Evolutionary Concepts

BIOL3671

Course Syllabus

Winter 2021

"There is grandeur in this view of life . . . from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved"

– Charles Darwin

Left: *Acinonyx jubatus*. Credit: CJ Sharp, cc-by-sa-4.0, https://creativecommons.org/licenses/by-sa/4.0/legalcode
Middle: *Lynx canadensis*. Credit: K Williams, cc-by-2.0, https://creativecommons.org/licenses/by/2.0/legalcode
Right: *Felis catus* (Pancake, a 7-year-old European Burmese). Credit: AC Algar

Evolution has shaped, and continues to shape, the living world. All living things that we see, whether it be through our binoculars, down our microscopes, or in our mirrors, are products of evolution, acting generation by generation with no foresight, plan, or intention. Whether we want to understand the rise of antibiotic resistance, the shape of a swallow's wing, or why the tropics harbour so many species, we must study evolution. Furthermore, we must consider evolution if we want to predict how the natural world will respond to the unprecedented pressures we, as human beings, are placing on the planet's natural systems. As Theodosius Dobzhansky famously wrote: "Nothing in biology makes sense except in the light of evolution"[1,2].

This course will introduce you to the fundamentals of evolution across scales of biological organization from genomic change to global biodiversity. To do so, we will travel from a Victorian naturalist's home in England, to the Galapagos Islands, glacial lakes in British Columbia, and to a very important freezer in a Michigan lab. Along the way, we will meet some of the people who have proposed theory, tested hypotheses, and shaped our evolutionary understanding, from Alfred Russell Wallace to Rosemary Grant. Throughout the class, I hope that not only will you gain an understanding of key evolutionary concepts, but also of why it is one of the most beautiful, elegant, and important ideas in the history of humankind.

[1]Dobzhansky, T. 1973. Nothing in biology makes sense except in the light of evolution. *American Biology Teacher* 35, 125–129

[2]Please never use footnotes for citations/references in my class! Do as I say, not as I do.

WHO WILL BE TEACHING AND HOW TO I CONTACT THEM?

Instructor:
Dr. Adam Algar
aalgar@lakeheadu.ca

Office hours:
By appointment.
Contact me via email to schedule.

Graduate Assistants:
Vianney Cupiche Herrera
vcupiche@lakeheadu.ca

Colin St. James
csstjam@lakeheadu.ca

Office hours:
GAs are available in the 2nd hour of each tutorial (lab) to answer questions

WHAT WILL I BE LEARNING?

During the course we will focus on

1) Gaining an understanding of fundamental evolutionary processes
2) Reading and critiquing the scientific literature to understand the limits of our current knowledge and learn how ongoing research is expanding that knowledge.
3) Communicating and explaining what you have learned

The course delivery will be split into weekly lectures and tutorials (labs). Lectures will introduce you to fundamental evolutionary concepts, beginning with microevolution and working outward in scale to finish with macroevolution. Tutorials will be mediated by the graduate assistants and will give you an opportunity to engage with cutting-edge research by discussing and critiquing journal articles. The goal is to guide you in critical thinking and in developing an understanding of how research is done, how knowledge develops, and of how to think like a scientist.

WHAT WILL I BE READING?

The suggested book for the course is:

Morris, D.W. & Lundberg, P.. 2011. *Pillars of Evolution: fundamental principles of the eco-evolutionary process*. Oxford University Press, Oxford, United Kingdom.

This book addresses the core themes, theory and concepts that we will cover in the course, but it also includes topics we won't address in the course and *vice versa*. We will **not** follow the book explicitly. Instead, **we will engage mostly with scientific articles in lectures and tutorials**. *Pillars of Evolution* can supplement this learning by covering some topics more in depth and, in some cases, giving an alternative perspective. It is an additional resource for you to use in the way that you see fit – I will not assign readings from it.

I will also supply a reading list of journal articles relevant to each week's topic.

HOW WILL I BE EVALUATED?

Discussion of ideas, concepts, and methods are a valuable part of science and I encourage you to discuss topics with your peers and instructors. **However, all assessments must be completed individually**. Late submissions will be penalized 10% per day unless you have a valid reason (e.g. family, medical) and supply evidence. Quizzes that are submitted late will receive a mark of zero. Normally the request for an extension should be given before the due date. I aim to ensure that all students can achieve their best possible results, so if you have particular circumstances affecting your assessments, please speak to me as soon as you can. **For students registered with Student Accessibility Services, please speak with me so that we can ensure that accommodations are in place. Working online presents challenges, so please don't hesitate to feed back to me regarding accessibility and accommodations that are in place so that we can make adjustments.**

Open Book Quizzes (Best 4 of 5): 4 × 10% = 40%
Scheduled throughout term (see introductory lecture) these open book quizzes will draw on lecture and tutorial material. There are 5 throughout term and your top 4 will contribute to your final mark. Quizzes will be made available on the Friday preceding the deadline and must be completed by the deadline. You will have 1.5 hours to complete the quiz so be sure you have set aside sufficient time. I expect it will take much less than this!

