

PRINCIPLES OF BIOLOGICAL DIVERSITY

BIOB 170, Spring Semester 2018

Instructors



Dr. John McCutcheon
 ISB 309
john.mccutcheon@mso.umt.edu
 Office hours: T Th 3-4
 or by appointment



Dr. Erick Greene
 Health Sciences 203a
erick.greene@mso.umt.edu
 Office Hours: MF 2-3
 or by appointment



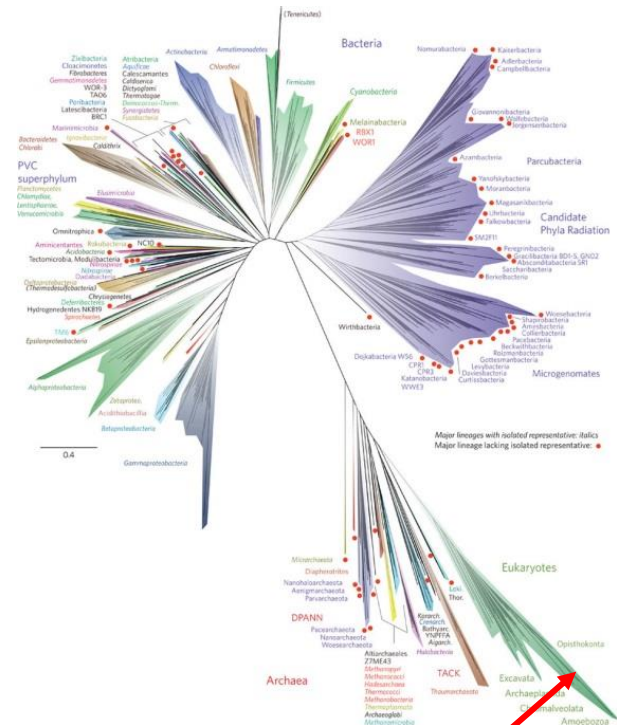
Victoria Dahlhoff – TA
 BioResearch Building
victoria.dahlhoff@umconnect.umt.edu

Overview and Objectives

We share this planet with an astounding variety of living organisms. Life arose on Earth about 3.8 billion years ago, and so there has been a LOT of time for species to evolve into a breath-taking diversity of forms. Living creatures are found virtually everywhere on Earth, from the stratosphere to the deepest parts of the oceans and land, from the hottest places (boiling hot springs and boiling deep sea thermal vents) to the coldest places (inside glaciers and frozen rocks in the Antarctic) on Earth, and everywhere in between. Living organisms range in size from microscopic bacteria to gigantic redwood trees and blue whales.

With a new array of genetic tools, biologists are making astounding discoveries about how all living organisms are related to each other, and how and when major groups arose and diversified. This class is a broad survey that will introduce you to the fellow creatures with whom we share the Earth, and on whom we depend. The class will be organized around the conceptual framework generated from research into the Tree of Life (shown on the right).

Molecular Tree of Life, showing genetic diversity of the major groups of organisms.



You are here!

Numerated List of Learning Outcomes:

- 1) Have fun! We don't need space travel to discover amazing forms of life – we share a planet with an astounding diversity of living creatures, most of which have not been “discovered.” Most organisms on Earth have not been described or given names!
- 2) Understand the major groups of organisms in the Tree of Life.
- 3) Understand how biologists construct phylogenies. How do we interpret them and what do they tell us about life on Earth?
- 4) Have a sense of the history of life on Earth. How long ago did life arise? For how long has life existed as single-celled organisms? When did multicellular life arise?
- 5) To have a sense of how we (try to) characterize biological diversity.
- 6) To understand the role that endosymbiosis has played in the evolution of major groups of organisms.
- 7) To know a few key organisms in each of the main groups we will be talking about.

Textbook and LaunchPad

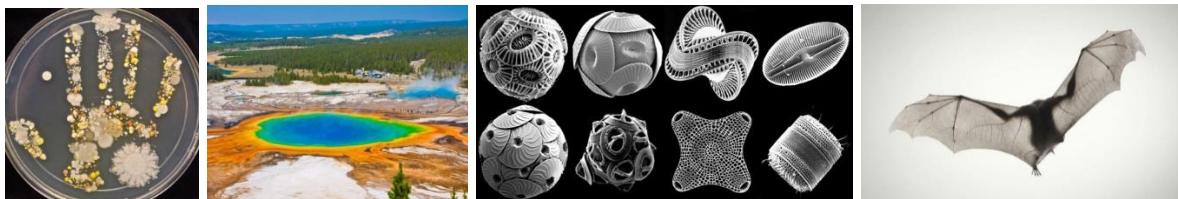
We will be using the textbook *Principles of Life* (2nd edition) by Hillis, Sadava, Hill and Price. We will also use the associated on-line “LaunchPad” site for quizzes, and you will have access to lots of resources. We have negotiated with the publisher and you will have **FREE** access to the eBook and LaunchPad. That's right folks – FREE! We did not want you to have to buy another expensive textbook halfway through the school year. (You can buy a loose-leaf version of the textbook at the bookstore for a really low price if you also like to have a hard copy). Detailed instructions about how to register for LaunchPad and the eBook are on our class Moodle site.

