

# Evolution and Diversity of Life (Biology 2010)

## Syllabus for Spring, 2018

**Overview:** Organisms are the result of their evolutionary history. This course teaches that history and how it is investigated. We trace the evolution of reproductive, metabolic, and morphological diversity from the origin of life through the major lineages of extant organisms. The environmental and biological processes behind major milestones in evolution are discussed along with their basis in evidence and methodology. The diversity of major groups is explored in their evolutionary context.

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Office hours by appointment

### Teaching

**Assistants:** Ethan Frehner: [ehfrehner@gmail.com](mailto:ehfrehner@gmail.com)  
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Office hours by appointment

**Lectures:** M, W, F 12:55 PM – 1:45 PM, JTB 310

### Textbook/

### Readings:

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1. Recommended: Online "eBook" consisting of chapters excerpted from Brooker, Widmaier, Graham, Stiling **Biology** 4th edition. To purchase (ca. \$25), go to <http://create.mheducation.com/shop/> and search for the title "Biol 2010" or the ISBN: 9781307095043 121734371. Add the book to your cart and pay using a credit card. You may also purchase the eBook from the University Bookstore. There are also limited number of (more expensive) hardcopy versions at the Bookstore.

2. Optional: Andrew Knoll, "Life on a Young Planet" and Peter Holland, "The Animal Kingdom: A Very Short Introduction" (both available at the U. bookstore and on 2 hour reserve in Marriott Library).

3. Journal articles as announced. These will be posted on the Canvas course site.

### Discussion

### Sections:

We strongly recommend that you attend a discussion section each week. You do not have to attend the section for which you registered. Choose from the alternatives below to suit your schedule. These sessions, which are led by the teaching assistants (TAs), allow you to ask questions regarding the lectures or assigned readings. You may attend more than one discussion if you prefer.

Discussion times and places are as follows:

|    |                     |         |         |
|----|---------------------|---------|---------|
| M  | 9:40 – 10:30 AM     | Ethan   | PAB 103 |
| T  | 10:45 – 11:35 AM    | Crystal | AEB 350 |
| W  | 8:35 – 9:25 AM      | Katie   | JTB 120 |
| W  | 11:50 AM – 12:40 PM | Maya    | JTB 320 |
| Th | 10:45 – 11:35 AM    | Jay     | AEB 350 |
| Th | 12:55 – 1:45 PM     | Karen   | JTB 110 |

There will be no Discussion sections the first week of class.

During exam week there will be an additional review session.

**Attendance and lecture notes:** You are expected to attend all lectures. You are responsible for taking your own notes during lecture. If unavoidable circumstances prevent you from attending a lecture, obtain lecture notes from someone else in the class. Lecture notes will not be provided by professors or teaching assistants.

**Online access to course materials:** The syllabus, handouts, study questions, homeworks, keys, powerpoints, and other course related items will be posted electronically at the U's Canvas site. Sign on to the Campus Information Services (CIS) page with your username and password. You should be able to access the Biology 2010 materials under "My classes." Course materials can be found under "Files" on the Biology 2010 page.

**Study questions and reading assignments** are posted at the beginning of each week on the Canvas site (under "Files"). Study questions are not graded, and are often gone over in the weekly Discussion sections. Reading assignments provide broader context that may help you better understand the lecture material.

**Grading:** The final grade is based on a total of 500 points. There are four exams of 100 points each. There are four homework assignments of 25 points each. No grades are dropped. There are no extra credit exercises. Letter grades are assigned at the end of the class. The point breakdown will be no *more* strict than the following: 90-100% A/A-, 80-90% B+/B/B-, 70-80% C+/C/C-, 60-70% D+/D/D-, <60% E. In other words, if you get 85% of the total points, you are guaranteed of a grade of B- or above.

Exams will be based on lecture material. The best study guides for the exams are your own lecture and discussion notes. Review session(s) will be given out of class time for each exam.

Exams will be graded as quickly as possible and returned in class. Keys will be posted on the website. *There will be no makeup exams unless permission has been obtained before the exam from the instructor.* Permission for makeup exams is usually granted only in the case of emergencies such as illness or accidents.

The homework assignments are take-home exercises. You may discuss the exercises with other students but your written answers must be your own work. Late exercises will be subject to point deduction, and their safe handling cannot be guaranteed. No homework will be accepted by email; it must be turned in in person. Likewise, we will not send any assignments or materials to you via email. They must be picked up in person or downloaded from the course website.

Questions regarding grading should be submitted *in writing* to a Teaching Assistant *within one week* of the day on which assignments are returned. Please be detailed and explicit with regard to exactly what mistake was made in the grading of your exam.

**Course Drop Policy:** The drop and withdrawal policy is the same as the University of Utah policy described in the Class Schedule. Friday, January 19 is the last day to drop with no tuition and no notation on the transcript. Friday, March 2 is the last day students can withdraw, but tuition will be assessed. Contact the registrar or academic calendar for more information.

**Evolution and Diversity Lab, Biology 2015:** A separate lab course, Biol 2015, runs concurrently with Biol 2010. The topics follow the order of Biol 2010, but give you a chance to experience examples of the organisms that we cover in class. This course complements Biol 2010 and is highly recommended but not required.

