Overview
Scientific theories tell us precisely what is possible, and what is not. Evolutionary theory, accordingly, tells us what life can be, and just as importantly, what life cannot be like. For instance, it is impossible for natural selection (the designing force in evolutionary theory) to design anything that results in its genetic demise.

The theoretical details that determine the possible and impossible are not necessarily obvious (and sometimes, have not yet been spelled out). For instance, we are still not sure about whether or not biological species are things (or filing categories), whether or not there are real group level adaptations, or the reason why sexual reproduction is so widespread.

One might wish to think that these are academic, or ivory-tower like questions, that no field, or laboratory researcher should ever have to bother with. But this is shallow thinking. Hypotheses (what researchers go into the lab, or out to the field to test), can only be derived from scientific theories. So, no nuanced knowledge of the parent scientific theory results in no good hypotheses formation, and consequently no good experimental design.

All in all then, for the biologist, a solid understanding of the nature and forces of evolution (that explain why life has the nature it has) must be understood as a necessary requirement for good, fruitful research. That is the objective of this class: to help you understand the conceptual nooks and crannies of evolutionary theory.

A Conceptual Map (not to be confused with an actual list of topics to cover)
1. The Nature and Role of Scientific Theories
   1.1. What are Hypotheses, Models, and theories?
   1.2. Just a theory? The Creationism/Intelligent Design Case
2. Darwin’s The Origin
   2.1. Natural Selection
   2.2. Sexual Selection
   2.3. The units of selection problem
   2.4. Adaptation
   2.5. Fitness

3. Post-Darwinian Theoretical Developments
   3.1. Memes and other “evolvers”
   3.2. The evolution of evolvability
   3.3. Complexity theory – or order “for free”

Requirements
Readings for each class will be assigned in advance. You will be expected to critically study this material before class (i.e. read it seriously enough to be able to participate in class discussions by answering and having questions regarding this material). My lectures will not repeat the reading material but critically analyze and supplement it. Attendance to class is mandatory and class participation is highly recommended.

Course Goals and Student Learning Outcomes
In terms of methodologies, by the conclusion of the course you will hopefully improve in three skills, demonstrated in your oral participation in class discussion, exposition of text; reconstruction of arguments; and critical evaluation of arguments.
In terms of content, you will understand what scientific theories are and what their crucial roles in the practice of science are. You will also understand and master the central tenets and forces within Darwinian Evolutionary Theory, in its original form, and also in terms of some of its most recent developments.

Support Services and Disabilities Services
• You are encouraged to use the UAF Writing Center as needed for assistance with the mechanics of writing, grammar review, etc. The Writing Center is located on the 8th floor of the Gruening Building.
• You should also be aware that the UAF Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. I will work with the Office of Disabilities staff (located at 203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities.
• Students having difficulties of a personal nature that interfere with normal completion of course requirements may speak with the instructor as warranted, consult a Faculty Advisor at the UAF Academic Advising Center (Gruening Building,
5th floor), or see a counselor at the UAF Center for Health and Counseling (Whitaker Building).

**Course Policies**

- **Attendance:** Students are expected to attend class regularly and actively participate in discussion of the assigned readings. Students having more than three unexcused absences may, at the discretion of the instructor, be withdrawn from the course.

- **Withdrawal:** Students whose participation is determined by the instructor to be less than required by assignments due, and attendance, will be withdrawn from the course.

- **Incomplete Grades:** Students should consult with the course instructor and/or their faculty advisor well in advance of final examination week to establish that an incomplete grade for the course is warranted. Students must have been performing minimally at “C” level and completed more than 50% of the required coursework to warrant an incomplete.

- **Late Assignments:** Assignments are to be submitted when due unless previous arrangement has been made with the instructor. Due dates may be extended when there are justified mitigating circumstances.

- **Office hours, or emails, are not alternatives to missed classes.** If you miss a class, you **should not** email me requesting a report of the class material covered, or of the assignments you might have missed. Emails requesting any of the above will not be answered.

- Any other email inquiries are welcomed and you should expect to receive a response within 48 hours. There will be no email responses after 4:30 pm and during weekends or holidays. All emails should be written in proper English (no emoticons, chat lingo, or abbreviations please); in proper form; and in every email you should provide your full name and the course name and number in question.

**Text**

A list of readings prepared by the instructor. The readings for each class will be available in advance in the class’ Blackboard page.

**Evaluation**

- **Three Exams (25% each)** These exams will respond to questions that will require the application of the material discussed in class. These exams will be about four weeks apart and refer to the material discussed in their particular (+/-) four week period.

- **Final Exam/Presentation/Essay (25%)** This will cover the material of the entire course. The actual form that this final evaluation will take (exam or presentation), will be decided after the first two evaluations are completed. The essay is only available (and will be required) for graduate students (enrolled in BIOL 687).