Department of Ecology and Evolution

Chair: Stefano Allesina
Director of Graduate Studies: Marcus R. Kronforst

Professors

- Stefano Allesina
- Luis Bettencourt
- Sarah E. Cobey
- Gregory Dwyer
- Marcus R. Kronforst
- Manyuan Long
- John Novembre, Human Genetics
- Catherine Pfister
- Trevor D. Price
- John Reinitz, Statistics
- Joseph Thornton
- J. Timothy Wootton

Associate Professors

- Ran Blekhman, Medicine
- Maureen Coleman, Geophysical Sciences

Assistant Professors

- Cara Brook
- Julia Kreiner
- Seppe Kuehn
- Dakota McCoy
- Pavitra Muralidhar
- Matthias Steinruecken
- Carl Veller

Emeritus Faculty

- Jerry Coyne
- Richard R. Hudson
- Martin Kreitman
- Wen-Hsiung Li
- Stephen Pruett-Jones
- Manfred D.E. Ruddat
- Chung-I Wu

Research Associate (Associate Professor)

- Michael Z. Ludwig

The Department of Ecology and Evolution provides training for research and teaching in the ecology, evolution and behavior of whole organisms, at the levels of the organism, the population, and the ecosystem. The research interests of our faculty include molecular evolution, population genetics, quantitative genetics, animal behavior, plant and animal ecology, evolutionary theory, systematics, paleontology, and related subjects. Individual levels of study range from molecules to communities. A common theme is the conduct of studies in a rigorous ecological and conceptual context, and the faculty share an interest in the architecture of populations, species and communities.

The department stresses scientific breadth and the interrelations between various specialized fields. Students are encouraged to approach basic biological problems with the most appropriate techniques: biophysical, biochemical, mathematical, physiological, or organismal. Departmental laboratories are equipped for a wide variety of contemporary research methods. Courses in other programs may be taken for credit in ecology and evolution for example, in the Departments of Organismal Biology and Anatomy, Biochemistry and Molecular

Biology, Molecular Genetics and Cell Biology, Statistics, Geophysical Sciences, Anthropology, and Chemistry. Many students in the Department of Ecology and Evolution participate in interdepartmental programs in genetics, cell biology, developmental biology, population biology, theoretical biology, and evolutionary biology, and in these programs dissertation research may be co-sponsored by faculty from different departments. Collaboration is also maintained with the Field Museum and the Shedd Aquarium for students interested in research in systematics, taxonomy, and evolutionary biology, and with the Brookfield Zoo for basic research in conservation and behavior involving zoo animals. New opportunities are available for research and education at the Woods Hole Marine Biological Laboratory as well as the Warren Woods Ecological Field Station (http://pondside.uchicago.edu/ee/facilities/WW.shtml/). Recent students in the department have performed field research in Central and South America, Asia, Australasia, Northern Europe, and other regions of the earth.

Program of Study

Most students in the Department of Ecology and Evolution complete their Ph.D. program in 5-6 years, though students entering with a master's degree may finish in slightly less time. A student advisory committee advises all incoming and second year students on academic and research concerns. The first and second years consist largely of course work and individual reading courses, aiming toward successful completion of an oral general knowledge examination by the spring quarter of the first year, supervised by the student advisory committee. The student and faculty advisor, in consultation with the director of graduate studies, then choose a five member faculty doctoral committee, scheduling a defense of the dissertation research proposal by the end of the second year of study. Work in subsequent years shifts to dissertation-centered research and, finally, preparation and defense of the Ph.D. dissertation. All students are required to register to be a supervised teaching assistant in two approved courses during their tenure in the doctoral program. While there is no terminal master's degree program in the department, students may elect to receive the S.M. degree upon successful completion of their dissertation proposal defense.

Entrance Requirements

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 without having fully satisfied these requirements will be required to remedy their deficiencies by taking appropriate courses during their first two years in the graduate program.

General Knowledge Examination

Each first year student will be expected to pass an oral general knowledge examination during the first year of study, generally no later than the 10th week of the spring quarter. This examination session shall be attended by all three members of an examination committee appointed by the student advisory committee. The goal of the examination will be to assess each student's general knowledge of key concepts, processes and issues in ecology and evolutionary biology, as covered in the courses recommended to the student by the student advisory committee during the student's first year in the program.

