Committee on Evolutionary Biology

Chair
  • Michael Coates
Associate Chair
  • Shannon Hackett
Faculty
  • Kenneth Angielczyk, Field Museum
  • John Bates, Field Museum
  • Joy Bergelson, Ecology and Evolution
  • Rüdiger Bieler, Field Museum
  • Michael Coates, Organismal Biology and Anatomy
  • Maureen Coleman, Geophysical Sciences
  • Jerry Coyne, Ecology and Evolution
  • Martin Feder, Organismal Biology and Anatomy
  • Michael J. Foote, Geophysical Sciences
  • Jack A. Gilbert, Ecology and Evolution
  • Lance Grande, Field Museum
  • Shannon Hackett, Field Museum
  • Lawrence Heaney, Field Museum
  • Patrick Herendeen, Chicago Botanic Garden
  • Andrew Hipp, Morton Arboretum/Herbarium
  • Robert Ho, Organismal Biology and Anatomy
  • David Jablonski, Geophysical Sciences
  • Susan M. Kidwell, Geophysical Sciences
  • Marcus Kronforst, Ecology and Evolution
  • Robert Lacy, Brookfield Zoo
  • Scott Lidgard, Field Museum
  • Sarah London, Psychology
  • Manyuan Long, Ecology and Evolution
  • Thorston Lumbsch, Field Museum
  • Vincent J. Lynch, Human Genetics
  • Zhe-Xi Luo, Organismal Biology and Anatomy
  • Dario Maestripieri, Comparative Human Development
  • Peter Makovicky, Field Museum
  • Robert D. Martin, Field Museum
  • Jill Mateo, Comparative Human Development
Committee on Evolutionary Biology

- Lance Miller, Chicago Zoological Society (Brookfield Zoo)
- R. Michael Miller, Argonne National Laboratory
- Corrie Moreau, Field Museum
- Gregory M. Mueller, Chicago Botanic Garden
- Salikoko Mufwene, Linguistics
- John Novembre, Human Genetics
- Bruce Patterson, Field Museum
- Catherine Pfister, Ecology and Evolution
- Trevor Price, Ecology and Evolution
- Victoria Prince, Organismal Biology and Anatomy
- Stephen Pruett-Jones, Ecology and Evolution
- Clifton Ragsdale, Neurobiology
- Richard Ree, Field Museum
- Olivier Rieppel, Field Museum
- Callum Ross, Organismal Biology and Anatomy
- Rachel Santymire, Lincoln Park Zoo
- Urs Schmidt-Ott, Organismal Biology and Anatomy
- Paul Sereno, Organismal Biology and Anatomy
- Neil Shubin, Organismal Biology and Anatomy
- Petra Sierwald, Field Museum
- Douglas Stotz, Field Museum
- Margaret Thayer, Field Museum
- Russell Tuttle, Anthropology
- Janet Voight, Field Museum
- Mark Webster, Geophysical Sciences
- Mark Westneat, Organismal Biology and Anatomy
- Huntington Willard, President and Director, Marine Biological Laboratory
- John Timothy Wootton, Ecology and Evolution
- Chung I Wu, Ecology and Evolution

Emeritus Faculty
- Stuart Altmann, Ecology and Evolution
- John Bolt, Field Museum
- James Hopson, Organismal Biology and Anatomy
- Michael LaBarbera, Organismal Biology and Anatomy
- Wen-Hsiung Li, Ecology and Evolution
- R. Eric Lombard, Organismal Biology and Anatomy
- Thomas Nagylaki, Ecology and Evolution
- Janice B. Spofford, Ecology and Evolution
The Committee on Evolutionary Biology (CEB) provides students with the opportunity for interdisciplinary study of all aspects of evolutionary biology. The committee consists of faculty members with primary appointments in departments in all four graduate divisions within the university and of associated faculty from institutions in the Chicago area, such as Argonne National Laboratory, Lincoln Park Zoo, Chicago Botanic Garden, Morton Arboretum, and the Field Museum. The diversity of research interests represented by the collective expertise of the committee faculty contributes to its strong national and international reputation as a graduate training program.

Students in the committee have ready access to facilities at the associated institutions, including the more than 1,100 animals representing over 200 species at Lincoln Park Zoo, more than 17 million specimens in the Field Museum collections in botany, zoology, and paleontology, and libraries at the Field Museum. Various facilities for the study of molecular evolution and phylogenetic analysis are available to committee students, as are several student computer centers, an on-campus greenhouse, and digital equipment for off-site research.

