentration Advisors are on the Life Sciences Education website in the Concentrations tab.

Can I be paid for doing research during the summer or term time?

Yes, but note that you can't simultaneously get paid and earn course credit for your research. For summer research, there are many sources of funding. To see a list of funding opportunities, go to <http://lifesciences.fas.harvard.edu/research> and select *Research Opportunities*.

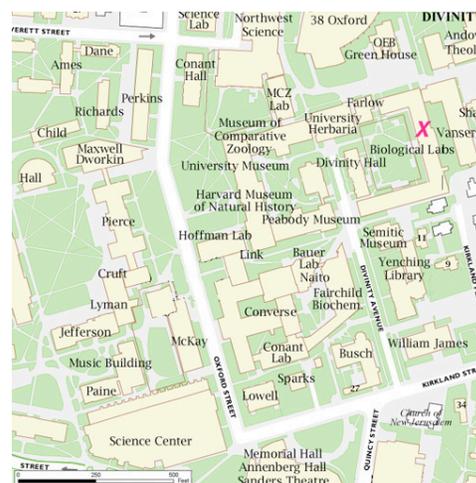
Notable funding sources include the Harvard College Research Program (HCRP) and the Faculty Aide Program. In addition, if you are eligible for the Federal Work-Study Program, you can qualify for term time and summer research funding.

For more information or to make an appointment:

Please contact the Life Sciences Undergraduate Research Advisor, Dr. Margaret A. Lynch at margaretlynch@fas.harvard.edu.

Directions to Dr. Lynch's office in the BioLabs, room 1087: Enter the main entrance of the BioLabs building (See X on the map; it's the door flanked by rhinoceros statues). My office is on the first floor. Turn left after you enter and walk down the hall to room 1087.

Visit the Life Sciences Education Website at: <http://lifesciences.fas.harvard.edu>.



Why did you pick your concentration?

BME

"I chose to concentrate in Biomedical Engineering because I enjoy learning how to design devices and use materials that can improve medical treatments and help people live better lives. I like working in groups, and engineering is all about teamwork. BME is a small concentration, so we all get to know each other really well through late-night problem set sessions and group projects. For someone interested in the intersection of the physical sciences and life sciences, someone who likes teamwork and contributing to new technology, BME is a great choice!" - Jake Weatherly '12

CHEM

"There are two general factors that make a Harvard chemistry undergraduate education truly unique and potentially transformative: having the opportunity for valuable interactions with thought leaders and pioneers of chemistry and having a guide to help you navigate the rich, and perhaps daunting, resources of Harvard Chemistry. In my three years here, I've found the Professors accessible and attentive; all my interactions with chemistry faculty, as a whole, have been influential; this is all in large part a result of excellent mentoring. I've never felt lost in the sea of potential chemistry courses or completely unsure in terms of how to approach a research opportunity." - David Jaramillo, Chemistry '14

"In many ways, chemistry at Harvard is taught like a language rather than a collection of unlinked facts. It is incredibly gratifying to approach a test having memorized very little but be able to puzzle solve your way through all the problems" - Ellie Lin, Chemistry '14

CPB

"I chose CPB because I was interested in studying biology through a molecular, chemical, and physical perspective. The concentration is incredibly versatile and provides a great education in the sciences, grants credit for courses in related fields such as CS and Statistics, and certainly makes it very easy to fulfill premed requirements. The mentoring we receive through the tutorial program is absolutely amazing and gives concentrators additional insight and perspective on their coursework as well as how what they are learning applies to 'the real world.'" - Manjinder Kandola, CPB '14

"CPB provides a foundation in quantitative methods that can be used to approach problems in biology as well as in any other academic discipline, and I view that as one of the greatest advantages of being a CPB concentrator. Since CPB encompasses a wide range of subfields and provides a lot of flexibility in the requirements, I am able to pursue coursework in a variety of topics ranging from neurophysiology to real analysis and tissue engineering. Most of all, the CPB student and faculty network is amazing - my advisors and tutors have been incredibly supportive of my scientific endeavors, and have introduced me to new ways of approaching the intersection of industry, academic research, and global health." - Yvette Leung, CPB '14

HEB

"Through lecture, seminar, and lab-based courses, HEB equips its concentrators with a powerful, evolutionary lens through which to understand humans and their primate relatives. For my senior thesis, I'm conducting lab-based research on how eating processed, rather than raw, uncooked foods increase energy intake and might have allowed for adaptations such as increased brain size. I chose HEB partly because I can participate in research that addresses questions about why humans are designed the way they are." - Gil Weintraub, HEB '10