News & Views Pieces (Best 2 of 3): 2 × 10% =20%
These short writing assignments will follow the structure of 'News & Views' pieces in the journal *Nature*. Each one will be based on a single tutorial reading and has an 800 word limit; you must include the word count on your submission. Please read the section on word limits below very carefully. Tutorials have been divided into three blocks and you can submit up to one News & Views from each block. Your best 2 will contribute to your final mark. More information will be presented in the first tutorial.

Tutorial participation: 5%
Show up at the tutorials, prepared, and contribute to the discussion. Being able to speak up in a group is an important skill that will serve you well throughout your life.

Final Paper: 35%
The final paper will address the question 'Are human effects on evolution predictable?'
This is a purposefully broad question that can be approached in a number of ways – you will need to decide what you think is the most effective. You will need to make decisions about what to include, and what to exclude and how to structure your narrative. You have the option to keep it broad or narrow in on one particular type of human influence, e.g. deforestation, anthropogenic climate change, urbanization, antibiotic resistance, etc. To develop your argument, you are expected to use, but are not limited to, examples and evidence across the breadth of concepts and scales covered in class, from microevolution to macroevolution (as appropriate). You are also expected to go beyond the assigned and recommended readings for the course to find relevant examples and references from the primary scientific literature. **The paper must not exceed 2500 words**. Please read the section on word limits below very carefully. Start planning early and take advantage of opportunities in the tutorials to discuss your essay with the GAs. We will use part of the tutorial time to help build your paper-writing skills and assist you in developing your paper.

Word Limits
Written assignments (News & Views and the Final Paper) have strict word limits. Word limits exclude the title, reference list and any figures or tables (and their captions) you choose to include. The marker will not read beyond the word limit, so if you exceed it, your mark will reflect an incomplete essay. You must report the word count on your paper; we will be sensible regarding the fact that different software can give slightly different word counts. Falsely reporting a lower word count to make your essay appear within the limit will be considered academic dishonesty and investigated as a potential breach of academic integrity.

Mark Schemes
Marking schemes for pieces of written works will be circulated in the first weeks of class.

Due Dates:
News & Views
Block 1: 23:59 Friday, February 12
Block 2: 23:59 Friday, March 12
Block 3: 23:59 Tuesday, April 6

Open-book Quizzes
Quiz 1: 23:59 Wednesday, February 3
Quiz 2: 23:59 Wednesday, February 24
Quiz 3: 23:59 Wednesday, March 10
Quiz 4: 23:59 Wednesday, March 24
Quiz 5: 23:59 Thursday, April 1

Final Paper
23:59 Tuesday, April 13

WHEN IS CLASS?

All times are listed in Eastern Standard Time

Lectures
Tuesday 8:30am-10:30am
All lectures on Zoom, links available through the Courselink site.
All lectures will be recorded – please read the policy around content in recorded lectures at the end of the syllabus. Also, bear in mind that technology is fickle so I recommend not sleeping in and relying on the recording. Bring coffee. I will.

Tutorials
All tutorials are on Zoom, links available through the Courselink site. Check your section. Students **must** attend their assigned section.
WD1: Fridays 8:30am-10:30am
WD2: Fridays 10:30am-12:30pm
WD3: Thursdays 8:30am-10:30am

WD4: Thursdays 10:30am-12:30pm
WD5: Fridays 12:30pm-2:30pm
Tutorials will be recorded but access will only be given to students who miss tutorials for valid reasons.

WHAT WILL WE COVER?

The topics below are a guide and are subject to change

Week	Start Date	Topic	Assessment
1	Jan 11	Introduction: Darwin's grand idea	
2	Jan 18	Natural Selection	
3	Jan 25	Evolution at a single locus	
4	Feb 1	Phenotypes, fitness, and adaptation	Qz1 (w2-w3)
5	Feb 8	Ecoevolutionary Dynamics	NV1 (blue)
6	Feb 15	Winter break (no classes)	
7	Feb 22	Why moose have big antlers	Qz2 (w4-w5)
8	Mar 1	Evolution in space	
9	Mar 8	Speciation	NV2 (green); Qz3 (w7,w8)
10	Mar 15	Macroevolution	
11	Mar 22	Adaptive Radiation	Qz4 (w9-w10)
12	Mar 29	Convergence and Contingency (no tutorial)	Qz5 (w11-w12),
13	Apr 6	No classes	NV3; FP (Apr 13)

Qz: open book quizzes, NV: News & Views, w: week, colours: NV blocks, FP: Final Paper

HOW SHOULD I MANAGE MY TIME?