In the Chicago area, committee students have access to the rich and diverse resources available at the Chicago Botanic Garden, Argonne National Laboratory, the Shedd Aquarium, the Morton Arboretum, and the many parks and lands managed by the local forest preserve and park districts.

The University of Chicago is a member of the Organization for Tropical Studies. Doctoral students in the committee have taken courses in tropical ecology and conducted research in Costa Rica through this affiliation. Recent evolutionary biology students have also conducted domestic research at a variety of field sites, including the Southwest Research Station of the American Museum of Natural History, Sierra Nevada Aquatic Research Laboratory, Kellogg Biological Station, the Marine Biological Laboratory at Woods Hole, and Friday Harbor Marine Laboratory. International research is conducted on every continent.

PROGRAM OF STUDY

Most students in the Committee on Evolutionary Biology complete their Ph.D. program in about five and a half years.

The first and second years consist largely of course work and individual reading and research courses, aiming toward successful defense of a dissertation research proposal by the end of the second year of study.

FIRST YEAR

Entering students are expected to have received a broad undergraduate training in biology and a good background in related quantitative subjects, such as chemistry, statistics and calculus. Students who are admitted with gaps in these areas may be required to remedy their deficiencies by taking appropriate courses during their first two years in the graduate program. The committee maintains a student advisory committee, which meets three times a year with each of the first and second year
students to advise them on courses available, arbitrate on which courses meet the committee’s course distribution requirements, and otherwise help students keep on track towards Ph.D. candidacy.

SECOND YEAR

Second year students continue to meet with the student advisory committee until they pass their preliminary examination/dissertation proposal hearing. The first part of the second year may be taken up mostly with course work, supplemented more heavily by reading and research courses.

READING AND RESEARCH REQUIREMENTS

CEB courses have been divided into six broad areas. Students must successfully complete a course in five of the six areas to be recommended for Ph.D. candidacy. The primary aim is that the student acquires considerable breadth in evolutionary biology; this breadth and the interdisciplinary research it permits should be the distinguishing feature of students working in the committee. In the first two years of study students generally enroll in three courses per quarter. This can be a combination of lecture, seminar, research, and reading formats.

DIVISION OF THE BIOLOGICAL SCIENCES TEACHING ASSISTANT REQUIREMENT PROGRAM

During their tenure in the doctoral program, students are required to register for two evaluated teaching assistants in two approved courses.

DISSERTATION PROPOSAL HEARING AND ADMISSION TO PH.D. CANDIDACY

Students should select an advisor no later than Autumn Quarter of their second year. This advisor normally will become the chair of the student’s dissertation proposal committee. The committee for the dissertation proposal hearing will be formed by the student and her/his advisor, subject to approval by the CEB Chair, when the student asks the CEB Chair in writing to approve her/his request to appoint the exam committee and hold the proposal hearing.

CEB students must present and defend their dissertation proposal, followed by an oral examination by a faculty committee on general issues in evolutionary biology. Students are expected to successfully defend their dissertation proposal by the end of the Spring Quarter of their second year in the Ph.D. program. After successfully defending their dissertation proposal, students may be recommended for candidacy for the Ph.D. by the CEB Chair.

PH.D. DISSERTATION

Upon successful completion of the dissertation proposal hearing and admission into candidacy for the Ph.D., students work on their dissertation projects in close consultation with their faculty advisor and dissertation committee. During a period of two to three years the student does primary original research, participates in seminars, discussion groups, and professional meetings and conferences, and completes the written Ph.D. dissertation. Students are expected to publish
dissertation related research, and encouraged to submit a substantial part of their research for publication before Ph.D. completion. A student is expected to submit a dissertation outline and proposed timetable for dissertation completion six months before the estimated date of final defense. These plans must be approved by the advisory committee, and a copy submitted as part of the meeting report to the CEB Chair.

The Ph.D. in evolutionary biology is awarded based upon the candidate’s having:

- Submitted a written dissertation reporting results of the student’s original research in a form suitable for publication, which must be approved by the faculty advisor and dissertation committee.
- Successfully completed a final oral examination covering the student’s field of specialization.
- Final approval of the dissertation by the CEB Chair and the University Dissertation Office.

ADMISSION

We strongly advise students considering application to CEB to begin preparation of their application early in the autumn quarter, so that all materials will arrive by the December 1st deadline. The committee requires GRE General Test scores from all applicants. Foreign applicants whose first language is not English also must submit TOEFL or IELTS test scores with their application materials (http://gradadmissions.uchicago.edu/admissions/international/).

