

Animal Senses A&S 500, Spring, 2013

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Advanced study of how animals use sensory abilities to communicate, navigate, and detect prey, predators and mates. We will focus on extreme and unusual sensory systems such as echolocation, electroreception, and magnetoreception, as well as vision, smell, touch, and hearing. Graduate students are required do additional research and to present their term paper orally and/or in writing.

Prerequisite: BIO 350 or PGY 412 or permission of instructor.

Meeting times: Tue and Thurs 9:30 to 10:45 AM, place TBA

Required.

Howard C. Hughes, **Sensory Exotica: A World beyond Human Experience** (Paperback), 978-0262582049, The MIT Press.

<http://www.amazon.com/Sensory-Exotica-World-beyond-Experience/dp/026258204X/>

Recommended only:

1. Gunther K. H. Zupanc, **Behavioral Neurobiology: An Integrative Approach**, 978-0198700562, Oxford University Press, USA. This text will provide background on the physiology of nervous systems as well as provide additional explanation of sensory systems with more figures. It is highly recommended for those students will little background in neurophysiology.

2. David Eagleman. Incognito: **The Secret Lives of the Brain** Publisher: Pantheon (May 31, 2011) English, ISBN-10: 0307377334; ISBN-13: 978-0307377333

Supplementary Materials: Readings from the primary literature will be assigned on occasion. These articles will be posted on Blackboard for you to download and print.

Course Websites: Blackboard: [syllabus, course announcements, study advice, class notes]

**Tentative Class Schedule:
Class Topics, due dates, Relevant Text Material**

January 10- Introduction to sensory systems & signals; Library research methods
TEXT Hughes 1-3 (Cooper). Fun activities.

January 15- (Cooper) Sound, hearing & bat echolocation, TEXT Hughes 4

January 17(Cooper) Sound, hearing & bat echolocation, TEXT Hughes 4

January 22(Cooper) Biosonar & avoidance, TEXT Hughes 5-7

January 24 (Cooper) Biosonar & avoidance, Paper1 discussion,

January 29 (Cooper) Navigation & compasses, TEXT Hughes 8-9

January 31 (Cooper) Navigation & compasses, **Abstract of a topic due**

February 5 (Cooper) Proprioceptors, Handouts and ppt will be posted

February 7 (Cooper) Proprioceptors, tension receptors; Handouts and ppt will be posted
Paper2 discussion, **Related to term paper: Reference list and articles (as PDFs) due**

February 12 (Cooper) Go to lab to record and observe neural responses of proprioceptors
TEXT Hughes 10-11 **Quiz 1**

February 14 (Morris) Vision, TEXT Hughes 12

February 19 (Morris) Vision, TEXT Hughes 12

February 21 (Morris) Vision, TEXT Hughes 12

February 26 (Cooper) Magnetoreception TEXT Hughes 10-11

February 28 New plan.....JOHN NICHOLLS: Central integration of visual system.

March 5 (Cooper) Magnetoreception; Vision; Paper 2 discussion,
.....Related to term paper: Reference list and articles (as PDFs) due.

..... **Electroreception & communication; TEXT Hughes 12,13,14,16**
(Cooper) Magnetoreception; Vision; Paper2 discussion,

Related to term paper: Reference list and articles (as PDFs) due

(Cooper) Electroreception & communication; TEXT Hughes 12,13,14,16

March 7 (Cooper) Electroreception & communication; **Outline of research a <500 word article
for the public, i.e. newspaper or magazine due**

March 12 (11-16) - Monday through Saturday - Spring Vacation - Academic Holidays

March 14 (11-16) - Monday through Saturday - Spring Vacation - Academic Holidays

March 19 MOVED TO Feb 28 JOHN NICHOLLS: Central integration of visual system.

NEW PLAN Electroreception & communication; **Outline of research a <500 word
article for the public, i.e. newspaper or magazine due**

March 21 (Cooper) Vision: crayfish caudal photo receptor in crayfish.

March 26 (Cooper) Olfaction & pheromones, TEXT Hughes 17-19

March 28 (Cooper) Olfaction & pheromones, **Quiz 2,**

April 2 (Cooper) Paper 3 discussion; **Draft paper due**

April 4 (Cooper) Temperature. handouts

April 9 (Cooper) Temperature. handouts

April 11 (Cooper) Topical ...class input.

April 16 (Cooper) Topical ...class input.

April 18 (Cooper) Cricket communication; Grad student presentations 1,2

April 23 (Cooper) Grad student presentations 3, 4

April 25 (Cooper) Grad student presentations 5,6,; **Quiz 3**

April 30 No class Final papers due (Finals week) (Cooper)

February 26 (Cooper) Magnetoreception, TEXT Hughes 10-11

March 7 (Cooper) Electroreception & communication; Outline of research a <500 word article for the public, i.e. newspaper or magazine due

March 12 (11-16) - Monday through Saturday - Spring Vacation - Academic Holidays

March 14 (11-16) - Monday through Saturday - Spring Vacation - Academic Holidays

March 19 ** CHANGE IN SCHEDULE.....moved to Feb 28 JOHN NICHOLLS: Central integration of visual system.

..... (Cooper) Electroreception & communication; Outline of research a <500 word article for the public, i.e. newspaper or magazine due.

Course Description: Advanced study of how animals use remarkable sensory abilities to communicate, navigate, and detect prey, predators and mates. We will focus on extreme and unusual sensory systems such as echolocation, electroreception, and magnetoreception, as well as vision, smell, touch, proprioception, muscle tension and hearing.