Dissertation Proposal Defense

This examination consists of the submission of a written Ph.D. research proposal and an oral presentation of the proposal in a public or closed/private seminar format, followed by a closed discussion and examination on the proposal presentation with the faculty committee chosen by the student and the chair of the department. Students are expected to schedule the dissertation proposal defense before the end of their second year.

Doctor of Philosophy

Upon successful completion of the dissertation proposal defense and admission into candidacy for the Ph.D., students work closely with the faculty advisor and dissertation committee on the dissertation project. During the period of two to three years in which students do primary original research, they also participate in seminars, discussion groups, and professional meetings and conferences, leading to the completion of the written Ph.D. dissertation. The Ph.D. in ecology and evolution is awarded based upon:

- Submission of a written dissertation based on original research, which must be approved by the faculty adviser and dissertation committee.
- Presentation of a public seminar based on the dissertation research.
- Following the public seminar, successful performance during an oral examination by the dissertation committee and other relevant faculty.
- Acceptance of the approved written dissertation by the university Dissertation Office in compliance with that office's regulations.

Application

We strongly advise students considering application to the department to begin preparation of their application early in the autumn quarter, so that all materials will arrive by the annual deadline (https://biosciences.uchicago.edu/admissions/how-to-apply/). Foreign applicants whose first language is not English also must submit TOEFL test scores with their application materials.

Further information also may be obtained from the graduate program's home page at http://eegraduate.uchicago.edu (http://pondside.uchicago.edu/ee/)

Ecology and Evolution Courses

ECEV 30415. Evolution Before Darwin. 100 Units.
This course will explore the emergence and development of evolutionary thought prior to Charles Darwin's On the Origin of Species (1859). We will pay particular attention to the way in which transformism was a feature of nineteenth-century thought more generally, connecting natural history to astronomy, theology, and the study of humanity. Natural philosophers and later scientists who wished to make arguments concerning nature's deep past and hidden or obscured processes (such as the long-term transformations of stars, strata, and organic species) faced an essential problem: the power of observation and experiment was limited. Our class will interrogate this problem, and examine the way in which the development of evolutionary thought prior to Darwin was intimately connected to contentious debates regarding speculation and scientific method. We will conclude by contemplating the ways in which the ideas and challenges raised by transformism and evolution influenced the reception of Darwin's work, and the way in which these ideas and challenges remain embedded within seemingly disparate fields of study today.
Instructor(s): J. Daly Terms Offered: Winter
Equivalent Course(s): KNOW 21415, HIST 25316, HIPS 21415, ORGB 30415

ECEV 30900. Evolution and Medicine: Brain & Sex. 100 Units.
TBD
Equivalent Course(s): GNSE 26600

ECEV 31100. Evolution of Biological Molecules. 100 Units.
The course connects evolutionary changes imprinted in genes and genomes with the structure, function and behavior of the encoded protein and RNA molecules. Central themes are the mechanisms and dynamics by which molecular structure and function evolve, how protein/ RNA architecture shapes evolutionary trajectories, and how patterns in present-day sequence can be interpreted to reveal the interplay data of evolutionary history and molecular properties. Core concepts in macromolecule biochemistry (folding and stability of proteins and RNA, structure-function relationships, kinetics, catalysis) and molecular evolution (selection, mutation, drift, epistasis, effective population size, phylogenetics) will be taught, and the interplay between them explored.
Instructor(s): J. Thornton Terms Offered: Winter
Prerequisite(s): Comfort with basic computer programming (course will use Python and R); undergraduate biology, chemistry, calculus, and introductory statistics.
Equivalent Course(s): HGEN 31100, BCMB 31100

ECEV 31200. Data Analysis in Ecol/Evol. 100 Units.
The course provides a basic introduction to statistics for biologists. We cover experimental design and many of the potential pitfalls associated with data analysis, including pseudoreplication, multiple testing, regression effects, setting up appropriate null models, and graphical presentation. Assumptions underlying elementary tests, including non-parametric vs parametric and fixed vs random effects will be clarified. We will not cover advanced methods of analysis, beyond straightforward linear models. Students will be encouraged to analyse their own datasets using R.
Instructor(s): T. Price Terms Offered: Autumn
Note(s): Required text: M. Whitlock & D. Schluter, Analysis of Biological Data, 2nd edition.
Equivalent Course(s): EVOL 31200

