

HUMAN BIOLOGY

Courses offered by the Program in Human Biology are listed under the subject code HUMBIO on the Stanford Bulletin's ExploreCourses web site.

The program offers a Bachelor of Arts and a Bachelor of Science in Human Biology, as well as a minor and an honors program.

Mission of the Undergraduate Program in Human Biology

The mission of the undergraduate program in Human Biology is to provide students with an interdisciplinary approach to understanding human beings from biological, behavioral, social, and cultural perspectives. Courses in the major allow students to see connections and parallels with other fields as they learn to formulate and evaluate health, environmental, and other public policy issues that influence human welfare. The program prepares majors to pursue advanced training in professional or graduate programs.

To achieve these goals, all students complete a 30-unit core sequence, normally in the sophomore year, which provides the foundation for the major. Also during the sophomore year, students consult with student advisers to choose a faculty adviser and complete the declaration process. Together they plan a road map of course work designed to help each student focus on an Area of Concentration within Human Biology. Early planning and subsequent refining of an individualized course of study, in consultation with student and faculty advisers, is a strength and requirement of the program. The curriculum draws on faculty from across the University. To complete a B.A. or B.S. in Human Biology, students must take courses from within the program and from other University departments. Many Human Biology majors go on to advanced training in professional schools, or graduate programs in the behavioral, natural, and social sciences, including coterminal master's degree programs in other University departments. Additional information about the major may be obtained from the program's offices or at the Program in Human Biology (<https://humanbiology.stanford.edu>) web site.

Learning Outcomes (Undergraduate)

The program expects its undergraduate majors to be able to demonstrate the following learning outcomes.

Communication

Because Human Biology is an interdisciplinary program with an emphasis on both empirical inquiry and applied knowledge, excellent communication skills are critical to majors. Successful students must be able to engage with literature and audiences not only from multiple disciplines but also with varying levels of subject expertise and to communicate information and ideas clearly, precisely, concisely, and purposefully in any setting. Toward this end, a graduate of Human Biology is expected to be able to:

1. adopt an appropriate style for written communication in the biological and social sciences
2. accurately summarize a scientific article
3. synthesize and criticize multiple sources of scientific literature
4. revise effectively in response to feedback
5. write collaboratively
6. present information visually in a variety of forms (charts, graphs, figures, and posters) for different audiences, purposes, and occasions
7. communicate in a variety of major scientific genres (such as abstracts, literature reviews, posters, research proposals, research presentations, and policy proposals) and popular genres (such as op-eds, PSA, podcasts, and science blogs)

8. use citations to provide context and to credit others for their intellectual contributions
9. communicate scientific knowledge to both specialist and non-specialist audiences
10. construct a well-supported, logical argument based on relevant evidence and established conceptual frameworks
11. frame a research question in relation to the current state of knowledge in a field
12. articulate a well-reasoned hypothesis
13. listen to any speaker and pose questions
14. deliver an oral presentation and respond to audience questions

Data Analysis

Data is used in the social and biological sciences to make observations and judgments regarding patterns of human behavior and function. These data are sometimes imperfect or incomplete, but they are used nevertheless to make decisions and policies regarding humans individually and in groups within the worlds they inhabit. Thus, students should cultivate a capacity within the Human Biology major to examine and analyze data. A graduate of Human Biology is expected to be able to:

1. recognize that different scientific disciplines draw on various sources and types of evidence
2. translate a research topic into a hypothesis or focused question that can be tested using quantitative or qualitative data
3. identify variables that are relevant to a study and describe their nature (e.g., categorical, continuous) and interrelationships (independent, dependent, covariates)
4. use statistical software to summarize and describe data of various types
5. choose an appropriate analytical framework or statistical model for testing a given hypothesis, considering the structure of the data (e.g., sample size, distribution, qualitative or quantitative nature)
6. employ quantitative or qualitative data to support a conclusion
7. judge whether a statistical association provides empirical support for causation
8. detect mistakes commonly made in empirical reasoning and data analysis
9. assess the limits of available data and identify potential sources of uncertainty
10. present data accurately, clearly, and effectively in the forms of tables, graphs, and figures
11. explore specialized modes of data analysis such as meta-analysis, bioinformatics, modeling, and epidemiological approaches

Scientific Literacy

The Program in Human Biology prepares students to join a broad scientific community with a culture of building and sharing knowledge. A goal of the major is to cultivate judicious consumers of research in the natural and social sciences, irrespective of their individual career paths. A graduate of Human Biology is expected to be able to:

