



BIOL*1070 Discovering Biodiversity

Fall 2018
Section(s): C01

Department of Integrative Biology
Credit Weight: 0.50
Version 1.00 - August 17, 2018

1 Course Details

1.1 Calendar Description

This course strongly emphasizes the development of learning and reasoning skills, an understanding of the nature of biological inquiry, and key concepts in evolution, ecology, and organismal biology. These include the meaning and significance of biodiversity and current issues surrounding it, the evolutionary processes through which biological diversity originates and is interrelated, the complexity of organisms and the importance of physical organization and regulatory processes, and the nature of interactions among organisms and between organisms and their biotic and abiotic environments. Students lacking Grade 12 or 4U Biology should consult with their program counsellor prior to taking BIOL*1070 in first semester.

1.2 Course Description

BIOL*1070 – Discovering Biodiversity strongly emphasizes learning and reasoning skills, biological inquiry, and key concepts in evolution, ecology, and organismal biology. Topics discussed in the course include: the meaning and significance of biodiversity, current issues surrounding biodiversity, the evolutionary processes through which biological diversity originates and is interrelated, the complexity of organisms, the importance of physical organization and regulatory processes, the nature of interactions among organisms, and the nature of interactions between organisms and their biotic and abiotic environments.

This course complements the two other first-year biology courses, BIOL*1080 and BIOL*1090.

1.3 Timetable

- Lecture: Monday 9:30-10:20am, ROZH 104
- Seminars: Monday-Thursday, 10:00am-3:30pm; see WebAdvisor for your specific seminar section.

1.4 Final Exam

Exam time and location TBD. Please see WebAdvisor for the latest information.

2 Instructional Support

2.1 Instructor(s)

Ryan Gregory

Email: rgregory@uoguelph.ca
Office: SSC 1450
Office Hours: TBD

Nicholas Bernier

Email: nbernier@uoguelph.ca
Office: SSC 3467
Office Hours: Wednesdays 3-5pm

2.2 Instructional Support Team

Course Co-ordinator: Lisa Robertson
Email: biol1070@uoguelph.ca
Office: SSC 3470
Office Hours: Fridays 12:30-1:30pm or email for an appointment.

3 Learning Resources

3.1 Required Resource(s)

Woodlot Biodiversity (Textbook)

Newmaster *et al.* 2013. *Woodlot Biodiversity* 2nd Edition
ISBN 978-09866554-1-8 (must use the 2nd edition).
Available in the University of Guelph Bookstore.

Field Guide to the Freshwater Mussels of Ontario (Textbook)

Metcalfe-Smith *et al.* 2005. *Field Guide to the Freshwater Mussels of Ontario*.
ISBN 0-9733179-2-2.
Available at the University of Guelph Bookstore.

Seminar Manual (Lab Manual)

The required seminar manual will be available for sale from the Department of Integrative Biology.
Times and locations for purchase will be announced in class and posted on the course homepage.

Courselink (Website)

<https://courselink.uoguelph.ca>

This course makes extensive use of Courselink, the University of Guelph's online learning environment. The course website will provide information and updates about the course, including background information on the inquiry cases, schedules, quizzes, discussions, and tracking of your progress.

iClicker (Equipment)

iclickers are required. These can be purchased at the bookstore.

4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Explain the central concepts of biodiversity, methods of analysis, and its ecological and societal importance.
 2. Develop accurate conceptions of evolutionary processes and patterns (especially natural selection and “tree thinking”), and to correct common misconceptions about evolution.
 3. Construct a conceptual framework that explains some of the causes and consequences of forest diversity.
 4. Describe the interactions between organisms and their biotic and abiotic environments and be able to apply these concepts to real-world examples.
 5. Organize and analyze data that characterize biological variation, patterns and relationships.
 6. Interpret complex graphs and figures and be able to choose appropriate graphs and figures to illustrate different types of data.
 7. Practice the process of biological inquiry using scientific methods and reasoning using real examples.
 8. Appreciate the integrative nature of modern biological science.
 9. Develop a level of comfort with the complexity and uncertainty inherent in biological science.
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5 Teaching and Learning Activities

The course will focus primarily on **skills** development and the process of inquiry entrenched within the meaning, significance, and current issues surrounding biodiversity. These will be underpinned by core **concepts** in evolution, ecology and physiology that will be introduced and reinforced throughout the course.