ECEV 31409. History of Extraterrestrial Life. 100 Units.
In 2014, the Vatican Radio made a splash when it reported that the pontiff, Pope Francis, condoned the baptism of extraterrestrials-if they so desired it. "Who are we to close doors?" he asked rhetorically. It was both a metaphor for spiritual inclusion and an accurate representation of the modern Vatican's position on the possibilities of modern astrobiology and the search for extrasolar planets, fields whose rapid growth over the past two decades make serious consideration of extraterrestrial life seem like a uniquely modern phenomena. Its history, however, is in fact many centuries old. In this course we will examine the development of beliefs concerning life in the universe from the sixteenth century to the present. How did historical actors understand the nature, abilities, and location of extraterrestrial life, and its relationship to man and god? We will analyze connections between these beliefs and contemporary political, social, scientific, and religious developments. These include the role of the plurality of worlds in the debates over heliocentrism, its impact and application in the context of deism and social and political freethought, its literary and artistic depictions and use as a tool of satire and social commentary, its influence on natural philosophy, its decline and the subsequent rise of alien conspiracists and their critics, and how and why conceptions of the extraplanetary other took a dark and sinister turn toward the early-to-mid twentieth century.
Equivalent Course(s): HIST 24917, KNOW 21409, HIPS 21409

ECEV 32000. Computing Skills for Biologists. 100 Units.
The course will cover basic concepts in computing for an audience of biology graduate students. The students will receive basic training in the use of version control systems, databases and regular expressions. They will learn how to program in python and R and how to use R to produce publication-grade figures for their manuscripts, and how to typeset scientific manuscripts and theses using LaTeX. All the examples and exercises

will be biologically motivated and will make use of real data. The approach will be hands-on, with lecturing followed by exercises in class.
Instructor(s): S. Allesina Terms Offered: Winter

ECEV 32900. Plant Development and Molecular Genetics. 100 Units.
Genetic approaches to central problems in plant development will be discussed. Emphasis will be placed on embryonic pattern formation, meristem structure and function, reproduction, and the role of hormones and environmental signals in development. Lectures will be drawn from the current literature; experimental approaches (genetic, cell biological, biochemical) used to discern developmental mechanisms will be emphasized. Graduate students will present a research proposal in oral and written form; undergraduate students will present and analyze data from the primary literature, and will be responsible for a final paper.
Instructor(s): J. Greenberg Terms Offered: Spring
Prerequisite(s): For undergraduates only: Three quarters of a Biological Sciences Fundamentals Sequence including BIOS 20187 or BIOS 20235.
Note(s): E.
Equivalent Course(s): MGCB 36100, DVBI 36100, BIOS 23299

ECEV 33400. Stochastic Processes in Continuous Time: Ecology and Epidemiology. 100 Units.
This course will introduce students to stochastic processes in continuous time, and to their application in major areas of Ecology and Epidemiology. These areas include theories of biodiversity, models for metapopulation dynamics and species' extinction, and those for the population dynamics of infectious diseases. Examples and discussions will include applications to data from ecosystems and infectious diseases in Latin America. The course is organized into four modules. The first two modules develop the basic concepts and methods of Markov processes in continuous time, from the formulation of models to their analysis and numerical simulation. The two following modules will involve 'hands-on' work by the students with guidance of the instructor, through projects formulated on the basis of a list of potential questions and problems. Students will be evaluated based on the oral and written presentation of their projects. Expected background includes calculus, basic probability, and some familiarity with a programming language.

ECEV 34500. Advanced Topics in Evolutionary Biology. 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): EVOL 34500

ECEV 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
Note(s): CHDV Distributions: A; 1 Not offered in 2023-2024
Equivalent Course(s): CHDV 34800, EVOL 34800

ECEV 35420. Stochastic Processes in Gene Regulation. 100 Units.
This didactic course covers the fundamentals of stochastic chemical processes as they arise in the study of gene regulation. The central object of study is the Chemical Master Equation and its coarse-grainings at the Langevin/Fokker-Planck, linear noise, and deterministic levels. We will consider both mathematical and computational approaches in contexts where there are both single and multiple deterministic limits.
Instructor(s): J. Reinitz Terms Offered: To be determined
Prerequisite(s): Consent of instructor.
Equivalent Course(s): STAT 35420, MGCB 35420, CAAM 35420

ECEV 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
Equivalent Course(s): EVOL 35800

ECEV 35901. Genomic Evolution I. 100 Units.
Canalization, a unifying biological principle first enunciated by Conrad Waddington in 1942, is an idea that has had tremendous intellectual influence on developmental biology, evolutionary biology, and mathematics. In this course we will explore canalization in all three contexts through extensive reading and discussion of both the classic and modern primary literature. We intend this exploration to raise new research problems which can be evaluated for further understanding. We encourage participants to present new ideas in this area for comment and discussion.

