

BIOC50: Macroevolution

Fall 2020

Person	Role	Contact	Office Hours
Professor Weir	Instructor	jason.weir@utoronto.ca	Monday 1:00 to 2:00pm via Zoom
Sean Anderson	TA	seanas.anderson@mail.utoronto.ca	Tuesday 12:00 – 2:00pm (please bring any tutorial questions you have to Sean during the latter half of Tuesday’s Tutorial via zoom)

OFFICE HOURS

Prof. Weir’s office hours from 1 to 2 pm Mondays on every Monday until Nov 30 except for week of Sept 28 when no office hours will be held.

- **Zoom link:** <https://utoronto.zoom.us/j/96460517075>
- **Passcode:** 397747

CONTACTING US

Please use contact e-mails and use of subject line of “BIOC50”. All emails without this subject line will not be answered.

COURSE EVENTS

Lectures: Monday 11:00am – 1:00pm (watch lectures online via streaming link)

Tutorials: Tuesday 12:00 – 2:00pm (via zoom).

COURSE OVERVIEW

This course consists of two parts: 1) a lecture-based section covering the evolutionary history of life on Earth and the evolutionary processes that result in macroevolution and 2) a computer based tutorial providing basic understanding of how to generate phylogenetic trees from DNA and proteins and how to use those trees to address macroevolutionary questions.

COURSE PREREQUISITS

BIOB50 and BIOB51. All students are expected to have an understanding of basic evolutionary processes: adaptation, natural selection, sexual selection, genetic drift. Many of these processes assume knowledge of ecological niches and how ecology may influence adaptation and natural selection.

REMOTE LEARNING SETUP

This course is only offered remotely via internet in Fall 2020. You need:

- 1) a computer/phone with access to the internet to stream lecture content and access slide handouts etc.
- 2) a reasonably fast computer (preferably with Windows 10 operating system) with good internet connection for tutorials. If you have poor internet connection you will not be able to effectively interact with your instructors during tutorials. This computer must have access to Microsoft Word, Excel, PowerPoint and two freely available pieces of software for working with phylogenetic trees (see Tutorials below).

If you lack a good internet connection, you may come to campus and use one of the available campus computers (including those from the computer lab in BV 598) which will have required software installed and access to high bandwidth internet. To come to campus you must follow current UTSC safety procedures during the pandemic.

TEXT

Class Text: D.J. Futuyma. Evolution. Sinauer Associates. Either the 3rd or 4th editions will work. (Course readings are from this text.)

STUDY TOOLS

Course Homepage: The homepage for this site is on Quercus. On the homepage you will find all the information for the course including a copy of this syllabus, an outline of the course content, lecture slides, tutorial handouts, tutorial datasets and announcements. Links to recorded lectures will also be provided.

Lecture slides: Key lecture slides will be posted on the course homepage as PDF files the evening before lecture. These may be printed and used to augment your note taking. You WILL still need to take notes, but printouts of lecture slides will mean that you do not have to write down everything during lecture.

Attendance at lectures: There is only a web option for this course in 2020. See next section for details.

Lecture Videos: All lectures will be delivered via video links that will allow you to stream a recording of the lecture with an internet connection. Video's cannot be downloaded. There are a total of 18 lectures and 19 lecture videos (Lecture 7 is split into two parts). Lectures from a given week will become available at 10:45 AM on Monday of that week and will persist for 1 week (until 11AM the following Monday) after which the lecture will no longer be available. If you are sick or have a conflict in schedule you can watch the lecture video up till 11AM on Monday of the following week, but not past this time (no exceptions). Two lectures (Lecture 2 and Lecture 15) are intended to span two weeks as indicated in the table below: **LECTURE TOPICS AND READINGS**. These will be made available for an additional week. If you miss watching a lecture you can make up for it by reading the course readings and lecture slide handouts and obtaining a copy of notes from a fellow class mate.