Skills:

1. To develop capabilities for independent study and research.
2. To develop the ability to assess and analyze biological information.
3. To reinforce numeracy skills by developing a broader knowledge base of data spreadsheets, statistical analyses and data presentation.
4. To understand and practice the process of biological inquiry using scientific methods and reasoning.
5. To develop skills for working in groups cooperatively and efficiently.
6. To develop effective communication skills.

5.1 Concepts

Evolution:

1. The processes by which biodiversity originates and is interrelated (evolution, with emphasis on natural selection and “tree thinking”).
2. Variability occurs at multiple levels: variation (population) vs. diversity (species) and may be visible (phenotypic) or not necessarily visible (genetic).
3. Causes and consequences of variation at population & species level.
4. The factors determining, relatedness and phylogeny, genetic isolation.
5. Adaptation and the pros/cons of specialization, invasions and radiations.
6. Consequences for competition (short-term, among conspecifics or between species), speciation (long-term), and extinction risk (long-term).

Ecology:

1. The nature of interactions among organisms and between organisms and their biotic and abiotic environments at the ecological scale.
2. Variability is expressed at different levels of organization (ecosystems, populations/species, and individuals).
3. Causes of diversity at each level can be understood by studying the processes operating in the levels below; the consequences of diversity can be examined as they affect diversity in the levels above.
4. Ecosystem diversity is known to vary both in space and time. Historical processes affect the dynamics of species diversity.
5. Understanding the complexity of variables associated with the causes and consequences of diversity.
6. Uncertainty in current dogma and the putative effects of anthropogenic change.

Physiology:

1. The complexity of organisms and the importance of physical organization and regulatory processes (e.g., information flow, structure/function, development).
2. Changes in the external environment impacts organisms. Organisms i) exchange molecules with the external environment, ii) regulate internal environment (homeostasis) through feedback mechanisms, iii) regulate, others conform to specific environmental parameters.
3. Organisms are organized in a hierarchy from cells to tissues to organs to organ systems. Structural features at all levels of organization have functional significance.
4. Plants respond to environment changes; circadian rhythms, dormancy, temperature stress.
5. Animals respond to temperature changes differently depending on their thermal group (endothermy, ectothermy): methods of heat transfer; metabolic rate changes with animal size, activity, temperature; strategies to cope with extreme cold in ectotherms and

endotherms; time frame of responses (acute, chronic, evolutionary time).

6. Impacts of climate change in arctic organisms include factors such as physiological change, geographic range and ecosystem disruption.

5.2 Lecture Content

Two 50-minute in-class interactions per week (with two Professors). The in-class interactions will focus on inquiry cases that explore both skills and major concepts. The first case study, "Invasion! Mussels of the Great Lakes Regions" is based on a serious and current concern about loss of biodiversity in mussel species in the Great Lakes and watersheds. Key concepts in evolution will be discussed in the context of an urgent biological, environmental and societal issue in Ontario. The second inquiry case, "Forest Biodiversity" is based on controversial issues surrounding species diversity in forests and conservation biology. Key concepts in evolution and ecology will be discussed within the framework of current ideas about forests. The third inquiry case "An Arctic Ecosystem 8° C Warmer" concerns climate change and the impact on arctic organisms. Key concepts in evolution, ecology and physiology will be integrated into a discussion of the impact of temperature change in the short and long-term on individuals, populations and the ecosystem. In-class interactions will involve active learning approaches (e.g. small and large group discussions, use of electronic clickers) and mini-lectures.

