



EESC04 – Biodiversity and Biogeography Fall 2019

Instructor: Prof. Adam Martin (adam.martin@utoronto.ca), Room EV 464, office hours Tuesday 2-4pm throughout the semester.

Teaching assistant: Rachel Rigden (Rachel.Rigden@colorado.edu) and Felicity Ni (felicity.ni@utoronto.ca)

Lectures: Tuesdays 5-7pm, Room IC 208

Practicals: None this term (all hosted as in-class discussions)

Course readings: Listed below.

Course description:

Biogeography is the study of the geographic distribution of species, and biodiversity is the study of species richness and relative species abundance. Through lectures and in-class discussions, this course explores the origin, maintenance, and loss of biodiversity, from a biogeographic perspective. The course aims to provide students with a broader understanding of what constitutes biodiversity, how it has come to be, and what geographic factors help explain and drive the patterns observed today.

The first half of the course will examine key themes within the sphere of biodiversity, including:

- i) Species concepts.
- ii) The number of species on Earth.
- iii) How biodiversity is distributed globally.
- iv) The value of biodiversity to humans.

The second half of the course then switches gears and evaluates key themes in the realm of biogeography including:

- i) Biodiversity changes across geologic time scales.
- ii) The major biomes of the world.
- iii) The Island Theory of Biogeography.
- iv) The SLOSS debate.
- v) The Anthropocene Epoch and the geological scale of human-caused extinctions.

Course evaluation:

Course Item	Due Date	Percent
What do we know, and what did we learn exercise	Nov. 26	5%
Discussion Lead	See Schedule	15%
Discussant Contributions	See Schedule	(3*5%=15%)
Mid-term Exam	Oct. 8	30%
Final Exam	TBD	35%

In-class content and schedule:

Week	Date	Lecture topic	Reading	During this week
1	Sept. 3	Introduction to Biodiversity and Biogeography		What do we know?
2	Sept. 10	Species concepts and classification	Reading #1	Discussion 1
3	Sept. 17	How many species are there in the world?	Reading #2	Discussion 2
4	Sept. 24	The latitudinal diversity gradient	Reading #3	Discussion 3
5	Oct. 1	Biodiversity and ecosystem function	Reading #4	Discussion 4
6	Oct. 8	Mid-term exam		Mid-term exam
	Oct. 15	Reading week		
7	Oct. 22	Biodiversity through geologic time Pt. 1	Reading #5	Discussion 5
8	Oct. 29	Biodiversity through geologic time Pt. 2	Reading #6	Discussion 6
9	Nov. 5	Biomes of the world	Reading #7	Discussion 7
10	Nov. 12	Island biogeography	Reading #8	Discussion 8
11	Nov. 19	The SLOSS debate	Reading #9	Discussion 9
12	Nov. 26	The Anthropocene and species extinctions	Reading #10	Discussion 10 What did we learn?

Course readings

- Reading 1.** Zachos, F.E. (2016) An annotated list of species concepts. *Species Concepts in Biology*, pp. 77-96. Springer, Cham.
- Reading 2.** Mora, C., Tittensor, D.P., Adl, S., Simpson, A.G. & Worm, B. (2011) How many species are there on Earth and in the ocean? *PLoS Biology*, 9, e1001127.
- Reading 3.** Mittelbach, G.G., Schemske, D.W., Cornell, H.V., Allen, A.P., Brown, J.M., Bush, M.B. & McCain, C.M. (2007) Evolution and the latitudinal diversity gradient: speciation, extinction and biogeography. *Ecology Letters*, 10, 315-331.
- Reading 4.** Costanza, R., de Groot, R., Sutton, P., Van der Ploeg, S., Anderson, S.J., Kubiszewski, I., Farber, S. & Turner, R.K. (2014) Changes in the global value of ecosystem services. *Global Environmental Change*, 26, 152-158.
- Reading 5.** Zhang, X., Shu, D., Han, J., Zhang, Z., Liu, J. & Fu, D. (2014) Triggers for the Cambrian explosion: hypotheses and problems. *Gondwana Research*, 25, 896-909.
- Reading 6.** Benton, M.J. & Twitchett, R.J. (2003) How to kill (almost) all life: the end-Permian extinction event. *Trends in Ecology & Evolution*, 18, 358-365.
- Reading 7.** Ellis, E.C., Klein Goldewijk, K., Siebert, S., Lightman, D. & Ramankutty, N. (2010) Anthropogenic transformation of the biomes, 1700 to 2000. *Global Ecology and Biogeography*, 19, 589-606.
- Reading 8.** Santos, A.M., Field, R. & Ricklefs, R.E. (2016) New directions in island biogeography. *Global Ecology and Biogeography*, 25, 751-768.
- Reading 9.** Gilbert-Norton, L., Wilson, R., Stevens, J.R. & Beard, K.H. (2010) A meta-analytic review of corridor effectiveness. *Conservation Biology*, 24, 660-668.
- Reading 10.** Ceballos, G., Ehrlich, P.R., Barnosky, A.D., García, A., Pringle, R.M. & Palmer, T.M. (2015) Accelerated modern human-induced species losses: entering the sixth mass extinction. *Science Advances*, 1, e1400253.

