Course Description
This course introduces students to the immensity of biological diversity and the timeline of the origin and evolution of life on Earth, focusing especially on natural selection, the construction and interpretation of phylogenies, physiology, and ecological relationships. We will use active learning - a form of evidence-based teaching strategy that directly involves the students in the learning process. Studies have shown that active learning strategies significantly enhance student learning. Student participation both inside (in learning activities) and outside the classroom is essential. This course is part of a four-course sequence, which includes 1610 (focusing on molecular and cellular biology), and two labs, 1615 and 1625. 3 credits.

Instructors: Please do not email instructors through Canvas, email instructors directly through the email addresses listed below. Please click on the About Course link on the Canvas home page to learn more about your instructors.

Dr. Jim Ehleringer
Email: jim.ehleringer@utah.edu
Office hours: open door policy - drop by anytime between 8-5 and we can meet if no other meeting is taking place or arrange for specific meeting times via email, ASB 522

or arrange for specific meeting times via email
(he/him/his)

Dr. Don Feener
Email: donald.feener@utah.edu
Office hours: Open door and by appointment, Biol 308
(he/him/his)

Dr. Amanda Hoepfner
Email: amanda.hoepfner@utah.edu
Office hours: Th 9:30-10:30, ASB 380 and by appointment
(she/her/hers)

*For any questions regarding Launchpad, iClicker, or grading, please email Dr. Hoepfner

Class help
Discussions: Learning Assistants (LAs) will hold multiple discussion sections each week. In the discussions, the LAs will guide you in reviewing quizzes, exams, and practice problems to help you better understand the material. These discussion sections are optional; however, we highly
encourage everyone to attend the discussions. Also, you can earn points that can replace your lowest quiz score, see below under points for discussions and Study Hall.

**Study Hall:** Our Study Hall is located at the Biology Learning Center, the first floor of the Biology building. Students are encouraged to meet here to work on course assignments. This course offers undergraduate *Learning Assistants* (LAs) who, through the guidance of weekly preparation sessions, facilitate discussions among groups of students that encourage active engagement, uncover misconceptions, and overcome content hurdles. LAs can help you with all course assignments and class concepts. LAs will not simply “give you the answer”. They will instead direct and empower you to figure out the answer on your own. LAs are available at designated times in the Study Hall. Students can also use that tutoring space whenever the building is open to study and complete assignments. Students struggling with a concept can submit their question or comment to the Canvas discussion board. Please click on the *Resources* Link on the Canvas home page to access all resources available to you.

**Points for Discussions and Study Hall:** Discussion sections and Study Hall are optional; however, you can earn points that could replace your lowest scoring quiz. Each discussion or Study Hall is worth 3 points (you can only earn 3 points per week) and at the end of the semester, if your discussion points are higher than your lowest scoring quiz, the discussion points will replace that quiz score. In other words, if you attend 10 out of the 14 discussions, your lowest scoring quiz will be replaced with 30 points (100% on one quiz).

**Required Materials**
1. **Textbook:** *Biology: How Life Works, Third Edition, 2019.* Authors: Morris J, Hartl D, Knoll A, Lue R, Michael M. Publisher: Macmillan Education. The book subscription includes 2 years of access to the E-book with *Launchpad* learning software and a 12-month subscription to iClicker Reef software. Instructions on how to connect to Launchpad and Reef can be found on the Canvas home page. Please click on the *Get Started* Link to access these instructions. Help will also be provided on the first day of class.

2. **Electronic Devices in Class:** Students are encouraged to bring their primary electronic devices (laptops/tablets/smart phones) to access course content and to participate in course activities. *Do not use those devices in class for non-course related activities because it disrupts the class.* The instructor has the right to ask you to leave the classroom for such behavior.

**Course Structure**
This course guides student learning through three components: Pre-class, In-class, and Post-class work. Please click on the *About Course* Link on the Canvas home page to find a canvas course navigation video that lays out the structure of the course on canvas.

**Pre-class:** Will include assigned readings, videos to watch, self-study, and an *on-line pre-class graded assignment.* These required assignments will be posted on canvas on the pre-class page
for each class and will be available one week prior to class meeting. Each pre-class online assignment is due by 7 am the day of the class.

**In-class:** A class may begin with a discussion designed to address misconceptions revealed by the pre-class assignment and extend student learning by in-depth discussion of key concepts. An audience response system, the Reef App, will be used to assess student learning. For select core or challenging concepts, a learning activity will be carried out to help improve student comprehension.

*Recording class sessions without instructor permission is prohibited. Those with permission should use the recordings for personal study only. Students should not post class recordings in any public forum or pass on recordings to another student.*

**Post-class:** Students are expected to read the book, review class notes and reflect upon the in-class session. In addition, optional reading and viewing materials are provided to supplement the required materials for that topic. These materials are not required but are likely to help you to better understand key concepts and to explore topics that are of interest to you.