Tutorials: These computer-based tutorials provide practical skills for addressing macroevolution. They often cover topics in the previous lecture. Tutorial materials will be posted by noon on the Monday before each tutorial. In tutorials you will make use of two pieces of software:

- 1) MEGA 7.0: https://www.megasoftware.net/older_versions (Please download GUI version 7). Our course instruction is only designed to use the Windows version. Mac and Linux versions may be available but the functionality may be different than the provided instructions and we will not be able to assist you with platform specific differences.
- 2) MESQUITE: <http://www.mesquiteproject.org/Installation%20on%20Windows.html> (You must first have Java installed as detailed in this link). Versions for Mac are also available, and for this program should have identical functionality to the Windows version)

You will also need access to Microsoft Word, Excel and PowerPoint to complete assignment sheets.

In Fall 2020, tutorials will be held only via zoom. To join tutorial, click on the zoom link that will be provided in Quercus. If you need help we will address your question in person via a “breakout room” where you can share your screen with us.

EVALUATION

Test	Covers	Proportion of Final grade
Midterm	First 6 lecture days	35%
Final	Last 6 lecture days	35%
Tutorial Assignments	1 assignment each week	15%
Tutorial open book exams	2 exams, each covering preceding 5 tutorial topics (each is worth 7.5% of the final grade unless the class does poorly on one of the tests, in which case I withhold the right to reweight the relative contributions of each of these exams.)	15%

Exams: This course covers the evolution and diversification of life. As such there are a lot of taxonomic names you will be presented with in lecture. Names of taxonomic groups covered in lectures will be provided on a sheet in alphabetical order during both the midterm and the final exams. You should be familiar with the taxonomic groups covered but you do not need to memorize spelling. Also, the course will present a lot of phylogenetic trees. You will not be asked to draw a phylogenetic tree from memory, but you may be asked to label the species at the tips of a phylogenetic tree and know where along the tree key evolutionary innovations occurred.

Tutorial open book exams: During tutorial exams you will apply the information learned in previous tutorial assignments to novel macroevolutionary questions. You will be given minimal instructions during the exam on the steps you need to take, but the exam will be open book meaning you can bring your textbook, another book, your own notes and previous tutorial assignments. You will not be permitted to communicate electronically or otherwise during tutorial exams. Doing so will be considered academic dishonesty and will be treated accordingly.

Make-up exams: Students unable to attend a midterm or tutorial exam for religious reasons must notify the instructor by e-mail as soon as possible after announcement of the date of the exam, in order to make alternate arrangements. Students unable to make a midterm or tutorial exam due to sickness must contact the instructor by e-mail within 3 working days of the test, must present the instructor with a valid doctor's note and must complete a UTSC medical certificate (available via the registrar's website) which confirms their illness, and medical attention at the time of the exam.

Students who miss a final exam must petition to the registrar.

ACADEMIC MISCONDUCT

Academic misconduct is a serious offense and will be treated as such. By taking this course you agree to act with academic integrity. This means you will:

- 1) Generate all your own data for tutorial Assignments. You may work with fellow students during tutorial assignments and I encourage collaboration in working through assignments. Collaboration does not mean having someone else generate data for you. All students must produce their own data and write their own assignments
- 2) Not use any study aids during identification Quizzes and Exams: you will not consult field guides, notes (electronic or printed) and that you are not obtaining help on quizzes from another person.

For full details of the University of Toronto's policies on Academic Integrity please see:

<https://www.utoronto.ca/aacc/academic-integrity>

COPYRIGHT AND PRIVACY

Recording each other and myself (via video or audio capture) in a class requires consent. Live online sessions (e.g. via zoom or similar platform) may not be recorded as doing so would require the consent of all participants. In this course consent is not provided. Likewise, video recordings of lecture and tutorial components may only be streamed during their designated time period and may not be recorded under any circumstance. All course content is copyrighted by Jason Weir. Lecture slide handouts, videos and tutorial files or screen captures of these may not be posted under any form on the web or other public network. Doing so may result in legal action being taken. What you may do:

- 1) Download and/or print a personal copy of lecture slide handouts and tutorial documents for personal use only
- 2) Stream video content for personal viewing only
- 3) Any other use of course materials is prohibited without direct consent of Jason Weir