Students have the opportunity to apply for the M.S. degree while completing their work for the Ph.D. The M.S. degree is also awarded in special cases, usually in association with Ph.D. requirements for graduate students in the Committee on the Conceptual and Historical Studies of Science.

Further information also may be obtained from the program’s home at http://evbio.uchicago.edu, or by sending an email to darwin@uchicago.edu.

EVOLUTIONARY BIOLOGY COURSES

**EVOL 30250. Chordates: Evolution and Comparative Anatomy. 100 Units.**

Chordate biology emphasizes the diversity and evolution of modern vertebrate life, drawing on a range of sources (from comparative anatomy and embryology to paleontology, biomechanics, and developmental genetics). Much of the work is lab-based, with ample opportunity to gain firsthand experience of the repeated themes of vertebrate body plans, as well as some of the extraordinary specializations manifest in living forms. The instructors, who are both actively engaged in vertebrate-centered research, take this course beyond the boundaries of standard textbook content.

Instructor(s): M. Coates
Terms Offered: Spring, L.
Prerequisite(s): Completion of the first three quarters of a Biological Sciences Fundamentals Sequence. Recommended for Advanced Biology students.
Equivalent Course(s): BIOS 22250, ORGB 30250
EVOL 30300. Key Issues in Early Vertebrate Evolution. 100 Units.
The course addresses questions about the origin of vertebrates, the interrelationships of major gnathostome clades, and the fish-tetrapod transition.
Instructor(s): M. I. Coates
Terms Offered: Winter
Prerequisite(s): Undergraduate level chordate biology required; familiarity with methods in systematic biology advantageous.
Equivalent Course(s): ORGB 31300

EVOL 31500. Ecological Genetics. 100 Units.
A graduate class in ecological genetics (evolution of the phenotype, without considering molecular approaches). This will be a weekly 2-hour seminar, emphasizing quantitative genetic approaches. Basic theory will cover such topics as heritability and breeding value, genetic correlation, Price's theorem and sexual selection. Seminars will include discussions of current topics from the literature.
Instructor(s): T. Price
Terms Offered: Autumn. not offered in 2015-16
Equivalent Course(s): ECEV 31500

EVOL 31700. Macroevolution. 100 Units.
Patterns and processes of evolution above the species level, in both recent and fossil organism. A survey of the current literature, along with case studies.
Instructor(s): D. Jablonski
Terms Offered: Spring
Equivalent Course(s): GEOS 36800

EVOL 31800. Taphonomy. 100 Units.
Lecture and research course on patterns and processes of fossilization, including rates and controls of soft tissue decomposition, post mortem behavior of skeletal hard parts, concentration and burial of remains, scales of time averaging, and the net spatial and compositional fidelity of (paleo)biologic information, including trends across environments and evolutionary time. Offered alternate years.
Instructor(s): S. Kidwell
Equivalent Course(s): GEOS 36700

EVOL 31900. Topics in Paleobiology. 100 Units.
In this seminar we investigate paleobiological or multidisciplinary topics of current interest to students and faculty. Previous subjects include the origin of phyla, historical and macro-ecology, the stratigraphic record and evolutionary patterns, and climate and evolution.
Instructor(s): D. Jablonski, S. Kidwell, T. Price
Terms Offered: Autumn
Equivalent Course(s): ECEV 36900, GEOS 36900
EVOL 32400. Invertebrate Paleobiology and Evolution. 100 Units.
This course provides a detailed overview of the morphology, paleobiology, evolutionary history, and practical uses of the invertebrate and microfossil groups commonly found in the fossil record. Emphasis is placed on understanding key anatomical and ecological innovations within each group and interactions among groups responsible for producing the observed changes in diversity, dominance, and ecological community structure through evolutionary time. Labs supplement lecture material with specimen-based and practical application sections. An optional field trip offers experience in the collection of specimens and raw paleontological data. Several "Hot Topics" lectures introduce important, exciting, and often controversial aspects of current paleontological research linked to particular invertebrate groups.

Instructor(s): M. Webster Terms Offered: Autumn
Prerequisite(s): GEOS 13100 and 13200, or equivalent. For BIOS students: Completion of the first three quarters of a Biological Sciences Fundamentals Sequence.
Equivalent Course(s): BIOS 23261, GEOS 36300, GEOS 26300

EVOL 32600. Evolutionary Aspects of Gene Regulation. 100 Units.
Using primary research literature, this course will examine recent advances in understanding of evolution of gene regulation. Among others it will cover the following topics: patterns and forces of evolutionary change in regulatory DNA and transcription factors, genetic changes that are responsible for phenotypic evolution, and discovery and evolutionary of implications of gene control by microRNAs.

