

# Syllabus

## BSCI 360 2013

### “Principles of Animal Behavior”

#### Fall 2013

## Overview

This course focuses on understanding the evolution of behavior. Since evolution requires genetic change, we will begin by examining evidence that genes influence behavior and learn how to measure their effects. We will then consider how natural selection operates to produce adaptations and how phylogenetic information can be used to reconstruct the evolution of behaviors among groups of animals. Genes, however, are inadequate to describe all behavioral change because of the inherent flexibility of behavior. For this reason we will discuss the conditions under which non-genetic modes of transmission, such as learning and imitation, should evolve. In the next part of the course predictions about which behavior to expect in a particular ecological or social setting will be made by using a variety of techniques borrowed from economics such as optimization and game theory. We will learn how to predict when competition among animals for space, food, and mates should lead to behavioral and morphological adaptations. We will also discuss when communication in animals should be honest or dishonest and discover the situations that favor cooperative or altruistic behavior. Throughout the course we will consider how the study of animal behavior may help us to understand our own behavior as well as to better conserve threatened or endangered species.

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## Course Format

**LECTURES:** There are two lectures per week, on Mondays and Wednesdays from 11-11:50 in PLS 1130. I expect all students to attend every lecture and to take notes. To supplement your notes, I will post my lecture slides on Canvas usually within 24 hours of the class.

**DISCUSSIONS:** Discussions take place each Friday at 9, 10, or 11 AM in PLS 1168 or 1172. One or two recent scientific papers will be assigned for each discussion and can be downloaded from the “Discussion Readings” folder on Canvas. Beginning with the second week, each seminar will be run by two students who will have prepared questions that must be turned in to the section’s instructor at the beginning of the period. The questions’ goal is to encourage discussion and clarify the assigned reading. **Everyone is expected to read every paper each week!** Performance will be evaluated by attendance, weekly participation, and preparation as a discussion leader. If you are unable to come to discussion due to illness, I will accept a self-signed note from you attesting to the date of your illness. The note must contain acknowledgement that the information is true and that providing false information is prohibited under Code of Student Conduct. To receive credit for a missed Discussion you must write a one-page summary of the article(s) under discussion and give it to me within two weeks of the missed discussion. See “Hints for Discussion Preparation” below.

**TEXTBOOK:** *Perspectives on Animal Behavior*, 3rd Edition (2010) by Goodenough, McGuire and Jakob (ISBN: 978-0-470-04517-6) is the text for the course. The “Schedule of Classes” lists the

chapters or page numbers that relate most closely to the material covered in each lecture. The book is intended to supplement, not necessarily duplicate, the lecture material.

**GRADES:** Your final course grade will be based on the sum of scores for all assignments and exams. The distribution of points across assignments/exams is as follows:

Exams/Assignments	Points
<i>Midterms I &amp; II</i>	100 each
<i>Problem Sets I &amp; II</i>	20 each
<i>Grant Proposal</i>	100
<i>Discussion</i>	90
<i>Final Exam</i>	120
<b>Total</b>	<b>550</b>

**PROBLEM SETS:** Most of the central concepts regarding the evolution of behavior are based on theoretical ideas that have empirical support. You will learn how some of these theoretical conclusions have been reached, and you will solve some algebraic problems using the techniques I present in class. To ensure that you gain competency in these tasks, you will be required to complete two problem sets that will be graded and returned to you.

**EXAMS:** There will be two midterms, **October 14** and **November 18**, and a cumulative final, **Wednesday, December 18, 8:00 – 10:00 AM** in PLS 1130. Questions will be a combination of multiple choice, short answer, and problem solving and will integrate seminar and lecture material. **Make-up exams will only be permitted with a valid health excuse from a doctor.** Some of the exam questions will be similar in style to problem set questions.

**GRANT PROPOSAL:** The remaining portion of your grade will be based on a report (**no longer than five** single-spaced type-written pages, excluding references), which will be written in the form of a grant proposal. Any topic which is related to animal behavior can be chosen, even if it was not discussed in class. If you are unsure how to begin this assignment, please read the suggestions below. We will discuss the assignment in one of the discussion periods (see schedule), and the TA and I are also very willing to discuss ideas with you in person. But, please do not wait until the last minute! Prior to turning in the final proposal, you will submit a **proposal summary** in the form of an abstract, which should have all your main ideas sketched out. This will help you formulate ideas early and revise them based on feedback from us. It will be returned to you in time for you to make adjustments in your final proposal. **Five** copies of the final proposals must be handed to us in person **no later than 5 PM on November 27.**

Proposals will be evaluated by the TA and me as well as by other students in the class. They will then be discussed during a mock panel meeting, which will take place during the last two discussion periods. Your proposal will be distributed to three students who will each read and prepare a written evaluation of your proposal. Then, one of the reviewers will lead the panel discussion and write a written summary of that discussion. After all proposals have been reviewed, the TA and I will rank them and assign grades using the criteria that are indicated below. The intention is for this to be a valuable learning experience that should give you a good idea of how governmental money is allocated to scientific research, and it will enable you to appreciate the efforts and ideas of your classmates.

