Environmental factors, treatment issues and engineering and legal interventions related to vehicular injuries, drowning, falls, fires and burns, poisonings, firearm injuries, and other intentional injuries. — W. (W) Romano

251. Environmental Epidemiology (3)
Lecture—3 hours. Prerequisite: Preventive Veterinary Medicine 405 (may be taken concurrently); upper division undergraduates who have completed Environmental Studies 126; or the equivalent. Examination of the human health effects and the risk of disease from community, occupational, and personal exposure to toxic substances. Offered in alternate years. — F. Schenker

252. Social Epidemiology (2)
Lecture/discussion—2 hours. Prerequisite: course 205A or Preventive Veterinary Medicine 205; Statistics 102 or Preventive Veterinary Medicine 202. Methods used in epidemiologic research on occupational hazards. Topics include design and analysis of cohort and case-control studies, sample size, measuring dose, choosing a control group, validation of employment and health data, interpreting negative studies, and analysis software. Offered in alternate years. — S. (S) Beaumont

270. Research Methods in Occupational Epidemiology (3)
Laboratory/discussion—3 hours. Prerequisite: course 205A or Preventive Veterinary Medicine 205; Statistics 102 or Preventive Veterinary Medicine 202. Methods used in epidemiologic research on occupational hazards. Topics include design and analysis of cohort and case-control studies, sample size, measuring dose, choosing a control group, validation of employment and health data, interpreting negative studies, and analysis software. Offered in alternate years. — W. (W) Cress

272. Cancer Epidemiology (2)
Recitation—1 hour; discussion—1 hour. Prerequisite: must have basic understanding of epidemiologic and statistical concepts that are covered in courses 205A, 205B, 260 (may be taken concurrently), and Statistics 101. We will cover the underlying concepts essential to understanding cancer epidemiology, such as trends in incidence and survival, epidemiologic methods used to assess cancer etiology, prevention and control, and an introduction to the carcinogenesis and progression multi-stage model. — W. (W) Cer

260. Epidemiology of Chronic Diseases and Aging (3)
Lecture/discussion—3 hours. Overview of the epidemiology of chronic disease in old age. Topics include biologic and genetic epidemiology of cardiovascular disease, neoplasms, osteoporosis and fractures, psychosocial factors and health in old age, dementia, functional status and prevention of disease. — W. (W)

270. Research Methods in Occupational Epidemiology (3)
Laboratory/discussion—3 hours. Prerequisite: course 205A or Preventive Veterinary Medicine 205; Statistics 102 or Preventive Veterinary Medicine 202. Methods used in epidemiologic research on occupational hazards. Topics include design and analysis of cohort and case-control studies, sample size, measuring dose, choosing a control group, validation of employment and health data, interpreting negative studies, and analysis software. Offered in alternate years. — S. (S) Beaumont

272. Cancer Epidemiology (2)
Recitation—1 hour; discussion—1 hour. Prerequisite: must have basic understanding of epidemiologic and statistical concepts that are covered in courses 205A, 205B, 260 (may be taken concurrently), and Statistics 101. We will cover the underlying concepts essential to understanding cancer epidemiology, such as trends in incidence and survival, epidemiologic methods used to assess cancer etiology, prevention and control, and an introduction to the carcinogenesis and progression multi-stage model. — W. (W) Cress

290. Seminars in Epidemiology (0.5)
Seminar—0.5 hours. Faculty and students will present and discuss ongoing or published epidemiologic research. (S/U grading only). — F. W. S. (F, W, S)

291. Seminars in Human Health Services Research and Clinical Epidemiology (1)
Seminar—1 hour. Critical review, evaluation, and discussion of research in health services and clinical epidemiology. Presentation of statistical, epidemiologic, and econometric methods. Students present their own research and critique the work of others. May be repeated for credit. (Same course as General Medicine 291). (S/U grading only). — F. W. S. (F, W, S)

