50.430 / 50.530 -- EVOLUTION

Fall 2007

Instructor: Marianna D Wood
104 Hartline
office hours- Monday 10:00 – 11:30
Tuesday 10:00 11:30
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Course Description

Evolution is one of the central, unifying theories of biological science. The diversity of living organisms we see today evolved through time from the basic organic building blocks. A shared evolutionary history can explain similarities among species in development, behavior, morphology, and physiology. Evolution continues today, explaining such phenomena as the development of new human diseases and the increases in pesticide and antibiotic resistance.

In this course, we will examine major events in the history of life on Earth. We will also examine the mechanisms of evolutionary change: mutation, recombination, natural selection, and stochastic events. Each class period will include lecture/seminar, group activities, and discussion of journal articles from the primary literature.

This course is a combined graduate and upper-level undergraduate course. Students enrolled in this course should have a solid background in basic biology, genetics, ecology, and mathematics.

Required Texts

Freeman, S, and JC Herron. 2007. Evolutionary analysis, 4th ed. Prentice Hall, Upper Saddle River, New Jersey, USA.

coursepack of EvoBeaker workbooks, SimBiotic Software, Ithaca, New York, USA.

Schedule of Topics and Readings

29 August **evolutionary thinking**
text: chapters 1, 2.1-2.3

5 September **natural selection and phylogenetic trees**
text: chapters 3.1-3.6, 4
Driscoll, CA, M Menotti-Raymond, AL Roca, K Hupe, WE Johnson, E Geffen, EH Harley, M Delibes, D Pontier, AC Kitchener, N Yamaguchi, SJ O'Brien, DW Macdonald. 2007. The Near Eastern origin of cat domestication. Science 317:519-523.

12 September **population genetics**
text: chapters 5, 6, 7
Dolgin, ES, B Charlesworth, SE Baird, and AD Cutter. 2007.
Inbreeding and outbreeding depression in *Caenorhabditis* nematodes. Evolution 61:1339–1352.

19 September **population genetics**

text: chapters 8.1-8.2, 9

Bratteler, M, C Lexer, and A Widmer. 2006. Genetic architecture of traits associated with serpentine adaptation of *Silene vulgaris*. Journal of Evolutionary Biology 19:1149–1156.

26 September **origin of life and speciation**

text: chapters 16, 17

Baaske, P, FM Weinert, S Duhr, KH Lemke, MJ Russell, and D Braun. 2007. Extreme accumulation of nucleotides in simulated hydrothermal pore systems. Proceedings of the National Academy of Sciences of the United States of America 104: 9346–9351.

Vrana, PB. 2007. Genomic imprinting as a mechanism of reproductive isolation in mammals. Journal of Mammalogy 88:5–23.

3 October **radiations and extinctions**

text: chapters 18, 19

Magri, D, GG Vendramin, B Comps, I Dupanloup, T Geburek, D Gömöry, M Latalowa, T Litt, L Paule, JM Roure, I Tantau, WO van der Knaap, RJ Petit, and J de Beaulieu. 2006. A new scenario for the Quaternary history of European beech populations: palaeobotanical evidence and genetic consequences. New Phytologist 171:199–221.

Prud'homme, B, N Gompel, and SB Carroll. 2007. Emerging principles of regulatory evolution. Proceedings of the National Academy of Sciences of the United States of America 104:8605–8612.

10 October **human evolution**

text: chapter 20

Bakewell, MA, P Shi, and J Zhang. 2007. More genes underwent positive selection in chimpanzee evolution than in human evolution. Proceedings of the National Academy of Sciences of the United States of America 104:7489–7494.

Thorpe, SKS, RL Holder, and RH Crompton. 2007. Origin of human bipedalism as an adaptation for locomotion on flexible branches. Science 316:1328-1331.

17 October **mid-term exam**

24 October **adaptations**

text: chapters 10, 15

Luo, Z, P Chen, G Li, and M Chen. 2007. A new eutriconodont mammal and evolutionary development in early mammals. Nature 446:288-293.

Pfennig, DW, AM Rice, and RA Martin. 2007. Field and experimental evidence for competition's role in phenotypic divergence. Evolution 61:257-271.

31 October **sex and sexual selection**

text: chapters 8.3, 11

Domes, K, RA Norton, M Maraun, and S Scheu. 2007. Reevolution of sexuality breaks Dollo's law. Proceedings of the National Academy of Sciences of the United States of America 104:7139–7144.

Fricke, C and G Arnqvist.. 2007. Rapid adaptation to a novel host in a seed beetle (*Callosobruchus maculatus*): the role of sexual selection. Evolution 440-454.

Klug, H, K Lindström, and CM St. Mary. 2006. Parents benefit from eating offspring: density-dependent egg survivorship compensates for filial cannibalism. Evolution 60:2087–2095.

7 November **social behavior**

text: chapter 12

O'Neill,MJ, BR Lawton, M Mateos, DM Carone, GC Ferreri, T Hrbek§, RW Meredith, DN Reznick, and RJ O'Neill. 2007. Ancient and continuing Darwinian selection on *insulin-like growth factor II* in placental fishes. Proceedings of the National Academy of Sciences of the United States of America 104:12404–12409.

