Biology 370 Bevington
Senior Seminar Fall Term, 2009

EVOLUTION

TEXTS: Carroll, Sean B. 2009. Into the Jungle: Great Adventures in the Search for Evolution. Pearson, Benjamin Cummings. 207 pp. ISBN: 0-321-55671-2

Kardong, Kenneth V. 2008. An Introduction to Biological Evolution. McGraw Hill. Second edition. 352 pp. ISBN: 978-0-07-305077-6

The underlying principle for all of biology is evolution - organisms changing over time in response to selection pressures in their environments. Since Darwin articulated the theory of evolution, this concept has unified the discipline of biology, serving as a lens through which biologists examine structure/function relationships in genes, organisms, and entire ecosystems. In this course students will examine topics of their choosing on evolutionary principles at the molecular level, in organisms, and in ecosystems. We want to understand why organisms change through time and what forces contribute to this change. Key concepts will include selection, adaptation and adaptive radiation, mutualism, coevolution, and extinction. In what ways have humans begun to alter the direction of evolution, both of other organisms and of ourselves? The course will involve seminar presentations, class discussions, and a written paper.

COURSE OBJECTIVES:

1. To become familiar with the biological literature and with on-line search strategies to access useful information from scientific data bases.
2. To develop good library research skills.
3. To acquire skills of critical data analysis.
4. To research and prepare effective oral presentations on topics of your choice.
5. To become acquainted with the field of evolutionary biology.
6. To improve your formal writing skills.

ORAL PRESENTATIONS:

The ability to effectively communicate one's ideas is the mark of an educated person. In science this skill is particularly important because information acquired by one scientist must be verified by others before it is accepted as part of the body of scientific knowledge. Scientists communicate research findings to their colleagues primarily in the form of journal papers to be read by the scientific community. This constitutes the primary literature. From the primary literature one or more authors may assemble the results of many scientists into a reference book on specific topics. Another method of communicating with one's colleagues is an oral presentation of data where one speaks to an audience of peers, typically at a professional meeting. Scientists attend professional meetings to exchange information about their research efforts and to present their data, often before they have published it in the primary literature.

During the semester you will give three oral presentations to the class on topics in evolution. One of your topics should be plant-related and another should be on an animal topic. A third topic could be on some aspect of evolution at the population or ecosystem level. Topics must be approved in advance by the instructor. The first presentation should be 15 minutes in length. The second two presentations will be longer (45 minutes), and they should be more detailed in scope and involve more thorough and extensive preparation on your part. Each of your presentations will be followed by a period of questions from the audience. During the first class meeting the dates for seminars will be assigned by drawing lots, and potential topics will be discussed. While it is not a requirement that you do so, you are encouraged to use Power Point to prepare your presentations.

As you conduct the research for your seminar, you should select select a scientific paper that seems to be central to the theme you plan to develop. This will be a **focus paper** for the rest of the class; they will read it before hearing your presentation. This article should be from the primary literature, and ideally it should have been published within the last 10 years.[1] One Xerox copy of the article is to be placed on reserve in Reeves Library and another copy is to be given to the instructor **one week prior to the date your seminar is given**. At the same time you will give the instructor a typed abstract of your seminar (not to exceed 300 words). Duplicate enough copies of your abstract so that you can distribute one copy to each member of the class. It is important that your abstract and the focus article be in on time. It is your responsibility to see that a copy of the article is on reserve in the library **and** in the hands of the instructor and other members of the class a full week before your talk.

CLASS PARTICIPATION:

It is your responsibility to come to class prepared to discuss the seminar topics. You have a standing, weekly assignment to go to the library and read the focus papers for each presentation. Prepare three (3) questions from the paper for the presenter, and bring them to class on the day the topic is to be discussed. You are also expected to ask questions about the oral presentation. Class participation makes up 15% of your grade, so it is an important component of the course.

