PCB 4683: EVOLUTIONARY BIOLOGY

Department of Biology, College of Sciences
4 credits, Fall 2022

Course Instructor

Dr. Chase Mason, PhD
Associate Professor
Email: chase.mason@ucf.edu
Contact via Webcourses messages *strongly preferred!*

Office Hours:
Tu 12:00-3:00 PM – In person, BIO 401E
[or virtual by appointment]

Teaching Assistant

Katie Martin, M.A.
Graduate Teaching Assistant
Email: katie.martin@knights.ucf.edu

Office Hours/Review Sessions:
M 1:00-2:30 PM – Zoom
W 9:00-10:30 AM – In person, BIO 416

Course Description

Evolution is the unifying theory of biology, applicable to all biological organisms including humans. As such, understanding evolutionary biology is critical for biologists and anyone who seeks an understanding of the natural world. To quote a notable evolutionary theorist, "Nothing in biology makes sense except in the light of evolution" (Theodosius Dobzhansky, 1973). In this class we take an analytical approach to explore the pattern and process of evolution in all life forms, from viruses to single-celled organisms to plants to *Homo sapiens*. Evolutionary genetics will be considered as the foundation underlying all aspects of evolutionary biology, and concepts in speciation, adaptation, classification, population genetics, and macroevolution will be covered in depth. The importance of evolutionary concepts to all facets of biology will be emphasized, particularly the interplay between evolution and ecology, genetics, development, and medicine.

Course Goals and Learning Objectives

Upon completion of the course, students will be able to:

- Understand major evolutionary patterns and how evolutionary relationships are estimated.
- Discuss the principles of population genetics, including selection, genetic drift, mutation, linkage, non-random mating, and gene flow.
- Understand the mechanisms of adaptation, speciation, and diversification.
- Engage with the scientific literature and think critically about individual scientific studies.
- Consider the relevance of evolutionary biology to human society.

Class Meetings (in person)

Tuesday/Thursday 10:30-11:50pm Building BA1, Room 119

Prerequisites

A grade of 'C' or better in undergraduate Genetics or consent of the instructor. A good understanding of basic genetics and ecology are vitally important to success in this class.

Course Materials and Resources

Webcourses (http://webcourses.ucf.edu) will be used to post materials for the course, including the syllabus, lecture slides and recordings, reading materials, and grades for all assignments. All exams, quizzes, and assignments will be conducted via Webcourses.

This course will use the textbook **"*Evolutionary Analysis*" by Scott Freeman and Jon C. Herron**. You may use any edition of this book from third to fifth. Chapters are the same for the fourth and fifth editions, but differ for the third edition (see table). Note that Syllabus and Webcourses references to chapters refer to the 5th edition.

5th Edition (2014) ISBN: 0321616677

4th Edition (2007) ISBN: 0132275848

3rd Edition (2003) ISBN: 0131018590

Additional supplementary reading materials (e.g. journal articles, videos, etc) will be provided by the instructor as files through Webcourses. This course will also involve an individual project using the evolution simulation game *Niche*. This will be made available to all students in the course via a remote connection.

Topic	5th Ed.	4th Ed.	3rd Ed.
Evolutionary Thinking	Ch. 1	Ch. 1	Ch. 1
The Pattern of Evolution	Ch. 2	Ch. 2	Ch. 2
Natural Selection	Ch. 3	Ch. 3	Ch. 3
Phylogenetics	Ch. 4	Ch. 4	Ch. 14
Mutation and Genetic Variation	Ch. 5	Ch. 5	Ch. 4
Population Genetics: Selection and Mutation	Ch. 6	Ch. 6	Ch. 5
Population Genetics: Migration, Drift, Mating	Ch. 7	Ch. 7	Ch. 6
Linkage and Sex	Ch. 8	Ch. 8	Ch. 7
Quantitative Genetics	Ch. 9	Ch. 9	Ch. 8
Studying Adaptation	Ch. 10	Ch. 10	Ch. 9
Sexual Selection	Ch. 11	Ch. 11	Ch. 10
Kin Selection	Ch. 12	Ch. 12	Ch. 11
Life History Evolution	Ch. 13	Ch. 13	Ch. 12
Evolution and Human Health	Ch. 14	Ch. 14	Ch. 13
Mechanisms of Speciation	Ch. 16	Ch. 16	Ch. 15
Human Evolution	Ch. 20	Ch. 20	Ch. 19