1. appreciate the distinct roles of common genres of scientific writing, including peer-reviewed research papers, review articles, commentaries, and popular science writing
2. acknowledge and apply the normative and ethical standards of conducting and publishing research, including accuracy, transparency, and responsibility to colleagues and subjects
3. evaluate the credibility and importance of a published article and its relevance within a field
4. engage with peer-reviewed scientific literature actively and critically
5. identify research questions, understand their theoretical or practical importance

6. assess research methodologies and experimental or other study design
7. evaluate evidence and statistical analyses presented in support of claims
8. interpret data presented in a table, graph, or figure
9. use a hypothesis or framework to make predictions or pose questions about a novel setting

Student Advisers

Human Biology has an advising program comprising faculty and student advisers. Before declaring Human Biology as the undergraduate major, each student must meet with student advisers who assist in developing a coherent study plan based on an individualized Area of Concentration, and the selection of breadth, depth, and upper-division courses. The student advisers also assist students in selecting an appropriate faculty adviser and a suitable capstone experience for their Area of Concentration and career goals. Student advisers offer drop-in services during scheduled office hours every weekday.

Storey House

Storey House, 544 Lasuen Mall, is an undergraduate resident theme house for Human Biology, devoted to developing an intellectual community among Human Biology majors at Stanford and allowing faculty and students to become acquainted and to share their Human Biology interests and research. Its goals are to foster intellectual discussion in the residential lives of the students living in Storey House, mentoring relationships between upperclassmen and core students in the house, and stimulating events for all Human Biology majors facilitated by academic theme associates. Assignment is made through pre-assignment and the regular undergraduate housing draw.

Declaring the Major

The program offers a Bachelor of Arts and Bachelor of Science in Human Biology. A prospective major must consult with the student and faculty advisers to obtain detailed information about the program and guidance in the development of an individual course of study.

At the time the major is declared, the student must submit a written statement (3-5 pages) of academic and long-term goals and the proposed list of courses satisfying the requirements for the major. The proposal is then reviewed by the student advisers who help identify an appropriate faculty adviser.

It is important to declare in the sophomore year, and planning may begin once a student in good academic standing has passed two of six courses in the core. The University requires students to declare a major by the end of Spring Quarter of the sophomore year.

Students who plan to pursue graduate work should be aware of the admission requirements of the schools to which they intend to apply. Early planning is advisable to guarantee completion of major and graduate school requirements.

Fundamental Program Requirements (34+ units)

Both degree programs, B.A. and B.S., require that the student complete all three of the Human Biology Fundamental Program requirements which include the Human Biology core, statistics and capstone.

Human Biology Core (30 units)

The required core sequence introduces the biological and social sciences and, most importantly, relationships between the two. Classes meet throughout the academic year. The A and B series are designed to be taken concurrently. Students should initiate the core in Autumn Quarter

of the sophomore year. Freshmen are not permitted to enroll. Majors must earn a minimum letter grade of 'C-' in core courses. The Human Biology core consists of the following courses:

		Units
HUMBIO 2A	Genetics, Evolution, and Ecology	5
HUMBIO 2B	Culture, Evolution, and Society	5
HUMBIO 3A	Cell and Developmental Biology	5
HUMBIO 3B	Behavior, Health, and Development	5
HUMBIO 4A	The Human Organism	5
HUMBIO 4B	Environmental and Health Policy Analysis	5
Total Units		30

Statistics (3-5 units)

The statistics course must be taken for a letter grade by majors. The minimum grade requirement is 'C-'. (*Note: Students who did not declare before September 21, 2015, may not use STATS 60 to fulfill the statistics requirement.*) Statistics may be chosen from courses such as:

		Units
BIO 141	Biostatistics	3-5
CME 106	Introduction to Probability and Statistics for Engineers	4
CS 109	Introduction to Probability for Computer Scientists	3-5
ECON 102A	Introduction to Statistical Methods (Postcalculus) for Social Scientists	5
EDUC 400A	Introduction to Statistical Methods in Education	3-4
HRP 259	Introduction to Probability and Statistics for Epidemiology	3-4
HUMBIO 85A	Essential Statistics for Human Biology	4
HUMBIO 88	Introduction to Statistics for the Health Sciences	4
HUMBIO 89	Statistics in the Health Sciences	3
SOC 181B	Sociological Methods: Statistics	5
STATS 116	Theory of Probability	3-5

Capstone (1-7 units)

The following options fulfill the Capstone (<https://humanbiology.stanford.edu/capstone>) requirement:

1. *Human Biology Practicum*: HUMBIO 191 Human Biology Practicum (1 unit total, S/NC grading). Allows students to integrate their academics with their community-engaged learning, research or pre-professional experiences through reflective written work and presentation; well-suited for career-enhancing project presentations or expressions of personal values and purpose. Required for students who wish to enroll in the Human Biology Synthesis (HUMBIO 192). Students can take workshops over several quarters, and enroll in one unit of 191 for the quarter they complete their five workshops.
2. *Human Biology Synthesis (by application)*: This sequence should be taken for 2-3 units in Autumn (HUMBIO 192A Human Biology Synthesis), Winter (HUMBIO 192W Human Biology Synthesis) and/or Spring (HUMBIO 192S Human Biology Synthesis) for 6 units total, letter grade (corequisite HUMBIO 191 Human Biology Practicum). The sequence expands upon the work of the Human Biology Practicum, although the student may also focus on a different aspect of the area of concentration topic. It allows students the opportunity to craft a culminating, creative work of scholarship based on a synthesis of personal and academic interests, including service projects. The work must be exhibited during senior year.
3. *Honors in Human Biology (by application)*: HUMBIO 194 Honors also satisfies the Capstone requirement.
4. Non-Human Biology activities that fulfill the Capstone requirement:
 - a. Biology Senior Reflection

- b. Notation in Science Communication
- c. Interdisciplinary Honors

Bachelor of Arts in Human Biology

The B.A. in Human Biology (HUMBIO) requires 81+ units in the major divided among four levels of courses: fundamental program requirements, breadth requirement, depth requirement and upper-division.

The B.A. degree is designed for students who prefer a traditional liberal arts degree with a curriculum based across the natural sciences, social sciences, and humanities. The degree is suitable regardless of whether a student plans to attend graduate or professional school. The B.A. degree gives students a solid foundation in biology, while allowing students more flexibility and breadth in the social sciences and humanities.

For the B.A. degree, majors take 10 or more units of breadth courses and 5 or more classes in the upper-division and depth courses from a set of pre-approved Social Sciences and Humanities courses. For the 5 or more B.A. eligible courses in your Depth and Upper Division, 3 of those courses must be in the Depth section. Many pre-approved courses satisfy University Ways of Thinking and Doing requirements, specifically Aesthetic and Interpretive Inquiry, Creative Expression, Engaging Diversity, Ethical Reasoning, and Social Inquiry. Students still also take courses in the natural sciences, although fewer than for the B.S. degree.

Bachelor of Science in Human Biology

The B.S. in Human Biology (HUMBIO) requires 81+ units in the major divided among four levels of courses: fundamental program requirements, breadth requirement, depth requirement and upper-division.

The B.S. degree allows students a more scientific and technical focus for their studies, and requires completion of course work and specialization in the biological sciences, physical sciences, mathematics, and/or computer science and engineering.

For the B.S. degree, majors take 10 or more units of breadth courses and 5 or more classes in the upper-division and depth courses from a set of pre-approved life and natural sciences courses. For the five or more B.S. eligible courses in the depth and upper division, three of those courses must be in the depth section. Many pre-approved courses satisfy University Ways requirements, specifically applied quantitative reasoning, formal reasoning, and scientific methods and analysis courses. Students still also take courses in the social sciences or humanities, although fewer than for the B.A. degree.

Breadth and Depth Requirement

These courses inform the student's chosen area of concentration topic. The student selects courses for these two requirement categories, in consultation with the advising program who approve the final course selections. A Human Biology area of concentration topic generally falls within one (or a combination of 2) of the following areas of emphasis:

- Environment and Environmental Policy
- Health and Health Policy
- Human Performance
- Human Development
- Biomedical Science and Biocomputation
- Brain and Behavior
- Ethics and Medical Humanities
- Evolution

Breadth Requirement (20+ units)

20-unit minimum, consistent with the student's chosen area of concentration topic. This requirement allows the student to explore the

topic with a broad focus. Courses may include introductory-level courses from across the University and lab courses, and may be taken for credit or letter grade. The minimum grade requirement is 'C-.'

Depth Requirement (20+ units)

A minimum of five courses totaling at least 20 units consistent with the student's chosen area of concentration topic. This requirement allows the student to gain expertise on the topic and to focus on educational and post-baccalaureate goals. Courses are non-introductory and are usually numbered over 100. Three or more departments must be represented in the depth requirement. Each course must be taken for a letter grade and at least three units. The minimum grade requirement is 'C-'. Three or more courses in the Depth must be in your chosen degree option of B.S. or B.A..

