

# Evolution – PCB 4674 U01, Fall 2016

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Hours: Mon. 11:30-2:30 and Wed. 1-4, or by appt.  
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Prerequisites: Ecology, Genetics, Bio 1 and Bio 2.

## Why do we care about evolution?

“Nothing in biology makes sense except in the light of evolution.” - Theodosius Dobzhansky.

This famous quotation encapsulates the centrality of evolution to every field of biology; it is the grand unifying theory underlying all areas of biology, from molecules to populations. Evolution is the change over time in one or more inherited traits (anatomical, behavioral, biochemical) found in populations of individuals. In this course we will explore many big questions. Is evolution a theory or a fact? Why are there around 400,000 species of beetles, but only about 5,400 species of mammals? Where do new species come from? Why are so many diseases becoming untreatable with antibiotics? How can we feed an exploding human population in the face of global climate change? Can we engineer a perfect human race? By mastering skills such as evolutionary tree thinking and analysis of what factors allow and prohibit evolutionary change, you will be able to understand and address these and many more intriguing puzzles. We will build upon your foundation in genetics and ecology to understand patterns of biological diversity and the processes that create that diversity.

## What will I be able to do after successfully completing this course?

- 1) Make your own assessment about the strength of the evidence that evolution is a theory, a fact, or both, and be able to use evidence to support your own compelling argument. Evaluate the arguments of others regarding evolution and be able to identify reasonable-sounding, but faulty evolutionary thinking.
- 2) Convert an evolutionary tree diagram into a text “story” about the evolutionary events depicted in the diagram and make connections between the diagram and the evolutionary processes that cause the patterns depicted.
- 3) Analyze circumstances under which evolutionary change will and will not happen and make qualitative assessments of the relative rates of evolutionary change under different conditions.

- 4) Describe the molecular mechanisms that increase, maintain, and decrease genetic diversity and understand how this genetic diversity is expressed to produce phenotypic diversity.
- 5) Make connections between changes in allele frequencies over time (microevolution) and large-scale patterns of diversity (macroevolution) when gene pools are isolated for long periods of time. Develop a deep and unshakable understanding that all living organisms are related in a single tree of life.
- 6) Apply a set of criteria to determine whether a trait is an adaptation in the evolutionary sense.

### **How will I learn to do all this?**

Education, the process of creating knowledge, values, and information, is going through a transformation from a teaching oriented process towards an active learning process in which students engage in an active, challenging role in each class session. Results from empirical studies indicate that knowledge is better created, retained, and used by students when acquired through active, participatory learning rather than a passive, receptive process (Fink, 2003). Following these findings, this course is centered in an active learning rather than a passive teaching model. The structure of the course is designed to motivate and engage students in learning activities that promote critical thinking through the solution of concrete problems.

As a result of the active learning model, this course emphasizes DEEP LEARNING rather than superficial memorization of facts that will be promptly forgotten. *You will learn from this course in proportion to the amount of effort you put into it.* To allow time for active learning activities in class, much of the content delivery will occur outside class through readings, videos, and web lectures. To help you prepare for each class session, you will complete a preparation assignment that will guide you through extracting the most important concepts from the reading or video. This course has several active learning components in which you are the driver of your education rather than a passive recipient of knowledge. Active learning tools include weekly preparation assignments, peer response assignments, Peer-Led Team Learning (PLTL) sessions, in-class activities, iClicker questions, and online quizzes. Because science is an increasingly collaborative field, this course takes a team-based learning approach. For most of the in-class activities, you will work in class in groups of 3-5. You are also strongly encouraged to work in small groups outside of class. Although facts can be memorized, **understanding is not downloadable**. The key to deep learning is engagement. In this class you will be an active learner and you will only master the material if you take all available opportunities to participate and engage with it.