298. Group Study (1-5)
Seminar—1.5-5 hours. Group study in selected areas of epidemiology. — S/U grading only.

299. Research (1-12)
Research in selected areas of epidemiology. (S/U grading only)

Evolution and Ecology

[College of Biological Sciences]
Sharon Strauss, Ph.D., Chairperson of the Department
Department Office, 2320 Storer Hall
530-752-1272; http://www.eve.ucdavis.edu
Faculty
David J. Begun, Ph.D., Professor
Graham Coop, Ph.D., Associate Professor
Jonathan A. Eisen, Ph.D., Professor (Medical Microbiology and Immunology)
Brian P. Gaylord, Ph.D., Professor
Jennifer R. Gremer, Ph.D., Assistant Professor
Richard K. Grosberg, Ph.D., Professor
Academic Senate Distinguished Teaching Award, UC Davis Award for Teaching and Scholarly Achievement
Susan L. Keen, Ph.D., Senior Lecturer, SOE
Academic Federation Excellence in Teaching Award
Artym V. Kopp, Ph.D., Professor
Charles H. Longley, Ph.D., Professor
Harris A. Lewin, Ph.D., Professor (Net Med: Population Health and Reproduction)
Susan E. Lott, Ph.D., Assistant Professor
Brian R. Moore, Ph.D., Assistant Professor
Gail L. Patrielli, Ph.D., Professor
Santiago Ramírez, Ph.D., Assistant Professor
Bruce H. Rannala, Ph.D., Professor
Marcel Rejmanek, Ph.D., Professor
Eric D. Scudellari, Ph.D., Professor
Johanna M. Schmitz, Ph.D., Professor
Thomas W. Schoener, Ph.D., Professor
Sebastian Schreiber, Ph.D., Professor
Arthur M. Shapiro, Ph.D., Professor
Academic Senate Distinguished Teaching Award
John J. Stachowicz, Ph.D., Professor
Academic Senate Distinguished Teaching Award
Maureen L. Stanton, Ph.D., Professor
UC Davis Prize for Teaching and Scholarly Achievement
Sharon Y. Strauss, Ph.D., Professor
Academic Senate Distinguished Teaching Award
Donald R. Strong, Ph.D., Professor
Michael Turelli, Ph.D., Professor
Peter C. Wainwright, Ph.D., Professor
Academic Senate Distinguished Teaching Award
SUSAN WILLIAMS, Ph.D., Professor
Emeriti Faculty
James A. Doyle, Ph.D., Professor Emeritus
John H. Gillespie, Ph.D., Professor Emeritus
Milton Hildebrand, Ph.D., Professor Emeritus
Academic Senate Distinguished Teaching Award
Robert W. Pearcy, Ph.D., Professor Emeritus
Judy A. Stamps, Ph.D., Professor Emeritus
Kenneth E. F. Watt, Ph.D., I.D., Professor Emeritus
Affiliated Faculty
Carole Hom, Ph.D., Academic Coordinator
R. Pat Randolph, Ph.D., Academic Coordinator/Lecturer
David A. Spiller, Ph.D., Project Scientist Emeritus
The Evolution, Ecology and Biodiversity Major Program
The major in Evolution, Ecology and Biodiversity offers the student a broad foundation in the historical and empirical basis of our understanding of the diversity and distribution of living organisms. The Program. The program of study for the major begins with a core of introductory courses in mathematics, physical sciences, and biological science. These are followed by survey courses in biodiversity, evolution and ecology and various more specialized courses that focus the student on particular disciplines or organisms, with an emphasis on problem-solving and critical thinking. Evolution, Ecology and Biodiversity majors may earn either a Bachelor of Science or a Bachelor of Arts degree. The requirements for the B.S. degree program include more science courses, such as biochemistry, whereas those for the A.B. degree program allow room for more electives within the humanities and social sciences. The A.B. degree is especially appropriate for those students who wish to combine arts or history or English with evolution and ecology for career preparation in such areas as scientific writing, translating or illustrating. Career Alternatives. A degree in Evolution, Ecology and Biodiversity prepares the student for career opportunities in research, teaching, professional careers, veterinary medicine, agriculture, environmental management, and industry. Many students gain some research experience while at UC Davis and choose to continue their training at the graduate level. This track offers careers in academics, government, environmental organizations, or business.

A.B. Major Requirements:

Preparatory Subject Matter ........................................41-45
Biological Sciences 2A-2B-2C ........................................ 15
Chemistry 2A-2B ................................................... 10
Chemistry 8A-8B ................................................... 6
Mathematics 17A-17B (17C recommended) or 21A-21B (21C recommended) or Statistics 100 or 102 ................................................... 4-8

Depth Subject Matter ..............................................36
Biological Sciences 101 ................................................... 4
One course from: Evolution and Ecology 100; Geology 107; Anthropology 151 ................................. 3-4
One course from: Evolution and Ecology 101; Environmental Science 100; Wildlife, Fish, and Conservation Biology 151 ................................................... 4
Additional upper division course work in biological science to achieve a total of 36 or more units ................................................... 24-25
Include at least one course from each of the areas of study below.

Areas of Study:

(1) Biodiversity: Entomology 103; Evolution and Ecology 105, 108, 112, 140; Microbiology 105; Nematology 110; Plant Biology 116, 148; Plant Sciences 147; Wildlife, Fish, and Conservation Biology 110, 111, 120, 130, 134.


