

**ANBI 140: Evolution of the Human Brain  
Summer Session I 2022**

**Lectures:**

Tu/Th 2 – 4:50 PM CENTR 217B

**Instructor:**

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Office: SSB 287

Office Hours: Thu 12 - 2 PM and by appointment

**Course website:** canvas.ucsd.edu. All lecture outlines, readings, and review guides will be posted on this site.

**Course overview:** This course is designed to provide an overview of the major concepts and themes related to evolution of the human brain. The course examines neuroanatomical specializations of the human brain, direct evidence of brain evolution based on endocasts of fossil hominins, and functional correlates of the brain organization as inferred from disorders and lesion studies. Emphasis is placed on brain structures and behaviors thought to be under selective pressure during the evolution of the human lineage.

**Required Readings:**

All required readings listed in the syllabus are available electronically on the course Canvas site.

**Recommended Readings:**

Schneider, G. E. (2014). *Brain structure and its origins in development and in evolution of behavior and the mind*. MIT Press. A copy of the book will be held on reserve at the Geisel library.

**Course Requirements:**

Midterm examination (25%)

Class paper (40%)

Final examination (35%)

To pass the course, you must satisfy all course requirements, i.e., you must take all exams and turn in all assignments. You are expected to complete assigned readings for the day of lecture.

**Examinations:**

There will be one midterm exam in this course and a final exam. The examinations will be designed to assess your grasp of the readings and lectures. Each will consist of a variety of objective questions, so if you attend lectures consistently and complete the readings, you can expect to do quite well on these assessments.

Make-up exams will only be granted in extreme and exceptional emergencies, in which case, valid documentation will need to be provided. Makeups will be given in a different format and include different content.

**Class paper:**

You will write ~8 page paper that will enable you to further engage with the material discussed in the class. The paper topic should be related to one of the topics discussed in lectures/readings but, beyond that, you can decide to write on anything that ties the class material to your educational and research interests. Some examples of topics include – but are not limited to – variations of a specific neuroanatomical structure across species and their evolutionary significance, connection between brain and cognitive evolution in fossil hominins, sex differences in the brain, ethics of using non-human primates in neuroscientific research, etc.

The paper grade consists of the paper proposal and annotated bibliography (**15% of your grade; due July 7**) and the final paper (**25% of your grade; due July 26**). The paper proposal should clearly identify the topic you are exploring and its significance for understanding human behavioral, cognitive, or anatomical specializations, and at least three scholarly sources (journal articles/edited books) which you will use in writing the paper.

All information that is not your own original work must be cited. As of 2017, American Journal of Physical Anthropology (AJPA) requires references to be prepared according to APA style guidelines (<https://onlinelibrary.wiley.com/page/journal/10968644/homepage/forauthors.html>), but you can use Chicago, MLA, CBE, or any other recognizable citation style.

***Office for Student Disabilities Accommodations:***

Students requesting accommodations and services due to either a short- or long-term disability for this course need to provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD), prior to eligibility for requests. Receipt of AFAs in advance is necessary for appropriate planning for the provision of reasonable accommodations. For additional information, contact the Office for Students with Disabilities: 858.534.4382 (V) 858.534.9709 (TTY) - Reserved for people who are deaf or hard of hearing, email: [osd@ucsd.edu](mailto:osd@ucsd.edu). OSD Website: <https://disabilities.ucsd.edu/>

***Academic Integrity:***

It is your responsibility to know and observe all the UCSD rules concerning academic integrity and plagiarism. You should familiarize yourself with your responsibilities and rights under the UCSD Student Conduct Code ([http://ugr8.ucsd.edu/judicial/22\\_00.html](http://ugr8.ucsd.edu/judicial/22_00.html)). If you have any questions about what constitutes plagiarism, how to credit the work and ideas of others properly, how to evaluate sources for quality and reliability, or any other related issues, please feel free to talk to me,

***Title IX Statement:***

The Office for the Prevention of Harassment and Discrimination (OPHD) is the Title IX Office for UC San Diego and investigates reports of sexual harassment, sexual violence, dating and domestic violence and stalking. You may file a report online with the UC San Diego Office for the Prevention of Harassment and Discrimination (OPHD). For further information about OPHD, please visit <http://ophd.ucsd.edu/>. Or you may call OPHD at 858-534-8298.

Please note that University employees (including all faculty and teaching and research assistants), who are not confidential resources, are designated Responsible Employees. Responsible Employees are required to report any incidents of sexual violence or sexual

harassment to OPHD. If you are not ready to file a report, but wish to receive confidential support and advocacy, please contact CARE at SARC: <http://students.ucsd.edu/sponsor/sarc/> CARE at SARC provides violence prevention education for the entire UCSD campus and offers free and confidential services for students, staff and faculty impacted by sexual assault, relationship violence and stalking. Accessing resources at CARE at SARC will not constitute a report to the University.

**Counseling and Psychological Services (CAPS):** College life can be stressful, and it is normal to feel overwhelmed at times. UCSD has a staff of professionals who are available for confidential meetings to discuss any personal concerns you might have. Feel free to contact CAPS at any time to set up an appointment: <https://caps.ucsd.edu/>

## TENTATIVE SCHEDULE OF TOPICS:

### **Week 1**

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#### **June 28:**

Introduction/ Course overview

Brain and Intelligence in Comparative Perspective

Roth, G., & Dicke, U. (2005). Evolution of the brain and intelligence. *Trends in cognitive sciences*, 9(5), 250-257.