Instructor(s): M. Long, J. Reinitz Terms Offered: Autumn
Equivalent Course(s): STAT 35410, EVOL 35901

ECEV 35902. Genomic Evolution II: New Gene Problems. 100 Units.
This course is a summary and analysis for a rapidly growing area of gene evolution in recent years: Origin and evolution of new genes. We will review major scientific problems related to origination and evolution of new genes, ranging from the mechanistic processes that create new genes, to the rates and patterns of new gene origination, to the evolutionary forces acting on the new genes and to the impacts of the new genes on phenotypic evolution and to recently found evolutionary dynamics of sexual conflicts. While hundreds of research articles are discussed and, more importantly, the potential new research problems will be raised and evaluated for the further understanding. Relevant criticisms and new ideas to the new gene evolution are encouraged to present and discussed, in particular, with interests in: (i) finding new problems; (ii) finding new concepts; (iii) developing new techniques for analysis of new genes.
Instructor(s): M. Long and C. Wu Terms Offered: Spring. first offered in Spring 2018

ECEV 36400. Molecular Phylogenetics. 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): J. Thornton, A. Drummond Terms Offered: TBD. offered in alternate years
Note(s): not offered in 2018-19
Equivalent Course(s): HGEN 36400, ORGB 36400

ECEV 36500. Quantitative Microbial Ecology. 100 Units.
Microbes live in nearly every niche on the planet from our bodies to the soil beneath our feet. In all of these habitats, microbes live in communities that harbor staggering complexity with thousands of species possessing almost unimaginable variation in traits and interactions. From all of this complexity emerge global nutrient cycles, the functional microbiota within higher organisms, and many industrial processes upon which life depends. In recent years ecologists and microbiologists have joined forces with physicists, engineers, chemists, and computer scientists to try and build quantitative and predictive formalisms to understand these systems. This course gives students a front-row seat to this emerging field through a "physics-style approach" to understand the structure, dynamics, and function of complex communities of microbes. We engage with the general principles of microbial physiology. These considerations connect our inquiry to consumer-resource models and computational studies of resource-mediated interactions in microbial communities.
Instructor(s): Seppe Kuehn Terms Offered: Spring
Prerequisite(s): Calculus. Basic familiarity with programming in Python, Matlab or R is beneficial but not required. Biology majors: Completion of three quarters of a Biological Sciences Fundamentals sequence.
Note(s): E. CB.
Equivalent Course(s): BIOS 23413

ECEV 36700. 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): EVOL 46700

ECEV 36900. 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; G. Slater
Equivalent Course(s): EVOL 31900, GEOS 36900

ECEV 37500. Sexual Selection. 100 Units.
A discussion and critical analysis of sexual selection. The course will consist of lectures, reading and discussion.
Instructor(s): S. Pruett-Jones Terms Offered: Winter
Prerequisite(s): Common Core Biology, BIOS 248, or consent of instructor.
Equivalent Course(s): CHDV 37501, EVOL 37500

ECEV 38500. Color in Nature. 100 Units.
Explanations for the diversity of colors in nature are one of the most elusive and outstanding problems in evolutionary biology. In this course, we will combine advances in understanding of color perception and color production, including the basics of the physics of light, with evolutionary models of social and sexual selection. We will emphasize Endler's sensory drive, which attempts to build a predictive model of what color an organism should display based on the environment it lives in, and its neurobiological make-up. Our examples will be

largely drawn from vertebrates, but we will touch on invertebrates and plants. The course will consist of a mix of lectures (some from invited outside speakers) and discussion.
Instructor(s): Trevor Price Terms Offered: Autumn. offered in alternate (odd) years
Note(s): This is a graduate level course. Undergraduates admitted by consent-only.
Equivalent Course(s): EVOL 38500

ECEV 40000. Introduction to Research in Ecology & Evolution. 100 Units.
A graduate seminar to introduce students to research of faculty in the Department of Ecology & Evolution.
Instructor(s): Marcus Kronforst Terms Offered: Autumn
Note(s): Required for first and second year graduate students in Ecology & Evolution.