Note: A maximum of four units of variable-unit courses (numbered 192, 198, 199) may be applied as upper division elective unit requirements.

Courses numbered 197T are not applicable to the upper division elective unit requirements.

Total Units for the Major ........................................... 77-81

B.S. Major Requirements:

Preparatory Subject Matter ........................................56-66
Biological Sciences 2A-2B-2C ........................................ 15
Chemistry 2A-2B-2C ............................................. 15
Chemistry 8A-8B or 118A-118B-118C ........................................ 6-12
Mathematics 17A-17B-17C or 21A-21B (21C recommended) ........................................ 8-12
Physics 7A-7B-7C ................................................... 12

Depth Subject Matter .............................................. 49
Biological Sciences 101, 105 (or 102-103), 107, 115, 117, 119, 120, 130-138 ................................. 10-12
Evolution and Ecology 100, 101 ................................... 8-10
Statistics 100, 102 or 130A-130B ................................... 4-8
Additional upper division course work in biological science to achieve a total of 49 or more units, including at least a total of two
Minor Program Requirements:

**Biodiversity area of study and two courses from the Advanced Evolution and Ecology areas of study below.**

### Areas of Study

1. **Biodiversity:** Entomology 103; Evolution and Ecology 102, 108, 112, 140; Microbiology 105; Entomology 110; Plant Biology 116, 148; Plant Sciences 147; Wildlife, Fish, and Conservation Biology 110, 111, 120, 134.


Note: A maximum of 4 units of variable-unit courses (numbered 192, 198, 199) may be applied to upper division elective unit requirements, but not to the upper division laboratory requirement. Courses numbered 197T are not applicable to the upper division elective unit requirement.

### Total Units for the Major: 105-115

#### Biological Sciences Electives

The following courses are acceptable toward the fulfillment of the upper division biological sciences requirement in the A.B. and B.S. major programs and may be selected without adviser approval.

Other elective courses are approved on an individual basis by petition through an adviser.

- Anatomy, Physiology and Cell Biology 100
- Anthropology 152, 153, 154A, 154BN, 154C, 154CL, 155, 156
- Biological Sciences, all upper division courses
- Chemistry 107A, 107B
- Entomology, all upper division courses
- Evolution and Ecology 190
- Geology 107L, 107L, 150C
- Microbiology, all upper division courses
- Molecular and Cellular Biology, all upper division courses
- Nutrition 101
- Pathology, Microbiology, and Immunology 101, 126, 126L, 128
- Physiology 108
- Plant Biology, all upper division courses
- Psychology 121, 122, 127, 129
- Wildlife, Fish, and Conservation Biology 120, 120L, 121

### Minor Program Requirements: UNITS

**Evolution, Ecology and Biodiversity.** 18

- Evolution and Ecology 100, 101 8
- One course in Biodiversity, 3-5
- Two courses in Advanced Ecology or Evolution 6-9

- Laboratory or field course: At least one of the courses taken to fulfill these requirements must include a laboratory or field component.

- *Appropriate courses from the above lists are indicated with an asterisk.

- These courses cannot be taken without the corresponding lecture course.

- Additional courses, if necessary, from above course lists to reach 18 units.

### Major Advisers

- Students transferring to UC Davis from another institution and majoring in Evolution, Ecology and Biodiversity must consult an adviser immediately upon matriculation so that their transfer credits can be applied to the major requirements.
- New students in the major should contact the Biology Academic Success Center for adviser assignment.

### Advising Center

Advising Center for the major is located at the Biology Academic Success Center (BASC), 1023 Sciences Laboratory Building, 530-752-0410. Students should visit the Health Professions Advising office at http://hpas.ucdavis.edu/ for information on pre-health requirements and to subscribe to their email list.

### Teaching Credential Subject Representative

- Students planning for a teaching career should consult the School of Education in regard to preparation for certification; see the Teaching Credential/M.A. Program on page 124.

### Courses in Evolution and Ecology (EVE)

#### Lower Division

- **2. Biodiversity (3)** Lecture—2 hours; lecture/discussion—1 hour. Introduction to nature, space and geographical distribution of biodiversity (the diversity of life, with emphasis on plants and animals, especially insects). Humans and biodiversity—domestication, aesthetic, ethics and values. Species richness and “success.” Biodiversity through time; monitoring, evaluation and conservation. Biomes—global, continental and Australian. (Same course as Entomology 2.) Offered irregularly. GE credit: SciEng, Wrt SE, SL, WE.