Instructor(s): I. Ruvinsky Terms Offered: Autumn
Equivalent Course(s): ECEV 32500, BIOS 23281, GENE 32500, ORGB 32600, DVBI 32500

EVOL 33001. Paleobiological Modeling and Analysis-1. 100 Units.
This course is an introduction to mathematical modeling as applied to problems in paleobiology and evolutionary biology. Topics include: basic probability theory; general approaches to modeling; model comparison using likelihood and other criteria; forward modeling of branching processes; sampling models; and inverse methods. A series of programming exercises and a term project are required. Programming in R or C is recommended, but any language may be used. Winter quarter, generally in even numbered years. GEOS 36501 and GEOS 36502 can be taken in either order.

Instructor(s): M. Foote Terms Offered: Winter
Prerequisite(s): Mathematics through first-year calculus; basic computer programming skills (or willingness to learn); elementary statistics helpful.
Equivalent Course(s): GEOS 36501
EVOL 33002. Paleobiological Modeling and Analysis-2. 100 Units.
This course is an introduction to multivariate analysis, with emphasis on morphological data and problems in paleontology and evolutionary biology. Topics include: types of data and scales of measurement; data transformations; bivariate analysis; measurement of similarity and difference; clustering; ordination; singular value decomposition; principal component analysis, factor analysis, principal coordinates, correspondence analysis, and other eigenvector methods; and path analysis. Each student will bring a multivariate dataset (not necessarily original) to the course and will write a series of short papers based on analysis of these data. Code written in the R programming language will be supplied for most analyses. Winter quarter, generally in odd numbered years. GEOS 36501 and GEOS 36502 can be taken in either order.
Instructor(s): M. Foote Terms Offered: Winter
Prerequisite(s): Mathematics at secondary school level; basic computer programming skills (or willingness to learn); calculus, linear algebra, and elementary statistics also helpful, although essential points will be reviewed.
Equivalent Course(s): GEOS 36502

EVOL 33700. Evolutionary Developmental Biology. 100 Units.
The purpose of this course is to provide a developmental genetic perspective on evolutionary questions that have emerged in various disciplines (e.g., developmental biology, paleontology, phylogenetic systematics). Topics range from the evolution of gene regulation to the origin of novelties (e.g., eyes, wings). Although these subjects are introduced in lectures, the focus of this course is on reading, presenting, and discussing original research papers.
Instructor(s): U. Schmidt-Ott Terms Offered: Spring
Prerequisite(s): Biological Sciences Fundamentals sequence. Recommended for AP5 students.
Equivalent Course(s): BIOS 22256

EVOL 33850. Evolution and Development. 100 Units.
The course will provide a developmental perspective on animal body plans in phylogenetic context. The course will start with a few lectures, accompanied by reading assignments. Students will be required to present a selected research topic that fits the broader goal of the course and will be asked to submit a referenced written version of it after their oral presentation. Grading will be based on their presentation (oral and written) as well as their contributions to class discussions.
Instructor(s): U. Schmidt-Ott Terms Offered: Autumn
Prerequisite(s): Advanced undergraduates may enroll with the consent of the instructor.
Equivalent Course(s): ORGB 33850, BIOS 22306, DVBI 33850
EVOL 34500. Advanced Topics in Evolution. 100 Units.
While evolution by natural selection is an elegantly simple phenomenon, modern research in evolutionary biology contains a variety of controversial, and sometimes confusing, topics. In this course, we will explore, as a group, a select list of controversial or confusing topics in evolutionary biology through a mix of student-led presentations and discussion of the primary literature. Each student will also write a review paper about his or her selected topic.
Instructor(s): M. Kronforst Terms Offered: Spring
Equivalent Course(s): ECEV 34500

EVOL 34800. Kinship and Social Systems. 100 Units.
This course will use a biological approach to understanding how groups form and how cooperation and competition modulate group size and reproductive success. We will explore social systems from evolutionary and ecological perspectives, focusing on how the biotic and social environments favor cooperation among kin as well as how these environmental features influence mating systems and inclusive fitness. While a strong background in evolutionary theory is not required, students should have basic understanding of biology and natural selection. Course will use combination of lectures and discussion.
Instructor(s): J. Mateo Terms Offered: Autumn
Note(s): CHDV Distribution, A*; 1*
Equivalent Course(s): CHDV 34800