Assessment and Grading Procedures

Grades will be assigned on the following scale without rounding:

A: 90-100% B+: 85-89.9% B: 80-84.9% C+: 75-79.9% C: 70-74.9% D: 60-69% F:<60%

The grade for this course will be based on the following components:

(1) Four **progress exams** consisting of multiple choice and math questions. The lowest exam grade will be dropped, with the highest three grades retained (12% each, 36% total). A 72-hour window will be provided to take each two-hour exam on Webcourses, and questions will be presented in random order.

(2) One **cumulative final exam** (20%) will have the same format as the progress exams and will take place on Webcourses during a 72-hour window containing the assigned final exam period for this course, which is Thursday December 6, 10am-12:50pm.

(3) Eight short **reading quizzes**, two per unit, that will help you gauge your understanding of the material. Each quiz can be taken up to twice, and the average score is kept. (3% each, 24% total).

(4) Eight **discussion thread posts** through Webcourses (2% each, 16% total) on scientific articles accompanying the recorded guest lectures by early-career scientists. For each thread, you must post a comment with at least one question about the study and the most interesting thing you learned from the article or guest lecture. These are graded for completion based on contribution of a worthwhile question and interesting item.

(5) A **pre-test** and **post-test** for the course to gauge course efficacy (2% each, 4% total).

Course Policies and Specific Expectations

1. The goal of this course is growth – if you are focused on growing your knowledge of evolutionary biology, you will succeed in this course.

2. This course contains both in-person and virtual components. In-person lecture is being held in the assigned class period, and attendance is strongly encouraged. I fully understand that in-person attendance may not always be possible on every single course date due to factors like illness. For this reason, content lectures are also pre-recorded and can be viewed at any time, exams are being given in a 48-hour window, and other assignments will have broad windows of time to be completed. In addition, required virtual guest lectures will be used to complement the course content.

3. Assigned readings are very important to this course, and all assigned readings for a given day should be completed before attending lecture.

4. This course may occasionally cover socially controversial topics where they intersect with science and scientific evidence. Students are expected to behave professionally and treat others in a civil manner in the interest of scholarly discourse. However, discourse that invalidates the human dignity of others will not be tolerated.

5. Written communication with the instructor should be sent via Webcourses message (preferred) or UCF email. Note that I will not be able to respond to course inquiries sent from third-party email addresses (e.g., Gmail) where student identity cannot be confirmed, in order to comply with FERPA regulations. I strive to respond within two business days, but please be patient as there are 220 students. Webcourses messages are most effective as student emails are not mixed in with research and administrative emails, and will therefore usually receive a faster reply.

6. This course will offer an individual project as extra credit, completed at your own pace over multiple weeks. Details will be announced during the semester.

7. Academic dishonesty (e.g. plagiarism or cheating) is governed by the UCF Golden Rule. Students found to have committed academic dishonesty will receive a minimum of an "F" for the assignment in question, and at the instructor's discretion based on severity of the violation, an "F" for the entire course with referral to the Office of Student Conduct. See university policy below. Note that any communication with other humans during exams through digital or analog means constitutes cheating, as does the use of the textbook or internet resources during exams. You don't need to cheat to succeed!

8. Students are highly encouraged to discuss any and all portions of this course with me. If you are struggling, please do not wait until you fall behind to meet with me. For one-on-one meetings, I will be available for scheduled in-person or virtual meetings during my designated blocks of office hours. Teaching assistant office hours are group-style, rather than one-on-one.

Course Schedule

Course schedule is an approximation and will be updated throughout the semester if needed – Webcourses dates govern for quizzes, exams, and assignments.