"I was introduced to HEB through a Freshman Seminar called Testosterone and Human Behavior. I got to see what HEB would be like beyond the introductory Life Sciences classes and realized that it was a flexible concentration that would not only allow me to focus on human biology but would also easily fulfill premed requirements. HEB is a great concentration if you are looking for small classes, supportive advisors, and exciting thesis opportunities." - Meggie Roberts, HEB '10

HDRB

"I chose HDRB for the community. Not only does HDRB have so much to offer students in terms of learning about and participating in cutting edge science and interacting with world-class faculty, but the people in this department really make this concentration outstanding. The faculty members are not only leaders in their field, but truly invested in the students, the advising is phenomenal, and the opportunity to be surrounded by such a bright, engaged, and collaborative group of my peers has certainly shaped my Harvard experience." - Kelsey Natsuhura, HDRB '13

"Our classes report the most recent discoveries in the stem cell world, and the individuals making these discoveries are the ones teaching those classes. And the best part is how the classes are taught. The goal is to teach us how to apply what we've learned in a scientific problem or issue, something crucial to properly prepare students interested in any career. Most importantly, the HDRB advisors and professors are dedicated to bringing concentrators into a real laboratory setting to work on new, cutting edge science." - Theodore Peng, HDRB '13

MCB

"I chose MCB because of its outstanding advising resources, flexible requirements, and exciting course offerings. As an MCB concentrator, I'm able to design my own tutorial through one-on-one paper discussions with a member of the board of tutors. I fulfill upper level requirements with classes from a variety of life sciences departments, and am always welcome in the concentration office for delicious baked goods and great academic, lab, and life advice." - Alicia Smart, MCB '13

"Being an MCB concentrator has been the most fulfilling academic experience I've had at Harvard. MCB gives me the opportunity to explore many facets within the life sciences: the core MCB requirements push me to think critically and understand the material in a new light, and since there is flexibility in the requirements I have the opportunity to apply that knowledge to a plethora of related topics." - Josephine "Josie" Volovetz, MCB '14

NEURO

"I chose to study neurobiology because it perfectly blends my interests in the biological and social sciences. I was fascinated by the workings of the cell, neural networks of learning and memory, and the biology behind human decision making, so I knew I wanted to be in an interdisciplinary field. By concentrating in neurobiology, I have had the chance to explore evolutionary biology, computer science, psychology, math modeling, and philosophy.
- Theresa Tharakan, Neurobiology '14

"To me, the brain is last great unexplored frontier in understanding the human body. I concentrated in neurobiology because it allows me to marvel at the magnificent work that has already been accomplished in the field by great scientists (often my own professors and mentors), while allowing me to quickly jump into a research lab working on cutting edge science as an undergrad. Ranging from molecular biology to bioinformatics, neurobiology is a vast field that allows everyone to comfortably find their own niche and shed light into the unknown."
- Kei Masuda, Neurobiology '15

OEB

"I loved OEB for the flexibility it gave me to explore any and every aspect of biology -- I could pick classes that genuinely interested me without feeling restrained by departmental requirements. OEB classes themselves are phenomenal, and their faculty are incredibly invested in the students and courses they teach - this is evident both in the quality of their teaching and their willingness to mentor students. And, the OEB community is incredible - you are surrounded by peers who love what they do and who are diverse in their interests and talents. Being an OEB concentrator was one of the best decisions I made at Harvard - the faculty, the peers, and the coursework made my academic experience at Harvard wonderful." - Bonnie Wong, OEB '13

"I chose OEB because of the freedom it allowed me. I knew I loved biology, but I've always been interested in a wide variety of subjects, and OEB gave me a lot of options to explore these interests. I also can't say enough about the people within the department: from devoted and invested advisers to passionate professors to fellow undergrads trotting off to all corners of the world for research, the people of OEB made this concentration a wonderful home base." Benjana Guraziu, OEB '13

PSYCH

"The life sciences track in psychology made me realize that there is a great degree of overlap between the biology and psychology. This track allowed me greater range and freedom in my choice of classes, including courses in MCB, statistics, and social psychology. Its interdisciplinary approach helped me see how psychology and the "pure" life sciences interact with each other in the most fascinating ways. I am really glad I made this decision." - Henrietta Afari, Psych '11

"I decided to join the life sciences track of the psychology concentration because it seemed like the best way to combine my main interest in psychology with my more secondary inclination towards biology in order to give me a stronger understanding of human cognition as a whole. I really appreciate that the life science track gives students a good deal of flexibility in choosing both psychology and biology courses that most interest them while still laying the groundwork necessary to get a full picture of how the brain and mind work." - Haven Jones, Psych '15