ECEV 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): S. Allesina, R. Ho, T. Wootton Terms Offered: TBD
Note(s): Open to first and second year graduate students in the Darwinian Sciences Cluster
Equivalent Course(s): ORGB 40101, EVOL 40100

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

ECEV 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): EVOL 42600

ECEV 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): EVOL 42800

ECEV 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

ECEV 43900. Theoretical Community Ecology. 100 Units.
TBD
Instructor(s): Stefano Allesina Terms Offered: Spring. offered in alternate odd years

ECEV 44002. Molecular Evolution II: Genes and Genomes. 100 Units.
This course covers the knowledge and well-established evolutionary analyses of genes and genomes, as well as related areas (e.g., origination and evolution of new genes, exon-intron structure, sex-related genes, sex-determination genetic systems, transposable elements, gene regulation systems, duplication of genes and genomes, evolution of genome sizes). These topics are discussed under the processes driven by various evolutionary forces and genetic mechanisms. The analysis of these problems is conducted with the genomic context. Lectures, discussions, and experiments are combined.
Instructor(s): M. Long Terms Offered: Spring. This course is offered in alternate (odd) years.
Prerequisite(s): BIOS 23258 or consent of instructor
Equivalent Course(s): BIOS 23259, EVOL 44002

ECEV 44500. Networks in Ecology and Evolution. 100 Units.
This course will introduce students to concepts and methods in Network Science, through their application to ecological systems, in particular communities of coexisting species and their interactions. The history of ideas on biodiversity from the perspective of food webs ("who eats whom" in an ecosystem) will be followed in the first part of the course by material on different types of networks, properties used to describe their topology/structure, and probabilistic models to generate such structure. In a 'hands-on' part of the course, students will become familiar with existing data sets and algorithms for network visualization, computation of network metrics, and model simulation and inference. The role of evolutionary constraints in network topology will be discussed. The second part of the course will consider the relationship between structure and dynamics, including notions of stability and robustness, and the interaction of ecology and evolution in the assembly of communities of interacting species. Networks in epidemiology will provide examples of other ecological and evolutionary applications.

ECEV 47500. Genetic Mechanisms from Variation to Evolution. 100 Units.
This course provides a graduate-level introduction to enduring questions regarding the fundamental processes by which genetic information is inherited, regulated, and transformed into organismal phenotypes and how these mechanisms shape and interact with evolutionary processes. We will describe different strategies, including new genome analysis and engineering technologies and statistical/computational principles, that can be used to study the complex, multi-layered organization of genomes, their interactions with varying environments, and ultimately, their evolution.
Instructor(s): John Novembre (primary), Francois Spitz Terms Offered: Autumn
Prerequisite(s): BIOS 201817 or BIOS 20153 or equivalent undergraduate course in Genetics or Evolutionary biology or consent of instructor
Equivalent Course(s): HGEN 47500

ECEV 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.
Equivalent Course(s): EVOL 49401, ORGB 49401

ECEV 49500. Teaching: Ecology/Evolution. 100 Units.
For graduate students to build their teaching skills by assisting with the instruction of a course in a core area of Ecology and Evolution. Students should register for the section under the faculty member who is their teaching mentor for the quarter.

ECEV 49600. READINGS: Ecology and Evolution. 300.00 Units.

ECEV 49700. Readings: Ecology/Evolution. 300.00 Units.

ECEV 49800. Off-Campus Grad Rsch: Ecology & Evolution. 300.00 Units.
For graduate students conducting dissertation research at an off-campus lab or field location. Students should register for the section under their advisor only when using pro forma status for the quarter.

ECEV 49900. On-Campus Grad Rsch: Ecology and Evolution. 300.00 Units.
For graduate students conducting dissertation research wholly or partly on campus for the quarter. Students should register for the section under their advisor and time spent should directly advance their dissertation in Ecology and Evolution.

ECEV 70000. Advanced Study: Ecology & Evolution. 300.00 Units.
Advanced Study: Ecology & Evolution