## Preparation Assignments

To maximize your learning (and grade) in this course, you must attend class regularly and you must prepare ahead for each class. Each week there will be a preparation assignment that must be completed before the start of class on Friday. Preparation consists of doing the assigned readings, video viewings, and/or web searches for the week and preparing a written response. The goal of the prep assignments is to give you a study guide of notes on course content as well as to make sure you have the necessary information to be able to do and understand the activities in class. You can think of this as turning in your reading and/or lecture notes rewritten in text form.

Prep assignments will consist of a list of reading and/or viewing assignments with discussion questions to guide your writing. ***The point of these questions is to guide you to the important parts of the content and as a starting point for discussion – not to just answer the question!*** All prep assignments will be approximately one page in length (700 words) and will be submitted through the course website as a TurnItIn assignment to protect you from plagiarism; emailed submissions will not be accepted.

Most effective strategy for doing prep assignments:

- 1) Read the discussion questions so that you will know what to focus on while doing the reading/viewing.
- 2) Put the questions away.
- 3) Do the reading (or viewing) paying particular attention and taking more detailed notes when you come to something that seems to relate to a discussion question.
- 4) Close the book, put your notes away (to avoid plagiarism) and get the questions back out.
- 5) Start to write, explaining the concepts as completely as you can.
- 6) When you get stuck, put your writing away and open your book and notes and look up what you are stuck on.
- 7) Close your book again and try again to complete your discussion.
- 8) If you are still stuck discuss the concept with a fellow student, an LA, or me.

This process allows you to self-check your understanding of the material by trying to explain it in your own words without simply trying to find different words to say what the book says. The process of explaining concepts from the reading in your own words allows you to generate your own understanding of the material; this is something you absolutely cannot do if you do not understand what you are reading. A common cause of unintentional plagiarism in written work is poor note taking habits. Students will take notes on their reading without paying attention to whether they are paraphrasing or quoting, then use their notes to create the written assignment. The student no longer remembers whether she is using her own words or the author's and plagiarism can slip in. In addition, the best time to check your understanding is while you are actually reading and can use the context, figures, and other materials in the book to guide your understanding. To both avoid plagiarism and maximize your understanding, the best time to explain concepts in your own words is when you are taking notes on the reading.

*General guidelines for prep assignments:* All coursework, including prep assignments, will be scored using specifications grading. Assignments that meet all specifications described below will be given full credit, assignments that fail to meet one or more specifications will get no credit. To receive full credit for prep assignments, they must be turned in before the start of class on Tuesday, be at least 700 words in length, have minimal matches in TurnItIn, and include no “filler material” (e.g. song lyrics, favorite recipes, irrelevant ramblings, baseball statistics, etc.). You are expected to correctly use terms from the weekly terms list and put them in **bold**. Do not include any additional text such as headers in your document. Please keep in mind that I have a large number of these to check each week and I cannot spend time figuring out if you have 700 words if the headers are removed. There is no upper limit on the length of prep assignments – make it as useful to yourself when it comes time to study for exams as you possibly can. To avoid excessive matching please do not quote or cite sources - demonstrate your understanding by explaining in your own words – and **do not paste the original questions from the assignment into the document you submit**. If pasting in the original questions helps you to organize your work, that is fine, but be sure to delete it before you turn it in. All TurnItIn assignments will be set to allow you to check your own originality report, so please do this before the assignment is due to make sure that no inadvertent plagiarism slipped into your work. A rule of thumb is never to have matches greater than four words in length and never two consecutive matches from the same source (i.e. don't just replace a few words here and there to avoid having four in a row). A similarity index greater than 50% will receive no credit. Lower percentages could still lose all credit depending on the nature of the matches.

Preparation assignments will be scored on a scale of 0-1 based on demonstrated serious effort to prepare for class. One point will be given for on-time, complete, thoughtful work, zero for inadequate effort (below length requirement, significant matches, any amount of filler material).