Wenseleers, T, and FLW Ratnieks. 2006. Comparative analysis of worker reproduction and policing in eusocial Hymenoptera supports relatedness theory. The American Naturalist 168:E163–E179.

Young, AJ, AA Carlson, SL Monfort, AF Russell, NC Bennett, and T Clutton-Brock. 2006. Stress and the suppression of subordinate reproduction in cooperatively breeding meerkats. Proceedings of the National Academy of Sciences of the United States of America 103:12005–12010.

14 November **life history evolution**

text: chapter 13

Reznick, DN, M Bryant, and D Holmes. 2006. The evolution of senescence and post-reproductive lifespan in guppies (*Poecilia reticulata*). Public Library of Science Biology 4:136-143.

Reznick, DN, and CK Ghalambor. 2005. Selection in nature: experimental manipulations of natural populations. Integrative and Comparative Biology 45:456–462.

28 November **evolution and human health**

text: chapter 14

Beall, CM. 2007. Two routes to functional adaptation: Tibetan and Andean high-altitude natives. Proceedings of the National Academy of Sciences of the United States of America 104:8655–8660.

5 December **creationism**

text: 2.4, 3.7

Diamond, J, and EM Evans. 2007. Museums teach evolution. Evolution 61:1500-1506.

Scott, EC, and NJ Matzke. 2007. Biological design in science classrooms. Proceedings of the National Academy of Sciences of the United States of America 104:8669–8676.

12 December **final exam**

Course Evaluation (Undergraduate)

Your course grade will be based on the following components—

weekly preparation (13 x 10)	130
weekly participation (13 x 10)	130
EvoBeaker exercises (3 x 15)	45
annotated bibliography	
topic and three citations	10
final paper	90
midterm exam	100
final exam	150
total	**655**

Your points earned will be converted to a letter grade using the following scale—

622-655	A	504-523	C+
589-621	A-	478-503	C
570-588	B+	458-477	C-
544-569	B	439-457	D+
524-543	B-	393-438	D
		<393	E

Weekly Preparation and Participation

Evolution is a seminar-style course. Regular attendance and participation by all students are necessary for the class to be successful. To allow meaningful participation, you must come to class prepared to discuss the evening's topic in depth. Your preparation and participation grade will include your pre-class study of the reading assignments, your contribution to your team's discussion of the papers, and your participation in the discussion and activities of the whole class. Preparation and participation will be graded through a combination of self-assessment, teammate input, and instructor assessment.

EvoBeaker Exercises

The EvoBeaker software is installed on the Specialized Software PCs in the library and the KUB Games Room (232). The library is a better location to do the exercises because the computers are in carousels with room for the workbook, notes, etc. In the library, the specialized computers are on the third floor on the far end away from the stairs and elevator and overlooking the parking lot and Student Rec Center. In the Games Room, the specialized computers are located in the middle of the lab and have a "Specialized Software PC" sticker. You will need your university user id and password to log on to the computer. You can start EvoBeaker from the Start menu under Specialized Software. *Domesticating Dogs* is due 12 September, *The HIV Clock* is due 26 September, and *How the Guppy Got Its Spots* is due 7 November.

Annotated Bibliography

You will prepare an annotated bibliography on a selected topic in evolutionary biology. You should read at least 200 pages on the topic and write a one-paragraph summary of each paper you read. Your sources should be from the primary literature. The topic and three summaries are due on 3 October, and the complete bibliography is due on 14 November.

Mid-term and Final Exams

There will be two in-class exams, a mid-term and a final. The final exam will conform to University policy and be comprehensive. Both exams will consist of a selection of short to moderate-length essays.

Course Evaluation (Graduate)

Your course grade will be based on the following components—

weekly preparation (13 x 10)	130
weekly participation (13 x 10)	130
discussion leading (3 x 15)	45
EvoBeaker exercises (3 x 15)	45
annotated bibliography	
topic and three citations	10
final paper	90
midterm exam	100
final exam	150
total	**700**

Your points earned will be converted to a letter grade using the following scale—

651-700	A	539-559	C+
630-651	A-	511-538	C
609-629	B+	490-510	C-
581-608	B	469-489	D+
560-580	B-	420-468	D
		<420	E

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Discussion Leading

You will be responsible for planning and leading the discussion of three of the assigned papers during the semester. For each paper, you must create a study guide and make it available one week before the paper is discussed. You are also responsible for leading the discussion of those papers during class.

EvoBeaker Exercises

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Annotated Bibliography
You will prepare an annotated bibliography on a selected topic in evolutionary biology. You should read at least 260 pages on the topic and write a one-paragraph summary of each paper you read. Your sources should be from the primary literature. The topic and three summaries are due on 3 October, and the complete bibliography is due on 14 November.

Mid-term and Final Exams
There will be two in-class exams, a mid-term and a final. The final exam will conform to University policy and be comprehensive. Both exams will consist of a selection of short to moderate-length essays.

Communication
As stated in PRP 3408 Student Use of University Assigned Email Accounts, you are responsible for all messages and attachments sent to your bloomu.edu e-mail account and items posted on Blackboard. You should regularly check your e-mail and Blackboard, http://blackboard.bloomu.edu