- **10. Evolution for Non-Biologists (4)** Lecture—3 hours. Introduction to evolutionary biology for the general population. Offered in alternate years. GE credit: SciEng | QL, SE, SL | (F) Begun

- **11. Principles of Ecology (4)** Lecture—3 hours; discussion—1 hour. Prerequisite: elementary biology recommended. Ecological principles with emphasis on human interactions with the environment; how humans affect and depend on natural ecosystems; the future of the Earth’s biosphere. Offered irregularly. GE credit: SciEng | QL, SE, SL, WS.

- **12. Life in the Sea (4)** Lecture—3 hours. Limited enrollment. Diversity of life in the sea; adaptations to physical/chemical ocean environment; marine science research methods; utilization of living marine resources by humans; factors and processes that influence diversity of sea life, including humans. GE credit: SciEng | SE, SL | —S. Williams

- **13. Sex in the Natural World (3)** Lecture/discussion—9 hours. Explores the diversification, mechanisms and evolution of sexual behaviors across the kingdoms of life. Offered in alternate years. GE credit: SciEng | SE, SL, VL | —F. Patirelli

- **20. Darwinian Medicine (3)** Lecture—3 hours. Introduction for non-biologists to the evolution of traits of humans and pathogens that influence human biological variation, health, and disease. Offered in alternate years. GE credit: QL, SE, SL | —(F) Begun

- **Internships (1-12)** Internship—3-36 hours. Prerequisite: lower division standing; consent of instructor. Work experience off campus in all subject areas offered in the Department of Evolution and Ecology. Internships supervised by a member of the faculty. May be repeated for credit. (P/NP grading only) —F, W, S (F, W, S)

### 98. Directed Group Study (1-5)

- Prerequisite: consent of instructor. (P/NP grading only). GE credit: SE.—F, W, S, F (F, W, S)

### 99. Special Study for Lower Division Students (1-5)

- (P/NP grading only). GE credit: SE.—F, W, S, F (F, W, S)

### Upper Division

- **100. Introduction to Evolution (4)** Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1A, 1B, 1C, or 2A, 2B, 2C; Biological Sciences 101; Mathematics 15A, 16A, 16B, 16C or the equivalent; Statistics 13 or 100 (Statistics 100 recommended). A general survey of the origins of biological diversity and evolutionary mechanisms. GE credit: SciEng | QL, SE, SL | —F, W, Su. (F, W, S, Su) Begun, Coop, Ramirez

- **101. Introduction to Ecology (4)** Lecture—3 hours; lecture/discussion—1 hour. Prerequisite: Biological Sciences 1A, 1B, 1C, or 2A, 2B, 2C; Mathematics 16A, 16B, 16C or the equivalent. A general survey of the principles of ecology. GE credit: SciEng | QL, SE, SL | —F, W, S, Su | Gaylord, Rejmanek, Schoener, Strong

### 101Q. Introduction to Computer Models in Ecology (1)

- Autotatorial—1.5 hours; extensive problem solving—1.5 hours. Prerequisite: concurrent enrollment in course 101. Computational methods and mathematical models used to study ecological phenomena. Offered irregularly.

### 102. Population and Quantitative Genetics (4)

- Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 101, and Statistics 100 or 102, and course 100. Evolution as caused by random mating, genetic drift, natural selection, introgression, migration, and mutation in theory and actuality. The resemblance between relatives and consequences of selection for quantitative traits. Application of these ideas to topics such as the evolution of sex. Offered in alternate years. GE credit: SciEng | SE | —F. Langley

### 103. Phylogeny, Speciation and Macroevolution (4)

- Lecture—3 hours; laboratory/discussion—3 hours. Prerequisite: course 100. Statistical inference of evolutionary processes and patterns above the species level. Topics include estimation of phylogenies and divergence times, character, biogeographic history, and rates and patterns of lineage diversification, with an emphasis on the origin of species. Offered in alternate years. GE credit: SciEng | QL, SE, SL | —E. Moore, S. Turelli

### 104. Community Ecology (4)

- Lecture—3 hours; discussion—1 hour. Prerequisite: course 101 or Environmental Science and Policy 100. Populaton growth and density dependence; predation, exploitative and apparent competition; coexistence mechanisms; niches, spatial and temporal variation; stability, diversity, and productivity of food webs; applications to conservation and biological control. Understanding through models, concepts, and empirical evidence. Offered irregularly. GE credit: SciEng | SE, SL, VL.