Date	**Lecture**	**Pre-reading (5th ed)**	**Additional Virtual Activity**	**Exams/Quizzes** (Dates on WC)
Aug 23 (T)	Why study evolution? A Case for Evolutionary Thinking	Chapter 1		Pre-Test!
Aug 25 (TH)	The Pattern of Evolution/ Scientific Method	Chapter 2		
Aug 30 (T)	Evolution by Natural Selection	Chapter 3		Reading Quiz 1
Sept 1 (TH)	Evolution by Natural Selection			
Sept 6 (T)	Intro to Phylogenetics	Chapter 4	Guest Lecture + Discussion Post #1	
Sept 8 (TH)	Intro to Phylogenetics			
Sept 13 (T)	Genetic & Environmental Variation	Chapter 5		Reading Quiz 2
Sept 15 (TH)	*Unit wrap-up and Exam 1 Q+A*			**EXAM 1 (Ch 1-5)**
Sept 20 (T)	Population Genetics I: Selection & Mutation	Chapter 6	Guest Lecture + Discussion Post #2	
Sept 22 (TH)	Population Genetics I: Selection & Mutation			
Sept 27 (T)	Population Genetics II: Migration & Drift	Chapter 7	Guest Lecture + Paper Discussion #3	Reading Quiz 3
Sept 29 (TH)	Population Genetics II: Migration & Drift			
Oct 4 (T)	Linkage and Sex	Chapter 8		
Oct 6 (TH)	Quantitative Genetics	Chapter 9	Guest Lecture + Paper Discussion #4	Reading Quiz 4
Oct 11 (T)	*Unit wrap-up and Exam 2 Q+A*			**EXAM 2 (Ch 6-9)**
Oct 13 (TH)	Methods for Studying Adaptation	Chapter 10	Guest Lecture + Paper Discussion #5	
Oct 18 (T)	Sexual Selection	Chapter 11		Reading Quiz 5
Oct 20 (TH)	Sexual Selection		Guest Lecture + Paper Discussion #6	
Oct 25 (T)	Kin Selection	Chapter 12		
Oct 27 (TH)	Life History Evolution	Chapter 13		Reading Quiz 6
Nov 1 (T)	Life History Evolution			
Nov 3 (TH)	*Unit wrap-up and Exam 3 Q+A*			**EXAM 3 (Ch 10-13)**
Nov 8 (T)	*No Class: Election Day*			
Nov 10 (TH)	Evolution and Human Health	Chapter 14	Guest Lecture + Paper Discussion #7	Reading Quiz 7
Nov 15 (T)	Mechanisms of Speciation	Chapter 16		
Nov 17 (TH)	Mechanisms of Speciation			
Nov 22 (T)	Human Evolution	Chapter 20	Guest Lecture + Paper Discussion #8	Reading Quiz 8
Nov 24 (TH)	*No Class: Thanksgiving*			
Nov 29 (T)	*Unit wrap-up + Exam 4 Q+A*			**EXAM 4 (Ch 14, 16, 20)**
Dec 1 (TH)	*Final Exam Review*			Post-Test
Dec 6 (T)				**FINAL EXAM (Dec 6)**

Guest Lecture Schedule

PDFs of papers will be posted to Webcourses. Never purchase a scientific journal article.

Sept 6-13 **Dr. E. Sally Chang, PhD –** NIH Postdoctoral Fellow, National Human Genome Research Institute
Yahalomi D, Atkinson SD, Neuhof M, Chang ES, Philippe H, Cartwright P, Bartholomew JL, Huchon D. 2020. A cnidarian parasite of salmon (Myxozoa: Henneguya) lacks a mitochondrial genome. *PNAS* 117:5358-5363. https://doi.org/10.1073/pnas.1909907117

Sept 20-27 **Jigyasa Arora, PhD Candidate** – Okinawa Institute of Science and Technology
Arora J, Brisbin MAM, Mikheyev AS. 2020. Effects of microbial evolution dominate those of experimental host-mediated indirect selection. *PeerJ* 8:e9350. https://peerj.com/articles/9350/

Sept 27-Oct 4 **Dr. Elizabeth Carlen, PhD –** NSF Postdoctoral Fellow, Washington University in St. Louis
Carlen E. and Munshi-South J. 2020. Widespread genetic connectivity of feral pigeons across the Northeastern megacity. *Evolutionary Applications*. https://doi.org/10.1111/eva.12972

