*We recognize and acknowledge that McMaster University meets and learns on the traditional territories of the Mississauga and Haudenosaunee nations, and within the lands protected by the “Dish With One Spoon” wampum, an agreement amongst all allied Nations to peaceably share and care for the resources around the Great Lakes.*

# BIOLOGY 4AE3 – Ecology and Evolution of Organisms

# 2022 Winter Term

**Instructor:**  Dr. Ben Bolker |  **Course e-mail:** [bolker@mcmaster.ca](mailto:bolker@mcmaster.ca) | **Offices:** HH-314/LSB 336 **Office hours:** TBA | **Course web page :** <https://bbolker.github.io/bio4ae3> | **Lecture hours and location:** MW 11:30-12:20, F 1:30-2:20, HH 217

## Course Description

Infectious disease plagues the natural and human worlds, affecting sex, death, and even taxes. This course surveys a wide variety of topics on the ecology and evolution of infectious disease, using examples from human, agricultural, and wildlife populations. Infectious diseases (ID) range from the prions causing bovine spongiform encephalopathy (mad cow disease) to viruses, bacteria, and protists, to creepy-crawly metazoan parasites (worms and flukes). We will ask questions like:

• *How do ecology and evolution shape the nature and distribution of IDs?* (**Death**: we are still trying to understand the ecological factors that allow virulent strains of influenza to jump between species)

• *How do IDs affect host evolution and shape ecological communities?* (**Sex**: the *Red Queen hypothesis* suggests that sexual reproduction evolved as a strategy to fight parasites.)

• *How can understanding ecology and evolution help us fight IDs, or promote them?* (**Taxes**: understanding evolution helps us design effective vaccines and drugs; biocontrol via the intentional spread of infectious diseases is often an economical way to control unwanted pest or invasive species.)

## Course and Learning Objectives

### Learning Objectives

The course focuses on conceptual and critical thinking about ecological and evolutionary interactions among hosts and parasites (the generalization of infectious diseases). You will learn about a variety of important concepts and theories in host-parasite biology (e.g. the *encounter* and *compatibility filters* for host infection; determinants of the evolution of virulence; basic compartmental models for infectious disease dynamics). More generally, you will be encouraged to think creatively and critically about biological problems by reading and discussing the primary and secondary literature. The course includes several writing assignments. By the conclusion of the course you should be able to reason carefully about the qualitative outcomes expected from host-parasite interactions in various ecological/evolutionary settings; suggest experimental or observational studies to test specific biological hypotheses; and critically interpret peer-reviewed research papers.

### Class Activities:

The class will alternate between lectures covering background concepts and material and in-class discussion of readings. Assessments

## Materials & Fees

### Required Materials/ Resources

*Textbook:* Claude Combes, [The Art of Being A Parasite](https://www.amazon.ca/Art-Being-Parasite-Claude-Combes/dp/0226114384/); available from the bookstore, also on the [Internet Archive](https://archive.org/details/artofbeingparasi0000comb)

## Virtual Course Delivery

We do not expect there to be a virtual component to the course. However, in the unlikely event that some components are online **it is expected that you have reliable access to the following:**

* A computer that meets performance requirements [found here](https://cto.mcmaster.ca/technology-resources-for-mcmaster-students/#tab-content-device-recommendations).
* An internet connection that is fast enough to stream video.
* Computer accessories that enable class participation, such as a microphone, speakers and webcam when needed.

If you think that you will not be able to meet these requirements, please contact [uts@mcmaster.ca](mailto:uts@mcmaster.ca) as soon as you can. Please visit the [Technology Resources for Students page](https://cto.mcmaster.ca/technology-resources-for-mcmaster-students/#tab-content-device-recommendations) for detailed requirements. If you use assistive technology or believe that our platforms might be a barrier to participating, please contact [Student Accessibility Services](https://sas.mcmaster.ca/), [sas@mcmaster.ca](mailto:sas@mcmaster.ca), for support.

## Course Overview and Assessment

### Topics

|  |  |
| --- | --- |
| **Topic** | **Schedule** |
| Epidemic dynamics | Week 1 |
| Within-host dynamics of pathogen populations | Week 2 |
| ID and host populations | Week 3 |
| Within-host communities of pathogens | Week 4 |
| ID and host communities | Week 5 |
| Host-parasite coevolution | Week 6 |
| Evolution of virulence | Week 7 |
| Evolution of specificity | Week 8 |
| Parasite life history and sex ratios | Week 9 |
| Red Queen dynamics | Week 10 |
| Parasite-mediated sexual selection | Week 11 |
| Host manipulation | Week 12 |
| ***Topics, order, and timing are provisional*** |  |

## Evaluation

|  |  |
| --- | --- |
| Grade Component | Weight |
| Class participation and discussion questions | 15% |
| Midterm test | 20% |
| Mini-essays | 15% |
| Emerging disease presentation | 20% |
| Term paper | 30% |

## Requests for Relief for Missed Academic Term Work

[McMaster Student Absence Form (MSAF):](https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/msaf-mcmaster-student-absence-form/) In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”.

## Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact [Student Accessibility Services (SAS](https://sas.mcmaster.ca/)) at 905-525-9140 ext. 28652 or [sas@mcmaster.ca](mailto:sas@mcmaster.ca) to make arrangements with a Program Coordinator. For further information, consult McMaster University’s [*Academic Accommodation of Students with Disabilities*](https://secretariat.mcmaster.ca/app/uploads/Academic-Accommodations-Policy.pdf) policy.

## Academic Accommodation for Religious, Indigenous Or Spiritual Observances (Riso)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the [RISO](https://secretariat.mcmaster.ca/app/uploads/2019/02/Academic-Accommodation-for-Religious-Indigenous-and-Spiritual-Observances-Policy-on.pdf) policy. Students should submit their request to their Faculty Office ***normally within 10 working days*** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

## Courses with An On-Line Element

***Some courses*** ***may*** use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

## Online Proctoring

***Some courses may*** use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

## Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

**It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the [*Academic Integrity Policy*](https://secretariat.mcmaster.ca/app/uploads/Academic-Integrity-Policy-1-1.pdf)*,* located at [https://secretariat.mcmaster.ca/university-policies-procedures- guidelines/](https://secretariat.mcmaster.ca/university-policies-procedures-%20guidelines/)

**The following illustrates only three forms of academic dishonesty:**

* plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
* improper collaboration in group work.
* copying or using unauthorized aids in tests and examinations.

## Authenticity / Plagiarism Detection

***Some courses may*** use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster’s use of Turnitin.com please go to the [McMaster Office of Academic Integrity](https://www.mcmaster.ca/academicintegrity/)’s webpage.

## Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all our living, learning and working communities. These expectations are described in the [*Code of Student Rights & Responsibilities* (the “Code”).](https://secretariat.mcmaster.ca/app/uploads/Code-of-Student-Rights-and-Responsibilities.pdf) All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students’ access to these platforms.

## Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

## Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.