

## Human brain variation: the varieties of mental experience

MWF 12-12:50

Room 105 Anthropology

Prof. Mascaro: Room 304 Anthropology, 7-4021, [jmascar@emory.edu](mailto:jmascar@emory.edu)

Office hours: Thursday 2-4, or by appointment

### Guest appearances from Prof. Carol Worthman and Prof. Todd Preuss

**Course outline:** Anthropology has a long history of investigating human variation with the goal of understanding the genetic, environmental, and epigenetic sources of variation existing within and between human populations. Yet the field has historically focused on variation from the neck down. This course will be a multi-disciplinary look at the sources, causes, and consequences of human brain variation. To set the tone for the course, we will first look at the problematic ways in which human brain variation has been approached in the past and continues to be studied by some researchers today. Next, we will examine the extent of human brain variation: just how much is there? How “plastic” are human brains? In the rest of the course, we will unpack the sources and effects of human brain variation in order to understand how and why human brains vary across time and space. Throughout the course we will introduce the varied methodologies used to study brain variation, including functional and structural neuroimaging and genetic and epigenetic analyses.

**A note about what this course is not:** Brain variation is a large topic and for this reason we will specify our scholarly boundaries at the outset. Our interest will primarily be in “healthy” variation; that is, we will **not** spend a lot of time on neuropathologies, brain injury, or brain rehabilitation.

**Course goals:** Students will develop critical reading skills important for analyzing articles in the popular press that deal with human brain variation. They will gain an understanding of the methodologies used to study human brain plasticity and variation, and explore the sources and consequences of brain plasticity and variation.

**General advice:** **Read and keep this syllabus.** It is your permanent guide to the course and your responsibilities. **This is your contract with us, and by staying here you agree to it.** This syllabus is a general plan for the course. Deviations may be necessary in the course of the semester. Changes will be both announced in class and posted on Blackboard. **It is the responsibility of every student to keep informed and be aware of any such changes.**

**Readings:** Readings will be posted on Blackboard. Reading assignments are listed in *italics* and are due by the class under which they are listed.

**Students with particular needs:** Any students with disabilities needing assistance in class may receive classroom accommodations through the Emory Office of Disability Services, or ODS (<http://www.ods.emory.edu/>). To make any accommodations for this course, you must communicate with ODS. To be fair and consistent to everyone, Dr. Mascaro can *only* provide special accommodations if they are sent directly from the ODS.

**Late /missed work:** Assignments that are handed in past their due date, or quizzes that are missed and need to be made up, will only be accepted if it is accompanied by one of the following:

- 1) A doctor's note verifying an illness that creates an inability to complete the assignment
- 2) A note from an Emory administrative office (such as the Dean's Office) explaining the circumstances that require you to miss or hand in the assignment on time (for example, a death in the family)
- 3) A note from the IT office at Emory explaining specific technological difficulties that *directly* prevented you from passing in an assignment on time (please note that this is not a guarantee of acceptance, as computers are available for student use at the library and elsewhere on campus)
- 4) Prior arrangement with Dr. Mascaro ***at least two class periods in advance***. This pertains to, among other reasons, religious holidays that overlap with class sessions or exams. This arrangement must be confirmed by Dr. Mascaro; sending an email with no follow-up is not sufficient.

Any assignments turned in past their due date without any of the above approved excuses will be accepted for half (50%) credit **up to two days** after the deadline. Any assignments turned in more than two days past their deadline without any of the above approved excuses **will not be accepted**.

**\*\*\*HONOR CODE REMINDER\*\*\***

***\*\*An important reminder about the HONOR CODE: Every student who applies to and is accepted by Emory College, as a condition of acceptance, agrees to abide by the provisions of the Honor Code so long as he or she remains a student at Emory College. By his or her continued attendance at Emory College, a student reaffirms his or her pledge to adhere to the provisions of the Honor Code.***

***Please note:*** Any *appearance* of cheating in this class will result in a referral to the Honor Council. Please remember that conviction on an Honor Code violation carries the possible penalty of a notation on the student's Personal Performance Record, meaning that the student **will not** be accepted to medical, and other professional, schools.

**Grades:**

1. 6 Take-home assignments (25%)
2. Paper synthesis for each speaker (30%)
3. Discussion questions, attendance, and participation (15%)
4. Final paper (30%)

**Particulars:**

1. **6 Take-home assignments (25%):** To be turned in on the dates announced on the syllabus. Detailed instructions found on blackboard.
2. **Paper synthesis for each speaker (30%):** 2 pages, double spaced summary of each invited speaker's talk. Please make every attempt to attend the public talk. If you cannot attend the talk I expect a written explanation 2 class periods prior to the talk, and you will be expected to write a synthesis of the lecture given by the speaker. Papers will be due at the *beginning* of the class following the talk. Please include (if appropriate):
  - a. Summary of the talk
    1. Background and/or historical information
    2. Primary research question
    3. Methodology
    4. Research findings
  - b. At least one paragraph of critical analysis
    1. What did you find most interesting?
    2. Most important?
    3. Most problematic?
    4. What were the most interesting questions asked during the public talk and how did the speaker answer them?
3. **Discussion questions and attendance (15%):** To help you prepare for discussion, students will email 1 discussion question based on ***each*** assigned reading ***by midnight the night before class***. The best question(s) will be read out loud in class and that person will receive a bonus point. Attendance and contribution are mandatory. If you attend every class but rarely or never contribute to class discussions, you will receive 13 of 15 possible points.