Oct 6-13 **Dr. Jordan Dowell, PhD** – USDA Postdoctoral Fellow, University of California Davis
Dowell JA, Reynolds EC, Pliakas TP, Mandel JR, Burke JM, Donovan LA, Mason CM. 2019. Genome-wide association mapping of floral traits in cultivated sunflower (*Helianthus annuus*). *Journal of Heredity* 110: 275-286. https://doi.org/10.1093/jhered/esz013

Oct 13-20 **Amanda Katzer, PhD Candidate** – University of Kansas
Katzer AM, Wessinger CA, Hileman LC. 2019. Nectary size is a pollination syndrome trait in *Penstemon*. *New Phytologist* 223: 377-384. https://doi.org/10.1111/nph.15769

Oct 20-27 **Andrea Wishart, PhD Candidate** – University of Saskatchewan
Wishart AE, Williams CT, McAdam AG, Boutin S, Dantzer B, Humphries MM, Coltman DW, Lane JE. 2018 Is biasing offspring sex ratio adaptive? A test of Fisher'sprinciple across multiple generations of a wild mammal in a fluctuating environment. *Proc R Soc.* B285: 20181251. https://doi.org/10.1098/rspb.2018.1251

Nov 10-17 **Dr. Taj Azarian, PhD MPH** – Assistant Professor, University of Central Florida
Azarian T, Martinez PP, Arnold BJ, Grant LR, Corander J, Fraser C, Croucher NJ, Hammitt LL, Reid R, Santosham M, Weatherholtz RC. 2020. Predicting evolution using frequency-dependent selection in bacterial populations. *Biorxiv*. https://www.biorxiv.org/content/10.1101/420315v3.full

Nov 22-29 **Dr. Maria A. Nieves Colón, PhD** – Assistant Professor, University of Minnesota
Nägele K, Posth C, Orbegozo MI, Chinque de Armas Y, Hernandez Godoy ST, González Herrera UM, Nieves-Colón MA, et al. Genomic insights into the early peopling of the Caribbean. *Science*. https://doi.org/10.1126/science.aba8697

Also, please read this article by Ed Yong at *The Atlantic*:
https://www.theatlantic.com/science/archive/2019/09/what-ancient-dna-says-about-puerto-ricos-history/598246/

Optional additional paper: Nieves-Colón MA, Pestle WJ, Reynolds AW, Llamas B, et al. 2020 Ancient DNA Reconstructs the Genetic Legacies of Precontact Puerto Rico Communities. *Molecular Biology and Evolution* 37: 611–626, https://doi.org/10.1093/molbev/msz267

University-Level Policies

Use of Zoom in this Course

This course may use Zoom for some portions of office hours. Any such office hours will be posted via the Zoom tool in Webcourses. Please take the time to familiarize yourself with Zoom by visiting the UCF Zoom Guides at https://cdl.ucf.edu/support/webcourses/zoom/. You may choose to use Zoom on your mobile device (phone or tablet). Things to Know About Zoom:

- You must sign in to a Zoom session using your UCF NID and password.
- You can contact Webcourses@UCF Support at https://cdl.ucf.edu/support/webcourses/ if you have any technical issues accessing Zoom.

COVID-19 and Illness Notification

Students who believe they may have a COVID-19 diagnosis should contact UCF Student Health Services (407-823-2509) so proper contact tracing procedures can take place. Students should not come to campus if they are ill, are experiencing any symptoms of COVID-19, have tested positive for COVID, or if anyone living in their residence has tested positive or is sick with COVID-19 symptoms. CDC guidance for COVID-19 symptoms is located here: (https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html). This course has been designed so that absences due to illness will not disrupt the ability of students to participate (e.g., pre-recorded versions of lectures). Students should contact the instructor if they need accommodations to assignment or quiz/exam deadlines.