### 105. Phylogenetic Analysis of Vertebrate Structure (4)

- Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A and 1B, or 2B and 2C. The structure of the classes and subclasses of vertebrates is described and interpreted in terms of phylogeny. Offered in alternate years. GE credit: SciEng | SE | —S. Wainwright

### 106. Mechanical Design in Organisms (3)

- Lecture—2 hours; discussion—1 hour; laboratory—3 hours; fieldwork—3 hours. Prerequisite: upper division standing or consent of instructor; introductory Fall 2011 and on Revised General Education (GE) AA—Arts and Humanities; SS—Science and Engineering; SS—Social Sciences; ACCG—American Cultures; DD—Domestic Diversity; OL—Occupational Skills; QL—Quantitative; SL—Scientific; VL—Visual; WC—World Cultures; WE—Writing Experience Pre-Fall 2011 General Education (GE): AA—Arts and Humanities; SciEng—Science and Engineering; SocSci—Social Sciences; DivD—Domestic Diversity; Wrt—Writing Experience Quarter Offered: F—Fall, W—Winter, S—Spring, Su—Summer; 2017/2018 offering in parentheses
animal biology (Biological Sciences 1B or 2B), invertebrate zoology (course 112), and/or ecology (course 112) recommended. Residence at near Bodega Marine Lab required. Enrollment restricted to application at http://www.bml.ucdavis.edu. Explores fundamental principles in the form and function of organisms, examining how basic properties of size, shape, structure, and habitat constrain ways in which plants and animals interact and cope with their physical surroundings. Offered in alternate years. GE credit: SciEng | OL, QL, SE, VI, WE.

107. Animal Communication (4)
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 2B. How animals use songs, dances, colors, chemicals, electricity and vibrations to communicate. Mechanisms of signal production and detection (sensor systems), theory of information transfer and signal design, and the role of natural selection in shaping communication. Offered in alternate years. GE credit: SciEng | QL, SE, VI, WE.—(F) Patricelli

108. Systematics and Evolution of Angiosperms (5)
Lecture—3 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, or 2A, 2B, 2C. Diversity and classification of angiosperms (flowering plants) on a world scale, and current understanding of the origin of angiosperms and evolutionary relationships among them based on morphological and molecular evidence. (Same course as Plant Biology 108.) GE credit: SciEng.—S. (S.) Potter

110. Running, Swimming and Flying (3)
Lecture—2 hours; discussion—1 hour; laboratory—3 hours; fieldwork—3 hours. Prerequisite: upper division standing or consent of instructor; introductory animal biology (Biological Sciences 1B or 2B), invertebrate zoology (course 112), and/or ecology (course 112) recommended; residence at near Bodega Marine Lab required. Enrollment restricted to application at http://www.bml.ucdavis.edu. Examines the bases of organism movement in terrestrial, aquatic, and aerial environments, emphasizing both the unifying principles underlying locomotion, as well as a range of strategies employed across diverse taxa. Offered irregularly. GE credit: SciEng | QL, SE, VI, WE.

111. Marine Environmental Issues (1)
Discussion—1 hour. Prerequisite: consent of instructor. Examination of environmental issues occurring in coastal waters including the effects of climate change, overfishing, and other human impacts. Through readings and group discussions, students will develop an integrative approach to understanding of the oceanographic and ecological processes. May be repeated two times for credit when topics differ. [Same course as Environmental Science and Policy 111.] GE credit: SciEng | OL, QL, SE, VI, WE—(F) Gaylord, Hill, Largier, Morgan, Sanford, Williams

112. Biology of Invertebrates (3)
Lecture—3 hours. Prerequisite: Biological Sciences 1B, 1B, 2B and 2C; courses in systematics, ecology, and evolution recommended. Limited enrollment. Survey of the invertebrate phyla, emphasizing aquatic forms, and focusing on morphology, development, and reproduction. GE credit: SciEng | SE, VI, WE—(F) Grosberg, Sanford

112L. Biology of Invertebrates Laboratory (2)
Laboratory—6 hours. Prerequisite: Biological Sciences 1B, 1C, or 2B. Course 112 concurrently. Enrollment limited to 50 students. Field and laboratory experience with representative members of the major invertebrate phyla discussed in course 112. Emphasis on organismal level, with paleontological, ecological, and behavioral investigations of living invertebrates. Two field trips required. Offered in alternate years. —(W) Grosberg, Sanford

114. Experimental Invertebrate Biology (3)
Lecture—2 hours; discussion—1 hour; laboratory—3 hours; fieldwork—3 hours. Prerequisite: upper division standing or consent of instructor; invertebrate zoology, animal and plant biology (Biological Sciences 1A, 1B and 1C), invertebrate zoology (Evolution and Ecology 101), and/or evolution (Evolution and Ecology 100) recommended; residence at near Bodega Marine Lab required. Enrollment restricted to application at http://www.bml.ucdavis.edu. Examination of local marine invertebrates with a focus on adaptations to environmental and biological factors encountered along the California coast. Hands-on laboratory and laboratory-based learning with an emphasis on generating and testing hypotheses. GE credit: SciEng | QL, SE, VI, WE.—S. (Su.) Sanford