Moodle Site

We will post important information on the course Moodle site. Make sure that you check it regularly and know how to navigate the site for information. The syllabus that we will give you on the first day of class is a rough road map to where we are going, but we will change some of the details as the class progresses. These changes will be on Moodle. We will not change the grading scheme outlined in this syllabus.

Clickers

We will be using iClickers a lot in class - probably every day, or nearly so. Please make sure that you have one before class starts. It can be either an iClicker 2 (which has a little screen on it) or iClicker Plus (no screen). You might already have one from previous classes, or you can buy one from the bookstore. iClickers are easy to buy second hand, too. But just beware that the ones you buy second hand may not work without paying an additional registration fee to the iClicker company. The cost is about \$10 or so, but second-hand iClickers might require you to do additional stuff to make them work. Instructions about how to register your iClicker with our course are on our class Moodle site.



Grading Scheme

Pre-week quizzes	15
Post-week quizzes	20
In-class activities	15
Test 1	15
Test 2	15
Final Test	<u>20</u>
Total	100

We have structured the class so there are many low-stakes ways to learn and generate “points” that will contribute to your final grade. You cannot get a good grade in this class without regularly coming to class.

Pre-week quizzes – on Moodle

You will have assigned readings and short videos to watch before each week’s classes. You will have short quizzes on this material to complete before class. There will be about 13 pre-week quizzes, and we will drop the lowest three grades to calculate your final grade (i.e. you can miss up to three of these and it will not bring down your grade). The purpose of these pre-week quizzes is to encourage you to do the required readings and come prepared for the material in the week ahead. These quizzes will be on the easier side. They will be posted on the Moodle and will be due before the class every Monday.

Post-week quizzes – on LaunchPad

These quizzes will test you on the material we have covered the previous week. These quizzes will be more detailed than the Pre-week quizzes, and will be similar to the questions we will ask on the tests. These post-week quizzes will also be before the class every Monday.

In-class Activities

A large portion of your grade will come from in-class activities. These will be a mix of ***individual*** and ***team*** activities. The ***individual*** points will be from iClicker activities that you generate yourself. You will also be working in a team, and your team will generate team points that you will all accrue. You will be assigned to a team of five students, and you will be working together throughout the semester. We will use team-based activities to emphasize problem-solving, to allow you to discuss concepts in class with your fellow students, and to allow you to apply and integrate the material and concepts. You will need to be a good team member, which means that you need to come to class prepared, and participate in team activities. Your teammates will also periodically evaluate your contributions.



Tests

There will be two tests during the semester, and a final exam. We will provide detailed information and study guides before the tests.

Course Outline and Assigned Readings and Activities (SUBJECT TO CHANGE)

Week	Date	Class #	Topic	Important Due Dates
1	Jan 11	1	Introduction to class	
2	Jan 14	2	What is phylogenetics and why is it important?	Pre-week quiz for week 2 (Moodle)
	Jan 16	3	Why and how do we classify things, and how can we measure “diversity?”	
	Jan 18	4	How old is life?	
3	Jan 21	MLK Day	No classes	
	Jan 23	5	What is the shape of the tree of life?	Post-week quiz for week 2 (LaunchPad) Pre-week quiz for week 3 (Moodle)
	Jan 25	6	What is the nature of prokaryotic biology & diversity?	
4	Jan 28	7	Case study: <i>Thermus aquaticus</i> , YNP and PCR	Post-week quiz for week 3 (LaunchPad) Pre-week quiz for week 4 (Moodle)
	Jan 30	8	Microbes in the sea (Church)	
	Feb 1	9	Archeal case studies: Lokiarchaeota and ANME	
5	Feb 4	10	Endosymbiosis and the origin of eukaryotes. Who were the players? Why did it happen?	Post-week quiz for week 4 (LaunchPad) Pre-week quiz for week 5 (Moodle)
	Feb 6	11	Eukaryotic cell biology	
	Feb 8	12	Eukaryotic diversity (metabolism, size, origins of multicellularity)	
6	Feb 11	13	Protistan case studies	Post-week quiz for week 5 (LaunchPad) Pre-week quiz for week 6 (Moodle)
	Feb 13	14	Slime mold case study	
	Feb 15	15	Fungal diversity	
7	Feb 18	Pres Day	No classes	