Make-up Assignments for Authorized University Events or Co-curricular Activities (UCF Policy 401.2)

Students are frequently asked to represent the university in authorized events and activities. In some cases, this participation conflicts with the students' course assignments and requirements. It is university policy that instructors of record offer a reasonable opportunity for such students to complete missed classroom assignments, including written or oral examinations, quizzes, term papers, or other assignments. Furthermore, the make-up assignment and grading scale should be equivalent to the missed assignment and its grading scale. No penalty due to absence may be applied to these make-up assignments. The names of students participating in authorized activities such as, intercollegiate athletics, band, choir, co-curricular activities, and other academically related programs and events to represent the university will be listed on a Program Verification Form. It is the student's responsibility to present a copy of this form signed by the appropriate individual to the instructor(s) of record responsible for the class from which the student will be absent. The student must provide the Program Verification Form prior to the class in which the absence occurs. The university sponsor signs a copy of the Program Verification Form and files it with the Office of Student Rights and Responsibilities for verification purposes.

Make-up Assignments for Religious Observances (UCF Policy 5.020)

The University of Central Florida will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. A student who desires to observe a religious holy day of his or her religious faith must notify all of the instructors teaching the class(es) from which the student desires to be excused no later than the tenth business day of the term. The student will be held responsible for any material covered during the excused absence, but will be permitted a reasonable amount of time to complete any work missed. Where practicable, major examinations, major assignments and University ceremonies will not be scheduled on a major religious holy day. Students who are absent because of religious observances and have complied with this regulation will not be penalized. A student who believes that he/she has been unreasonably denied an educational benefit due to his/her religious belief or practices may seek redress with the Office of Institutional Equity in accordance with that office's Investigation Procedures.

Course Accessibility Statement

The University of Central Florida is committed to providing access and inclusion for all persons with disabilities. This syllabus is available in alternate formats upon request. Students with disabilities who need specific access in this course, such as accommodations, should contact the professor as soon as possible to discuss various access options. Students should also connect with Student Accessibility Services (Ferrell Commons, 7F, Room 185, sas@ucf.edu, phone (407) 823-2371). Through Student Accessibility Services, a Course Accessibility Letter may be created and sent to professors, which informs faculty of potential access and accommodations that might be reasonable.

Deployed Active Duty Military Students

If you are a deployed active duty military student and feel that you may need a special accommodation due to that unique status, please contact your instructor to discuss your circumstances.

Academic Integrity

Students should familiarize themselves with UCF's Rules of Conduct. According to Section 1, "Academic Misconduct," students are prohibited from engaging in:

1. Unauthorized assistance: Using or attempting to use unauthorized materials, information or study aids in any academic exercise unless specifically authorized by the instructor of record. The unauthorized possession of examination or course-related material also constitutes cheating.
2. Communication to another through written, visual, electronic, or oral means: The presentation of material which has not been studied or learned, but rather was obtained through someone else's efforts and used as part of an examination, course assignment, or project.
3. Commercial Use of Academic Material: Selling of course material to another person, student, and/or uploading course material to a third-party vendor without authorization or without the express written permission of the university and the instructor. Course materials include but are not limited to class notes, Instructor's PowerPoints, course syllabi, tests, quizzes, labs, instruction sheets, homework, study guides, handouts, etc.
4. Falsifying or misrepresenting the student's own academic work.
5. Plagiarism: Using or appropriating another's work without any indication of the source, thereby attempting to convey the impression that such work is the student's own.
6. Multiple Submissions: Submitting the same academic work for credit more than once without the express written permission of the instructor.
7. Helping another violate academic behavior standards.
8. Soliciting assistance with academic coursework and/or degree requirements.

Responses to Academic Dishonesty, Plagiarism, or Cheating

Students should also familiarize themselves with the procedures for academic misconduct in UCF's student handbook, *The Golden Rule* <https://goldenrule.sdes.ucf.edu/>. UCF faculty members have a responsibility for students' education and the value of a UCF degree, and so seek to prevent unethical behavior and respond to academic misconduct when necessary. Penalties for violating rules, policies, and instructions within this course can range from a zero on the exercise to an "F" letter grade in the course. In addition, an Academic Misconduct report could be filed with the Office of Student Conduct, which could lead to disciplinary warning, disciplinary probation, or deferred suspension or separation from the University through suspension, dismissal, or expulsion with the addition of a "Z" designation on one's transcript.