5.3 Seminars

One 50-minute seminar per week (~30 students + Teaching Assistant). Seminars will emphasize skills development (especially modes of scientific inquiry) and small group interactions. Students will meet weekly with a graduate student Teaching Assistant and the same group of ~30 students. Students will be organized into groups of ~4 students for activities and discussions (see below). Seminars take place both in the Science Complex and outdoors in the Dairy Bush, a woodlot on campus. Students must dress appropriately for the weather during the outdoor seminar.

5.4 Field Trips

One seminar will take place outdoors in the Dairy Bush, a woodlot on campus that is an approximately an 8 minute walk from the Science Complex. Students must dress appropriately for the weather during the outdoor seminars. Students must review the field safety protocols outlined in the seminar manual before engaging in field activities.

6 Assessments

6.1 Marking Schemes & Distributions

6.2 Assessment Details

Quizzes (11 at 0.5% with lowest quiz mark dropped) (5%)

Date: , Weekly - Online

Evolution, ecology & physiology

Midterm Exam 1 (Multiple Choice) (10%)

Date: Mon, Oct 1

Inquiry Case 1 - Evolution

Midterm Exam 2 (Multiple Choice) (15%)

Date: Wed, Oct 31
Inquiry Case 2 - Ecology

Online Orientation Modules (1%)

Code of Conduct - 0.5%
Skills Self Assessment - 0.5%

Scientific Inquiry Online Workshop (1%)

Date: Sun, Sep 16, 12:00 AM - Mon, Sep 24, 9:29 AM
Scientific Inquiry

Numeracy Online Workshop (1%)

Date: Sun, Sep 23, 12:00 AM - Mon, Oct 1, 9:29 AM
Numeracy

Seminar Assignment 1 (lowest mark of Assignment 1 to 5 dropped) (3%)

Due: Completed in Seminar 2
Identifying Organisms

Seminar Assignment 2 (lowest mark of Assignment 1 to 5 dropped) (3%)

Date: Completed in Seminar 3
Hypotheses/ Predictions

Seminar Assignment 3 (lowest mark of Assignment 1 to 5 dropped) (3%)

Date: Completed in Seminar 4
Biological Variation

Seminar Assignment 4 (lowest mark of Assignment 1 to 5 dropped) (3%)

Date: Completed in Seminar 5
Methods - sampling data

Seminar Assignment 5 (lowest mark of Assignment 1 to 5 dropped) (3%)

Due: Completed in Seminar 6 - Dairy Bush
Sampling and identifying plants

Forest Fragmentation Assignment (11%)

Due: Week 9
Ecology, Numeracy

Interdisciplinary Project (10%)

Date: Due in Week 11
Integrative thinking: Evolution, ecology & physiology

Final Examination (34%)

Date: , TBD
Undergraduate examination regulations can be found at: [Undergraduate Calendar - Examinations](#)

6.3 Note

Students will be required to participate in discussion groups in class and seminars. Some assignments will be based on group work, however the majority of marks in the course are based on individual work.

6.4 Up to 5% Bonus Marks

Throughout the lectures we will have 'clicker questions'. All of these will be worth up to a 5% bonus on your final grade. We will indicate the value of each one when they are presented, some questions will be marked simply for clicking in an answer, and others will be worth more if you

select the correct answer. Stay tuned during lectures for more information and make sure to REGISTER YOUR CLICKERS at: <http://www.uoguelph.ca/courselink/iclickers.html>.

We will begin counting clickers for marks on the first day of class so please come prepared and registered.

7 Course Statements

7.1 Grading Policies

Inquiry Case Exam #1, #2 (Midterm #1, #2)

- **Midterm exams will be held during normal lecture hours.** These 40-50 minute exams will consist of multiple choice questions that focus on concepts and skills related to the first two inquiry cases. Sample questions will be discussed in class. There are no make up or alternate exam times offered.

Seminar Assignments

- Students will explore the process of biological inquiry through directed seminar activities.
- In seminars, students will use various methods to identify organisms, discuss concepts and approaches to testing hypotheses, measure biological samples, collect and analyse data.
- Assignments 1 to 5 will be worksheets completed by groups in seminar.
- Students that are absent, or arrive late to seminar such that they are unable to contribute equally to the group, will be given a mark of zero.
- At the end of the term we will drop your lowest seminar assignment mark from Assignments 1 to 5 and not include it in your final grade.