115. Marine Ecology (4)
Lecture—4 hours; discussion—1 hour. Prerequisite: course 101 or Environmental Science and Policy 100 or Biological Sciences 2B, or consent of instructor. Processes affecting the distribution, abundance, and diversity of plants and animals in the sea. Introduction to marine habitat diversity and human impacts on marine ecosystems. Offered in alternate years. GE credit: SciEng | SE, VI, WE.—W. Stachowicz

117. Plant Ecology (4)
Lecture—3 hours; fieldwork—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, or 2A, 2B, 2C. Plant Biology 111 recommended. The study of the interactions between plants, plant populations or vegetation types, and the physical and biological environment. Special emphasis on California. Four full-day field trips and brief write-up of class project required. (Same course as Plant Biology 117.)—F. (F.) Latimer, Rejmanek

119. Population Biology of Invasive Plants and Weeds (3)
Lecture—2 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, or 2A, 2B, 2C. Introductory statistics recommended. Origin and evolution of invasive plant species and weeds, reproduction and dispersal, seed ecology, modelling of population dynamics and interactions between invasive species, native species, and crops, biological control. Laboratories emphasize design of competition experiments and identification of weedy species. [Same course as Plant Biology 119.] Offered in alternate years. GE credit: SciEng | SE—S. Rejmanek

120. Global Change Ecology (3)
Lecture/discussion—3 hours. Prerequisite: course 100 and 101 or equivalents. Treatment of historical evolution and the processes that produce physical, chemical, and biological influences. Focus upon changes caused by humans. Topics pertain to biodiversity, resources, conservation, and ecosystem services. Offered irregularly.—F. Su | F. Su; Gaylord, Strong

131. Human Genetic Variation and Evolution (3)
Lecture—3 hours. Prerequisite: Biological Sciences 1B or 2B. Introduction to genome-wide nucleotide sequence variation in human populations and computational methods for its analysis. Topics include forensics, disease gene mapping, and studies of human evolutionary history at low latitudes, such as genomics, and ethical/legal issues will be discussed. Offered in alternate years.—W. Rannala

138. Ecology of Tropical Latitudes (5)
Lecture—3 hours; discussion—1 hour; extensive writing. Prerequisite: one course in Biological Sciences, Entomology, Wildlife, Fish, and Conservation Biology, Geography, or tropical experience, or consent of instructor. Biological, physical, and human-related aspects of the ecology of low latitudes. Distribution, numbers, and relationships of tropical organisms. Problems of development and conservation in the context of ecological and evolutionary theory. Offered in alternate years. GE credit: SciEng, WR | SE, VI, WE.—(F) Shapiro

140. Paleobotany (4)
Lecture—3 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, or 2A, 2B, 2C. Introduction to the study of plant fossils, beginning with invasion of land in the Silurian, emphasizing origin and evolution of major groups and adaptations and changes in composition and distribution of floras in relation to plate tectonics and climatic change. Offered irregularly.

141. Principles of Systematics (3)
Lecture—2 hours; independent study. Prerequisite: Biological Sciences 1B or 1C or 2B, course 100 recommended. Historical background, classification, and reasoning; biogeography, cladistics, and working rules of biometrics, including International Code of Botanical Nomenclature. Offered in alternate years. GE credit: SciEng, WR | OL, QL, SE, SL, VI, WE.—S. Shapiro

147. Biogeography (4)
Lecture—3 hours, term paper. Prerequisite: Biological Sciences 1A and 1B. Movements of terrestrial and marine organisms. The role of physical, climatic, and biologic changes in the geographic distribution of organisms. Offered in alternate years. GE credit: SciEng | QL, SE, VI, WE.—(F) Shapiro

149. Evolution of Ecological Systems (4)
Lecture—3 hours, term paper. Prerequisite: course 101 or Environmental Science 100 (or the equivalent), and course 100 (or the equivalent). Evolution as an organizing force in natural communities. Co-adaptation in taxonomic and ecological relations. Evolution of polymorphisms, clines, and specialization. Offered in alternate years. GE credit: SciEng | SE, SL, Vi, WE.—(F) Shapiro

150. Evolution of Animal Development (3)
Lecture—3 hours. Prerequisite: Biological Sciences 101; and course 100 (may be waived for graduate students with consent of instructor). Comparative analysis of animal development and the genetic basis of morphological diversification. Offered in alternate years. GE credit: SciEng | SE, WE.—Kopp