Student Learning Outcomes

By the end of this course, you should be able to:

1. Have a conceptual understanding of animals possessing different sensory abilities and limitations that are shaped by their evolutionary history as assessed by examination.
2. Understand how physical stimuli travel and how they are transduced by sensory cells into chemical responses in animals as assessed by examination.
3. To appreciate how sensory stimuli are simplified and analyzed by sensory systems as assessed by examination
4. Develop a basic knowledge of the sensory processing as assessed by examination.
5. Be able to solve problems and critically analyze research papers in the field of Neuroscience.
6. Be able to discuss and develop new ideas and suggest future research directions in the field of Neuroscience.

Course goals/objectives

The goals of this course are that the learning outcomes will be met by the students

Course Requirements: The course will be a mix of lecture and student-led discussion. Readings will be taken from the text and from the primary research literature. The main output of the course will be a term paper on your chosen subject in animal senses. I will provide greater detail on the term paper, but basically you will read recent primary research papers on one subject and will explain their meaning and how they relate to each other. Graduate students will be required to read more papers than undergrads, and will also be required to present their research as a 30 min oral presentation in class. I will help you all to decide on a term paper topic, your topic proposal is due in Week 4, and the titles of all of your research papers are due in Week 5 (see schedule).

Topic- 5 pts

References- 20 pts

Summaries (Abstract 25points, article of <500 words layman article 25 points) - 50 pts

Outline- 50 pts

First draft- 20 pts

Final draft- 100 pts

Quizzes- 25 pts each = 75 pts

Class participation (questions in class, paper discussions, online discussions)- 15 pts
Late assignments will lose 10% of total point possible for every day late. Lateness will be calculated based on the time and date listed on Blackboard, and your assignment will be counted when it is submitted on BB/Turnitin or by email, depending on which method is requested by the instructor.

Undergraduate students will be provided with a Midterm Evaluation (by the midterm date) of course performance based on criteria in syllabus

Final grades will be based on total points earned and will be assigned as follows:

Undergraduates:

- A = 90 - 100 %
- B = 80 – 89.99 %
- C = 70 – 79.99 %
- D = 60 – 69.99 %
- E = less than 60 %

Graduates:

Topic- 5 pts

References- 20 pts

Two Summaries (Abstract 12.5 points for each, two article of <500 words layman each article 12.5 points each) - 50 pts

Outline- 50 pts

First draft- 20 pts

Final draft- 100 pts

Quizzes- 25 pts each = 75 pts

- A = 92 - 100 %
- B = 82 – 91.99 %
- C = 72 – 81.99 %
- D = 62 – 71.99 %
- E = less than 62 %

Writing assignments for course:

Abstract: Write an abstract on a topic of interest related to current literature on the topic of choice

Short newspaper type report: Write a <500 word article for the public, i.e. newspaper or magazine

Review article/term paper: There will be one formal manuscript write-up due this semester. The manuscript is intended to mimic the review manuscript writing and submission processes required for scientific publication, and it will utilize results from reviewing scientific literature. The manuscript must be written independently (no group

submissions). The draft and final submission dates are listed above in class schedule. The writing format described by the Journal of Comparative Biochemistry and Physiology - Part A: Molecular & Integrative Physiology will be used or Annual Reviews in Physiology. As an example, go to the journal's web page and look up information for authors at:

http://www.elsevier.com/wps/find/journaldescription.cws_home/525464/description

The “guide to authors” provided by the journal provides the formatting guidelines that must be followed for this assignment. Additional information for this assignment will be made available through the course website.

Office hours and study habits: Please come visit during my office hours. Feel free to stop by to chat, or to clarify something from class or the reading materials. Please realize that we are here to help you, not to trip you up with tough assignments. We all have the same goal—for students to learn and master the course material. But it can be hard for me to help, unless I know you need help. To find out if you need help, please ask questions in class, by email, or Blackboard. Form study groups and study together regularly. If you make these efforts, you will greatly benefit. It is important in your future professions to become 'active learners'. This means that you take responsibility for your own learning and actively seek out the knowledge you require. Please do not accept "not understanding"! If you don't understand, don't think that you are the only one who did not get it, and be embarrassed to ask a question. It is my pleasure (and my paid responsibility) to HELP you understand. Class time is most productive and enjoyable when it is a two-way communication between teachers and students.

About the quizzes: The quizzes will allow you to demonstrate your understanding of the material presented in class and in the textbook. Each quiz will last ~30 min and will involve short answers of a few sentences or a diagram. Make-up quizzes are given only in cases that are documented by a medical excuse, and by notification of the instructor *before administration* of the exam. Unexcused absence from an exam or failure to notify the instructor prior to the quiz will result in a score of zero for that exam. All make-up quizzes must be completed within one week of the scheduled exam date. Missing more than one quiz will result in a failing grade. A grade of incomplete (INC) can only be given if a *major* portion of the course has been completed at a *passable* level. An INC grade will not be given for poor performance or for lack of attendance. Documentation is required to justify a grade of INC. See the University catalog or schedule of classes for information on withdrawal from the course.

Blackboard/Class Communications

Course announcements, assignments, lecture outlines and additional materials will be posted online using Blackboard. Exams and homework dates will remain fixed. Updates to this syllabus (regarding topics and reading) will be posted; please check periodically. You will also receive important course announcements via your UK e-mail account. If you do not use your UK e-mail account, you need to activate it. It is strongly recommended that you check your e-mail regularly. I may send messages—sometimes with attachments—to the class using this medium.

•April 29-May 3 - Monday through Friday - Final Examinations