

EEB 464 Macroevolution Fall 2011

Instructor: Dr. Brian C. O'Meara

Office hrs: TBD

Meeting time: 11:15-12:05 MWF (50 minute class × 42 classes) 427 Hesler Biology

Description:

The course is a lecture format course with classroom discussion and participation. Students are introduced to fundamental concepts in macroevolution including current areas of debate (drivers of evolutionary rates, modes of speciation, etc.) and taught to think critically. Computer-based exercises, especially simulations, will allow students to learn how processes acting on short to medium time scales affect long term patterns.

To understand macroevolution, it is important to learn about who, what, where, when, how, and why.

Who: Organisms

What: Non-living context (rocks from space, environmental conditions)

Where: Biogeography (on Pangaea or Bermuda?)

When: Geological time scale

How: Pattern of evolution

Why: Process of evolution

The course will cover all these areas. The ones that are most interesting, of course, are the how and especially the why. These are also the best to cover in class, where there can be discussion and other interaction. Rote learning (word meanings and the like) is something that you should be able to do on your own at this point in your education, with occasional guidance. We're not going to use much class time on this, but you will have to learn this info. I will clearly describe what you do have to learn (and if it's not clear, ASK), and quizzes and tests will be ways to evaluate your progress and provide further incentive to learn.

We are going to try an experiment regarding the "who" – the organisms. To really understand evolution and converse with other scientists, you have to know the names of some groups (imagine trying to talk about the history of some musical genre without knowing the names of any musicians or songs in that genre). Thus, most days, you will be responsible for learning about a particular taxon (on the syllabus, below). This could be a single species or a clade of many species. You should learn very basic info: what is it, what is it related to (i.e., where it attaches to the tree of life we will grow over the class), why it is important to know. For example: "Angiosperms: all flowering plants, lots of species, became common in the Cretaceous but may have originated earlier, sister to Gnetales." Working together on the website forum to get this info is encouraged (you can decide to rotate the job, let whoever gets the info first post it, etc.). What I really care about is that you learn it. Note that some of the taxa may be subsets of the other taxa (elephants are a kind of vertebrate).

Writing and presentations will be graded on a variety of levels, such as grammar, structure, and substance. The purpose of grading and comments is to improve your writing. Remember that your writing is being graded, not you.

Word count sets a minimum length (and references are not counted) but you may go a bit longer if needed (try to keep below 125% of required length). Since length is judged by words, not page length, please don't do any odd formatting of your paper (huge or tiny margins, font sizes of 8 or 18, etc.) to try to meet some page limits.

Papers/midterms will be turned in via Online@UT. This eliminates issues with printers, odd file formats, and the like. The site will automatically check your work for possible plagiarism. I do this in all my classes with written work. Except where noted, assignments are to be done individually. You must cite and reference work properly. **When in doubt about citation, plagiarism, or collaboration, ASK.**

For help with submitting documents online, see <http://online.utk.edu/students/assignment.shtml>. There is a practice uploading assignment that will allow you to test to make sure you can upload files correctly before the pressure of a deadline. If there is a problem at the moment of a deadline, email me your work instead to verify it is done on time (but normally you should be using BlackBoard).

We will be using laptops for some work in class. If you see the laptop cart in the classroom, take a laptop. When class is done, please return them to the cart and plug them in. Take care of them when you are using them. Some of our work will use the statistical analysis package R (<http://www.r-project.org/>) and some may use Processing (<http://processing.org>). Both are free and work on Mac, Linux, and Windows, so you may want to play with them on your own computers.

Communication is very important. I have set up a forum on the BlackBoard site (Online@UT) for our course. If you post a question there, I will immediately be emailed about it and will respond on the forum (though perhaps not immediately). Emailing me directly will not be any faster (though do email me if the issue is better addressed one-on-one). The benefit of using the forum is that everyone can see the answers and there's a chance that one of the other students will answer the question first. Feel free to use the forum for other class-related discussions.

Attendance is expected at all classes, though missing a class or two due to illness, family problem, etc. might happen (and is strongly suggested in the case of flu: <http://safety.utk.edu/flu/>). Make up of quizzes is normally not available (lowest three grades are dropped).