Assignments and graded material in brief

What do we know, and what did we learn exercise: This will seem like a pop quiz on day 1. Don't freak out. The goal of this exercise is to ask you a series of questions on biodiversity and biogeography on the first day of class, and then return to these questions and your answers on the final day of class. This is therefore designed to evaluate i) how familiar you are with major themes in biodiversity and biogeography, and then ii) how familiar you have become are with these same themes following this course. This learning approach complements the mid-term and final exams, but addresses topics in a more broadly. Note that your grade will be based on i) your *efforts* to answer comprehensively on Day 1, and ii) your *technical correctness* on the Final Day of the course; in other words, you will not be penalized for being unfamiliar with the content on Day 1.

Discussion group lead: The discussion sessions are an opportunity to summarize the key points on the readings, and discuss a major theme in biodiversity and biogeography in an informal setting. Each discussion will be primarily based on that week's reading, but may expand to address different questions/ comments based on that reading. Each week different students will lead the discussion sessions. Suggestions for how to lead a discussion are provided on the assignment sheet on Quercus.

Discussion contributions: Students are expected to attend and participate in each of the discussion groups. However due to logistical reasons, students will be graded on their participation as a "discussant" in 3 designated discussions. As a discussant, students are expected to prepare written questions and/ or comments based on that week's readings; the written questions will be marked (see assignment sheet on Quercus).

Midterm test: A mid-term test will be held in class on Tuesday October 8th. The test will consist of multiple-choice and short answer questions. It will be worth 25% of your final grade, and will be based on both lecture content and readings. If you miss the test for a verifiable reason (as indicated by a doctor's note), a single sitting of a make-up midterm exam will be offered.

Final exam: A comprehensive final exam covering the entire course material, though weighted heavily to the final half of the course, will be given during UTSC examination period worth 35% of your final grade. The final exam will consist of multiple choice, short answer, and long answer questions, and will be based on both lecture and readings.

Course policies – written assignments

Formatting: Discussant contributions must be word-processed, 1.5-spaced, 12-point font size. There is no need **to use a cover page** for any written assignments.

Submission guidelines: All Discussant contributions must be handed in **hard copy in class** on the specified date of the discussion, immediately following the completion of that particular discussion, and in person.

Late assignments: Due to the nature of the written assignments (i.e. the Discussant Contributions), no late submissions will be accepted.

Plagiarism: Plagiarism is a serious academic offence. Please read the faculty's guidelines on plagiarism. Do not hesitate to consult with your instructor or TA about strategies that you can use to avoid being accused of plagiarism.

Email contact, office hours, and communication: The course instructor will send out important course information by email. Therefore all students are required to have a valid UTSC email address. You are also responsible for ensuring that your UTSC email address is set up and properly entered in the ROSI system.

That said my preference is to meet with you in person. I am more than happy, and encourage you, to set up meeting times. I am certainly open to discussing with you lecture material, the nature of the exams, the Environmental Science programs at UTSC, graduate school, career interests, and/ or the state of the world in general. I will make time for you and your interests – please take advantage of it. My door is open.

You may also email me questions about course material. I will make an effort to respond to you within 24 hours during weekdays. My responses will take longer during weekends because I deliberately remain offline. **Email should not be a substitute to office appointments.**

Course website – Quercus: EESC04 uses Quercus as its course website. To access the EESC04 website go to the U of T portal login page at <http://toolboxrenewal.utoronto.ca/>, and log in using your UTORid and password. Once you have logged in to the portal, look for your course modules where you'll find the link to the EESC04 course website.

Class conduct: This is a small class. I remind you that cell phones and other communication devices must be turned off or in silent mode. A 10-minute break in the middle of lecture sessions will be provided. Taking photos, audio and/or video recordings are not allowed unless permission from the instructor is granted.

Accessibility Statement: Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodation, please feel free to approach me and/or Accessibility Services Office as soon as possible. I will work with you and Accessibility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC Accessibility Services staff (located in S302) is available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416-287-7560 or ability@utsc.utoronto.ca).

The Writing Centre: The Writing Centre is a free service that provides support for teaching and learning through writing for all UTSC students. The Writing Centre provides service such as one-on-one consultation, drop-in hours, English language development and writing clinics. They are located in AC 210, in the Academic Resource Centre.

Health and Wellness Clinic: The Health & Wellness Centre has trained health professionals to provide medical, nursing, counseling, health promotion, and education services to University of Toronto Scarborough students. Any student with a current student card and a valid health card can use our services. They are located in the Student Centre, UTSC, SL 270.