

Faculty of Science Course Syllabus**Department of Biology***MARI/BIOL 3301**Invertebrate Biology**Winter 2020***Instructor(s):** *Dr. Jennifer Frail-Gauthier* *jfrail@dal.ca* *LSC 5014***Lectures:** *13:35 – 14:25 Tues, Thurs, Fri* *LSC 240***Laboratories:** *3 hours per week (Wednesdays B01 11:35 or B02 2:35; LSC 2102 by touch tanks)***Teaching Assistants:** *Kayla Hamelin and Anthony Cormier***Course Description**

From the Undergraduate Calendar: *A survey of the diversity, ecology and evolutionary history of the major invertebrate groups. Lectures will emphasize phylogenetics and diversity of body plans. Labs will emphasize identification and anatomy through dissections and observations.*

This class is taught mostly from an evolutionary perspective (including molecular phylogeny), with ecology, form and function, and even paleontology. Instead of being taught from the “earliest invertebrates” to the “most vertebrate-like invertebrates” chronology, this course is taught in major evolutionary groups and patterns. You will have to use your previous BIOL 2003 knowledge to help with the backbone nuts and bolts. By the end of the semester, you will all be invertebrate zoologists. Pretty cool, huh?

This is an intense course, with a lot of information. You will have to memorize, but most importantly, understand. The bulk of your grade will come from being able to understand, analyze, evaluate and process information about invertebrate ecology and evolution... look for main connections, and look for WHY and HOW things are the same/different--- whether it’s the animals’ form and function or their evolution and phylogeny.

Course Prerequisites

BIOL 2003; BIOL 2040 or permission of instructor

Course Objectives/Learning Outcomes

Picking up from BIOL 2003, you will learn many things in BIOL 3301. By the end of this course you should be able to (this is not a complete list!):

- ✓ recall, recognize, classify, and understand all Metazoan Phyla
- ✓ understand the process of evolution and phylogeny of invertebrate groups
- ✓ manage a lot of new information (by taking good lecture notes, reviewing frequently, and staying on top of available readings)
- ✓ critically analyze scientific papers (through your annotated bibliography), lectures, and guest talks
- ✓ prepare an oral presentation and written annotated bibliographies
- ✓ understand why there are so many hypotheses surrounding invertebrate evolution
- ✓ ...and most importantly, appreciate the extreme diversity and complexity of these invertebrate groups!

Course Materials

No required textbooks: required readings will be posted to Bright Space. These will include articles from the primary literature, commentaries, Science blogs and other news-related web pages. 1-2 hours should be devoted each week to these readings/exploration. All this information will be essential to integrate into the essay questions for the final exam.

No required lab manuals: required preparatory material will be on BrightSpace before each lab.

*****REQUIRED: Top Hat will be used this semester.** Instructions on how to register can be found on BrightSpace or <https://app-ca.tophat.com/e/768774>***

Lectures

Tuesday Thursday Friday 13:35 to 14:25, LSC 240

Lectures are available for download on Bright Space. Full lecture PowerPoints will be available AFTER the lecture. BEFORE the lectures, I will have “Pre-Lecture Hot Topics” posted in .doc format. Some lectures will be discussion-based, following assigned readings/explorations. I will be learning how to use TopHat throughout the semester, so you will also have access to the Invertebrate Biology TopHat classroom. Some lectures may be guests as well!

Labs

Exact schedule will be based on Guest Availability and order may change throughout the semester.

Labs are a mixture of wet-lab explorations, dissections, class debates, and guest demonstrations. The last three labs will be devoted to your presentations. It is very important for you to ask questions and participate in the labs. The in-class debates and discussions cover some of the big ideas and hypotheses about invertebrate evolution. For a few labs, I have preserved animals for dissection and examination. I will also have some smaller live animals to see in action! At the end of every lab, you will hand in a short critical summary of the information from the guest speaker or the discussion, or hand in a completed question sheet from dissections. This will help keep you engaged in the lab and will help develop your critical thinking and scientific communication—very important for future research in Honours and beyond.