EVOL 35300. Phylogenetic Comparative Methods. 100 Units.
This is a graduate seminar course about the uses of phylogenetic trees in evolution and ecology, emphasizing historical inference of phenotypic traits, geographic ranges, and community ecology. (This is not a course on how to infer phylogenies, or their uses in studies of molecular evolution and population genetics.) Within this scope we will focus on topics of popular interest and relevance to student research. The format of the 2-hour weekly meeting will be somewhat fluid, but I anticipate giving introductory remarks or a lecture on main topics, followed by discussion of primary literature, and opportunities to work hands-on with software (bring your own laptop). Small-group assignments will be given to develop and present short tutorials on conducting analyses of real data.
Instructor(s): R. Ree, A. Hipp
EVOL 35401. Reconstructing the Tree of Life: An Introduction to Phylogenetics. 100 Units.
This course is an introduction to the tree of life (phylogeny): its conceptual origins, methods for discovering its structure, and its importance in evolutionary biology and other areas of science. Topics include history and concepts, sources of data, methods of phylogenetic analysis, and the use of phylogenies to study the tempo and mode of lineage diversification, coevolution, biogeography, conservation, molecular biology, development, and epidemiology. One Saturday field trip and weekly computer labs required in addition to scheduled class time. This course is offered in alternate (odd) years.
Instructor(s): C. Moreau, R. Ree. Terms Offered: Autumn. L.
Prerequisite(s): Completion of the general education requirement in the biological sciences or consent of instructor
Note(s): This course is offered in alternate (odd) years.
Equivalent Course(s): BIOS 23404

EVOL 35501. Phylogenetics. 100 Units.
This course will explore the principles of molecular systematic biology and the use of contemporary phylogenetic methods to address diverse evolutionary questions. Topics include homology and the alignment of sequence data, genome evolution, computational complexity, tree-searching algorithms, optimality criteria, coalescent methods, tree support, and an introduction to comparative methods. This course will emphasize theoretical issues followed by empirical examples to examine these topics as well as feature hands-on instruction for relevant computer programs and resources.
Terms Offered: Spring

EVOL 35600. Principles of Population Genetics-1. 100 Units.
Examines the basic theoretical principles of population genetics, and their application to the study of variation and evolution in natural populations. Topics include selection, mutation, random genetic drift, quantitative genetics, molecular evolution and variation, the evolution of selfish genetic systems, and human evolution.
Instructor(s): C.-I. Wu and M. Kreitman Terms Offered: Spring
Equivalent Course(s): ECEV 35600

EVOL 35800. Classics in Evolutionary Genetics. 100 Units.
Major classic papers in evolutionary genetics that had great impact on the development of the field are reviewed.
Instructor(s): M. Long Terms Offered: Spring
Note(s): Not offered in 2015-16
Equivalent Course(s): ECEV 35800

EVOL 36300. Speciation. 100 Units.
A review of the literature on the origin of species beginning with Darwin and continuing through contemporary work. Both theoretical and empirical studies will be covered, with special emphasis on the genetics of speciation.
Instructor(s): C-I Wu, S. Pruett-Jones Terms Offered: Winter. in alternate (odd) years
Equivalent Course(s): ECEV 36300
EVOL 36700. Morphometrics. 100 Units.
This graduate-level course serves as an introduction to the field of morphometrics (the analysis of organismal shape). Quantitative exploratory and confirmatory techniques involving both traditional (length-based) and geometric (landmark-based) summaries of organismal shape are introduced in a series of lectures and practical exercises. Emphasis is placed on the application of morphometric methods to issues such as (but not restricted to) quantification of intraspecific variability, interspecific differences, disparity, ontogenetic growth patterns (allometry), and phylogenetic changes in morphology. Relevant statistical and algebraic operations are explained assuming no prior background. Students are required to bring personal laptop computers, and are expected to acquire and analyze their own data sets during the course.
Instructor(s): M. Webster
Equivalent Course(s): GEOS 36000

EVOL 36900. Biopsychology of Sex Differences. 100 Units.
This course will explore the biological basis of mammalian sex differences and reproductive behaviors. We will consider a variety of species, including humans. We will address the physiological, hormonal, ecological and social basis of sex differences. To get the most from this course, students should have some background in biology, preferably from taking an introductory course in biology or biological psychology.
Instructor(s): J. Mateo Terms Offered: Autumn. Not offered 2015-2016
Equivalent Course(s): GNSE 30901,PSYC 31600,CHDV 30901