4. **Final paper (30%):** Your final paper will be 6-9 pages in length and will be due on the day and time of the final exam: Tuesday, Dec. 16<sup>th</sup> at 8:00a. You will submit a proposal and outline on Dec. 1<sup>st</sup> that will account for 5% of your paper grade. More details on the topic will be provided on the blackboard site and during class.

**Prerequisite – One or more of: Anthropology 210, NBB 201/Anth 200, Psych 103, or Psych 110; or permission of the instructor**

### **Section 1: Lessons in variation: How it's been done and what we have (or haven't) learned**

- Wed. Aug. 27 Syllabus and introduction to the course
- Fri. Aug. 29: Where have we been? Have we learned from our mistakes?
  - *American Association of Physical Anthropologists. ( 1996). AAPA statement on biological aspects of race. American Journal of Physical Anthropology, 101569–570.*
  - *Webinar debate between Agustin Fuentes and Nicholas Wade (link on BB)*
  - **Take home assignment #1 (due at the beginning of this class): Webinar debate**

### **Section 2: Brain basics: anatomy and function (light)**

- Mon Sept. 1 No Class (Labor Day)
- Wed Sept. 3: Basics of brain anatomy and function (**guest lecture by Dr. Todd Preuss**)
  - *Ch. 2 The Human Brain in Brief: The lives of the brain: Human Evolution and the Organ of Mind by John S. Allen*
- Fri Sept. 5: Basics of brain anatomy and function lab
  - *Breedlove Ch. 2 Functional Neuroanatomy: the Nervous System and Behavior*
  - *Rilling (2008)Neuroscientific Approaches and Applications Within Anthropology. Yearbook of Physical Anthropology. [only highlighted portion is required]*
  - **Take home assignment #2 (due the following class): Neuroanatomy lab**
- Mon Sept. 8 Gross anatomy methods (neuroimaging)
  - Tour fMRI facility: meet on the 1<sup>st</sup> floor of PAIS.
  - *Rilling (2008)Neuroscientific Approaches and Applications Within Anthropology. Yearbook of Physical Anthropology. [only highlighted portion is required]*
- Wed Sept. 10 Methods of brain imaging

- *Review: Rilling (2008) Neuroscientific Approaches and Applications Within Anthropology. Yearbook of Physical Anthropology. [only highlighted portion is required]*

### **Section 3: How variable is the human brain? How do we know?**

- **Fri Sept. 12** Methods applied: How do we measure structural and functional plasticity?
  - *Ch. 5 The Plastic Brain in: The lives of the brain: Human Evolution and the Organ of Mind by John S. Allen*
- **Mon Sept. 15** Methods: genetics (**guest lecture by Dr. Todd Preuss**)
  - *Vargha-Khadem, Faraneh, et al. "FOXP2 and the neuroanatomy of speech and language." Nature Reviews Neuroscience 6.2 (2005): 131-138.*
  - *Preuss, Todd M. "Human brain evolution: From gene discovery to phenotype discovery." Proceedings of the National Academy of Sciences 109. Supplement 1 (2012): 10709-10716.*
- **Wed Sept. 17** Application of methods papers
  - *Human Biological Variation. Ch. 13. Population Structure and Population History*
- **Fri Sept. 19** The Social Mind A Festschrift Symposium Honoring the Career of Frans de Waal, PhD
  - **Take home assignment #3 (due the following class): see BB for instructions**
- **Mon Sept. 22** Epigenetics and brain function
  - *Carey N (2012) The Epigenetics Revolution: How Modern Biology is Rewriting Our Understanding of Genetics, Disease, and Inheritance. Columbia University Press, Ch. 3 & 4.*
  - *Buchen, L. Neuroscience: In their nurture. Nature 467, 146-148 (2010) | doi:10.1038/467146a*  
<http://www.nature.com/news/2010/100908/pdf/467146a.pdf>
  - *Optional: [http://www.nature.com/news/society-don-t-blame-the-mothers-1.15693?WT.ec\\_id=NATURE-20140814](http://www.nature.com/news/society-don-t-blame-the-mothers-1.15693?WT.ec_id=NATURE-20140814)*
- **Wed Sept. 24** **Guest lecture: Luke Hyde (Public talk in PAIS at 4:00)**
  - *Falk, E. B., Hyde, L. W., Mitchell, C., Faul, J., Gonzalez, R., Heitzeg, M. M., et al. (2013). Neuroscience meets Population Science: What is a representative brain? Proceedings of the National Academy of Sciences, 110, 17615-17622*
  - *Optional: Paus, T. (2010). Population neuroscience: Why and how. Human Brain Mapping, 31, 891-903.*
- **Fri Sept. 26** Epigenetics and brain function