LECTURE TOPICS AND READINGS

Lecture #	Date	Topic*	Lecture title	Lecture Video Length (hours: minutes)	Futuyma 3rds ED textbook reading	Futuyma 4th ED textbook reading
0	8-Sep-20 (Tuesday)	MT	Course Introduction	00:17		
1	14-Sep-20	MT	Classification and phylogeny	01:09	Futuyma Chapter 2	Chapter 2 and optional (Chapter 16)
2	14-Sep-20	HL	Evolution towards life PART1	1:11	Futuyma pg. 78-81, 104-106	Pg. 432-437
2	21-Sep-20	HL	Evolution towards life PART1	continued	Futuyma pg. 78-81, 104-106	Pg. 432-437
3	21-Sep-20	HL	Precambrian life	00:37	Futuyma pg. 107-110	Pg. 438-440
4	28-Sept-20	HL	Ediacaran, Cambrian and Ordovician	00:34	Futuyma pg. 111-115	Pg. 440-446
5	28-Sept-20	HL	Evolution and diversification of plants	00:42	Futuyma pg. 115-121	Pg. 447-457
6	5-Oct-20	HL	Evolution of vertebrates	00:22	Futuyma pg. 83-85, 122-125	Pg. 447-457
7	5-Oct-20	HL	PART1: Leaving the water – evolution of land tetrapods and PART2: Diversification of tetrapods	00:22 and 00:32	Futuyma pg. 83-85, 122-125	Pg. 447-457
8	19-Oct-20	HL	Marine monsters of the Mesozoic	00:30	Futuyma pg. 83-85, 122-125	Pg. 447-457
9	19-Oct-20	HL	Evolution of pterosaurs and Dinosauria	00:48	Futuyma pg. 83-85, 122-125	Pg. 447-457
	26-Oct-20	HL	Midterm			
10	2-Nov-20	HL	Evolution of birds	00:36	Futuyma pg. 85-86	Pg. 414-16
11	2-Nov-20	HL	The K/T mass extinction and other mass extinctions	00:48	Futuyma pg. 125-133	Pg. 500-501

12	9-Nov-20	HL	Origin and diversification of mammals	00:45	Futuyma pg. 86-90, 126-128,	456-463, 517-520
13	9-Nov-20	MP	Evolution of primates and humans	00:35	Futuyma pg. 90-95; 149-204	547-557
14	16-Nov-20	MP	The evolution of biodiversity	00:58	Futuyma Chapter 7	Chapter 19
15	16-Nov-20	MP	Speciation part 1	00:58	Futuyma Chapter 17	Chapter 9
14	23-Nov-20	MP	Speciation part 1	continued	Futuyma Chapter 17/18	Chapter 9
16	23-Nov-20	MP	Speciation part 2	01:01	Futuyma Chapter 18	Chapter 9
17	30-Nov-20	MP	Coevolution	00:41	Futuyma Chapter 19	Chapter 13
18	7 Dec 2020	MP	Macroevolution	00:49	Futuyma Chapter 22	Chapter 20

* **Lecture Topics:** MT = Macroevolutionary tools, HL = The History of Life, MP = macroevolutionary processes

TUTORIAL DATES AND TOPICS

Tutorial	Date	New Phylogenetic Skill	Biological Topic
1	15-Sep-20	Genbank, genetic distances	Calibrating rates of molecular evolution
2	22-Sep-20	Parsimony	Horizontal gene transfer in bacteria and Arcaea
3	29-Sep-20	Bootstrapping	Plant evolutionary history
4	6-Oct-20	Parsimony on morphometric data	Are turtles Anapsids or Diapsids?
5	20-Oct-20	TUTORIAL MIDTERM	Classified – top secret.
6	27-Oct-20	Maximum Likelihood	Are birds dinosaurs or earlier tetrapods?
7	3-Nov-20	Time calibrated trees and Parsimony based ancestor state reconstructions	When did the Great American Biotic Interchange in birds occur?
8	10-Nov-20	LTT plots, speciation and extinction rate estimates	Diversification rates in Neotropical birds
9	17-Nov-20	Maximum likelihood-based ancestor state reconstruction	Evolution of swords in swordtail fish
10	24-Nov-20	Effect of character state on speciation and extinction rate estimates	Comparing rates of speciation and extinction in the Andes versus lowland along a phylogeny of tanagers
11	1-Dec-20	TUTORIAL FINAL	Classified – top secret