## **Concept Maps**

Each week there will be a weekly term list. Concept maps will connect these terms, as well as other terms from past weeks, using arrows and/or other connectors. All connectors are accompanied by an explanation (at least one full, substantive sentence) of how the two concepts are related to each other, as well as a definition. All concept maps must be hand-written (no photocopies or digital images will be accepted), and must be handed in before the start of the class – once class has started no more will be accepted. As with prep assignments, concept maps will be scored on scale of 0-1 based on demonstrated serious effort to prepare for class. One point will be given for on-time, complete, thoughtful work. Zero will be given for inadequate effort (below length requirement, significant matches, any amount of filler material).

## **Quizzes**

Each week there will be a quiz in Blackboard covering the concepts from the previous week. Quizzes will be due on Thursday at midnight. The quiz questions will be representative of the questions you can expect to see on the exams and will serve as practice tests. Each quiz will have five questions and you will have thirty minutes to complete the quiz once you start. This will be a good opportunity for you to practice the testing conditions with real exam-type questions. You will get the most benefit from this if you complete the quiz on your own and do not allow other students to sabotage your learning by providing the questions and/or answers to you. To allow for rare technical difficulties with the quizzes, your lowest quiz score will be dropped at the end of the semester.

## **Online Laboratories**

We will do four online laboratory exercise provided by SimBio. Links to these will be provided in blackboard, although they will be completed directly through a SimBio portal with your scores sent directly to me.

The laboratories are scheduled to coincide with the topics in the course, and to help you prepare for exams.

Finch lab: week of September 9

Flower lab: week of September 16

Mendelian lab: Week of September 30

Ferret lab: Week of October 7

## **Participation**

Actively participating in class is your best opportunity to meaningfully engage with the material using fellow students, LA's, and the instructor as resources. Graded participation activities will include iClicker questions as well as written work, which can include activities such as minute writes, quantitative problem solving, etc. There will also be a limited number of opportunities to participate in online activities through Blackboard and the course facebook site. Written in-class activities will be turned in at the end of class and will be returned at the beginning of the next class. Both iClicker scores and in-class activities will be worth participation points. All in-class activities will be done in small groups, but you will write up the results and turn them in individually.

If you have regular conflicts with class time, you must see Dr. von Wettberg at the beginning of the semester to determine whether your conflict can be remedied.

Participation points can only be made up with prior approval or under unforeseeable circumstances. Professional, medical, legal, or absences due to religious observances recognized by the university can be made up with Dr. von Wettberg's approval. It is your responsibility to gain this permission prior to your absence and find out what the make-up is. In the case of unforeseeable absences, approval for a make-up must be requested within one week of the absence.

There will be two kinds of iClicker questions in this class that will be graded differently. At the beginning of each class there will be preparation check questions to test whether you have adequately prepared for class. These questions will be answered individually and you will only get points for correct answers. During the class there will be additional participation clicker questions to help you to assess your understanding of the material or challenge your thinking. These questions may be answered in collaboration with your peers. For these questions you will get one (required) participation point just for responding to the question and an additional (extra credit) point for giving the correct response. Written in-class assignments will be scored on a scale of 0-2 based on demonstrated effort. Two points will be given for fully developed, thoughtful work, one point for responses with minimal effort (e.g. a sentence or bullet points when a discussion was asked for), and zero for no response. Points will not be deducted for incorrect statements or calculations.

For each iClicker question and all in-class calculations and discussion questions, class time will be allocated to discussion of the answers. The participation assignments that you hand in will be evaluated based on *demonstrated effort* rather than correct answers. *No real learning happens without making mistakes!* In-class activities and participation clicker questions are designed to be a safe place where you can work through the material and make mistakes with the help and support of the entire class community.

On a typical class day there may be three prep check questions, four participation activities, and five clicker questions. For that day there would be three clicker points available if the questions are answered correctly, eight participation points (two for each activity), and five clicker points, plus five extra credit points for correct answers for a total of 16 points and a maximum possible score of  $21/16 = 131\%$  for the day. If you end up at the end of the semester with more than 100% for clicker points due to the extra credit, the extra points will be averaged into the total grade (according to their weight), so it can make up for deficiencies in other areas.