161. Microbial Phylagenomics—Genomic Perspectives on the Diversity and Diversification of Microorganisms (3)
Lecture—3 hours. Prerequisite: Biological Sciences 2A, 2B, and 2C or equivalent. Use of DNA and genomic sequencing in studies of the diversity of microorganisms. Diversity of microbes, phylogenetics, genome sequencing, comparative genomics, phylagenomics, lateral gene transfer, molecular ecology, metagenomics, and studies of the human microbiome. Offered in alternate years. GE credit: SciEng | SE.—(J.) Eisen

175. Computational Genetics (3)
Lecture—2 hours; discussion—1 hour. Prerequisite: Biological Sciences 101 and Statistics 100 or 102. The use of computers to solve problems in genetics and evolution. Introduction to computer language (Python), computational statistical methods, and applications such as QTL mapping, linkage detection, estimation of rates of evolution, and gene finding.

180A. Experimental Ecology and Evolution in the Field (4)
Lecture/fieldwork—3 hours; fieldwork—3 hours. Prerequisite: course 100; course 101, or Environmental Science and Policy 100, Entomology 105. Experimental design in field ecology. Examination of primary literature, experimental design, independent and collaborative research, analysis of data, development of original research project based on field experiments. [Same course as Entomology 180A.] (Deferred grading only; pending completion of sequence) Offered in alternate years. GE credit: SciEng | QL, SE, VI, WE.

180B. Experimental Ecology and Evolution in the Field (4)
Lecture/fieldwork—3 hours; fieldwork—3 hours. Prerequisite: Evolution and Ecology or Entomology 180A; course 100; course 101 or Environmental Science and Policy 100; Entomology 105. Experimental design in field ecology. Examination of primary literature, experimental design, independent and collaborative research, analysis of data, development of original research project based on field experiments. [Same course as Entomology 180A.] (Deferred grading only; pending completion of sequence) Offered in alternate years. GE credit: SciEng | QL, SE, VI, WE.
and collaborative research, analysis of data, development of original research paper based on field experiments. (Also as Entomology 180B.) (Deferred grading only, pending completion of sequence.) Offered in alternate years. GE credit: SciEng | GI, SE, VI, WE | F - S. Yang

181. Ecology and Evolution of Animal-Plant Interactions (4) Lecture—1.5 hours; discussion—1.5 hours; term paper; extensive writing or discussion. Prerequisite: Biological Sciences 2B and 2C required; Biological Sciences 2C may be taken concurrently. Animal adaptations for eating plants, pollinating flowers, dispersing seeds. Plant adaptations to herbivore defense, attraction of mutualists; role of coevolutionary arms race, mutualists and cheaters in plant/animal specialization. Exploration through lectures, original scientific literature, discussions and term paper. Offered in alternate years. GE credit: SciEng | GI, GL, SE, VI, WE | F - S. Strauss

189. Introduction to Biological Research (1) Discussion—1 hour. Prerequisite: upper division standing in Evolution and Ecology or related biological science; consent of instructor. Introduction to research methods in biology. Presentation and discussion of research by faculty, graduate, and undergraduate students. May be repeated for credit up to a total of 6 units. (P/NP grading only.) GE credit: SciEng | SE | F, W, S. (F, W, S.)

190. Undergraduate Seminar (2) Seminar—2 hours. Prerequisite: upper division standing in the biological sciences or a related discipline. Student reports on current topics with emphasis on integration of concepts, synthesis, and state-of-the-art research approaches. Reviews of literature and reports of undergraduate research may be included. May be repeated for credit. (P/NP grading only.) GE credit: SciEng | SE | F, F, W, S. (F, W, S.)

192. Internship (1-12) Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work experience off and on campus in all subject areas offered in the Department of Evolution and Ecology. Internships supervised by a member of the faculty. (P/NP grading only.)—F, W, S. (F, W, S.)

194HA. Research Honors (2) Laboratory—6 hours. Prerequisite: students who have completed 135 units and qualify for the honors program as defined by the current catalog. Students pursue intensive research under the guidance of a faculty adviser. Students are expected to complete the full three-quarter sequence culminating in the writing of an honors thesis. (Deferred grading only, pending completion of sequence.) GE credit: SciEng | SE, VI | F, W, S. (F, W, S.)

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197T. Tutoring in Biological Sciences 2B (1-2) Tutorial—3-6 hours. Prerequisite: Biological Sciences 18 or Biological Sciences 2B with a grade of B or better. Assisting the instructor by tutoring students in a Biological Sciences 2B laboratory. Tutoring is voluntary and is supervised by a Laboratory Teaching Assistant and the laboratory coordinator. May be repeated three times for credit. (P/NP grading only.) GE credit: SciEng | SE = F, W, S. (F, W, S.)

