

GENE 3000

Syllabus and Course Materials

Tracie M. Jenkins, Ph.D

Office	Office Hours	Phone #	Email
Redding Building #125	Tu 10:00 AM-12:00 PM and by appointment	770-412-4093	jenkinst@uga.edu

Prerequisites

BIOL 1108-1108L or its equivalent. You should:

- 1) Know Mendelian genetics;
- 2) Understand the basic concepts of molecular genetics and biochemistry;
- 3) Be able to use basic algebra.

Lectures

12:30 – 1:45 PM Tues. and Thurs.

Flynt Building Room #323

Discussion/Problem Sessions (Required)

T: 2:30 – 3:30 PM.

Flynt Building Room #323

Required Materials (Books, used and new, can be ordered from amazon.com with a two day turnaround. Also all books are on reserve in the library)

BOOKS:

- I. Futuyma, Douglas J. 2005. *Evolution*. Sinauer Associates, NY (ISBN 0-87893-187-2)
- II. Hall, B. G. 2004. *Phylogenetic Trees Made Easy: A How-To Manual*. 2nd Ed. Sinauer Associates, Inc.
- III. Weiner, J. 1995. *The Beak of the Finch*. Vintage books.
- IV. Wells, S. 2003. *The Journey of Man*. Random House
- V. Palumbi, S. R. 2001. *The Evolution Explosion*. W. W. Norton & Co., NY

JOURNAL ARTICLES (Please check with Ms. Regina Cannon, Head librarian, about getting journal articles from the UGA library on line):

- I. **Pagel, M.** 2004. Limpets break Dollo's law. *Trends Ecol. Evol.* 19: 278-280.
- II. **Blair, J. E. and S. B. Hedges.** 2005. Molecular clocks do not support the Cambrian explosion. *Mol. Boil. Evol.* 22: 387-390.

- III. **Ellis, J. S., M. E. Knight, B. Darvill, D. Goulson.** 2006. Extremely low effective population sizes, genetic structuring and reduced genetic diversity in a threatened bumblebee species, *Bombus sylvarum* (Hymenoptera: Apidae). *Mol. Ecol.* 15: 4375-4386.
- IV. **Jenkins et al.** 2007. Phylogeography illuminates maternal origins of exotic *Coptotermes gestroi* (Isoptera: Rhinotermitidae). *Mol. Phylogenet. Evol.* In Press.
- V. **Mellars, P.** 2006. Why did modern human populations disperse from Africa ca. 60,000 years ago? A new model. *PNAS* 103: 9381-9386.
- VI. **Nowak, M. A.** 2006. Five rules for the evolution of cooperation. *Science* 314: 1560-1563.
- VII. **Jenkins, T. M., C. J. Basten, W. W. Anderson.** 1996. Mitochondrial gene divergence of Colombian *Drosophila pseudoobscura*. *Mol. Biol. Evol.* 13: 1266-1275.
- VIII. **Arnold, M. L., A. Meyer.** 2006. Natural hybridization in primates: One evolutionary mechanism. *Zoology* 109: 261-276.
- IX. **Rosas, A. et al.** 2006. Paleobiology and comparative morphology of a late neandertal sample from El Sidrón, Asturias, Spain. *PNAS* 103: 19266-19271.

Course Description and Expected Learning Outcomes

Charles Darwin's *The Origin of species by Means of Natural Selection* ranked him, according to George Gaylord Simpson, "among the greatest heroes of man's intellectual progress." One hundred and fifteen years after Darwin and Wallace's 1858 joint paper on natural selection, Theodosius Dobzhansky condensed Fr. Pierre Teilhard de Chardin's conviction that "evolution is a light which illuminates all facts, a trajectory which all lines of thought must follow" into "nothing in biology makes sense except in the light of evolution." Thus the theory of evolution should be understood by all educated people, particularly by all majors in the biological sciences. In light of this, GENE 3000 is a rigorous introduction to biological evolution, from the level of genes to populations. Students should attend Friday study sessions unless they are sure they understand all the material. The goals of this class are to:

- 1) introduce you to the principles of evolutionary biology, including population genetics and macroevolution;
- 2) demonstrate the application of evolution to other fields, e.g. agriculture, conservation, and medicine, through journal articles;
- 3) help you understand the mathematical models of evolution through practice;
- 4) help you understand the forces of evolution;
- 5) help you appreciate the evolutionary processes that led to the generation of earth's biodiversity; and,
- 6) assist you in demonstrating through oral presentations the concepts presented in class that underlie the theory ("a statement of what are held to be the general laws, principles, or causes of something known or observed, Oxford English Dictionary) of evolution.