#### *Online or in-person Participation Opportunities:*

You may earn further participation points for the following contributions to class discussion.

#### Post to Facebook group – 1 point

- Post a substantive question or comment about course content **OR** share an article, video, or image (cartoons are encouraged!) **WITH** a substantive comment about how it relates to a concept we are working on in class.
- Example of a non-substantive comment: “Check out this really cool article about the evolution of jawed vertebrates!”
- Example of a substantive comment with explicit reference to a concept from the course: “Check out this really cool article about the evolution of jawed vertebrates! It really shows how the evolution of jaws played a huge role in the radiation of gnathostome vertebrates by correlating the origin of jaws in the fossil record to rapid speciation soon afterward using molecular methods.”
- You will know if you earned the point if one of the LA’s or I “like” it.

#### Post to Blackboard discussion board – 1 point

- Post a substantive question or comment about course content **OR** provide a substantive response to a peer's question or comment.
- Examples of non-substantive discussion board (or FB) questions: “Does anyone know why the answer to the coelacanth question on quiz 4 was [correct answer]?” “What’s up with Hox genes? I don’t get it.”
- Examples of substantive discussion board (or FB) questions: “Does anyone know why the answer to the coelacanth question on quiz 4 was [correct answer]? I thought it should be [incorrect answer] because [explanation]. Where am I going wrong?” (Hint: if asking about quiz questions, do not refer to question numbers or the letters corresponding to answers because both of these are randomized for each quiz.) “What’s up with Hox genes? I understand that there were multiple whole genome duplications that resulted in multiple copies of the Hox clusters, but I don’t see what this has to do with the rapid diversification and increased complexity of vertebrates. Please help!”

#### Film Review – 1 point

- Post a review to the film review discussion board describing a documentary film you have seen about a topic in Evolution we are studying. This can be anything from a YouTube video to a television show (such as Nature) to a full length feature film.
- Must give details about the strengths and/or weaknesses of the film and why you would recommend that your fellow students should watch it or skip it.
- Must make explicit reference to how it addresses (or possibly misrepresents) specific concepts we are working on in the course.

#### Study group – 1 point

- If you have a study session with three or more people, take a picture of the group studying.
- Post the image to the study group discussion board
- The discussion board post must also include one sentence from **EACH** member (be sure to include the names of the members!) about how they individually contributed to the study group.
- Also include with the post a group statement describing specifically how working in a group has benefitted them.
- The study group discussion board can also be used to find people to study with.

#### Office hours – 1 point

- Come to my office hours with a substantive question about the content and concepts in the course.
- “I don’t get it” is not a substantive question. Think carefully about what you do and do not understand about the topic and come with a well-formulated question.
- I am happy to answer questions during office hours about how to improve your grade or discuss study strategies, but you will only get the point if you also have a question as described above.

## Exams

There will be three exams and a final exam. Exams will be multiple choice and will focus on higher order learning such as analysis and conceptual understanding. Weekly quizzes will consist of practice exam questions to help prepare you for the level and format of questions you can expect.

Please arrive on time to exams. You will want to have the maximum amount of time to carefully think about each question. Because of the possibility of information leakage, I cannot let anyone start the exam after the first exam has been turned in. There will be no make-up exams given for this course. If you must miss an exam (medical, legal, professional, recognized religious observances), you may use your final exam score to replace the missed exam score (see below). Please check the exam schedule as soon as possible for any conflicts with religious observances and notify Dr. von Wettberg within the first week of class.

The final exam will be a comprehensive exam that synthesizes major concepts from throughout the course. The questions on the final will be in a similar format and level of difficulty as the regular exams, but will emphasize connections between different parts of the course. Because the final exam represents the end point of where I hope your understanding of the material will be by the end of the semester, I will use your exam score as a “recovery score”. What this means is that the score you get on the final will be used both as your final exam score, and will also replace your lowest midterm exam score. **This will only be done if you have taken all of the midterm exams or if you have missed an exam with a valid, documented excuse.** If your final exam score is lower than all of your regular exam scores, then no scores will be replaced (i.e. this can only help, not hurt, your grade).