Between the quizzes, News & Views pieces (N&Vs) and the final paper, you will be busy. Although your mark will only be based on 4 quizzes and 2 N&Vs, I strongly recommend not skipping a quiz or a N&V early in the semester as the workload ramps up toward the end. I also strongly recommend not leaving your final paper until the last minute/day/week. To achieve a good mark, you will have to work on it throughout the semester, gathering evidence and examples on which to base your conclusion. Start early and take advantage of the time available with the graduate assistants during the tutorials to ask questions and discuss ideas.

If you are struggling with the lecture content, readings, quizzes or with writing, please contact one of us to discuss – we are here to help!

WHAT ELSE DO I NEED TO KNOW?

Land Acknowledgement
Lakehead University respectfully acknowledges its campuses are located on the traditional lands of Indigenous peoples.

Lakehead Thunder Bay is located on the traditional lands of the Fort William First Nation, Signatory to the Robinson Superior Treaty of 1850. Lakehead Orillia is located on the traditional territory of the Anishinaabeg. The Anishinaabeg include the Ojibwe, Odawa, and Pottawatomi nations, collectively known as the Three Fires Confederacy.

Lakehead University acknowledges the history that many nations hold in the areas around our campuses, and is committed to a relationship with First Nations, Métis, and Inuit peoples based on the principles of mutual trust, respect, reciprocity, and collaboration in the spirit of reconciliation.

Academic Integrity
I have no tolerance for academic dishonesty and breaches of Academic Integrity. A breach of Academic Integrity is a serious offence. The principle of Academic Integrity, particularly of doing one's own work, documenting properly (including use of quotation marks, appropriate paraphrasing and referencing/citation), collaborating appropriately, and avoiding misrepresentation, is a core principle in university study. You should view the Student Code of Conduct – Academic Integrity – for a full description of academic offences, procedures when Academic Integrity breaches are suspected and sanctions for breaches of Academic Integrity

Link to the Student Code of Conduct and Policy on Academic Integrity:
https://www.lakeheadu.ca/sites/default/files/policies_procedures/Student%20Code%20of%20Conduct%20-%20Academic%20Integrity.pdf

Furthermore, by signing up for the course, you agree that:
Unless otherwise allowed by the course instructor, I must complete the assignments in this course without the assistance of anyone else. I further understand and agree that, if I violate either of these two rules, or if I provide any false or misleading information about my completion of course assignments or exams, I may be prosecuted under the Lakehead University Student Code of Conduct – Academic Integrity, which requires students to act ethically and with integrity in academic matters and to demonstrate behaviours that support the University's academic values.

Accommodation and Accessibility
Lakehead University is committed to achieving full accessibility for persons with disabilities/medical conditions. Part of this commitment includes arranging academic accommodations for students with disabilities/medical conditions to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability/medical condition and think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please email sas@lakeheadu.ca or visit https://www.lakeheadu.ca/faculty-and-staff/departments/services/sas

Please talk to me about accommodations you may have, as early as possible, so that we can ensure these are in place. Also, please feed back to me during the semester regarding accessibility and accommodations so that we can make changes or adjustments that will improve accessibility and better implement accommodations.

Copyright Compliance

By taking the course you sign up to the following statement:

I understand and agree that all instructional, reference, and administrative materials to which I am given access in this course (the "course materials"), whether they consist of text, still or kinetic images, or sound, whether they are in digital or hard copy formats, and in whatever media they are offered, are protected in their entirety by copyright, and that to comply with this copyright and the law.

(a) I may access and download the course materials only for my own personal and non-commercial use for this course; and

(b) I am not permitted to download, copy, store (in any medium), forward or share, transmit, broadcast, show, post or play in public, adapt, or change in any way any text, image, or sound component of the course materials for any other purpose whatsoever except as expressly authorized, and only to the extent authorized, in writing, by the course instructor.

I further understand and agree that, if I infringe the copyright of the course materials in any way, I may be prosecuted under the Lakehead University Student Code of Conduct – Academic Integrity, which requires students to act ethically and with integrity in academic matters and to demonstrate behaviours that support the University's academic values.

Recording Lectures and Class Activities

"In Evolutionary Concepts, BIO3671 and associated lab sections (WD1-WD5), instruction in the classroom will be recorded for confidential access by students registered in the course but who are unable to attend class due to the pandemic or other necessity. To the greatest extent possible only the image and voice of the instructor will be recorded for this purpose but, due to class interaction, the images and voices of students present in the classroom may be incidentally recorded and, thus, be available for access by course students in remote locations. These recordings, however, are strictly confidential and may be used only by the instructor and students registered in the course and only for purposes related to the course. They may otherwise not be used or disclosed. Students in the classroom who are concerned about being recorded in this fashion may request the instructor to exclude them from the recording to the greatest degree possible on the understanding that total exclusion cannot be guaranteed. The recordings are made under the authority of sections 3 and 14 of The Lakehead University Act, 1965. Questions about the collection of the images and sounds in the recordings may be directed to the Chair of the Department of Biology, Lakehead University, 955 Oliver Rd, Thunder Bay, ON, P7B 5E1, +1 (807) 343-8460.