Forest Fragmentation Assignment

- Students will explore the process of biological inquiry through this field project focused on sampling Forest Biodiversity in a protected forest on campus (the Dairy Bush).
- Students will use ecological methods to collect data in the field, use online resources to analyze data, and write an independent report of their findings.
- This assignment is **completed and submitted individually** by students.
- This assignment will be due at the indicated time to the online dropbox, and will be assessed a 25% penalty for each day late or portion thereof.

On-line quizzes

- Students will be introduced to inquiry cases and related information online.
- Students will test their knowledge and understanding of the key concepts and terminology in the online inquiry cases in the weekly online quizzes.
- Quizzes that are submitted late will be given a mark of zero.
- At the end of the term we will drop your lowest quiz mark from quizzes 1 to 11 and not include it in your final grade.

Interdisciplinary Project

- Students will change seminar groups for weeks 9 to 11 of the semester and interact with students in BIOL*1080 and BIOL*1090.
- Students will work in small teams of students to explore an interdisciplinary theme from different perspectives depending on their course affiliation.
- Students will individually contribute a portion of a final poster-style presentation, as well as contribute to a group written component.
- Late Interdisciplinary Projects will **not** be accepted for grading.

Final Exam

- The final exam will be held outside of class during the normal final exam period. This 2 hour exam will consist of multiple choice questions that focus on the 3rd inquiry case inquiry as well as application of concepts from the entire semester to novel biological examples.
- Sample questions will be discussed in class.

7.2 Expectations & Grading

BIOL*1070 has a 0.5 credit weight. At the University of Guelph, this translates to an expectation of 10-12 hours of deliberate and productive work per week (<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-aload.shtml>). If you notice that you are not fulfilling this expectation, please meet with your instructors to discuss strategies.

We expect you to become familiar with the University of Guelph grading policy (<https://www.uoguelph.ca/registrar/calendars/undergraduate/2016-2017/c08/c08-grds-proc.shtml>).

Here it is clearly stated what the expectations are in accordance with each letter grade. For example, an assignment evaluated at 80% or higher has the following attributes:

80 - 100 (A) Excellent. An outstanding performance in which the student demonstrates a superior grasp of the subject matter, and an ability to go beyond the given material in a critical and constructive manner. The student demonstrates a high degree of creative and/or logical thinking, a superior ability to organize, to analyze, and to integrate ideas,

and a thorough familiarity with the appropriate literature and techniques.

If you find yourself at risk of not achieving your goals, please make sure that you seek help from any of your instructors. If you are prepared to make the effort, we will be delighted to help you.

7.3 Group Work

- Seminar Assignments 1-5 will be worksheets completed and submitted by **groups** in seminar.
- The Forest Fragmentation Assignment is completed and submitted **individually** by students.

7.4 Use of Electronic Devices & Recording of Lectures

Electronic recording of classes is expressly forbidden without consent of the instructor. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the instructor.

7.5 Collection of Information for Academic Purposes

Use of personal information:

Personal information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes. The University of Guelph's policy on the Collection, Use and Disclosure of Personal Information can be found in the Undergraduate Calendar.

(<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/intro/index.shtml>)

8 Department of Integrative Biology Statements

8.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the [Learning Commons](#) including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You

can also set up individualized appointments with a learning specialist.

- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: [Chemistry & Physics Help](#) and [Math & Stats Help](#)

8.3 Wellness

If you are struggling with personal or health issues:

- [Counselling Services](#) offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.
 - [Student Health Services](#) is located on campus and is available to provide medical attention.
 - For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to [stress management and high performance situations](#).
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9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The regulations and procedures for [Academic Consideration](#) are detailed in the Undergraduate Calendar.

9.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Undergraduate Calendar.

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is

required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: www.uoguelph.ca/sas

9.6 Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The [Academic Misconduct Policy](#) is detailed in the Undergraduate Calendar.

9.7 Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.