## Grading Policy:

### How will I know if I am “getting it”?

No matter what you do in life, your ability to assess your own performance will be critical. You will be given many opportunities to learn and practice this skill in this course. It is essential to your professional preparation that you exercise this skill by taking advantage of all opportunities to self-assess your understanding and critically examine your learning process. I enthusiastically encourage you to come to my office hours so that I may help you with any concepts with which you are struggling.

In addition to your self-assessments, there will be regular, graded components of the course that will help you to keep track of how you are doing.

### Homework – 30% of final grade

Preparation assignments and concept maps: 10%

SimBio labs: 10%

Weekly Quizzes: 10%

### **Classwork – 30% of final grade**

Clicker questions: 15%

Written activities: 15%

Other participation: Extra credit

### **Exams – 40% of final grade**

Exams: 24% (8% each)

Final exam: 16%

An excel file with a grade calculator is provided in the course website to help you track your grade.

### **Final Grades**

Your final score will be the weighted average of the individual component scores, as described above. Final grades will be computed as a percentage of the maximum number of points.

| Score     | Grade |
|-----------|-------|
| 95 - 100% | A     |
| 90 - 94%  | A-    |
| 86 - 89%  | B+    |
| 83 – 85%  | B     |
| 80 – 82%  | B-    |
| 76 – 79%  | C+    |
| 73 – 75%  | C     |
| 70 – 72%  | C-    |
| 66 – 69%  | D+    |
| 63 – 65%  | D     |
| 60 – 62%  | D-    |
| Below 59% | F     |

### **PLTL**

PLTL (Peer-led team learning) is a program that provides a setting for students to work outside class on course concepts in small groups under the guidance of a peer leader who has successfully completed the class. I have expended great effort to ensure the activities you will work on in these sessions will be well aligned with what we are doing in class and will provide a useful opportunity to actively engage with core concepts. **I consider PLTL to be a critical part of your active learning process. Although the program is**

**optional, I urge you to make every possible effort to participate.** Through years of experience, I have seen that students who engage in PLTL perform better in class, gain better understanding of material and get better grades. If you choose to participate in PLTL, your PLTL score will become 15% of your final course grade and the weight of your midterm and final exam scores will be reduced, with the grade distribution becoming the following:

**Homework – 30% of final grade**

Preparation assignments: 10%

SimBio lab: 10%

Weekly Quizzes: 10%

**Classwork – 30% of final grade**

Clicker questions: 15%

Written activities: 15%

**Exams – 25% of final grade**

Exams: 15% (5% each)

Final exam: 10%

**PLTL – 15% of final grade**

You may not use your PLTL score to replace the final exam. Information on how to sign up for PLTL will be provided on the first day of class and on the course website.

**What resources will I have available?**

**Textbooks and Supplies**

Everything listed below is available from the FIU Bookstore.

Required textbook:

*Evolutionary Analysis*, Fifth Edition, Herron and Freeman

ISBN-13: 9780321928160

<https://www.pearsonhighered.com/program/Herron-Evolutionary-Analysis-5th-Edition/PGM296285.html>

**iClickers**

iClickers will be required for each class session, beginning with the first class. The bookstore lists iClicker2 as required, but if you already have an iClicker1 it will work. The course will be set up to enable iClicker REEF for use on mobile devices, but please be advised that I cannot be responsible for any problems with connectivity in the classroom, so use of REEF must be strictly at your own risk. I also cannot be responsible for malfunction of clickers. It is your responsibility to make sure that you see a confirmation on your clicker screen each time you submit a response and that you carry

extra batteries in case your batteries run out.