EVOL 37600. Research Seminar in Animal Behavior I. 100 Units.
Description: This workshop involves weekly research seminars in animal behavior given by faculty members, postdocs, and advanced graduate students from this and other institutions. The seminars are followed by discussion in which students have the opportunity to interact with the speaker, ask questions about the presentation, and share information about their work. This workshop exposes students to current comparative research in behavioral biology and provides interactions with some of the leading scientists in this field.
Instructor(s): J. Mateo Terms Offered: Autumn
Prerequisite(s): Graduate students only.
Note(s): Students register for this course in Autumn Quarter and receive credit in Spring Quarter after successful completion of the year’s work. CHDV Distribution, 1
Equivalent Course(s): CHDV 37500

EVOL 37700. Research Seminar in Animal Behavior II. 100 Units.
No description available.
Instructor(s): J. Mateo Terms Offered: Winter
Prerequisite(s): Graduate students only.
Note(s): CHDV Distribution, 1
Equivalent Course(s): CHDV 37502
EVOL 37800. Research Seminar in Animal Behavior III. 100 Units.
No description available.
Instructor(s): J. Mateo Terms Offered: Spring
Prerequisite(s): Graduate students only.
Note(s): CHDV Distribution, 1
Equivalent Course(s): CHDV 37503

EVOL 38100. Evolution of the Hominoidea. 200 Units.
This course is a detailed consideration of the fossil record and the phylogeny of Hominidae and collateral taxa of the Hominidea that is based upon studies of casts and comparative primate osteology.
Instructor(s): R. Tuttle Terms Offered: TBD
Prerequisite(s): Third- or fourth-year standing and consent of instructor
Equivalent Course(s): ANTH 28100, ANTH 38100, HIPS 24000

EVOL 38200. Comparative Primate Morphology. 200 Units.
This course covers functional morphology of locomotor, alimentary, and reproductive systems in primates. Dissections are performed on monkeys and apes.
Instructor(s): R. Tuttle Terms Offered: TBD
Equivalent Course(s): ANTH 28300, ANTH 38200, HIPS 23500

EVOL 38400. History and Theory of Human Evolution. 100 Units.
This course is a seminar on racial, sexual, and class bias in the classic theoretic writings, autobiographies, and biographies of Darwin, Huxley, Haeckel, Keith, Osborn, Jones, Gregory, Morton, Broom, Black, Dart, Weidenreich, Robinson, Leakey, LeGros-Clark, Schultz, Straus, Hooton, Washburn, Coon, Dobzhansky, Simpson, and Gould.
Instructor(s): R. Tuttle Terms Offered: Winter
Equivalent Course(s): ANTH 21102, ANTH 38400, HIPS 23600

EVOL 38800. Introduction to Research at the Field Museum. 100 Units.
Introduction to Research at the Field Museum and the University of Chicago. This course meets once every two weeks for a lecture by a curator at the Field Museum. A different curator lectures each week, presenting results of her/his current research on a range of topics in evolutionary biology, including phylogenetic systematics, molecular biology, paleontology, development, conservation biology and biodiversity, population biology, or biomechanics. Lectures often are followed by a tour of one of the major natural history collections in the world of living or fossil birds, mammals, plants, insects, fishes, invertebrates, or amphibians and reptiles.
Instructor(s): S. Hackett Terms Offered: Autumn
EVOL 40100. Grants, Publications and Professional Issues. 100 Units.
Covers professional topics in evolutionary biology, primarily strategies in grant writing and review. Each student will work towards the submission of an application of their choice. The course meets weekly and involves extensive writing and discussion.
Instructor(s): J. Bergelson, R. Ho, M. Coates Terms Offered: Autumn
Note(s): Only open to first year graduate students in the Darwinian Sciences Cluster Equivalent Course(s): ORGB 40100,ECEV 40100

EVOL 40200. Advanced Topics in Ethics for the Darwinian Sciences. 100 Units.
This course covers advanced topics in ethics relevant to senior Ph.D. students in the Darwinian Sciences. CEB students are required to successfully complete this course before being awarded the Ph.D.
Instructor(s): M. Coates, P. Herendeen Terms Offered: Winter
Prerequisite(s): Open to Ph.D. students in the Darwinian Sciences Equivalent Course(s): ECEV 40200,ORGB 40200

EVOL 40900. Behavioral Ecology. 100 Units.
This graduate seminar will explore current advances of animal social behaviors in their natural contexts, including theoretical and methodological approaches. Format will include reading and analysis of empirical and review articles, as well as an oral presentation on a topic of interest to the student. We will meet once a week.
Instructor(s): J. Mateo Terms Offered: Winter. Not Offered 2015-2016
Prerequisite(s): Consent of Instructor Equivalent Course(s): CHDV 40900