Course Assessment

Component	Weight (% of final grade)	Date
<i>Tests/quizzes</i>	15%	<i>Lectures Jan 28th and March 5th</i>
<i>Final exam</i>	30%	<i>(Scheduled by Registrar)</i>
<i>Assignments*</i>	55%	<i>See details below</i>

Assignment Evaluation Details* (55%)

Invertebrate Term Project (science literacy, academic writing, oral presentation): 35%

- Composed of three separate parts due at different times
- Information will be on BrightSpace and discussed in the first lab (January 8th) (criteria, instructions, etc.)
- Part 1 Annotated Bibliography due Feb 5th (12%)
- Part 2 Annotated Bibliography due March 11th (12%)

- Part 3 Presentation (11%) – In Lab March 18th, 25th, April 1st (sign up for TOPIC in 2nd lab (January 15th). Presentation order will be determined by the end of February and will be based on topics.

Lab Summaries/Debates (13% total)

Depending on the type of lab (debate, guest speaker, animal examination, dissection...), you will hand in a summary and/or drawing. Attendance will be taken in every lab. Summaries must be handed in by 11:59 PM of the same day. Guiding questions and criteria will be posted on BrightSpace to help write your summaries. These are not “busy work” assignments: they help you to maintain focus in the lab, and think critically during the guest lecture and lab. They also help in picking out the important information and critically analyzing information given to you. These will be graded on an all-or-nothing basis (details will be posted to BrightSpace). These will be worth 7%. The 6% for the debates will be graded based on content, quality of discussion, and participation. More information will be given before these labs.

Class Participation and Top Hat (7%)

Certain lectures will be attendance-mandatory. They may be guest lectures, or class discussion lectures based on assigned readings or website explorations. You will know in advance when these discussion or guest lectures will be. Top Hat questions will be posed throughout the term both in class, and “homework” questions.

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D	(50-54)
A (85-89)	B (73-76)	C (60-64)	F	(<50)
A- (80-84)	B- (70-72)	C- (55-59)		

Course Policies

Absences: Dalhousie has a new *Student Declaration of Absence*. SDA forms “**replace sick notes for absences of three days or fewer that result in missed or late academic requirements. The submission of the form does not provide an automatic exemption from any academic requirements that were missed or late during an absence. Any alternate coursework arrangements for missed or late academic requirements are at the discretion of individual course instructor(s).**”

Details on how to use the form can be found here: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/academic-policies/Information%20for%20students.html

IMPORTANT: SDA forms cannot be used more than once, and cannot be used for the final exam or presentations. Please contact Jen about your absences for labs, tests, or attendance-required lectures, and for your missed assignments/deadlines. Please try to be as proactive as possible. Unexcused absences from labs, student presentations, and guest lectures will result in deductions to either class participation or lab grade. Late penalties will be decided on a case-by-case basis. Please do not leave the Annotated Bibliographies to the last minute!

Extra Pointers to Ace Invertebrate Biology!

The framework that I will use to teach invertebrate zoology is, broadly, evolutionary. I hope by the end of the course that you will have a really good understanding of the evolution of the invertebrates, how organisms with different body plans evolved and who their ancestors might have been. You will get an introduction to paleontology, to evolution, to molecular phylogenetics, to ecology, and to the great and

varied diversity of invertebrates on the planet. You will be able to wow your friends by your ability to identify ~97% of the animal life on planet earth!

Here is some advice to make sure you don't get overwhelmed in BIOL 3301!

- ✓ Form a study group with other students for review sessions. Ask for help when you have a question, not just right before the exams. Post questions and topics on Bright Space, or ask during lecture (chances are, if you have a question about a topic, so do other students!). Using Top Hat this year will be a great learning tool, I hope!
- ✓ Explore online! Follow science and biology blogs on Twitter (i.e., Scientific American, New Scientist, NOAA, Nature...), watch David Attenborough, search Invertebrate topics in Google and/or Google Scholar regularly! The best way to learn is to be excited about learning—I'll definitely help with that one! ☺
- ✓ Do the readings! You are given a manageable amount every week. Do not leave them until April!
- ✓ Memorize the phylogeny. Memorizing is the base of the pyramid, and knowing this phylogeny will help you understand the HOW's and the WHY's of invertebrate evolution.
- ✓ Study throughout the term. You should be reviewing every week at the minimum—don't leave studying for the last minute. Studying should be a REVIEW of material, not learning it for the first time.
- ✓ Think proactively and critically to best prepare yourself for the tests. What are some overall patterns of information you are learning? Themes, body plans, evolution, etc...