**OFFICE HOURS:** My office hours will be by appointment only (BPS 4123). You can schedule an appointment with me after class or by email [shb@umd.edu](mailto:shb@umd.edu). If you are having difficulty with either the lecture or reading material, please don't hesitate to talk to me or the TA. We are available to help, but you must take the initiative to meet with us. If you have a short question, you are welcome to send it to us by email.

**TA:** Danielle Adams will be the teaching assistant for this course. I will announce her office hours during the first lecture of the class and post them on Canvas. You can schedule an appointment with her after class or by email at [dadams37@gmail.com](mailto:dadams37@gmail.com).

**CELL PHONES:** Cell phones should be turned off and put away during **every** class period. Cell phones are not permitted during exams and will be confiscated, if we see them in use. Any student that is a repeated offender of ringing/talking on a cell phone in the classroom will be referred to the Honor Council under the Student Code of Conduct classroom disruption policy for disciplinary action.

**ACADEMIC DISHONESTY:** You should be aware that academic dishonesty is a serious offense that will not be tolerated in this course. The University of Maryland, College Park, has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. This is especially important when writing your grant proposal. If you have any doubt about what constitutes plagiarism or any of the other offenses, please ask us. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <http://www.shc.umd.edu>. Remember also to sign the **Honor Pledge on all examinations and assignments:** "I pledge on my honor that I have not given or received any unauthorized assistance on this examination (assignment)."

**ACADEMIC ACCOMODATIONS:** If you have a documented disability, you should contact Disability Support Services 0126 Shoemaker Hall. Each semester students with documented disabilities should apply to DSS for accommodation request forms which you can provide to your professors as proof of your eligibility for accommodations. The rules for eligibility and the accommodations a student may request can be reviewed on the DSS web site at <http://www.counseling.umd.edu/DSS/eligibility.html>.

**RELIGIOUS OBSERVANCES:** The University System of Maryland policy provides that students should not be penalized because of observances of their religious beliefs, students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances. It is the responsibility of the student to inform the instructor of any intended absences for religious observances in advance. Notice should be provided as soon as possible but no later than two weeks after the start of class. Prior notification is especially important in connection with final exams, since failure to reschedule a final exam before the conclusion of the final examination period may result in loss of credits during the semester.

## Helpful Hints

**HINTS FOR DISCUSSION PREPARATION:** The intent of weekly discussions is to help you learn to think critically and speak confidently about animal behavior research. You should try to understand the assigned material and uncover its strengths and weaknesses by drawing on what you have learned in the course. Identify the main points and critically examine the data and logic the authors use to support their conclusions. Don't be intimidated by statistical or scientific terms you do not understand. Just because this paper was published does not mean that it is necessarily correct. Your responsibility is not only to understand the research, but to evaluate its importance and quality. By the end of the term you should have a better appreciation for the kind of research currently being conducted on animal behavior and for the process scientists use to reach general conclusions, such as those described in the text.

When you are responsible for presenting the week's paper, do not merely reiterate what the paper says. Your job is to encourage and lead discussion. The best way to do this is to BRIEFLY summarize the work, and then either ask questions of the group or suggest an interpretation that will provoke disagreement. Come prepared with several questions and pose them to the class. You can choose either to work through the paper systematically, or identify the major weakness (or strength) and build discussion around this.

**Students who are not presenting in a given week should come to the discussion with at least one question or criticism (positive or negative) about the assigned paper.** If you do not understand some aspect of the paper, ask your classmates for clarification. You can use the following set of questions to help guide you through understanding the main points and evaluating the paper's strengths and weaknesses:

- What is the paper's primary objective? Is it clearly stated and logically developed?
- Does the research attempt to test a specific hypothesis, and if so, what is it? Or is the work descriptive?
- Are the methods appropriate for achieving the stated objective?
- Is the work observational or experimental? Are the observational techniques free from bias, and/or is the experimental design free from flaws?
- Are the data analyzed appropriately?
- What have the authors discovered? Are there any inconsistencies in the results?
- What conclusions do the authors draw from the results? Is each conclusion supported by the results presented or by cited work?
- Where do the authors speculate, if at all, and are these speculations logical?
- What is the contribution of this research to our understanding of the stated objectives and the larger field of which the research is a part?
- What kind of follow-up work would increase our understanding of the main questions?