We will have discussions in some classes. You should participate in them. Sometimes, discussions in a class such as this consist of students trying to return the right answer to the instructor's question. To avoid this, sometimes I pursue a policy of not talking during a discussion for several minutes or longer so you have to talk to each other. This can result in complete silence. If you find this annoying, talk! Even if there is not a formal discussion, please ask questions.

Late work is penalized at 10%/day (so something turned in 49 hours late is given a score 70% of what it would have received on the due date). Extensions are not normally granted, except under extraordinary circumstances (having too much work to do does not qualify, for example).

Remember that even if you turn something in seven days late, it is still worth more points than not turning it in at all (and the grading for the class is just #points received / #points available, so something getting 20/100 points is still worth twice something getting 10/100 points, even though they are both an “F” individually).

My goal is to have you learn. If you are having trouble with something in the course, or if there is a topic you just have to learn more about, let me know (email, office hours, online forum, etc.). Faculty often use evaluations at the end of the semester to get info from students so we can improve before the next class, but this does not help you directly. To allow the class to improve while you are taking it, I have created a site for anonymous feedback at <http://brianomeara.info/feedback> (and yes, it is really anonymous). Let me know things that are going well or poorly — both are important. I might not implement all your suggestions, but they will all be read and considered, generally the same day you submit them.

The book **The Tangled Bank: An Introduction to Evolution** by Carl Zimmer is a recommended book for this class. It is recommended, not required. This is an accessible, well-written introduction to many topics in evolution. It is a great supplement to the information you will receive in class. Note that the structure of our class does not mirror that of the book. This book also covers more topics than we will have time for in class.

Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss specific needs. Please contact the Office of Disability Services at 865-974-6087 in Dunford Hall to coordinate reasonable accommodations for students with documented disabilities.

All relevant University policies (including, but not limited to, policies on academic integrity, attendance, etc.) apply to this course. In the case of any conflict between the policies in this syllabus and University policy, University policy applies. The instructor reserves the right to revise, alter, and/or amend this syllabus as necessary. Students will be notified by email of any such revisions, alterations, and/or amendments.

Schedule

Date	Topic	Big question	Taxon to have learned	Assignment
W 08/17	Pre-test, syllabus		-	
F 08/19	History of planet & life	What is the history of life?	Crinoid	
M 08/22	History of planet & life	What is the history of life?	Archaea	
			Bdelloid	
W 08/24	Evidence	What is the history of life?	rotifers	
F 08/26	Taphonomy	What is the history of life?	Trilobite	
M 08/29	Jargon		<i>Acromyrmex</i>	
W 08/31	Phylogenetics	What is the history of life?	Ammonite	
		What is the history of life? What explains trait frequencies?	<i>Ichthyornis dispar</i>	
F 09/02	Empirical distributions			
M 09/05	Labor day			
		What is the history of life? What explains trait frequencies?		McClung foyer
W 09/07	McClung field trip			
F 09/09	Biogeography	What is the history of life?	Brachiopod	