Upper-Division Requirement (9+ units)

Students must take three Human Biology upper-division courses numbered 100 to 189. These courses should be used to explore subjects outside the depth requirement. One upper-division course may be taken satisfactory/no credit. Each course must be taken for a minimum of 3 units. Minimum grade requirement for upper-division courses is 'C-'. All non-laboratory advanced HUMBIO courses (those numbered 100 to 189) fulfill the Human Biology upper-division requirement. A list of Overseas Studies courses that satisfy upper-division requirements and are given in 2016-17 can be found on the Overseas tab (p. 4) of this section of this bulletin.

Honors Program

The honors program in Human Biology provides qualified majors the opportunity to work closely with faculty on an individual research project, culminating in an honors thesis. Students may begin honors research from a number of starting points including topics introduced in the core or upper-division courses; independent interests stemming from an internship experience; or collaborating with faculty from the natural, social, or behavioral sciences.

Students may apply to the honors program if they have completed the Human Biology core with a minimum GPA of 3.0, have an overall Stanford GPA of 3.2, and meet other requirements detailed in the honors handbook. Interested students should consult the Human Biology Honors web site (<http://humanbiology.stanford.edu/academics/honors>) and meet with the Human Biology Associate Director or student services officer.

Most honors projects involve a total of 10-15 units of course work in HUMBIO 193 and 194:

		Units
HUMBIO 193	Research in Human Biology	1-5
HUMBIO 194	Honors	1-10

Admission to the honors program is by preliminary application in early February, followed by the full application in early March of the junior year. Students planning to undertake honors begin research or preparation as early as completion of the sophomore year.

The honors thesis is normally completed by the middle of Spring Quarter of the senior year. Honors students present summaries of their research at the Human Biology Honors Poster Symposium in May.

Human Biology also holds a Summer Honors College just prior to Autumn Quarter each year for students who have applied to the honors program. Students apply to Summer Honors College in April of the junior year.

Minor in Human Biology

A minor in Human Biology provides an introductory background to the relationship between the biological and social aspects of humanity's origin, development, and future. Many of the major problems facing human civilization today involve both biological and social aspects. Scientific approaches to these problems are essential, but they must be broadly conceived, integrating what is known of the biological with an understanding of the social and cultural setting in which they exist. Students with a minor in Human Biology are expected to develop a strong background in the integration between the biological and social aspects of human beings.

Students declaring a minor in Human Biology must do so no later than two quarters prior to their intended quarter of degree conferral (for example, a student must declare a minor before the end of Autumn Quarter to graduate the following Spring Quarter).

To minor in Human Biology, students must take the Human Biology Core:

- HUMBIO 2A Genetics, Evolution, and Ecology
- HUMBIO 2B Culture, Evolution, and Society
- HUMBIO 3A Cell and Developmental Biology
- HUMBIO 3B Behavior, Health, and Development
- HUMBIO 4A The Human Organism
- HUMBIO 4B Environmental and Health Policy Analysis
- and one additional upper-division course (for example, any HUMBIO course numbered 100-189).

The student must earn a minimum letter grade of 'C-'. Courses that count towards the fulfillment of major requirements may not be counted towards the minor.

Emeriti (Professors) Doug Brutlag (Biochemistry), Stanley Falkow (Microbiology/Immunology), A. Dale Kaiser (Biochemistry), Herant Katchadourian (Human Biology), Donald Kennedy (Biology), Gordon Matheson (Orthopaedic Surgery), Ellen FitzSimmons Porzig (Developmental Biology), Carol Winograd (Medicine)

Director Paul Fisher (Neurology)

Associate Director Katherine Preston

Professors Laurence Baker (Health Research and Policy), Ben Barres (Neurobiology), Donna Bouley (Comparative Medicine), William H. Durham (Anthropology), Heidi Feldman (Pediatrics: Neonatology), Russell D. Fernald (Biology), Paul Fisher (Neurology), Margaret Fuller (Developmental Biology), Angela Garcia (Anthropology), Garry Gold (Rad/Musculoskeletal Imaging), Lawrence H. Goulder (Economics), James J. Gross (Psychology), H. Craig Heller (Biology), Jill Helms (Surgery: Plastics), Richard Klein (Anthropology and Biology), Tanya Luhmann (Anthropology), Yvonne Maldonado (Pediatrics: Infectious Diseases), Michael Marmor (Ophthalmology), Roeland Nusse (Developmental Biology), Ruth O'hara (Psychiatry and Behavioral Sciences) Amado Padilla (Education), Julie Parsonnet (Infectious Diseases), Rob Reich (Political Science), Allan Reiss (Interdisciplinary Brain Science Research), Thomas Robinson (Pediatrics), Robert Sapolsky (Biology), Walter Scheidel (Classics and History), Randall Stafford (Stanford Prevention Research Center), William Talbot (Developmental Biology), Shripad Tuljapurkar (Biology), Jeffrey Wine (Psychology), Paul Wise (Pediatrics: Neonatology)