Most importantly, come to Jen if you have any issues! I am approachable and easy to reach. No question is too dumb, no concern is too little. Let's have a great semester!

Course Content

Tentative Class Dates

Topics flow from one lecture to the next; Guest lectures may change dates slightly

Tentative Lab Schedule

Dates subject to change because of guest availability, however, the Annotated Bibliography due dates, midterm, and the presentation dates will not change.

Date	Lecture Topics for the Week	Lab Topic and Assignments
Jan 7 - 10	Introduction, the fossil record and metazoan taxonomy/phylogeny/cladistics	Jan 8 th – Lab introduction and Invertebrate Phyla Exploration
Jan 14 - 17	Porifera and Placozoa	Jan 15 th – Class Discussion/ Exploration 1: The Cambrian Explosion (Sign up for Topic) Discussion/Notes due 11:59 PM (3%)
Jan 21 - 24	Cnidaria and Ctenophora	Jan 22 nd – Class Discussion/Exploration 2: The First Animal Discussion/Notes due 11:59 PM (3%)
Jan 28 – 31	Jan 28th – Quiz 1 (7.5%) – first 30 mins of class Basal bilaterians and odd early groups	Jan 29 th – Bedford Basin Zooplankton Exploration Lab summary due 11:59 PM
Feb 4 - 7	Chaetognatha, the “Protostomes and Deuterostomes”, and the enigmatic “Xenoturbella” Munro Day February 7th – no classes	Feb 5 th – Deuterostomes (echinoderms and chordates) Annotated Bibliography 1 due beginning of lab 12% Lab summary due 11:59 PM
Feb 11 - 14	Deuterostomes --- Ambulacraria (Echinoderms and Hemichordates), Invertebrate Chordates]	Feb 12 th – All the Small Things (exploration of a variety of phyla) Lab summary due 11:59 PM
Feb 17– 21	Reading Week --- no classes or labs	Reading Week
Feb 25 – 28	Ecdysozoa – the moulting animals (Non-arthropod Ecdysozoa)	Feb 26 th – The “Articulata” group: Crustaceans and Annelids Lab summary due 11:59 PM
Mar 3 – Mar 6	Panarthropoda – Tardigrada, Onychophora, Arthropoda Mar 5 – Quiz 2 (7.5%, first 30 mins of class)	March 4 th – Shawn Adderley, Little Ray’s Reptiles (Arachnids) Lab summary due 11:59 PM
Mar 10 – 13	Crustaceans and Insects	March 11 th – Roger Croll (Molluscs) Annotated Bibliography 2 due start of lab (12%) Lab summary due 11:59 PM
Mar 17 – 20	Lophotrochozoa: Enigmatic groups, Annelids and Allies	March 18 th - Topic Presentations week 1 (11%)
Mar 24 - 27	Molluscs	March 25 th – Topic Presentations week 2 (11%)
Mar 31 - Apr 3	Platyhelminthes, Nemertea, and other Lophotrochozoans	April 1 st – Topic Presentations week 3 (11%)
April 6	MONDAY! Last day of class --- review trivia	Friday schedule April 6 th

April 8th-24th - Final Exam (Scheduled Exam Period)

Faculty of Science Course Syllabus (Section B) (revised June-2018)
MARI/BIOL 3301 – Invertebrate Biology 2020

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: <http://www.dal.ca/cultureofrespect.html>

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

https://www.dal.ca/academics/important_dates.html

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Missed or Late Academic Requirements due to Student Absence (policy)

https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: <https://www.dal.ca/faculty/science/current-students/academic-advising.html>

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: <https://libraries.dal.ca/>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Fair Dealing Guidelines <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: <https://dsu.ca/dsas>

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Biosafety: <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>