M 09/12	Speciation	Why are some groups more speciose than others?	<i>Wolbachia</i>	
W 09/14	Speciation	Why are some groups more speciose than others?	<i>Anomalocaris</i>	
F 09/16	Guest lecture 1	Why are some groups more speciose than others?	<i>Gasterosteus aculeatus</i>	
M 09/19	Extinction	Why are some groups more speciose than others?	Geospizinae	
W 09/21	Extinction	Why are some groups more speciose than others?	<i>Dionaea muscipula</i>	
F 09/23	Extinction	Why are some groups more speciose than others?	<i>Tribolium</i>	
M 09/26	Diversification	Why are some groups more speciose than others?	bonobo	
W 09/28	Diversification	Why are some groups more speciose than others?	Lichen	
F 09/30	Fall break			
M 10/03	Diversification	Why are some groups more speciose than others?	Fig wasp	
W 10/05	BISSE	Why are some groups more speciose than others? What explains trait frequencies?	<i>Anolis</i>	
F 10/07	Natural selection & drift	What explains trait frequencies? What sets the rate of phenotypic evolution?	Tunicates	
M 10/10	Sex	What explains trait frequencies? What sets the rate of phenotypic evolution?	Spiny anteater	Midterm distributed
W 10/12	Trends	What explains trait frequencies? What sets the rate of phenotypic evolution?	Eubacteria	
F 10/14	Trends	What explains trait frequencies? What sets the rate of phenotypic evolution?	<i>Maiasaura</i>	
M 10/17	Trends	What explains trait frequencies? What sets the rate of phenotypic evolution?	Isopod	Midterm due at 8 pm
W 10/19	Escalation	What explains trait frequencies? What sets the rate of phenotypic evolution?	<i>Riftia pachyptila</i>	
F 10/21	Correlated traits	What explains trait frequencies? What sets the rate of phenotypic evolution?	Ground sloth	
M 10/24	Correlated traits	What explains trait frequencies? What sets the rate of phenotypic evolution?	<i>Thermus aquaticus</i>	
W 10/26	Many to one mapping	What explains trait frequencies? What sets the rate of phenotypic evolution?	Lycophytes	
F 10/28	Contingency	All	Strepsiptera	
M 10/31	EvoDevo	What explains trait frequencies? What sets the rate of phenotypic evolution?	Diatom	Paper due at 8 pm

W 11/02	Systematics	Basic	<i>Dimetrodon</i>	
		What explains trait frequencies? Why are some groups more speciose than others?		
F 11/04	Coevolution		<i>Buchnera</i>	
		What explains trait frequencies? Why are some groups more speciose than others?		
M 11/07	Symbiosis		<i>Welwitschia</i>	
	Origin of life & astrobiology	What is the history of life?	<i>Ginkgo</i>	
W 11/09	Guest lecture 2		silversword	
F 11/11	Free topic 1		orca	
M 11/14	Free topic 2		<i>Cordyceps</i>	
W 11/16	Presentations			Presentation
F 11/18	Presentations			Presentation
M 11/21	Presentations			Presentation
W 11/23	Presentations			Presentation
F 11/25	Thanksgiving break			
M 11/28	Review			

Grading:

Fifteen 3-point quizzes, lowest three dropped: On average once per week (but a given week can have anywhere from zero to three quizzes) there will be a pop quiz at the start of class. This quiz is generally intended to test rote learning. One thing it will often cover is placement of focal organisms on the tree of life or vocabulary.

100 points: Topic review. 1000 words, including references. Cover a macroevolutionary question: what is known about it, what is the state of work on it, what work might be done in the future? Work should be individual.

100 points: Pair presentation. Imagine you are trying to get money to study a macroevolutionary question. You have to make a compelling case to a potential funder (i.e., the NSF will give you \$15K to study it, or a professor might offer you a place in her lab to work on this). You should include 1) why that question is interesting (this should include what is known about it), 2) how you plan to address it, 3) what potential outcomes of your work may be, and 4) the implications of these. 10 minute talk (PowerPoint, Keynote, PDF, etc.). Be sure to include references in your slides. As part of this, each member of the team will meet with me in private to talk about their presentation – no riding on your partner’s coattails.

150 points: Interactions/discussions in class. Your performance is judged daily and then the lowest ten days are dropped. It is hard to perform well without showing up (and the dropped days should more than cover usual absences for illness, family emergencies, etc.).

100 points: Take home midterm. You may NOT work with classmates, but you can use notes, books, papers, etc. (though do not plagiarize them, not that the questions will be ones you can typically plagiarize).

50 points: Floating assignments. Students may have trouble with certain topics or work, so I am reserving 50 points to distribute to needed assignments over the course of the semester. For example, if students are not reading papers properly, I may assign writing short summaries for

papers. If learning jargon is becoming hard, I may create an online quiz to evaluate this. Any assignments like this will be announced both in class and in email.

200 points: Final exam. Similar to the midterm, but with a bit more evaluation of rote knowledge.

In addition to these assignments, students will periodically be given articles to read for later discussion.