Statement of Academic Integrity

It is expected that each student will behave honorably throughout this course. Thus all academic work must meet the standards contained in “A Culture of Honesty.” Each student is responsible for informing themselves about these standards before performing any academic work (refer to http://www.uga.edu/ovpi/academic_honesty/academic_honesty.htm). All violations of the *Honor Code* will be referred to the Assistant Dean for Academic Affairs’ office.

Documented Disability Statement

(For Griffin Campus)

Students with a documented disability must inform the instructor at the close of the first class meeting. You will be referred to the Office of Academic Programs, Room 107 in the Flynt Building for consultation regarding evaluation, documentation of your disability, and a recommendation as to the accommodation, if any, to be provided. Students must provide instructors with an accommodation form from the Office of Academic Programs listing reasonable accommodation to sign and return to the Office of Academic Programs. Students who do not wish to receive services are still **strongly** encouraged to register with the Office of Academic Affairs.

Attendance

- Attendance is mandatory. Students are expected to attend and participate in all class sessions. Discussion sessions are required for this four hour course.
- Students are not allowed to make up a quiz. The lowest quiz grade will be dropped.. Missed quizzes are recorded as a “0”.
- Students must take all exams at the time allotted. They may make up one missed exam. Students will not, however, be given the same exam that was missed.

Requirements

- Students are expected to come to class prepared. This means that all reading assignments must be completed before the corresponding lecture.
- Students should be able to discuss or work all problems at the end of chapters. If there are questions these should be addressed in class or in Tuesday Discussion Sessions.
- Students will receive problem sets (refer to syllabus schedule), the grade for which will count as two quizzes.
- Students will team to teach a 45 minute class on one of the topics below. They are expected to develop a PowerPoint presentation and be able to explain all concepts as well as go over all problems and questions at the end of the chapter. The objectives of this exercise are to provide the student with an opportunity to: apply concepts learned to learning new

material, work as part of a scientific group, and gain experience in oral presentations. I will be available to go over any questions and/or concepts one-on-one. Just make an appointment with me. Each student will be graded according to the chart below. Initial source material is identified in parentheses. This grade will count as Exam # 3.

Topics:

- 1) Evolution of Phenotypic Traits (Futuyma, Chapter 13)
- 2) Coevolution (Futuyma, Chapter 18)
- 3) Evolution of Genes and Genomes (Futuyma, Chapter 19)
- 4) Evolution and Development (Futuyma, Chapter 20)
- 5) Macroevolution (Futuyma, Chapter 21)
- 6) Health implications of human evolutionary heritage (Jobling, M.A., Hurler, M. E. , Tyler-Smith, C. 2004. Human Evolutionary Genetics: Origins, Peoples & Disease. Garland Publishing, NY.)
- 7) Extinct Humans: Tracing human ancestors. (Tattersall, I. and Schwartz, J. 2001. Extinct Humans. Westview Press, Boulder, CO.)

Organization and Content (45%):	Poor		Avg.	Excellent	
Appropriate Introduction	1	2	3	4	5
Clear Thesis	1	2	3	4	5
Presentation Organization	1	2	3	4	5
Adequate Support for Ideas (Weighted 2x)	2	4	6	8	10
Definite Conclusion	1	2	3	4	5
PowerPoints (Appropriateness & Effectiveness)	1	2	3	4	5
Q & A Session-Knowledge of Topic	1	2	3	4	5
Use of Allotted Time	1	2	3	4	5
Presence (15%):					
Physical Appearance, Neatness, and Grooming	1	2	3	4	5
Posture, Gestures, and Movement	1	2	3	4	5
Eye Contact	1	2	3	4	5
Delivery and Grammar (40%):					
Enthusiasm and Vocal Variation (freedom from monotone)	1	2	3	4	5
Preparation and Knowledge of Materials	1	2	3	4	5
Effectiveness of Delivery Method (Powerpoint)	1	2	3	4	5
Vocabulary and Use of Appropriate Words	1	2	3	4	5
Freedom from Distracting "Uh"s & "Like"s, etc.	1	2	3	4	5
Pronunciation, Enunciation, Audibility, and Clarity	1	2	3	4	5
Grammar (Weighted 2x)	2	4	6	8	10