**Expected Learning Outcomes**

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

- Describe fundamental events in the origins and evolution of life on Earth, including all major branches in the Tree of Life, and evaluate phylogenetic trees.
- Describe key evolutionary innovations: multicellularity, sex, and the evolutionary relationship between form and function.
- Explain major ecological cycles and services, including carbon (photosynthesis, respiration) and nutrient (nitrogen fixation, decomposition) cycles.
- Explain factors associated with mass extinction events through time, including the current Anthropocene Extinction.
- Read and interpret scientific literature, graphs, and data.
- Communicate scientific literature through individual and group activities.
- Evaluate interactions between biology and society.

**Broad learning objectives for core concepts in Biology:**

- **Evolution:** Students will be able to apply the principles of natural selection and mechanisms of genetic change, including trait variation and heritability, to explain the observed diversity of life that has arisen over long-term as well as recent evolutionary time frames.

- **Transmission, flow and interpretation of biological information:** Students will be able to apply a knowledge of genetics, gene expression, growth and development, signal perception and transduction, and physiological regulation to explain how information is stored, transmitted and used in biological contexts.
• **Structure and function:** Students will be able to apply knowledge of molecular, cellular, and organismal structures to explain the diverse set of functions ranging from sub-cellular functions to behavioral and ecological functions that underlie the remarkable diversity of individual organisms as well as communities of organisms.

• **Systems:** Students will be able to explain how biological units interact to give rise to emergent properties at multiple levels of biological organization. These interactions range from the cycling of matter and energy at scales ranging from the subcellular to organismal, and community scales. Students will also be able to explain the interaction and interdependency of organisms, including humans, with their environment.

• **Ability to apply the process of science:** 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.

• **Ability to use quantitative reasoning:** Students will be able to use mathematical and computational methods and tools to describe living systems and will be able to apply quantitative approaches, such as statistics, quantitative analysis of dynamic systems, or mathematical modeling.

• **Ability to participate in the interdisciplinary nature of science through clear communication and collaboration with other disciplines:** Students will be able to apply concepts and sub-disciplinary knowledge from within and outside of biology in order to interpret biological phenomena, communicate with clear written and oral arguments, and work collaboratively to solve problems.

• **Ability to explain the relationship between science and society, and engage:** Students will be able to evaluate the interactions between biology and society, including the societal impacts of biological research as well as public perception and decision-making about science, and clearly communicate biological concepts and their implications to broad audiences.
Assignments and Grading
Course grade will be determined from your percentage score out of 1000 total points. Cumulative scores of 90%, 80%, 70% or 60% will guarantee grades of not less than A-, B-, C- and D, respectively. See assignment and grading table below.

<table>
<thead>
<tr>
<th>Assignment (Goal)</th>
<th>Total Points (calculation)</th>
<th>Notes</th>
</tr>
</thead>
</table>
| **Pre-Class**  
(Students explore and engage)  
*Canvas pages include pre-class work and Launchpad assignment* | 50 (percentile score) | • Students have 3 attempts per question.  
• Canvas will drop 4 lowest scores.  
• Missed assignments cannot be made up, and students will use score drop for missed assignments. |
| **In-Class Clicker Questions**  
(Assess learning and identify misconceptions)  
*Students will use the Reef app to participate in clicker activities. Subscription is included with textbook.* | 50 (percentile score) | • Canvas will drop 4 lowest scores.  
• Missed clicker questions or sessions cannot be made up, and students will use score drop for missed assignments. |
| **In-Class Activities**  
(Reinforce core concepts with group interactions)  
Students will hand in worksheets, write answers on paper, or respond with clickers. | 50 (percentile score) | • Group work in class. Turn in to TAs during class.  
• Canvas will drop 4 lowest scores.  
• Missed activities cannot be made up, and students will use score drop for missed activities. |
| **Post-class**  
(Connect and cement concepts)  
*Post-class quiz or Draw to Learn assignment on canvas. Upload a picture of your drawing from your notebook.* | 50 (percentile score) | • Canvas will drop 4 lowest scores.  
• Missed draw-to-learn assignments cannot be made up, and students will use score drop for missed assignments. |
| **Quizzes**  
(Evaluate at regular intervals)  
*In class, on paper, see schedule for dates* | 150 (total score) | • Five 30-point quizzes.  
• Practice exam-style questions.  
• Lowest score can be replaced with discussion/Study Hall help points.  
• Missed quizzes cannot be made up, and students will use discussion/Study Hall points for a missed quiz. |
| **Exams**  
(Summative assessment)  
*In class, on paper, see schedule for dates.* | 150 (total score) | • Two 75-point exams.  
• Not comprehensive, only include material for that half of the course. |

**Total Points**  
500
Course Policies

Rescheduling Assignments, Quizzes, and Exams: The lowest grades for all assignments and in-class clicker questions are dropped to accommodate low scores and unexpected absences. Therefore, rescheduling assignments is not allowed. Rescheduling of quizzes and exams is allowed only under extreme extenuating circumstances, such as serious illness or injury. Written documentation, such as a doctor’s note, is required in each case. Rescheduled quizzes and exams are also allowed for school-sponsored activities if a letter from the faculty mentor is provided.