#### **Expected Learning Outcomes for Biology 2010**

- Students will be able to apply the principles of natural selection to explain how the observed diversity of life has arisen over macro-evolutionary time frames.
- Students will be able to apply knowledge of molecular, cellular, and organismal structures to explain the diverse set of functions that underlie the remarkable amount of biodiversity on Earth.

#### **Core Competencies for Biology 2010**

- Students will be able to apply the process of science to identify knowledge gaps, formulate hypotheses, and test them against experimental and observational data to advance an understanding of the natural world.
- Students will be able to apply concepts and interdisciplinary knowledge from within and outside biology in order to interpret biological phenomena.
- Students will be able to evaluate and clearly communicate biological concepts and their implications to broad audiences.

**Americans with Disabilities Act (ADA):** In accordance with University policy with respect to ADA matters and students with other identifiable disabilities, we will provide additional examination time as needed and appropriate. Students needing this service should identify themselves to the course instructor at least one week in advance of the first examination. In addition you must provide a written statement of how

we can assist you in completing course requirements. Students requiring additional time with teaching assistants are encouraged to attend as many discussion sections as needed and also to arrange to meet with the teaching assistants or the faculty during their office hours.

### **Lecture Schedule**

| DATE     | TOPIC   | PROFESSOR |
|----------|---|-----------|
| Jan 8 M  | Course intro. Scientific names and classification.      | Bohs      |
| Jan 10 W | Phylogenies.  | Bohs      |
| Jan 12 F | The tree of life.                                       | Bohs      |
| Jan 15 M | Martin Luther King, Jr. Day                             | No class  |
| Jan 17 W | Origin of life I.                                       | Bohs      |
| Jan 19 F | Origin of life II.                                      | Bohs      |
| Jan 22 M | Prokaryotic lineages. <b>Homework 1 assigned</b>        | Bohs      |
| Jan 24 W | Prokaryotic metabolism.                                 | Bohs      |
| Jan 26 F | Evolution of eukaryotes. <b>Homework 1 due</b>          | Bohs      |
| Jan 29 M | Protozoans: heterotrophic protists.                     | Bohs      |
| Jan 31 W | Protist diversity.                                      | Bohs      |
| Feb 2 F  | <b>EXAM 1</b>   | Bohs      |
| Feb 5 M  | Origin of the algae.                                    | Bohs      |
| Feb 7 W  | Algal diversity and reproduction.                       | Bohs      |
| Feb 9 F  | Evolution of land plants.                               | Bohs      |
| Feb 12 M | Bryophytes: non-vascular plants.                        | Bohs      |
| Feb 14 W | Seedless vascular plants.                               | Bohs      |
| Feb 16 F | Evolution of seed plants. <b>Homework 2 assigned</b>    | Bohs      |
| Feb 19 M | President's Day   | No class  |
| Feb 21 W | Gymnosperm life cycle. <b>Homework 2 due</b>            | Bohs      |
| Feb 23 F | Gymnosperm diversity; angiosperm life cycle.            | Bohs      |
| Feb 26 M | Angiosperm origin and diversity.                        | Bohs      |
| Feb 28 W | <b>EXAM 2</b>   | Bohs      |
| Mar 2 F  | Fungi I. What is a fungus? Evolution.                   | Feener    |
| Mar 5 M  | Fungi II. Classification, Life Cycles.                  | Feener    |
| Mar 7 W  | Fungi III. Evolutionary relationships within the Fungi. | Feener    |
| Mar 9 F  | Fungi IV. Diversity & Ecology.                          | Feener    |
| Mar 12 M | Animal Origins. <b>Homework 3 assigned</b>              | Feener    |
| Mar 14 W | The "Cambrian Explosion."                               | Feener    |

|           |   |          |
|-----------|---|----------|
| Mar 16 F  | Body Plans. Basal phyla. <b>Homework 3 due</b>  | Feener   |
| Mar 19-23 | Spring Break  | No class |
| Mar 26 M  | Porifera, Ctenophora.   | Feener   |
| Mar 28 W  | Cnidaria, Placozoa, Acoela.   | Feener   |
| Mar 30 F  | Lophotrochozoa I. Platyhelminthes.<br>Evolution of muscle tissue.   | Feener   |
| Apr 2 M   | <b>EXAM 3</b>   | Feener   |
| Apr 4 W   | Lophotrochozoa II. Molluscs.  | Feener   |
| Apr 6 F   | Lophotrochozoa III. Annelida.   | Feener   |
| Apr 9 M   | Ecdysozoa I. Nematodes.   | Feener   |
| Apr 11 W  | Ecdysozoa II. Arthropoda.   | Feener   |
| Apr 13 F  | Ecdysozoa III. Arthropoda.<br>Evolution of the nervous system.  | Feener   |
| Apr 16 M  | Deuterostomes I. Echinoderms – Urochordates.<br>Mutualism with photosynthetic organisms. <b>Homework 4 assigned</b> | Feener   |
| Apr 18 W  | Deuterostomes II. Vertebrates.  | Feener   |
| Apr 20 F  | Deuterostomes III. Tetrapods. <b>Homework 4 due</b>   | Feener   |
| Apr 23 M  | Deuterostomes IV. Birds, Mammals & Mass Extinctions.  | Feener   |
| Apr 30 M  | <b>EXAM 4: 1:00 – 3:00 PM. JTB 310</b>  | Feener   |