PCB 4674 Evolution - Fall 2015 Syllabus

Instructor: Dr. Charles Baer

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Teaching Assistants:

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Office Hours: Friday discussion sections, and by app't.	Office Hours: Wed discussion sections, and by appointment

Credits: 4

Time / Room:
Lecture: TTh Period 5-6, 211 Bartram
Lab: W, P.3,4, TBA; W, P.5-6, TBA; Fri P. 3-4; Fri. P.5-6, TBA

Class web page: PCB4674 in Canvas

Prerequisites: BSC 2010 or the equivalent. Familiarity with Mendelian genetics, basic molecular biology, and high-school algebra.

Texts: **The first two texts are OPTIONAL but highly recommended.** (1) Charlesworth, B. and D. Charlesworth, 2003. *Evolution: A Very Short Introduction*. Oxford University Press (~$7). **NOTE:** the C&C book IS "very short" (~130 pages). I ****HIGHLY**** recommend that upon purchasing the C & C book at the beginning of the semester you sit down and read it from cover to cover. That way (most of) the lecture material will be familiar when you encounter it and you can re-read the relevant material in the text as necessary. (2) Lane, Nick, 2009. *Life Ascending: The Ten Great Inventions of Evolution*. W. W. Norton & Co. (~$11). We will not formally cover the Lane book in class, but material from the book will appear on the midterm and final exam, in the "answer (say) any five of the following eight questions" context, where (say) three of the eight questions may come from the Lane book. It is a fascinating, thought-provoking book and I am confident that you will enjoy it. (3) Darwin, C., 1859. *The Origin of Species*, First Edition. *The Origin* is available for free online and a pdf is available on the class web page.

I do not assign a formal textbook, but some students feel more comfortable having a text to draw on as a resource. There are many excellent textbooks on basic evolutionary biology, they all contain pretty much the same conceptual material, although the emphases and choice of examples will differ. I have posted a (partial) list on the course web page.

Discussion Sections: The "lab" section of the class will consist of discussion sections. Each week the class will read two chapters from *The Origin of Species*. The first ~ 45 minutes of each section will be devoted to discussion of the readings; groups consisting of two or three students will lead the discussion, which will be moderated by the teaching assistants. The remainder of the section will be devoted to a TA-led discussion of the

week's Homework assignment. **NOTE: Homework will NOT be graded!** Grading of the discussion section will be based on class participation, both in leading the discussion and in participating in discussions led by others. Material from the *Origin* will appear on the midterm and/or final exams.

In-Class Presentations: The last two class periods will be devoted to group presentations. This year, the group presentation will be a **video presentation** in an informal style that **accurately** conveys an evolutionary topic of your group's choice to the general public. Topics will be vetted by me; I reserve the right to modify or veto topics, but I promise I will use the veto sparingly. You will be randomly divided into teams of 3-4 individuals (depending on class size), and as part of this group, you will design, prepare, direct, and edit your video. The video may be as simple or sophisticated as you want to make it (animated videos are acceptable). Videos should be 10 minutes in length, with five minutes for questions. You will be graded (by the rest of the class, myself, and the TAs) on your creativity, scientific accuracy, and effectiveness in presenting the topic.

Grading:

Midterm Exam: 3/8 (Take-home exam, open book)
In-Class Presentation: 3/16 (peer grade 50%, CFB grade 25%, TA grades 25%)
Discussion: 1/16 (based on class participation)
Final Exam: 3/8 (Take-home exam, open book)

Grading Policy:

Each assignment will be curved according to a normal distribution with a mean of 83% and a standard deviation of 10%, truncated at 100% (i.e., if your curved score is greater than 100%, it will be rounded down to 100%). The following table shows the proportion of students who will receive a curved score greater than or equal to the percent grade indicated in the right column:

Proportion of students	whose grade is greater than or equal to:
0.903	70%
0.618	80%
0.242	90%
0.115	95%

For example, the top row indicates that 90.3% of students will receive a curved grade of 70% or higher. Note that **your curved score may be higher or lower than your raw score**. For example, if the class mean is higher than the mean of the curved distribution (83%), then your curved score will likely be lower than your raw score. **Your final score for each assignment will be the maximum of your raw and curved scores for that assignment.** Each assignment will be curved separately.

If your final curved % is ≥90%, you are guaranteed an A (not A-), if your final curved % is ≥ 80% you are guaranteed a B (not B-), if your final curved % is ≥ 60% you are guaranteed a C (not C-). I reserve the right to curve downward, i.e., be more generous. Since UF does not recognize grades below C as passing, the only grade below C that I give is an E, i.e., if you pass the class you will receive at least a C.

Answer keys to exam questions will be posted on the class web page shortly after the due date. You are entitled to a re-grade on any assignment. Requests for re-

grades must be submitted in writing to me (CB) no more than **one week** after the assignment was returned, with a ≤ 1/2 page typed explanation of why you believe justice was not served. I reserve the right to re-grade the entire assignment, not just the disputed question. All re-grades are final.

