EEOB/MolGen 640

Genetic Basis of Evolution
Spring 2006
09314-0 (MOLGEN)
19093-2 (EEOB)

111 Parks Hall
MWF 1:30 - 2:48

Instructor: Paul Fuerst

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office : 386 Aronoff Laboratory - open office hours 11:30-12:30 MWF, or arranged

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COURSE DESCRIPTION: Molecular Genetics 640 reviews the areas of Evolutionary and Population Genetics. Population genetics is concerned with the processes that affect the patterns of genetic variation within a species, and how genetic variation changes over time, resulting in evolutionary change. Population genetic mechanisms provide important aspects of the applied and theoretical foundations to many fields, including ecology, systematics, forensic analysis, agriculture, wildlife management and conservation biology. During the course, we will survey the types of genetic variation that have been used by geneticists to study patterns and changes in populations.   As we do this, the course will also develop some of the basic algebraic foundations for the genetic study of populations. The forces that change allele frequencies within populations will be described. These include mutation, recombination, natural selection and migration between populations. The effects of finite population size will be investigated, including the processes of genetic drift. The evaluation of inbreeding patterns and the effect of inbreeding on genetic variability within population variation will be discussed. Methods of studying the structure of natural populations will be examined. The processes of molecular change (in both amino acid sequences and nucleic acid sequences) during evolution will be reviewed. Finally, the use of new molecular methods to examine quantitative variation, and a brief overview of the theory of quantitative genetics will also be discussed.

TEXTBOOK: Philip W. Hedrick - *Genetics of Populations* (3rd edition). Jones and Bartlett

Additional readings will be assigned and posted on the class web site.

GRADES: Final grades will combine evaluations by traditional exams, problems sets and material from supplemental reading. Grades are based on three examinations, each worth 20% of the final grade, and five problem sets, each worth 8% of final grade.

FINAL EXAM: Scheduled date and time: Wednesday, June 7   1:30 pm - 3:18 pm

Exams: Each exam will include short answer questions, problems and possibly longer questions. You will be required to understand the facts, and to be able to apply this knowledge to the problems. The two midterm exams may also include some material which will be answered as take-home material. The final exam will definitely include a take-home part. Students are expected to be present for the exams. Make-ups will be allowed only for valid excuses <u>with documentation</u>. Make-ups will normally be different from the regular examination.

PROBLEM SETS: Problems will be assigned approximately every two weeks, beginning in the middle of week 1. Students are welcome to discuss the problems, but the work turned in by each individual should represent the final product that student (unless the instructions for a problem indicate otherwise). I encourage students to visit me during office hours, or at arranged times, to discuss any questions you may have about the problem sets. Unless otherwise approved, problem sets will be expected to be turned in on the date they are due. Late problems sets will be docked one-eighth of heir value for each day that occurs after they are due.

PARTICIPATION: I encourage students to ask questions during class about topics being considered. I especially encourage students to visit me during office hours, or as arranged, to discuss any topic, but especially if you have question about problems. Papers from the primary literature will be regularly assigned as supplemental reading, and will be the basis of in class discussion.

POLICY ON MISSED EXAMS AND MISSED ASSIGNMENTS - A make-up exam for the midterm will only be given provided you have a documented/valid excuse. Information about the reason for a missed exam must be provided by the next lecture period, or no make-up can be considered. Missing a midterm will mean that the other two exams will count for an additional 10% each of your final grade. Problem sets are expected in class on the day announced. Late problem sets loss 1/8th of their value for each day late. Documented valid excuses for late assignments will be considered.

COURSE NOTES AND SUPPLEMENTAL READINGS: These can be accessed at the course web site on CARMEN:
     http://carmen.osu.edu

     Lecture notes will be available on the course web site. A complete set of notes from 2004 will be posted during the first week of the quarter. I suggest that you do not print off a particular lecture until close to the date that the lecture will be given. I will be updating notes (to a greater or lesser degree depending on the topic of the lecture), and these updated versions will be posted, usually a day or two before the lecture. In some cases, I will simply post the changed pages, if the changes are small.

OTHER IMPORTANT DATES:
Apr 14 (Friday) (other than filing your taxes): Last day to drop the course without permission.
Last day to drop a course or withdraw from the University using an OSU Withdrawal
Form, without having a "W" on your permanent record.
May 12 (Friday)- Last day to drop a course or withdraw from Spring Quarter without
petitioning; a "W" will appear on your permanent record.
May 29 (Monday) - Memorial Day - no classes
June 2 (Friday) - Last day of regularly scheduled classes:(F)

STUDENTS WITH DISABILITIES: Any student who feels he or she may need an
accommodation because of a physical or learning disability should contact Dr. Fuerst privately to
discuss your particular needs. Students should be registered with the Office for Disability
Services (ODS, 614-292-3307) in 150 Pomerene Hall and should contact that office to arrange
for specific accommodations. Please contact Dr. Fuerst for completion of ODS proctor sheets.

ACADEMIC MISCONDUCT: All instructional faculty and staff are required by Ohio State
University to forward all cases of suspected cheating to the Committee on Academic
Misconduct. Any form of academic misconduct, no matter how seemingly small, will not be
tolerated in this course. Unless indicated on an assignment, problems sets and take-home
material are expected to be the ultimate product of the student handing in the assignment.
Students are expected to adhere to the university's honor code or else suffer the consequences.

LECTURE SCHEDULE: (TENTATIVE; subject to change)

(be sure to read chapter 1. This chapter contains background material on genetics. I will assume all students are familiar with this general material; if you are not familiar with some aspects, please see me and I will suggest some supplemental reading material).

Week 1- Genetics and the theory of evolution;
               Types of Genetic Variation; morphological; immunological;

Week 2- Types of Genetic Variation; protein; nucleic acids
           Simple algebraic models of population genetics
           Hardy-Weinberg model ; measures of genetic variation

Week 3- Types of Genetic Variation; nucleic acids
           measures of necleic acid variation; Linkage Disequilibrium

Midterm 1 - Friday April 21

Weeks 4-5 - relaxation of the assumptions of the Hardy-Weinberg Model
           inbreeding
           population structure; migration

Weeks 6 - 7 changes in allele frequency
           mutation
           selection
           random drift

Midterm 2 - Friday May 12

Weeks 8- 9 - Molecular Mechanisms of Evolution
           patterns of variation; gene duplication
           molecular phylogenies

Week 10 - complex traits - supplemental readings

Final Examination : Wed, June 7   1:30 am - 3:18 pm with additional take home component