#### **June 30:**

Organization of the Nervous Systems

Lecture Notes

Organization of the Primate Brain

Allen, J. S. (2009). Chapter 2: The human brain in brief. *The Lives of the Brain*. Harvard University Press. Pp. 6-35

### **Week 2**

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#### **July 5:**

Evolutionary Principles: Evolution of Brain Size

Holloway, Ralph L. (2009). Brain Fossils: Endocasts. Squire, Larry R. (ed.) *Encyclopedia of Neuroscience*. Pp. 353-361). Oxford: Academic Press.

Du, A., Zipkin, A. M., Hatala, K. G., Renner, E., Baker, J. L., Bianchi, S., ... & Wood, B. A. (2018). Pattern and process in hominin brain size evolution are scale-dependent. *Proc. R. Soc. B*, 285.

Robin, E. D. (1973). The evolutionary advantages of being stupid. *Perspectives in Biology and Medicine*, 16(3), 369-380.

**July 7: \*\*\* PAPER PROPOSAL DUE \*\*\***

Evolutionary Principles: Brain Reorganization

Striedter, Georg F. (2005). Chapter 5: Evolutionary changes in brain region size. *Principles of Brain Evolution* (pp. 137-176). Sinauer Associates.

**Week 3**

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**July 12: \*\*\*\*\* MIDTERM EXAMINATION\*\*\*\*\***

Human Brain and Primate Brain Evolution

Barton, R. A. (2006) Primate brain evolution: integrating comparative, neurophysiological, and ethological data. *Evolutionary Anthropology* 15:224-236.

Rilling, James K. (2006). Human and nonhuman primate brains: are they allometrically scaled versions of the same design? *Evolutionary Anthropology* 15(2), 65-77.

**July 14:**

The Evolving Cortex: Gross Features

Aldridge K (2011) Patterns of differences in brain morphology in humans as compared to extant apes. *J Hum Evol* 2011:94–105.

The Evolving Cortex: Microstructural Features

Bianchi, S., Stimpson, C. D., Bauernfeind, A. L., Schapiro, S. J., Baze, W. B., McArthur, M. J., ... & Sherwood, C. C. (2013). Dendritic morphology of pyramidal neurons in the chimpanzee neocortex: regional specializations and comparison to humans. *Cerebral cortex*, 23(10), 2429-2436.

Raghandi, M. A., Edler, M. K., Stephenson, A. R., Munger, E. L., Jacobs, B., Hof, P. R., Sherwood, C. C., Holloway, R. L., Lovejoy, C. O. (2018) A neurochemical hypothesis for the origin of hominids. *Proc Natl Acad Sci* 115(6): E1108-E11162.

**Week 4**

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**July 19:**

Evolution of Language Networks

Schenker, N. M., Hopkins, W. D., Spocter, M. A., Garrison, A. R., Stimpson, C. D., Erwin, J. M., ... & Sherwood, C. C. (2009). Broca's area homologue in chimpanzees (*Pan troglodytes*): probabilistic mapping, asymmetry, and comparison to humans. *Cerebral Cortex*, 20(3), 730-742.

Aboitiz, F., & Garcia, R. (1997). The evolutionary origin of the language areas in the human brain. A neuroanatomical perspective. *Brain Research Reviews*, 25(3), 381-396.

Stout, D., & Chaminade, T. (2009). Making tools and making sense: complex, intentional behaviour in human evolution. *Cambridge Archaeological Journal*, 19(1), 85-96.

**July 19:**

The Limbic System and Social Brain Networks

Lew, C. H. & Semendeferi, K. (2017) Evolutionary specializations of the human limbic system. Kaas, J. (ed.) *Evolution of Nervous Systems* (2nd edition), Pp 277–291. Elsevier

Pessoa, L. (2008). On the relationship between emotion and cognition. *Nature reviews neuroscience*, 9(2), 148.

Shultz, S., & Dunbar, R. I. (2012). Social cognition and cortical function: an evolutionary perspective. Schulkin, J. (ed.) *Action, perception and the brain: adaptation and cephalic expression*. New York:Palgrave Macmillan.

## **Week 5**

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**July 26: \*\*\* FINAL PAPER DUE \*\*\***

### Evolution and Brain Development

Leigh, S. R. (2004). Brain growth, life history, and cognition in primate and human evolution. *American Journal of Primatology* 62(3), 139-164.

**July 26:**

### Disorders/Lesion Studies

Hanson, K. L., Hrvoj-Mihic, B., & Semendeferi, K. (2014). A dual comparative approach: integrating lines of evidence from human evolutionary neuroanatomy and neurodevelopmental disorders. *Brain, behavior and evolution*, 84(2), 135-155.

**Read one of the following:**

Petanjek, Z., & Kostović, I. (2012). Epigenetic regulation of fetal brain development and neurocognitive outcome. *Proceedings of the National Academy of Sciences*, 109(28), 11062-11063.

Gazzaniga, M. S. (2005). Forty-five years of split-brain research and still going strong. *Nature Reviews Neuroscience*, 6(8), 653.

Ramachandran, V. S., & Rogers-Ramachandran, D. (2000). Phantom limbs and neural plasticity. *Archives of neurology*, 57(3), 317-320.

**\*\*\*\* Final examination: Saturday, July 30, 3-5:59 PM \*\*\*\***