EVOL 41500. Topics in Stratigraphy and Biosedimentology. 100 Units.
Seminar course using the primary literature and/or a field problem. Topic selected from the rapidly evolving fields of sequence stratigraphy, basin analysis, and animal sediment relationships.
Instructor(s): S. Kidwell
Prerequisite(s): GEOS 26400 and GEOS 28300 or equivalent Equivalent Course(s): GEOS 38400

EVOL 42600. Community Ecology. 100 Units.
Lectures and readings cover advanced topics in multi-species systems, and include an introduction to basic theoretical approaches.
Instructor(s): J.T. Wootton Terms Offered: Autumn Equivalent Course(s): ECEV 42600

EVOL 42800. Population Ecology. 100 Units.
A lecture course on the empirical and theoretical approaches to the study of natural populations, including field methodologies and quantitative approaches. Includes computer assignments.
Instructor(s): C. Pfister Terms Offered: Winter Equivalent Course(s): ECEV 42800
EVOL 42900. Theoretical Ecology. 100 Units.
An introduction to mathematical modeling in ecology. The course will begin with linear growth and Lotka-Volterra models, and proceed to partial differential equations. The course’s perspective will emphasize numerical computations and fitting models to data.
Instructor(s): G. Dwyer, S. Cobey Terms Offered: Winter
Equivalent Course(s): ECEV 42900

EVOL 44001. Molecular Evolution I: Fundamentals and Principles. 100 Units.
The comparative analysis of DNA sequence variation has become an important tool in molecular biology, genetics, and evolutionary biology. This course covers major theories that form the foundation for understanding evolutionary forces that govern molecular variation, divergence, and genome organization. Particular attention is given to selectively neutral models of variation and evolution, and to alternative models of natural selection. The course provides practical information on accessing genome databases, searching for homologous sequences, aligning DNA and protein sequences, calculating sequence divergence, producing sequence phylogenies, and estimating evolutionary parameters.
Instructor(s): M. Kreitman Terms Offered: Winter
Prerequisite(s): Two quarters of biology and calculus, or consent of instructor
Equivalent Course(s): BIOS 23258, ECEV 44001

EVOL 44200. Bioinformatics and Microbial Ecology. 100 Units.
We will explore the application of sequencing data treatment and statistical analysis to explore ecology and biodiversity in microbial ecosystems. The course will explore metagenomic principles and bioinformatic techniques. The course will be different to most in that the class will be split into two small groups, each will be given a novel dataset and will be asked to produce a publishable paper. We will then work to submit the paper following the completion of the course. Essentially, following 4 weeks of lectures on techniques, application and theory, we will start to work on real data to solve real problems. Students will be graded on 1 mid term paper, and on the quality of the final group manuscript aimed for publication.
Instructor(s): J. Gilbert Terms Offered: Spring. Not offered in 2015-16
Prerequisite(s): An interest in sequence data and no fear of computers.
Equivalent Course(s): ECEV 44200
**EVOL 44800. Evolutionary Biomechanics of Vertebrate Feeding Systems. 100 Units.**
This proseminar examines the evolutionary and functional principles underlying the diversity of vertebrate musculoskeletal systems as revealed by research on vertebrate feeding systems. Mechanical, neuromechanical, modeling and experimental approaches to the biomechanics of vertebrate feeding systems are examined. Weekly labs cover practical skills surrounding collection and analysis of in vivo data. Students are required to participate in class discussions and prepare a written and oral proposal of a research project on a vertebrate feeding system. It is expected that the students will then perform that research in the Summer Quarter. Instructor(s): C. Ross Terms Offered: Winter
Prerequisite(s): Vertebrate diversity and phylogenetic relationships; algebra, some linear algebra and calculus helpful. Not offered in 2015-16.
Equivalent Course(s): ORGB 34800

**EVOL 45500. Biogeography. 100 Units.**
This course examines factors governing the distribution and abundance of animals and plants. Topics include patterns and processes in historical biogeography, island biogeography, geographical ecology, areography, and conservation biology (e.g., design and effectiveness of nature reserves).
Instructor(s): B. Patterson (odd years, lab). L., Heaney (even years, discussion) Terms Offered: Winter
Prerequisite(s): Completion of the general education requirement in the biological sciences and a course in either ecology, evolution, or earth history; or consent of instructor
Equivalent Course(s): BIOS 23406, ENST 25500, GEOG 25500, GEOG 35500