	Feb 20	16	The corals, comb jellies and choanoflagellates	
	Feb 22	17	Test 1 (includes 15 lectures)	
8	Feb 25	18	What lurks beneath the ground? Mycorrhizal fungal networks! Dr. Ylva Lekberg	Pre-week quiz for week 8 (Moodle)
	Feb 27	19	Case study: what causes coral bleaching?	
	Mar 1	20	Lichens: macroorganisms built from microbial parts!	
9	Mar 4	21	Chloroplasts - the second big endosymbiotic event; photosynthetic microbial eukaryotes and bryophytes	Post-week quiz for week 8 (LaunchPad) Pre-week quiz for week 9 (Moodle)
	Mar 6	22	Checking back in to the tree of life and measures of diversity – what about viruses?	
	Mar 8	23	Viruses – massive global players with no place on the tree of life!	
10	Mar 11	24	The greening of the Earth – what does it take to get onto the land? Non-vascular plants	Post-week quiz for week 9 (LaunchPad) Pre-week quiz for week 10 (Moodle)
	Mar 13	25	Getting tall – the sky is the limit Seedless vascular plants	
	Mar 15	26	What good is a seed? Gymnosperms	
11	Mar 18	27	The fruits of our labor - Angiosperms	Post-week quiz for week 10 (LaunchPad) Pre-week quiz for week 11 (Moodle)
	Mar 20	28	Wiggle room and review	
	Mar 22	29	Test 2 (12 lectures)	
12	Mar 25-29	None	Spring Break	
13	Apr 1	30	Getting Big – what does it take to become a multicellular animal?	Pre-week quiz for week 13 (Moodle)
	Apr 3	31	Body plans and the “holey” grail (sponges to Protosomes to Deuterostomes)	
	Apr 5	32	Don’t clam up on me – mollusks	
14	Apr 8	33	Creepy crawlies part I - arthropods	Post-week quiz for week 13 (LaunchPad) Pre-week quiz for week 14

				(Moodle)
	Apr 10	34	An inordinate fondness for beetles! Insects	
	Apr 12	35	Echinoderms – our surprisingly close relatives!	
15	Apr 15	36	Get a backbone! Chordates	Post-week quiz for week 14 (LaunchPad) Pre-week quiz for week 15 (Moodle)
	Apr 17	37	One bone, two bones, many bones, digits! Radiation of vertebrates	
	Apr 19	38	Amniotes – what good is an egg?	
16	Apr 22	39	Humans and our ancestors	Post-week quiz for week 15 (LaunchPad) Pre-week quiz for week 16 (Moodle)
	Apr 24	40	Biodiversity through time: turnover, extinctions big and small, and the Anthropocene	
	Apr 26	41	Wrap up, circling back, review	
17	April 30		Final Exam: 3:20-5:20 PM Urey (13 lectures + comprehensive)	

How to succeed in this class

If you want to do well in this class, here are some things you need to do:

- ***Come to class***
We will cover important material in class, and a large part of your grade will be based on in-class activities. Many studies have found that one of the best predictors of your final grade is how often you come to class. Try it – you might like it!
- ***Keep up – be responsible for your learning***
- We will be covering a lot of material in this class, and so you should take the Pre-week and Post-week reading and studying seriously.
- ***Survival Guide***
We have posted a “Survival Guide” on the class Moodle site. It is a bit preachy, but does contain some very useful suggestions and advice.



- **Office hours**
We have posted four office hours a week, and don't be scared of us! We actually love to help you out with any questions you are having with the material. If you can't make any of our office hours just let us know and we will set up other times to meet.
- **Come to see us if you need help.**
If you have problems with class material, deadlines, personal problems or any other issues related to the class we urge you to talk with us as **EARLY** as possible. We will be better able to help you if you talk with us as problems arise. You will find that we are extremely sympathetic and flexible if you talk with us early; you will find that we turn into unsympathetic ogres two minutes before a test.
- **Come to class**
Did we mention that it is important to come to class?

Miscellaneous Important Stuff

Emails

We are required to email you with you official UM email. If you email us from your personal email (e.g. gmail, yahoo, etc.) we are not allowed to respond. If you do not receive official emails from us you should check your spam filters; group emails may end up in your junk email.

Students with Disabilities

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students ([DSS Information](#)). If you think you may have a disability adversely affecting your academic performance, and you have not already registered with DSS, please contact DSS in Lommason 154 or 243-2243. We will work with you and DSS to provide an appropriate modification.

Important Dates about Dropping Classes or Changing Credit/No Credit

To 15 th instructional day	You can drop classes on Cyberbear – no charge	January 31
16 th to 45 th instructional day	Cyberbear and Student Services; \$10 fee; 'W' (for withdraw) will show up on your transcript.	February 1 - March 15
46 th instructional day to the last instructional day.	Cyberbear and Student Services; \$10 fee; "WP" or "WF" will show up on your transcript.	March 18- April 26
Credit/No credit grading option	Allowed up until last day of classes	April 26



A Note on Behavior in Class

Using cell phones and computers for non-class related stuff is incredibly distracting, disrespectful and disruptive. You will be asked to leave the class if you are texting, shopping, watching cute cat videos, playing video games, etc.

Student Conduct Code

For much of your work in this class we encourage you to work collaboratively with others. But on the tests all the work must be your own. Copying or cheating on tests is a serious violation and will be dealt with according to the student conduct code. Penalties for serious violations may be as severe as suspension or expulsion.

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. You need to be familiar with the [Student Conduct Code](#)