VIDEO TAPING OF SEMINAR PRESENTATIONS:

One of the most effective ways to evaluate your presence before an audience is to see a video of your own presentation. This will give you an opportunity to see yourself after the seminar. Your first seminar will be video taped by the Media Center staff. It is your responsibility to make an appointment with the Media Center staff to view your tape during the week after it is given. The Media Center will prepare a CD or DVD for you for this purpose.

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[1] Some of the seminal papers or classic citations for your topic may be more than 10 years old. Generally, however, it is preferable to utilize more current literature unless you feel there is a compelling reason to do otherwise. Check with the instructor if you are in doubt.

CRITERIA FOR EVALUATING SEMINAR PRESENTATIONS:

1. Were the abstract and focus paper turned in on time?

2. Is there a central theme developed through the presentation?

3. Is the focus paper selected by the speaker representative of the topic, and does it focus on the theme?

4. Does the presentation indicate that the speaker has thoroughly researched the topic and has command of the literature?

5. Is the speaker neatly dressed?

6. Delivery of the presentation:

    A. Is there an introduction?

    B. Are the data clearly presented? Do they illustrate the points being made?

    C. Is the theme cohesive? Does the speaker ramble?

    D. Did the speaker analyze the data correctly?

    E. Was the use of visual aids effective?

        (1) Are figures and tables **properly labeled** (i.e. conspicuous titles, axes labeled and supplied with appropriate units)?

        (2) Is the amount of data presented adequate for the points being made?

        (3) Do PowerPoint slides or overhead transparencies have too much data so that they appear crowded and difficult to read, or has the speaker obviously taken care to make the data easy for the audience to understand? **This is especially important to a good seminar presentation**.

        (4) Are visual aids used to illustrate points, or just to consume time and "get the speaker through?"

        (5) Are PowerPoint slides or transparencies left on the screen long enough for the audience to grasp their contents, or are they removed too quickly due to the speaker's nervousness? **Another important point**.

F. The speaker's demeanor:

(1) Did the speaker maintain eye contact with the audience, or was the presentation read from a script?

(2) Was the delivery smooth or jerky?

(3) Were gestures used effectively, or were they distracting?

(4) Posture. Did the speaker stand up straight, or lean over the lectern or or against the blackboard?

G. Response to questions:

(1) How did the speaker handle himself/herself under fire (i.e. response to questions from the audience)?

(2) Were answers logical and analytical?

(3) Were questions answered directly, or did the speaker "beat around the bush?"

7. Was there a summary? Did it focus audience attention on the major points made during the presentation. **A summary is important**.

READING ASSIGNMENTS:

Readings come from the texts by Kardong and Carroll. They should be completed by the due dates indicated below. Put these in your date book calendar so you will stay on target with the readings. Unannounced quizzes may be given from time to time on readings in the text and/or the focus papers assigned for your presentations.

Due Date	Assignment
Thur. 3 Sept.	Carroll: Preface, Chapters 1 & 2
Fri. 4 Sept.	Kardong: Chapters 2 & 3
Mon. 7 Sept.	Carroll: Chapters 3, 4 & 5
Thur. 10 Sept.	Carroll: Chapters 6 & 7
Tue. 15 Sept.	Kardong: Chapters 4 & 5
Thur. 17 Sept.	Carroll: Chapter 8 & 9
Mon. 21 Sept.	Kardong: Chapter 6
Thur. 24 Sept.	Kardong: Chapters 1 & 7
Tue. 29 Sept.	Kardong: Chapters 8 & 9
Thur. 1 Oct.	Kardong: Chapter 10
Tue. 6 Oct.	Kardong: Chapters 12 & 13

Thur. 8 Oct. Kardong: Chapters 14 & 15

RESEARCH PAPER INSTRUCTIONS:

The research paper should be a major library research project, and as a result, it should be substantial in character.[2] Plan to write the paper on your first seminar presentation topic. You might want to keep in mind that toward the end of the semester deadlines and course assignments begin to pile up, so there is merit to writing a paper before the end-of-term chaos sets in.