Being found in violation of academic conduct standards could result in a student having to disclose such behavior on a graduate school application, being removed from a leadership position within a student organization, the recipient of scholarships, participation in University activities such as study abroad, internships, etc. Let's avoid all of this by demonstrating values of honesty, trust, and integrity.

In-Class Recording Statement

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use, for use in a complaint against the institution, or for use as evidence in a civil or criminal proceeding. Students may not record for any other purpose without the consent of the faculty member. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. Recording classroom activities other than class lectures, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, and private conversations is prohibited. Recordings may not be used as a substitute for class participation and class attendance, and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct as described in the Golden Rule. Under existing Florida law (Florida Statutes 1004.097), a recorded lecture may not be published without the consent of the faculty member, except it may be shared with university officials or state and federal government officials in connection with a complaint to or against the university, or used as evidence in a criminal or civil proceeding. Violation of this provision may subject the student to disciplinary action by the university and/or to a legal action by a person injured by the publication. To publish means to share, transmit, circulate, distribute or otherwise provide access to the recording, regardless of format or medium, to another person, or persons, including but not limited to another student in the class. Additionally, a recording, or transcript of the recording, is published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, picket signs, or any mode of print. Under this law, a faculty member may bring legal action *"against a person who has published video or audio recorded in a classroom in violation of paragraph (3)(g) in a court of competent jurisdiction to obtain declaratory and injunctive relief and may be entitled to damages plus court costs and reasonable attorney fees, with the total recovery not to exceed $200,000."*

Campus Safety Statement

Emergencies on campus are rare, but if one should arise in our class, we will all need to work together. Everyone should be aware of the surroundings and familiar with some basic safety and security concepts.

- In case of an emergency, dial 911 for assistance.
- Every UCF classroom contains an emergency procedure guide posted on a wall near the door. Please make a note of the guide's physical location and consider reviewing the online version at http://emergency.ucf.edu/emergency_guide.html.
- Familiarize yourself with evacuation routes from each of your classrooms and have a plan for finding safety in case of an emergency. (Insert class-specific details if appropriate)
- If there is a medical emergency during class, we may need to access a first aid kit or AED (Automated External Defibrillator). To learn where those items are located in this building, see http://www.ehs.ucf.edu/AEDlocations-UCF (click on link from menu on left.
- To stay informed about emergency situations, sign up to receive UCF text alerts by going to my.ucf.edu and logging in. Click on "Student Self Service" located on the left side of the screen in the tool bar, scroll down to the blue "Personal Information" heading on your Student Center screen, click on "UCF Alert", fill out the information, including your e-mail address, cell phone number, and cell phone provider, click "Apply" to save the changes, and then click "OK."
- If you have a special need related to emergency situations, please speak with me during office hours.

Resources for Success

University Writing Center

The University Writing Center (UWC) offers writing support to UCF students from first-year to graduate in every discipline. Trained peer consultants provide help at every stage of the writing process, including understanding assignments, researching, drafting, revising, incorporating sources, and learning to proofread and edit. The UWC's purpose is not merely to fix papers or to make better writers, but to teach writers strategies to navigate complex situations for writing, both in and outside the University. Consultations are available for individuals and small groups. https://uwc.cah.ucf.edu/

UCF Libraries

The Research and Information Services Department exists to help students and faculty use library resources and services to find high-quality information both in the physical library collections and online. This unit provides one-on-one research consultations with a librarian for extensive, in-depth assistance with research. Sandy Avila is our science librarian, and she will participate directly in this course. https://library.ucf.edu/about/departments/reference/

Counseling and Psychological Services

Counseling and Psychological Services (CAPS) is a campus agency designated to provide psychological services to currently enrolled students free of charge. CAPS provides a variety of services from career assessment and stress management to crisis intervention. The office is located in Counseling Center 101, which is next to the UCF Health Center. http://caps.sdes.ucf.edu/