Make-up policy* - (1) *Mid-term and Final exams*. Make-up exams will be offered only in the case of verifiable medical and/or family emergency, or pre-identified special circumstance (e.g., a job interview, a wedding, etc.). Make-up exams will be two-hour, closed book essay exams. (2) *Presentations*. If you miss a Discussion section presentation, I will assign a suitable substitute assignment on an *ad hoc* basis.

Academic Ethics - The exams in this class are take-home, open-book exams. You may consult any written or otherwise recorded source material (e.g., class notes, books, a recorded lecture, the vast, completely reliable source that is the Internet, etc.). **You may NOT (!) discuss ANY aspect of the exam with any other person!** By turning in your exam paper you confirm that you have adhered to ALL the rules and conditions of the exam. Suspected cases of academic dishonesty will (1) receive a grade of 0.0, and (2) be dealt with through the appropriate Departmental, College, and University channels.

Accommodations for students with disabilities: Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

Introduction: Evolution is at once the central organizing principle of biology and (along with climate change) the most controversial aspect of science currently in the public discourse. In this course we will examine the "The Theory of Evolution" in detail and break it down into its underlying components. As much as possible, important concepts will be introduced with simple mathematical models. Theoretical principles will be illustrated with real-world examples, with particular attention devoted to issues relevant to medicine, agriculture, and sociology. Controversial issues will be met head-on, not avoided. Moreover, you will have the opportunity and motivation to read *The Origin of Species* from cover to cover, which will place you in rarefied intellectual company. Upon successful completion of the course you will be able to lucidly and convincingly explain to friends, family, and random strangers why you do, or do not, "believe in evolution".

Class Schedule: Discussion section does NOT meet in weeks designated with a **

Week	Day/Date	Lecture	Topic	Reading	Discussion
1**	T 8/25	1	Introduction, Learning Objectives, Review of genetics and probability	Handouts	No meeting
	H 8/27	2	Mutation and Genetic Variation	GenomesII TOC@NCBI	
2	T 9/1	3	Intro to Theoretical Evolutionary Biology - one locus, infinite population (H-W, general viability selection)		*Origin* / Intro (TA leads)
	H 9/3	4	Mutation and Migration as evolutionary forces		
3	T 9/8	5	Evolution in a finite population (1): binomial sampling, decay of heterozygosity		*Origin*/Ch. 1,2 Homework 1
	H 9/10	6	Evolution in a finite population (2): effective population size, the Neutral Theory		
4	T 9/15	7	Non-random mating and its consequences		*Origin*/Ch.3,4 Homework 2
	H 9/17	8	Two-locus theory: Linkage Disequilibrium, its causes and consequences		
5	T 9/22	9	Quantitative Genetics (1): genetic variation		*Origin*/Ch.5,6 Homework 3
	H 9/24	10	Quant Gen (2): selection and the response to it		
6	T 9/29	11	Evolution of Sex and Recombination	TBA, Otto?	*Origin*/Ch.7,8 Homework 4
	H 10/1	12	Sexual selection		
7	T 10/6	13	Levels of selection	TBA, Wade?	*Origin*/ Ch. 9,10 Homework 5
	H 10/8	14	Evolution of Life History		
8**	T 10/13	15	Adaptation and the genetics thereof	Spandrels, Spaniels	**Midterm Exam, no meeting**
	H 10/15	16	Speciation and the genetics thereof	TBA	
9	T 10/20	17	Phylogenetic Inference		*Origin*/ Ch. 11,12 Homework 6
	H 10/22	18	Phylogenetics, con't - the Comparative Method	TBA, Martins?	
10	T 10/27	19	Origins of Genome Complexity	Lynch	*Origin*/ Ch. 13,14 Homework 7
	H 10/29	20	Origins of Life	Koonin and Martin	
11**	T 11/3	21	Origins of the Genetic Code	TBA	No meeting

	H 11/5	22	Origins and diversity of Viruses	TBA	
12**	T 11/10	23	**TBA (guest lecture)**		No meeting
	H 11/12	24	**TBA (guest lecture)**		
13**	T 11/17	25	Origins of the Eukaryotic cell	TBA, Martin	No meeting
	H 11/19	26	Extinction and the Fossil Record	TBA	
14**	T 11/24	27	Great Moments in Human Evolution	TBA	Thanksgiving, no meeting
	H 11/26		Thanksgiving, no class		
15**	T 12/1	28	Evolutionary Psychology (w/ M. Wayne)	TBA	No meeting
	H 12/3		**Group presentations (1)**		
16**	T 12/8		**Group presentations (2)**		No meeting

Homework Schedule

Week	Assignment	Software
3	Assignment 1 - Deterministic evolution at one locus	Populus
4	Assignment 2 - One-locus evolution in a finite population	Populus
5	Assignment 3 - One and two-locus evolution in a finite population	Populus
6	Assignment 4 - Introduction to Quantitative Genetics	Populus
7	Assignment 5 - Life-history evolution	Spreadsheet (e.g., Excel)
9	Assignment 6 - Introduction to Bioinformatics	TBA
10	Assignment 7 - Intro to Phylogenetic Analysis	-