

GENETICS and EVOLUTION

BIOB 272

Spring 2016

INSTRUCTOR: Dr. Wenfei Tong, wenfei.tong@mso.umt.edu
Bioresearch Building 108
Office hours: Bioresearch Building 108, MW, 9-10:30 or by appointment

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LECTURES: MWF, 8:10 a.m., North Underground Lecture Hall 101 (NULH) 101

TEXTBOOKS: *Evolution - Making Sense of Life*, C. Zimmer & D. Emlen, 2nd edition, 2016
The Selfish Gene (30th Anniversary edition), R. Dawkins, 3rd edition, 2006

SUPPLEMENTARY: *Genetics: Analysis & Principles*, Chs 1-9, R.M. Brooker, 5th ed., 2015

ONLINE RESOURCES:

Class website on Moodle - <https://moodle.umt.edu>
iClicker: i>clicker (ISBN: 9781464120152), <http://iclicker.com/>
Nature Podcast: <http://www.nature.com/nature/podcast/>

INTRODUCTION – The first part of our course will briefly introduce the study of evolution and then focus on the basic principles of genetics. We will begin with the classic work of Mendel and then continue through the discoveries of modern genomics. The second part of the course focuses on evolution. As the prominent geneticist Dobzhansky famously put it, “Nothing in biology makes sense except in the light of evolution.” The study of evolution is therefore all-inclusive, and draws upon many scientific disciplines - geology, chemistry, physics, mathematics, anthropology, botany, zoology, and computer science - in order to develop a comprehensive understanding of the development of life on Earth.

These two topics - genetics and evolution - are treated as a single integrated field of scientific inquiry. Genetic change is the basis of evolution, and genes and the architecture of genomes are themselves products of evolution. Our understanding of evolution, therefore, requires a basic understanding of genetics. The converse is true as well. The sequence of the entire human genome was published in 2001 (Venter et al., 2001, *Science* 291:1304-1351), ushering in the age of large-scale genomics with broad implications for the study of human health and disease. Since this time, the genome sciences have come to dominate the fields of genetics and evolution. Complete genome sequences have been generated for 1,000s of species from a broad diversity of life, including dozens of mammals. Current efforts are underway to sequence 1,000s of human genomes and over 10,000 genomes from a diverse collection of animals. The basic principles of genetics and evolution form the foundation of these exciting frontiers in biology.

EXPECTED OUTCOMES – This course will emphasize biological principles, scientific concepts, and the synthesis of information. Expected outcomes are to understand the fundamental mechanisms of inheritance and evolution, and to have a basic knowledge of the history of life on Earth. Exams will be designed to encourage synthesis of subject matter and not to simply test your ability to recall details.

LECTURES – Attendance at lectures is an important part of this course, and **all students are expected to attend lectures regularly**. Points will be included in your grade for participating in iClicker questions during lecture.

DISCUSSION GROUPS – The topic in these groups will vary from week to week, as shown on the discussion group schedule (see Moodle). If you have a reasonable conflict (defined by your TAs), please email both your TA and the TA whose section you can attend instead at least a week before your usual section. Your grade in the discussion group will be based on homework assignments, attendance, and participation in class discussions, including your opinion of *The Selfish Gene* and the *Evolution* text. Homework assignments will be made available on Monday mornings on the Moodle page. Your answers must be submitted on Moodle by the following Monday (5 pm). Answers to the homework assignments will be available on the course web page after the deadline, therefore **late assignments will not be accepted**.

WEEKLY PODCASTS – Genetics and evolution are dynamic fields of science and important discoveries are reported weekly in scientific journals. *Nature*, one of the leading scientific journals in the world, produces a weekly ~30 minute podcast that summarizes some of the most important current scientific advances. **Students are expected to listen to this weekly podcast and be prepared to discuss any key findings** the following week. Material from the podcasts will be discussed in lecture or in discussion groups and will sometimes be used as a basis for exam questions. The Nature podcast is available for streaming or download every TH and, when applicable, materials will be covered in lecture the following M or W.

<http://www.nature.com/nature/podcast/>

REVIEW SESSIONS

There will be an evening review session scheduled two days prior to each exam. These sessions provide an additional opportunity to ask questions on the lectures, readings, and problems.

MISCELLANEOUS INFORMATION

Accommodations to ensure accessibility of students with disabilities will be gladly made, but to qualify you must be registered with Disability Services for Students (DSS). Arrangements for accommodations on exams must be made through DSS.

Academic misconduct will be reported and handled as described in the University of Montana Student Conduct Code. 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. All students need to be familiar with the Student Conduct Code:

http://life.umt.edu/vpsa/student_conduct.php

Dropping course or changing grading status: Students will not be able to change to an audit after the 15th day of instruction (Feb 12th; 5 p.m.). Dropping the course will not be allowed after the 45th day of instruction (March 28th). Changing the grading status (to CR/NCR) is not automatically approved after the 30th day of instruction (March 7th). Exceptions to these rules may be requested by petition, but the petition must be accompanied by documentation of extenuating circumstances. **Requests to drop the course or change the grading status after these deadlines simply to benefit a student's grade point average will not be approved.**

Student Behavior

To maximize their likelihood of success, students should attend each lecture, and complete assigned readings before class. It would be unwise simply to rely on presentations posted on-line. When in class students are expected to behave in a manner that is respectful of others. **All disruptive electronic devices must be turned off during lecture, during Discussion and Review sessions as well as during exams.** If you prefer, you may use laptops or eTablets to take notes during lecture – please be respectful of others when doing so.

GRADING

Make-up exams in case of emergency or illness will only be administered if requests are made **prior** to the exam. You must contact Dr. Tong *at least one week before an exam* if you need to make other arrangements to take an exam because you will be off campus due to other University activities (track, ROTC, etc.). Over 15% over your grade (100 points) will be based on attendance and participation in class and weekly discussion groups, additional extra credit will not be offered.

Grades will be based on how many of **650 points** you earn over the course of the semester.

- (1) **Two mid-term exams** (100 points each; 200 points total)
- (2) **Discussion groups** (50 participation, 100 HW – 150 points total). Eleven problem sets worth 10 points each will be assigned throughout the semester. Up to 100 points of your discussion grade will come from your 10 highest scores. The remaining 50 points will be based on attendance and participation in discussions. Please tell your TA before class if you are not able to attend a meeting; points will be subtracted from your score for each discussion meeting that you miss without informing the TA before the section meets.
- (3) **Three take home exam questions** (25 points each; 75 points total).
- (4) **iClicker points** (50 points). These are strictly participation points.
- (5) **Comprehensive final exam** (175 points). 50% of the Final Exam will focus on material covered in the last third of the course, and the other half of the exam will be comprehensive and test material covered throughout the semester.

Final grades will be based on your total points as a percentage of the 650 total points possible. Pluses (+) and minuses (–) will be used (**A, A–, B+, B, B–, C+, C, C–, D+, D, and D–**) in the assignment of letter grades will be determined by the distribution of total scores, following these guidelines:

- >90% of points (585): A- or better
- >80% of points (520): B- or better
- >70% of points (455): C- or better
- >60% of points (390): D- or better

These cutoffs may be adjusted downward (in favor of the student) to better reflect natural breaks in the class scores.