*You may not hand your clicker to another student in the class to answer while you are not in class. Students found with two clickers will have both clickers confiscated. Both students will receive a zero for the clicker grade throughout the entire course.*

There will be several clicker questions given in each class session. After the first week of class I will post the clicker scores to the course website. **It will be your responsibility to make sure that your clicker points are being recorded correctly.** If your score is not accurate, you must contact me within one week to correct the problem. After that time, I cannot guarantee that the problem can be solved. Participation in the clicker questions will constitute the majority of your participation grade, so please make sure you bring your clicker to each class. In a class this size I cannot accept written answers to clicker questions, so it must be your responsibility that your clicker is not lost, forgotten, or nonfunctional.

### **Course Website**

Our course website will be in the Blackboard Learn platform. Please log on as soon as possible to make sure you have access. After today, all course materials including extra readings, lecture handouts, etc. will be distributed electronically and it is your responsibility to retrieve these materials. In addition, all written work will be submitted through the course web page, so you don't want to wait and find out that you can't get in when you have something due. When you login to Blackboard Learn from the [ecampus.fiu.edu](http://ecampus.fiu.edu) site using your my account credentials, you will see your Blackboard Learn Courses listed at the top of the page. Click on a course to go into the course.

NOTE: You will not see a Blackboard Learn course in the My Courses block until your instructor makes it available to the students. If you don't see your class in My Courses when you login,

- Check with your instructor to find out if he or she has made the course available to students. Most instructors will do this the first week of class, but this is up to your instructor.
- If you recently registered for the course in the PantherSoft class schedule, it may take a few hours or overnight until you see the course in the My Courses block.

If you still don't see a Blackboard Learn course you believe you should have, call the UTS Support Center at 7-2284 for assistance.

### **Class Facebook page**

This is an optional forum where you can post questions, resources, interesting articles, cartoons, or anything relating to evolution. I will share all of the extra videos, web tutorials, and other helpful resources on the web that I find here, so it can be a really great resource. In addition, I periodically will hold virtual office hours in the Facebook group, so it is a great way to get questions answered quickly without having to find me in my

office. To join, sign up for FIU Groups, then search under **Evolution – von Wettberg** (or **use this link**) and request to join.

## **Academic Integrity**

*“Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and to honestly demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.”*

Professionals in any field are expected to maintain the highest standards of ethics, integrity, and personal responsibility at all times. The best way to make these standards a matter of habit is to use them consistently at all times. This course is designed to be highly interactive and collaborative; a culture of trust is essential for it to work well. We are all honest people here – be your best self.

Studies have shown that the majority of cases of plagiarism are unintentional mistakes. You will submit all of your prep assignments through TurnItIn to self-check for plagiarism or copying from other students. I will always set assignments for unlimited submissions and allow you to view your originality report so that you can self-correct any inadvertent matches. I do not have a set matching percentage that I use to determine copied work, but I look at each originality report and make a judgment call. Avoid any matches that exceed four words in length (except for names of things that have multiple words) and consecutive matches from the same source. If I determine that an assignment has an unacceptable similarity to other sources, it will not be accepted. In the case of matches to another paper from the class, both papers will receive a zero. If there is any chance that another student has had access to your paper, it is in your interest to check your originality report repeatedly until the due date. If you are the first to turn it in, you will see low similarity, but once the other student has submitted their paper, it will go up.

Although you are an honest student, there may be times when you are tempted to help another student cheat. Any student seen with more than one iClicker in class will have all clickers confiscated, to be returned after their numbers are recorded, and all clicker numbers involved will receive a zero for participation for the course – that will mean automatically losing 15% of your grade.

I will follow strictly the “Student Handbook” regarding cheating. Procedures for both formal and informal procedures can be found under the section “Academic Misconduct” in the “Conduct & Policies” chapter. **ANYONE CAUGHT CHEATING ON AN EXAM WILL BE**

**ASKED TO LEAVE THE CLASS, WILL BE GIVEN AN “F” FOR THE WHOLE COURSE AND A PETITION WILL BE SENT TO ACADEMIC AFFAIRS.**