**GRANT PROPOSAL SUGGESTIONS:** The grant proposal is a chance for you to explore in greater depth anything you have discovered or always thought was interesting about animal behavior. I want you to be creative and try to come up with a problem that either has not been treated in sufficient depth, which has been ignored, or appears to be involved in some kind of controversy. Be problem-oriented, not organism-oriented. If you are unable to pick a suitable organism for testing your ideas, come see me or the TA. We will be glad to discuss this assignment with you.

**Choice of Topic:** Be problem-oriented, not animal-oriented. Good research in animal behavior provides answers to general questions that apply to many animal species. At least three different styles of presentation can be successful. One particularly effective method is to focus on an **area of controversy**. Examples of such areas are honest vs. deceptive advertisement, good genes vs. non-adaptive models of sexual selection, evolution of eusociality through parental manipulation of sibling cooperation, etc. Frequently, controversy exists because conflicting theories have been proposed in the absence of supporting data. A good grant proposal reviews the theory sufficiently to identify the kind of data necessary to discriminate between competing hypotheses.

An alternative approach is to **reexamine a traditional idea from a new perspective**. This often means challenging what is commonly viewed as conventional wisdom. As an example, Wynne-Edwards' notion of group selection clearly challenged the traditional view of Darwinian natural selection and stimulated extensive thinking about levels of selection and the evolution of altruistic behavior. This particular example illustrates, though, that if you overstate your case, as Wynne-Edwards did, you lose credibility.

The third approach is to **extend previous studies in new directions** or to a finer level of analysis. Tom Seeley's work on honeybee language, learning and communication, which built upon the classic studies of von Frisch, is a fine example of how progress can be made by continuing to pursue a single area over a long time period. Regardless of which approach you decide to adopt, use as your ultimate criterion how much you like the subject. If you can't get excited about it, you won't be able to convince anyone else to give you money.

Identify a central question around which to build your grant proposal. This is without doubt the most difficult part of this assignment. You should consider the book as a good starting place to look for potential grant proposal topics. If nothing you like easily comes to mind, use the Web of Science or Google Scholar to search on particular topics. You can also browse through the latest issues of the behavior journals such as *Animal Behaviour*, *Proceedings of the Royal Society of London, series B*, *Behaviour*, *Behavioral Ecology*, *Ethology*, *Behavioral Ecology and Sociobiology* or review journals such as *Trends in Ecology and Evolution*, *Annual Review of Ecology and Systematics*, or *Quarterly Review of Biology*, or *Biological Reviews*. If you are off campus, you will need to first authenticate your student status by going to <http://researchport.umd.edu/> and login with your university ID. You then will need to click on the "Databases" tab at the top of the page if you want to use Web of Science or on the "E-Journals" tab and type in the name of the journal (e.g. *Animal Behaviour*) into the search bar. Follow the links to the online source of the paper. You can then browse through the archives of the journal or the latest volume. Most journals now publish articles online before they appear in print or in databases.

If you find an article that sounds interesting, read it, and read some of the references that are cited in it. You should be able to trace an idea back to its origin by just reading a handful of articles and quickly decide if the topic is suitable for a grant proposal. After you **identify a topic**, try to **develop a central question**, e.g. why do large white wading birds often form foraging groups? While much of the material in this course centers on "why" questions that inquire into the adaptive significance of behavioral traits, you should not feel inhibited from asking more mechanistic questions, for example, how do some bats

manage to fly hundreds of miles from nursery colonies to winter hibernation sites and successfully return to the exact same site where they were born? Notice that both of my questions specified particular animals even though the ideas, group foraging and migration, are very general topics in animal behavior. You must also decide on an appropriate **animal group or model species** to investigate after you have decided on a question. This requires careful thought because the animal you choose dictates, to a large extent, the kind of observations or experiments that can be performed. If you decide on a question (for example, "Why do some animals seek extra-pair copulations?") but cannot think of an appropriate organism, come see me or the TA or send us an email. Do not choose an organism at random. **You should be able to justify both your study question and animal.** Thus, you should be able to claim, without too much imagination, that this animal is better than any other for investigating the topic you have chosen.

**List Alternative Hypotheses:** After picking a question and organism you should attempt to enumerate all possible alternative hypotheses which can answer your original question. Typically, one of these will be a null hypothesis, which often states that the observed pattern is due to chance, rather than as a consequence of past selection or the experimental treatment. You should present these hypotheses without bias, i.e., do not state what your beliefs are unless you have direct evidence for making such a conclusion. The **purpose of your research should be to test these hypotheses.** For the group foraging question, for example, you might suggest that being in a group somehow decreases predation on individuals or alternatively, increases each bird's foraging success. Note that these particular examples are not mutually exclusive. Unfortunately, this is often the case in biology and consequently, you usually need to test both alternatives, not just one. Once you have suggested as many alternatives as you can you should **devise experimental or observational tests** that allow you to unambiguously reject as many of these hypotheses as possible. If you initially propose a correlative study, i.e., observations on free-ranging animals, you should also suggest experiments that will identify causal relationships. Such a combination of observational and experimental studies often leads to the most convincing results.