**EVOL 46200. Evolution and the Fossil Record. 100 Units.**
This course serves as an introduction to the practical and theoretical issues involved in obtaining primary systematic data from the fossil record, and demonstrates the criticality of such data to the rigorous documentation and interpretation of evolutionary patterns. Precise topics of the seminar discussions will vary from year to year depending on relevance to student research projects and interest, but are likely to focus on issues such as (but not restricted to) practical techniques in specimen-based paleontology (including fossil preparation and photography), species delimitation (including species concepts, variability, and ecophenotypy), stratigraphic/geographic range determination (including biostratigraphic correlation), phylogeny reconstruction (including the relevance of stratigraphic data), and the importance of these topics to broader macroevolutionary issues such as diversity/disparity dynamics and the determination of evolutionary trends, rates and processes.
Instructor(s): M. Webster
Equivalent Course(s): GEOS 36200
EVOL 46700. Advanced Topics in Behavioral Ecology. 100 Units.
This is a reading course covering advanced topics in behavioral ecology. The list of topics to be covered will be based in part on student interests, but may include: behavior and conservation, communication, mating systems, sexual conflict, and sperm competition. This course is designed as a graduate course, but advanced undergraduates may enroll with the permission of the instructor.
Instructor(s): S. Pruett-Jones, T. Price
Terms Offered: Winter
Equivalent Course(s): ECEV 36700

EVOL 49401. Approaches to Teaching in the Darwinian Sciences. 100 Units.
This course will introduce different teaching philosophies and methods that address how to be an effective teacher in the Darwinian Sciences. Specifically, the course will address what skills and knowledge undergraduates need to acquire and which assignments best teach these skills. Students will prepare course syllabi, discuss different approaches to teaching, and draft a philosophy of teaching statement. The overall goal for the course is that the students think critically about the art of teaching and formulate their own thoughts on the matter to better prepare them for their own careers in teaching.
Instructor(s): Staff
Prerequisite(s): Open to Ph.D. students in the Darwinian Sciences

EVOL 49500. Teaching in Evolutionary Biology. 100 Units.
Under the supervision of University faculty, graduate students in the Evolutionary Biology may serve as teaching assistants for courses in the College and relevant Graduate Divisions. Students will be evaluated and mentored throughout the quarter by their faculty supervisor, and at the end of the quarter by enrolled students. Prerequisite: successful fulfillment of the BSD teaching requirement and consent of instructor. Students must choose the instructor name from the faculty listing in the *Time Schedules* and register using that instructor’s assigned section number.
Instructor(s): Staff

EVOL 49600. Graduate Readings in Evolutionary Biology at the Field Museum. VAR Units.
Directed individual reading courses supervised by CEB faculty members who are curators at the Field Museum. Students must choose the instructor name from the faculty listing in the *Time Schedules* and register using that instructor’s assigned section number.
Instructor(s): Staff
Prerequisite(s): Consent of instructor.

EVOL 49700. Graduate Readings in Evolutionary Biology. VAR Units.
Directed individual reading courses in evolutionary biology supervised by CEB faculty members. Prerequisite: consent of instructor. Students must choose the instructor name from the faculty listing in the *Time Schedules* and register using that instructor’s assigned section number.
Instructor(s): Staff.
Prerequisite(s): Consent of Instructor
EVOL 49800. Graduate Research - Off Campus. VAR Units.
Advanced research under the direction of the faculty of the Committee on Evolutionary Biology, undertaken away from the University of Chicago campus at the Field Museum, the Chicago Zoological Park, Lincoln Park Zoo, established biological field stations under the direction of their staffs, or other locations approved by the Chair and the student's advisory committee. Students must choose the instructor name from the faculty listing in the Time Schedules and register using that instructor's assigned section number.
Instructor(s): Staff
Prerequisite(s): Consent of Instructor

EVOL 49900. Graduate Research - On Campus. VAR Units.
Advanced research under the direction of the faculty of the Committee on Evolutionary Biology. While any approved research problem may be pursued under this course number, special attention is called to the following research fields available in the Committee: population ecology and genetics, entomology, applied ecology, plant biology, systematics of fossil invertebrates, molluscs, problems in the systematics of arthropods, herpetology, mammalogy, ornithology, and ichthyology, theoretical biology, animal behavior, paleoecology, molecular evolution, functional morphology, evolution of development, community ecology and evolution, evolutionary paleobiology and macroevolution, and physiological ecology. Students must choose the instructor name from the faculty listing in the Time Schedules and register using that instructor's assigned section number.
Instructor(s): Staff
Prerequisite(s): Consent of Instructor