The paper should summarize the current status of our understanding about your topic. **The paper must be written in college-level English**. Papers not meeting this standard will be returned ungraded to be rewritten.[3] Pay particular attention to spelling, grammar, and syntax. The paper should be written in a **critical** and **analytical** manner, not simply a recounting of publications you have found in the literature. As you work your way through the reference materials for your topic, ask yourself what are the important unresolved issues? Where are the gaps in our knowledge about this topic? What should we know more about, and what specific questions do you think should be answered? As you assemble and analyze the materials for your paper make a list of these items. Use the list for the last section of your paper as described below.

When you construct the narrative of your paper, devote the last section to the specific questions you want to answer and describe for the reader how you propose to answer those questions. You can title this section "Unresolved Problems" or "Strategies to Address Unanswered Questions." I am asking you here to **go beyond** simply recounting what you have read by making value judgements about what additional work needs to be done and by explaining how you would go about doing it. In short, I am asking you to think scientifically. Propose hypotheses and tell your reader what experimental data would be required to support these hypotheses. What experiments need to be done? How would you set them up? Lay out the rationales for them. How would you interpret the results from your experiments? I want you to identify interesting, unanswered questions and then show your reader how you propose to address them experimentally.

In the text of your paper **you must document statements with literature citations**. You may do this by number or by author's last name and publication date. In scientific writing documentation is necessary so that your reader can find the sources to which you refer. Assemble your citations at the end of the paper, alphabetically by first author's last name according to the format on page 7. Note that this is not a bibliography of reference works which you consulted, but rather a list of specific papers from the primary literature and reference texts that you have cited directly in the text of your paper. **Follow the prescribed literature citation format carefully**.

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[2] Approximately 20 typewritten pages double spaced with normal margins in 12 point font. Statements referring directly or indirectly to scientific research should be properly documented with literature citations.

[3] Not a good thing at the end of the semester when you have 10^6 other things to do.

GRADING:

Grades will be based on your seminar presentations, class participation, a written paper, and other library assignments. Unannounced quizzes may be given during the semester on reading materials for seminars for the day.

Seminar presentations (Short seminar 10%, Major seminars 15% each)	40%
Class participation	15%
Research Paper	35%
Quizzams (2)	10%

TIME LINE FOR WRITING YOUR PAPER

Put these dates into your datebook calendar. It is important to stay on target with the progress of your paper. Since it is a major undertaking and involves a substantial amount of library research time, it is unlikely that you will do well on it if you put it off until late in the semester.

Date	Items Due
Tue. 8 Sept.	Selection of first seminar topic
Thur. 24 Sept.	1. Paper outline 2. List of literature citations and reference texts you plan to use 3. Xerox copies of all journal articles you have received through interlibrary loan.
Thur. 15 Oct.	1. Expanded outline. 2. Rough draft 3. A list of the gaps in our knowledge (i.e. unanswered questions) that you have identified about the topic. You will use these for the last sectionof your paper. 4. Xerox copies of all journal articles you are using
Tue. 17 Nov.	Second draft (this is a **firm deadline**)
Thur. 3 Dec.	Paper due

HOW TO CITE LITERATURE IN YOUR PAPER:

Literature Cited

For journal articles:

DeFazio, S.J.. 2001. Elevated rates of tree collisions by high-flying toucans in an Ecuadorian rain forest associated with increased dietary intake of *Erythroxylum coca*. Ecology. 102: 76-85.

Espinoza, G. 1902. An initial study of the adaptive strategies of the green iguana. I. Swan-diving from tall trees, it only hurts for a while. Journal of Herpetology. 26: 243-249.

Mead, J. and S.J. Defazio. 1987. Pollination failure in tropical vines affected by hummingbird intoxication and its correlation with the period of party activity by the birds during the previous night. Ecological Monographs. 26: 89-103.

Raines, G. 2004. Why bats sometimes fly into walls. Collision Science. 16: 2017-2023.

Wolfe, J T., G. Espinoza, and M. Salgado. 1992. How to enjoy termite ecology while they eat you out of house and home. Journal of Irreproducible Results. 54: 22-47.

