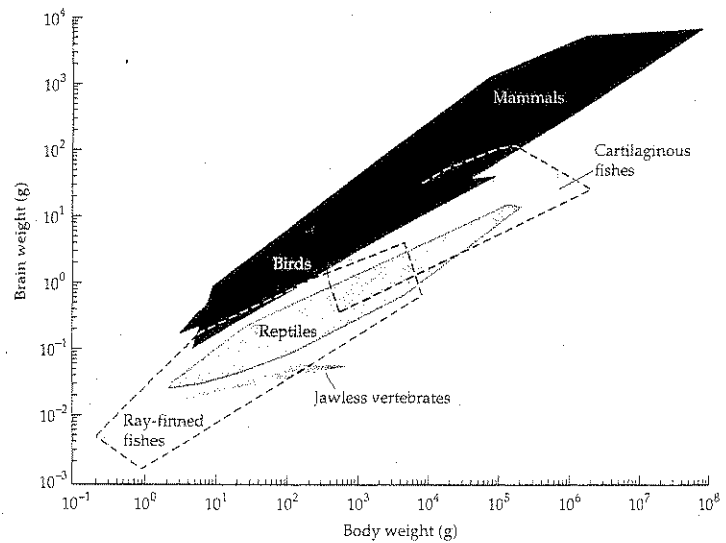


# NEUROSCIENCE 400: EVOLUTION OF BRAIN AND BEHAVIOR



A) Minimum convex polygons



Mark Braford  
Spring, 2013

*Nothing in biology makes sense except in the light of evolution.* Theodosius Dobzhansky, 1973

**Course Objectives.** One major objective of this course is to engage in scientific communication and to improve the skills needed to do so effectively. The other major objective is to develop a more sophisticated understanding of the evolution of vertebrate brains and behaviors—the focus of our communications in this course.

Scientific communication is bi-directional and multi-modal. It includes all of the following: reading background information, review articles and primary literature (and the unpublished writings of colleagues) with a careful, thoughtful and evaluative eye; summarizing, synthesizing and transmitting the data and interpretations from the scientific literature (or your own research) to others orally, in writing and with visual aids; listening attentively to the presentations of others and providing thoughtful questions and constructive feedback.

Since science is a social enterprise, communication is essential. A scientist must know what has been done in order to know what he/she might do. In the doing and the reporting of research, all scientists continually seek input from their peers. In fact, the peer-review process employed by scientific journals depends on the willingness of the members of the scientific community to convey with care and honesty their concerns for accuracy and clarity in scientific communications.

**Readings.** The reading material in this course will be articles in the primary literature, review articles, book chapters and, perhaps at times, written assignments by fellow students. The reading material will on reserve in the Science Library, on Blackboard, online or distributed to you by email or in class. In addition, some books are on reserve in the Science Library as reference material for this course. They include, Principles of Brain Evolution by Georg Striedter, Comparative Vertebrate Neuroanatomy: Evolution and Adaptation by Ann Butler and William Hodos, and Cognition, Evolution and Behavior by Sara Shettleworth.

**Websites.** For a colorful review of human Neuroanatomy, go to the interactive atlas at the Digital Anatomist website: <http://www9.biostr.washington.edu/da.html> . For an extensive collection of mammalian brains and brain sections go to <http://brainmuseum.org> and for zoomable, very high resolution sections of a smaller collection of brains go to <http://brainmaps.org> . If you should come across an website that would be useful to the class, please share it with us.

**Oral Presentations.** After some background readings and lecture/discussions during the first few class meetings, students will present material and lead class discussions on various aspects of the evolution of brain and behavior. Each presentation will be a co-ordinated/integrated group presentation. Groups will be made up of four or three students and each student will be expected to speak for 30 minutes. During the semester each student will present twice.

**Writing.** Writing assignments will include short essays in response to specific questions, other written exercises, evaluations of fellow students' presentations, and a final research paper.

**Grading.**

Class Participation: Preparedness, Engagement, Contributions	20%
Short Writing Assignments and Other Exercises	10%
Oral Presentations	40%
Final Research Paper	25%

**Other Information.** My office is Science Center A136, my phone is x58031 and my email is [mark.braford@oberlin.edu](mailto:mark.braford@oberlin.edu) . My office hours are M 11-12, Tu 11-12, Wed 4-5 and by appointment.

## CLASS SCHEDULE

- FEB 5      **Introductions and Organization**
- FEB 12     **Background in Evolutionary Concepts; Some Principles of Brain Evolution**
- FEB 19     **Background in Approaches to Evolution of Behavior**
- FEB 26     \***Evolution of Overall Brain Size:** What are big brains for? Costs and Advantages; Clever Foraging or Social Complexity?
- MAR 5      \***Evolution of Brain Region Size:** Mosaic or Concerted Evolution? Late Equals Large? Evolution of Food-Storing Behavior in Birds and its Relationship to Hippocampal Size
- MAR 12     \***Evolution of Brain Region Organization:** Diversity of the Neocortex among Mammals: Nature and Mechanism
- MAR 19     \***Evolution of Neuronal Connections:** Trophic Cascades; Parcellation; Invasion; Large Equals Well-Connected?
- SPRING BREAK
- APR 5      Open
- APR 9      \***Mirror Neurons:** Tool Use; Social Cognition; What Else?
- APR 16     \***Evolution of Communication and Language:** Monkey Calls; Parrot Talk; Singing Neanderthals
- APR 23     \***Evolution of Mind:** Intentionality; Self Recognition; Theory of Mind
- APR 30     \***Evolution of Consciousness:** Who has it? What are its selective advantages? Intelligence, Sentience and Consciousness
- MAY 7      **Potluck:** Bring a Dish and a Paper to Share

**Final Paper due no later than 11:00 am Sunday, May 19.**

\* student presentations and discussions