Grading

% Quiz Avg	% Exam Avg	% Final Exam	% Total
25	50	25	100

Testing

- Each **exam** will cover about 75% new material and 25% old material, e.g. Exam 2 will cover about 75% of the material covered since exam 1 and about 25% of old material. As Futuyma points out, “material in *Evolution* builds cumulatively; almost every concept, principle, or major technical term introduced in any chapter is used again in later chapters. You will need to understand the early chapters just as thoroughly for your final exam as for a midterm exam.”
- Quizzes will take 10 minutes and will be given at the beginning of class according to the syllabus. Unscheduled quizzes may also be given.
- Problem Sets count as **two quizzes**.
- Final exam (**May 3, 12:00 PM – 3:00 PM**) will be comprehensive (25% old material and 75% new material)

Assignments (The Library has reference materials and books for this course on reserve. Journal Articles may be downloaded from the UGA Library on-line. Please check with Ms. Regina W. Cannon, Head Librarian)

Day/Date	Topic	Text Chap	Readings/ Problem Sets	Quizzes
Tu Jan 09	Introduction	1 & 22		
Th Jan 11	The Tree of Life: Classification and Phylogeny	2	<i>Phylogenetic Trees Made Easy</i> by Hall. Pp 1 - 8	1
Tu Jan 16	The Tree of Life: Classification and Phylogeny	2	Hall, Chap 1	
Th Jan 18	Patterns of Evolution	3		
Tu Jan 23	Evolution in the Fossil Record	4	Pagel. 2004; Hall, Chap 2	
Th Jan 25	A History of Life on Earth	5	Blair & Hedges. 2004.	2
Tu Jan 30	The Geography of Evolution	6	Hall, pp 157 – 166; 179 – 192; 193 - 198	
Th Feb 01	The Evolution of Biodiversity	7		
Tu Feb 06	<u>Exam # 1: Chapters 1, 22, 2-7, Phylogenetic Trees Made Easy</u>		<i>The Beak of the Finch</i> by Weiner	
Th Feb 08	Variation and Mutation	8	Problem Set # 1	3
Tu Feb 13	Genetic Variation: Hardy-Weinberg principle	9		
Th Feb 15	Population Variation cont., Inbreeding	9		
Tu Feb 20	Population Variation: Inbreeding	9		

Th Feb 22, MIDTERM	Genetic Drift and Inbreeding	10	Ellis et al. 2006.	
Tu Feb 27	Genetic Drift	10	Jenkins et al. 2007; Mellars. 2006;	
Th Mar 01	Natural Selection and Adaptation: <i>The Beak of the Finch</i>	11	Problem Set #1 due	
Tu Mar 06	Exam # 2: Everything since Exam # 1 plus 25% of old material		The Journey of Man by Wells	
Th Mar 08	Natural Selection	12	Problem Set # 2	4
Mar 12 – Mar 16	Spring Break			
Tu Mar 20	Natural Selection	12		
Th Mar 22	Natural Selection; <i>The Journey of Man by Wells</i>	12	The Evolution Explosion by Palumbi	5
Tu Mar 27	Sexual Selection; Conflict and Cooperation	14		
Th Mar 29	Conflict and Cooperation		Nowak. 2006.	
Tu Apr 03	Species and Speciation I	15		
Th Apr 05	Species and Speciation II	15	Jenkins et al. 1996.	6
Tu Apr 10	Species and Speciation III	16	Problem Set # 2 due	
Th Apr 12	How to be Fit: Reproductive Success	17		7
Tu Apr 17	Student Class			
Th Apr 19	Student Class		Arnold and Meyer. 2006.	
Tu Apr 24	<i>The Evolution Explosion</i> by Palumbi and world events			
Th Apr 26	Are humans still evolving and other important questions?		Rosas et al. 2006.	
Th May 03	FINAL EXAM: 12 – 3 PM			