198. Directed Group Study (1-5) (P/NP grading only.)—F, W, S. (F, W, S.)

199. Special Study for Advanced Undergraduates (1-5) (P/NP grading only.) GE credit: SciEng | SE = F, W, S. (F, W, S.)

210. Molecular Phylogenetic Analysis (3) Lecture—2 hours; laboratory—3 hours. Theory and practice of inferring phylogenetic trees using molecular sequence data. Practical techniques for obtaining sequence data, advantages and disadvantages of common approaches for inferring trees, statistical methods for comparing alternative hypotheses. (Same course as Nematology 210.) Offered irregularly. —Ndler

211. Applied Phylogenetics (3) Lecture—2 hours; laboratory—3 hours. Prerequisite: course 103 or 210 or Population Biology 200C or the equivalent, graduate standing. Applications of phylogenetic methods to fields outside of systematics. Core lectures/labs in remedial phylogenetics, phylogeography, conservation and comparative morphology. Special topics vary yearly. May be repeated one time for credit. —W. Moore, Wainwright

220. Species and Speciation (3) Lecture—2 hours; discussion—1 hour. Prerequisite: course 100, Population 108 or the equivalent. History and Philosophy of Science 130B recommended. Current status of species concepts, models of speciation, current research on speciation, and relevance of species to conservation biology. Offered in alternate years. —W. Shapiro

231. Principles of Biological Data Analysis (3) Lecture—2 hours; laboratory—3 hours. Introduction to the principles of data analysis, experimental design, statistical modeling, inference, and hypothesis tests. Statistical methods of particular importance in biological applications will be emphasized. Examples will be presented from the fields of ecology and evolutionary genetics. Offered irregularly. (S/U grading only.)—Rannala


290C. Research Conference (1) Discussion—1 hour. Prerequisite: standing and consent of instructor. Presentation and discussion of faculty and graduate student research in biology. May be repeated for credit. (S/U grading only.)—F, W, S. (F, W, S.)

298. Group Study (1-5) (S/U grading only)—F, W, S. (F, W, S.)

299. Research (1-12) (S/U grading only)—F, W, S. (F, W, S.)

Professional

390. Methods of Teaching (2) Lecture—1 hour; discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Practical experience in the methods and problems of teaching. Includes analyses of texts and supporting material, discussion of teaching techniques and pre-paring and conducting of laboratory and discussion sections. May be repeated for credit for a maximum of 8 units. (S/U grading only)—F, W, S. (F, W, S.)

Exercise Biology

See Neurobiology, Physiology, and Behavior, on page 478.

Family and Community Medicine

See Medicine, School of, on page 427.

Feminist Theory and Research

Wendy Ho, Ph.D., Adviser
Program Office. 1219 Hart Hall 530-752-6429; http://gsws.ucdavis.edu/welcome

Graduate Study. The Gender, Sexuality and Women’s Studies Program at UC Davis offers a Designated Emphasis in Feminist Theory & Research. Currently graduate students in the following fourteen affiliated Ph.D. programs are eligible to participate: Anthropology, Comparative Literature, Cultural Studies, Education, English, French, Gender, Geography, History, Native American Studies, Performance Studies, Psychology, Sociology, Spanish, and the Study of Religion.

The Designated Emphasis in Feminist Theory and Research affords graduate students in affiliated programs the opportunity to augment their Ph.D. in a given discipline with a specialization in Feminist Theory and Research. Typically a doctoral student in good standing may seek admission to the Designated Emphasis in Feminist Theory and Research and enroll in Designated Emphasis in Feminist Theory and Research courses. Those students in affiliated Ph.D. programs who complete the requirements of the Designated Emphasis will have this noted on their transcripts and their Ph.D. diploma will note the “Special Emphasis in Feminist Theory & Research.” Students must complete all the requirements for the Ph.D. in their home department. The requirements for the Designated Emphasis in Feminist Theory and Research are the successful completion of the two core courses, Women’s Studies 200A and Women’s Studies 200B, and two additional courses focusing on gender, sexuality and women’s studies; one in the student’s home department and one outside their home department. A student of the DE affiliated faculty must be a member of the student’s qualifying examination. Analysis of gender or sexuality is expected to be a central component of both the student’s qualifying examination and doctoral research.

Students should consult with the Chair of the Designated Emphasis in Feminist Theory and Research before enrolling in a graduate course for which they wish to receive credit to ensure that it will count toward fulfilling the requirements of the Designated Emphasis. If possible, please bring a copy of the syllabus or an expanded course description to your meeting with the Graduate Adviser.

Graduate Adviser, Wendy Ho in 1219 Hart Hall 530-752-6429; who@ucdavis.edu.