Regrading Quizzes and Exams: Questions regarding grading other than arithmetic errors should be submitted in writing on Gradescope within one week of the day on which the homework/exams are returned. Please be detailed and explicit with regard to exactly what mistake was made in the grading of your exam.

Attendance & Punctuality: The University and your instructors expect all students to attend all class meetings. Students are expected to acquaint themselves and satisfy the entire range of academic objectives and requirements as defined by this syllabus.

Electronic Devices in Class: Students are encouraged to bring their primary electronic devices (laptops/tablets) to access course content. Devices may only be used for course-related material during class, and the instructor holds the right to ask you to leave the classroom for such behavior.

Equipment Failure: It is your responsibility to maintain your electronic equipment for participation in the course assignments.

Computer and Canvas Literacy Expectations: Students are expected to be computer and internet literate to take this course, including canvas navigation skills. For Canvas orientation, see https://utahtacc.zendesk.com/hc/en-us/articles/205654094. Call 581-4000 for CIS help or bring your laptop to Knowledge Commons on second floor of Marriott Library for help. As will be explained in class, sometimes more than one browser is needed for Launchpad assignments. Post your technical issues to the class discussion board and we will crowd-source solutions as issues arise.

Online Classroom Equivalency: Discussion threads, emails and canvas are all considered equivalent to classrooms, and student behavior within those environments shall conform to the student code. Specifically:
1. Posting photos or comments off-topic in a classroom are also off-topic in an online forum.
2. Off-color language and photos are never appropriate.
3. Using angry or abusive language is not acceptable and will be dealt with according to the student code.
4. Do not use ALL CAPS, except for titles since it is an equivalent of shouting online, as is overuse of punctuation marks such as exclamations!!!!!! And question marks??????
5. Course e-mails and other online course communications are part of the classroom and as such are University property and subject to the Student Code. Privacy regarding these communications between correspondents must not be assumed and should be mutually agreed upon in advance, in writing.

**University of Utah Policies**

**The Americans with Disabilities Act.** The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

**University Safety Statement.** The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

**Addressing Sexual Misconduct.** Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

**Drop, Withdrawal or Incomplete.** The University of Utah drop and withdrawal dates are on the class schedule. Also see [http://registrar.utah.edu/academic-calendars/index.php](http://registrar.utah.edu/academic-calendars/index.php). University policy allows assignment of a grade of incomplete (I) if 80% or more of the course work has been completed. We will consider assigning an “incomplete (I)” only under exceptional circumstances unrelated to academic performance, and only if a student is passing the course with a C or better when the “Incomplete” is requested.

**Academic Misconduct.** All suspected cases of academic misconduct including cheating, answering clicker questions for someone else, and plagiarizing will be dealt with according to rules in the student code, University policy 6-400(V). Please know that looking into someone else’s exam is cheating and will be dealt with seriously as stated above. By accepting admission to the University, you have
agreed to abide by the University rules provided to you in the student handbook. Cheating and plagiarism are serious offenses and can result in getting a zero on the assignment, failing a class, a note in your record, or being expelled. Here is the link: http://www.admin.utah.edu/ppmanual/8/8-10.html

**Wellness Statement.** Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student’s ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at www.wellness.utah.edu or 801-581-7776.

**Diversity / Inclusivity Statement.** It is the intent of the instructors that students from all diverse backgrounds and perspectives be well served by this course, that students’ learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is our intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally or for other students or student groups.

**English Language Learners.** If you are an English language learner, please be aware of several resources on campus that will support you with your language and writing development. These resources include: the Writing Center (http://writingcenter.utah.edu/); the Writing Program (http://writingprogram.utah.edu/); the English Language Institute (http://continue.utah.edu/eli/). Please let us know if there is any additional support you would like to discuss for this class.

**See class schedule on next page**
Course Schedule

Please note that we may modify the course schedule to accommodate the needs of our class. Any changes will be announced in class and posted on Canvas under Announcements.