**Organization:** The following outline and page lengths are merely a suggestion. If your project more easily fits another format, feel free to use it. However, you should cover all of these topics in your proposal and write **no more than a total of five single-spaced, typewritten pages.** The reference list and your figures and tables can be included in addition to the five pages of text.

**Purpose and Objectives:** (1/2 page) This introductory section can be very brief. A single paragraph is often enough. Most people state the underlying question and then describe how they will answer it, i.e. will this be lab work, field studies, both, etc. Alternative hypotheses can be included here, but they often make more sense in the Proposed Work section after more background has been provided.

**Background:** (1 page) This often consists of two parts: a review of relevant theoretical and empirical studies and justification for why the animal system which you plan to use was chosen. This section should be sufficiently detailed to enable the reader to place your study in the broader context of related work and make it clear why your study is needed or will be important. If you have pilot data that relates to the proposed experiments, this is the appropriate place to include and discuss it.

**Proposed Work:** (2 pages) This should be a description of the experiments, observations, and analyses you propose to conduct to test your alternative hypotheses and answer your original question. Enough detail is needed to show you know what you are talking about and to convince the reader that these are practical things to do in the time period of the grant. Ideally, this should be a logical progression of experiments such that the results from one influence the next. Clearly state how each experiment or

observation addresses each hypothesis. For this paper, you need not worry about time limits, but try to think about 1 to 3 year time periods. In a formal proposal you should be conscious of statistical design and include such details as sample sizes and appropriate statistical procedures you plan to use to evaluate the results of each experiment. You don't need to worry about statistics for this proposal. If you propose to do several different experiments or have multiple observation periods, you should consider including a table that clearly outlines the schedule you plan to follow. The more organized you appear to be, the more likely a reviewer will believe that you can accomplish what you propose.

**Potential Results:** (1 page) This is an optional section in which you predict the outcome of each experiment. You should attempt to interpret the results of each experiment such that you can foresee each possible outcome. Preferably, it should be made clear that exciting results will be forthcoming no matter what result you obtain.

**Impact:** (1/2 page) How will your results affect the big picture? Who should care about what you discover and why? Why should someone give you money rather than contribute money to find a cure for AIDS? These are hard questions, but every scientist has to be able to justify why their research is of value. This need not require any kind of immediate benefit nor relate to improving human living conditions. The quest for knowledge is sufficient, if you can provide evidence (and list recent relevant references) that lots of people are also interested in the same problem.

**References:** You should use citations in the text, e.g., (Smith 1996), whenever you mention the results or ideas of a previous study. I expect you to locate **primary** references, i.e. original research articles published in journals, rather than secondary references, i.e. summaries of studies from textbooks, review articles, or articles written for a lay audience, such as newspaper or popular magazine articles. Any articles cited in the text must be fully referenced in a Literature Cited section at the end of your paper. You should adopt a **consistent format** for these references. A good example is provided by the journal *Animal Behaviour* at the end of every article.

### **DOs and DON'Ts**

#### **DOs:**

- Create subdivisions within sections to highlight topics and improve readability.
- Include figures that convey information simply and dramatically.
- Include a flowchart to link experiments, if more than three or four are planned.
- Hand in **five copies** of your proposal.

#### **DON'Ts:**

- Go beyond page limits.
- Miss deadline for submission.
- Make grammatical or typographical errors.
- Write references inconsistently or incorrectly within the text and in the reference list.
- Write for the specialist; instead, write for the informed lay person.
- Forget to summarize importance of project at the end of the proposal.

**Evaluation:** Each student will submit five copies of their proposal. Three of your classmates will read and comment on your proposal. During the last two discussion section meetings we will discuss our reviews

and the class will rank the proposals and recommend the best one for funding. The instructions for reviewers are below. This is very much like the process used by governmental organizations, such as the National Science Foundation, when they solicit reviews from external sources:

*Please provide a frank, critical appraisal of this project proposal. Evaluate the grant on creativity in choice of subject and design of research, adequacy of experimental or observational protocol in testing hypotheses, logic and clarity of presentation, and potential impact of the research on the scientific community as well as on society. Use the scale at the bottom of the page to categorize your overall impression of the proposal. If you do not sign the proposal, your comments will be returned to the applicant anonymously.*

\_\_\_\_ Excellent    \_\_\_\_ Very good    \_\_\_\_ Good    \_\_\_\_ Fair    \_\_\_\_ Poor