Associate Professors Kate Bundorf (Health Reserach and Policy), Anne Fernald (Psychology), Jeremy Goldhaber-Fiebert (Primary Care and Outcomes Research), Brenda Golianu (Anesthesia), Joachim Hallmayer (Psychiatry and Behavioral Sciences - Child and Adolescent Psychiatry and Child Development), Peter Kao (Pulmonary and Critical Care Medicine), Norman G. Miller (Primary Care and Outcomes Research), Jelena Obradovic (Education)

Assistant Professors Geoffrey Abrams (Orthopaedic Surgery), Sanjay Basu (Primary Care and Outcomes Research), Eran Bendavid (General Internal Medicine), Jorah Dannenberg (Philosophy), Alvan Ikoku (Comparative Literature), Anshul Kundaje (Genetics and Computer Science), Michelle Monje-Deisseroth (Neurology), Jamie Zeitzer (Psychiatry and Behavioral Sciences)

Professor (Research) Christopher Gardner (Stanford Prevention Research Center), David Lyons (Psychiatry and Behavioral Sciences), Marcia Stefanick (Stanford Prevention Research Center)

Associate Professor (Research) Karen Parker (Psychiatry and Behavioral Sciences)

Professors (Teaching) Donald Barr (Pediatrics), David Magnus (Pediatrics/SCBE), Robert Siegel (Microbiology and Immunology), Gary Darmstadt (Pediatrics - Neonatology)

Associate Professors (Teaching) Catherine Heaney (Psychology), Lianne Kurina (General Internal Medicine), Eunice Rodriguez (Pediatrics), Kristin Sainani (Health Research and Policy – Epidemiology)

Clinical Assistant Professors Cynthia Nguyen (Psychiatry and Behavioral Sciences), Rita Popat (Health Research and Policy, Epidemiology), Daryn Reicherter (Psych/Public Mental Health & Population Sciences)

Senior Research Scholar Wesley F. Alles (Med/HIP/BeWell)

Other Teaching Faculty and Staff William Abrams, Maya Adam (Pediatrics - Infectious Diseases), Judy Chu, Sophia Colamarino (Psychiatry and Behavioral Sciences), Anne Firth-Murray, Anne Friedlander, Ronald Garcia (Center for Excellence), Renu Heller (Biology), Catherine Ley (Infectious Diseases), Mark Mabry, Lisa Medoff, Joe Nation (Public Policy), Katherine Preston, Lisa Goldman Rosas (Stanford Prevention Research Center), Annette Salmeen, Clea Sarnquist (Pediatrics - Infectious Diseases), Darwin Scott Smith (Microbiology and Immunology), Clyde Wilson, Jennifer Wolf (Education)

Course Associates Andrea Fisher, Annie Kaufman, David Ly, Christine Nguyen, Siyou Song, Sarita Sooklal, Taylor Streaty, Jazzmin Williams

Honors Chair Katherine Preston

Overseas Studies Courses in Human Biology

The Bing Overseas Studies Program (<http://bosp.stanford.edu>) manages Stanford study abroad programs for Stanford undergraduates. Students should consult their department or program's student services office for applicability of Overseas Studies courses to a major or minor program.

The Bing Overseas Studies course search site (<https://undergrad.stanford.edu/programs/bosp/explore/search-courses>) displays courses, locations, and quarters relevant to specific majors.

For course descriptions and additional offerings, see the listings in the Stanford Bulletin's ExploreCourses (<http://explorecourses.stanford.edu>) or Bing Overseas Studies (<http://bosp.stanford.edu>).

		Units
OSPAUSTL 10	Coral Reef Ecosystems	3
OSPAUSTL 25	Freshwater Systems	3
OSPAUSTL 30	Coastal Forest Ecosystems	3
OSPCTWN 43	Public and Community Health in Sub-Saharan Africa	3
OSPCTWN 63	Socio-Ecological Systems	3
OSPFLO 85	Bioethics: the Biotechnological Revolution, Human Rights and Politics in the Global Era	4

OSPMADR 57	Health Care: A Contrastive Analysis between Spain and the U.S.	4
OSPMADR 72	Issues in Bioethics Across Cultures	4
OSPOXFRD 58	Ethical, Legal, and Policy Issues in the Biosciences: Comparative Perspectives	3
OSPPARIS 98	Global Health Systems: the Future	5