For a chapter or an article in a reference book:

Salgado, M, G. Raines, and J. Mead. 1994. Migratory tropical birds flying at low altitudes have difficulty discriminating between open windows and closed ones. In: S. DeFazio and G. Espinoza. Fun and games with migratory birds. Macmillian Publishing Co, Inc., New York. pp. 223-227.

Wolfe, J.T. 2009. The sloth and the hare: A new paradim. In: G. Espinoza and J. Mead. Winning is Everything. Bench Press, Inc. Bogota. pp. 235-253.

Suggestions for Seminar Topics in Evolution

This is a short list of ideas to get you thinking about potential topics. You can find additional topics by consulting the list of selected references at the end of each chapter in Kardong's text, and Carroll's book should prompt you to think about things you would like to explore.

Sexual selection
Darwin's finches
Evolution of photosynthetic metabolism
Role of polyploidy in speciation
Introgression (introgressive hybridization)
Punctuated equilibrium theory
Pleistocene refugia and speciation
Ecotypic differentiation
Latitudinal gradients in species diversity (Why are there more species in the tropics than in the temperate zone?)
Coevolution
Evolution in protein structure
Origins of eucaryotic organelles – endosymbiont theory
Evolution of migration patterns in animals (birds, fish)
Kin selection
Sibling species
Evolutionary forces which shape ecosystems (deserts, rain forests, savanna, etc)
Island biogeography and extinction
Human evolution
What makes us human?
Are we changing the course of our own evolution?
Evolution of parasitism
Obligate parasites: When is being too successful the same as being unsuccessful?
Evolution at the level of the genome
Gene structure
Evolution of evelopmental control
Monoecious vs dioecious plants
Chemical evolution (pheromones in animals, defensive secondary metabolites in plants, etc.)
Evolution of territorial behavior (peeing on a fire hydrant?)
Extremeophiles
Thermoregulation in animals
Drought or freezing tolerance in plants
Convergent evolution
Adaptive radiation
The ice fish and fossil genes
Earth's spasms of species extinction
Evolution of complex behavior and/or division of labor in ants (e.g. termites, leaf-cutter ants,

army ants)

SEMESTER SCHEDULE

A final version of the semester schedule including meeting dates and seminar topics will be distributed in the second week of classes.

Tue.	1 Sept.	Orientation, course objectives, discussion of topics
Thur.	3 Sept.	Evolution, discussion of topics
Tue.	8 Sept.	Library session: online searching strategies
Thur.	10 Sept.	Structuring your presentation. Presentation skills
Tue.	15 Sept.	History and the evolution of evolution, selection
Thur.	17 Sept.	Variation
Tue.	22 Sept.	Variation, speciation
Thur.	24 Sept.	Quizzam 1
Tue.	29 Sept.	Complete speciation, coevolution
Thur.	1 Oct.	Life in groups, extinction
Tue.	6 Oct.	Surprise
Thur.	8 Oct.	Quizzam 2
Sat. 10 Oct. – Tue. 13 Oct.		**Fall Recess**
Thur.	15 Oct.	Short seminars 1 and 2:
Tue.	20 Oct.	Short seminars 3 and 4:
Thur.	22 Oct.	Short seminars 5 and 6:
Tue.	27 Oct.	Major seminar 1:
Thur.	29 Oct.	Major seminar 2:
Tue.	3 Nov.	Major seminar 3:

Thur. 5 Nov. Major seminar 4:

Tue. 10 Nov. Major seminar 5:

Thur. 12 Nov. Major seminar 6:

Tue. 17 Nov. Major seminar 1:

Thurs. 19 Nov. Major seminar 2:

Tue. 24 Nov. Major seminar 3:

Wed. 25 Nov. – Sun. 29 Nov. **Thanksgiving Recess**

Tue. 1 Dec. Major seminar 4:

Thurs. 3 Dec. Major seminar 5:

Tue. 8 Dec. Major seminar 6:

Wed. 9 Dec. Last day of classes