<table>
<thead>
<tr>
<th>Class #</th>
<th>Date</th>
<th>Topic</th>
<th>Quizzes and Group Changes</th>
<th>Instructor</th>
<th>Discussion topic</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>T Jan 7</td>
<td>Course Introduction</td>
<td></td>
<td>All</td>
<td>1 – How to study and working in groups</td>
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<tr>
<td>2</td>
<td>Th Jan 9</td>
<td>Introduction to Evolution</td>
<td>Groups assigned</td>
<td>Hoepfner</td>
<td>2 – Evolution activity #1</td>
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<td>3</td>
<td>T Jan 14</td>
<td>Evolution by Natural Selection</td>
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<td>Hoepfner</td>
<td>3 – Evolution activity #2</td>
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<tr>
<td>4</td>
<td>Th Jan 16</td>
<td>Evolutionary Processes</td>
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<td>Hoepfner</td>
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<tr>
<td>5</td>
<td>T Jan 21</td>
<td>Species and Speciation</td>
<td></td>
<td>Hoepfner</td>
<td></td>
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<tr>
<td>6</td>
<td>Th Jan 23</td>
<td>Phylogenetic Trees</td>
<td></td>
<td>Feener</td>
<td>4 – Phylogenetic trees activity</td>
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<tr>
<td>7</td>
<td>T Jan 28</td>
<td>Sexual Reproduction</td>
<td>Quiz 1</td>
<td>Feener</td>
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<tr>
<td>8</td>
<td>Th Jan 30</td>
<td>Origin of Life</td>
<td></td>
<td>Ehleringer</td>
<td>5 – Review Quiz 1</td>
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<tr>
<td>9</td>
<td>T Feb 4</td>
<td>Bacteria and Archaea Diversity</td>
<td></td>
<td>Ehleringer</td>
<td>6 – Energy/Electron Tower activity</td>
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<tr>
<td>10</td>
<td>Th Feb 6</td>
<td>Carbon and Nitrogen Cycles</td>
<td></td>
<td>Ehleringer</td>
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<tr>
<td>11</td>
<td>T Feb 11</td>
<td>The Great Oxidation Event</td>
<td>New Groups</td>
<td>Ehleringer</td>
<td>7 – Study for Mid-Term</td>
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<tr>
<td>12</td>
<td>Th Feb 13</td>
<td>Origin of Eukaryotes</td>
<td>Quiz 2</td>
<td>Ehleringer</td>
<td>8 – Review Mid-Term Exam</td>
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<tr>
<td>13</td>
<td>T Feb 18</td>
<td>Land Plants</td>
<td></td>
<td>Ehleringer</td>
<td>9 – Global Climate activity</td>
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<tr>
<td>14</td>
<td>Th Feb 20</td>
<td>Mid-Term Exam</td>
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<td>Ehleringer</td>
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<tr>
<td>15</td>
<td>T Feb 25</td>
<td>Gymnosperms</td>
<td></td>
<td>Ehleringer</td>
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<tr>
<td>16</td>
<td>Th Feb 27</td>
<td>Angiosperms</td>
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<td>Ehleringer</td>
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<td>17</td>
<td>T Mar 3</td>
<td>Biogeography - Biomes and Global Ecology</td>
<td></td>
<td>Ehleringer</td>
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<td>18</td>
<td>Th Mar 5</td>
<td>Fungi</td>
<td>Quiz 3</td>
<td>Ehleringer</td>
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<td>Spring Break</td>
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<td>T Mar 17</td>
<td>Symbiosis</td>
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<td>20</td>
<td>Th Mar 19</td>
<td>The Cambrian Explosion</td>
<td>New Groups</td>
<td>Feener</td>
<td>11 – Species Interactions activity</td>
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<td>21</td>
<td>T Mar 24</td>
<td>Origin of Animals</td>
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<td>Feener</td>
<td>12 – Where are we on the tree of life?</td>
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<td>22</td>
<td>Th Mar 26</td>
<td>Arthropods</td>
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<td>Feener</td>
<td>13 – Review Quiz 4</td>
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<td>23</td>
<td>T Mar 31</td>
<td>Vertebrates</td>
<td>Quiz 4</td>
<td>Feener</td>
<td>14 – Review Quiz 5 and Study for Final</td>
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<tr>
<td>24</td>
<td>Th Apr 2</td>
<td>Animal Behavior</td>
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<td>Feener</td>
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<tr>
<td>25</td>
<td>T Apr 7</td>
<td>Sexual Selection</td>
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<td>Feener</td>
<td></td>
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<tr>
<td>26</td>
<td>Th Apr 9</td>
<td>Evolution of Hominins</td>
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<td>Feener</td>
<td></td>
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<tr>
<td>27</td>
<td>T Apr 14</td>
<td>Extinction and Biodiversity in the Anthropocene</td>
<td>Quiz 5</td>
<td>Feener</td>
<td>15 – Review Quiz 5 Study for Final</td>
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<tr>
<td>28</td>
<td>Th Apr 16</td>
<td>Human ecosystem relationships</td>
<td></td>
<td>Feener</td>
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<tr>
<td>29</td>
<td>T Apr 21</td>
<td>Mid-Term 2 Exam</td>
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