- *J Blaze and TL Roth. 2013. Epigenetic mechanisms in learning and memory. Wiley Interdisciplinary Reviews: Cognitive Science. 4:105-115.*

#### **Section 4: Mechanisms of plasticity: How does the brain change?**

- Mon Sept. 29 Mechanisms of plasticity: development
  - *Kolb, Bryan, and Robbin Gibb. "Searching for the principles of brain plasticity and behavior." Cortex (2013).*
- Wed Oct. 1 Mechanisms of plasticity: adulthood
  - <http://www.nature.com.proxy.library.emory.edu/scientificamerican/journal/v298/n3/pdf/scientificamerican0308-54.pdf>
  - *review: Kolb, Bryan, and Robbin Gibb. "Searching for the principles of brain plasticity and behavior." Cortex (2013).*
- **Fri Oct. 3 Guest speaker: Bradley Cooke from GSU (Public talk in PAIS at 4:00)**
  - *Cooke, Bradley M., and Deep Shukla. "Double helix: reciprocity between juvenile play and brain development." Developmental cognitive neuroscience 1.4 (2011): 459-470.*

#### **Section 5: Development happens**

- Mon Oct. 6 Developmental trajectories
  - *Edwards, Carolyn Pope, and Marianne Bloch. "The Whitings' concepts of culture and how they have fared in contemporary psychology and anthropology." Journal of Cross-Cultural Psychology 41.4 (2010): 485-498.*
- Wed Oct. 8 Developmental trajectories, cont. [Carol Worthman]
  - *Nowakowski, Matilda, et al. Confluence of individual and caregiver influences on socioemotional development in typical and atypical populations.(Ch. 5) in Worthman, Carol M., Paul M. Plotsky, Daniel S. Schechter, and Constance A. Cummings, eds. 2010. Formative experiences: The interaction of caregiving, culture, and developmental psychobiology. Cambridge, UK: Cambridge Univ. Press.*
- Fri Oct. 10 Developmental trajectories, cont.
  - Movie day: Babies (2010)
  - **Take home assignment #4 (due the following class): see BB for instructions**
- Mon Oct. 13 No Class (Fall Break)
- Wed Oct. 15 Psychoneuroendocrinology; Sex and Gender
  - <http://blogs.scientificamerican.com/primate-diaries/2014/06/12/does-nature-need-to-be-nurtured/>

- <http://www.nature.com.proxy.library.emory.edu/scientificamerican/journal/v21/n2s/pdf/scientificamericanbrain0512-12.pdf>
- *Optional: Miller, David I., and Diane F. Halpern. "The new science of cognitive sex differences." Trends in cognitive sciences 18.1 (2014): 37-45.*
- Fri Oct. 17 Life history theory and the brain (life changes: adolescence, aging, becoming a parent) [Carol Worthman]
  - Hill, Kim. "Life history theory and evolutionary anthropology." Evolutionary Anthropology: Issues, News, and Reviews 2.3 (1993): 78-88.*

### **Section 6: Life happens: Effects of the environment on brain structure and function**

- Mon Oct. 20 Psychoneuroimmunology
  - *Raison, Charles L., and Andrew H. Miller. "Malaise, melancholia and madness: the evolutionary legacy of an inflammatory bias." Brain, behavior, and immunity 31 (2013): 1-8.*
- Wed. Oct. 22 Poverty and stress
  - *Mani, Anandi, et al. "Poverty impedes cognitive function." science 341.6149 (2013): 976-980.*
  - *Kim, Pilyoung, et al. "Effects of childhood poverty and chronic stress on emotion regulatory brain function in adulthood." Proceedings of the National Academy of Sciences 110.46 (2013): 18442-18447.*
  - *Optional: Hackman, Daniel A., Martha J. Farah, and Michael J. Meaney. "Socioeconomic status and the brain: mechanistic insights from human and animal research." Nature Reviews Neuroscience 11.9 (2010): 651-659.*
- Fri Oct. 24 Poverty and stress, cont.
  - *Griskevicius, Vladas, et al. "The influence of mortality and socioeconomic status on risk and delayed rewards: a life history theory approach." Journal of personality and social psychology 100.6 (2011): 1015.*
- Mon Oct. 27 Nutrition and Malnutrition
  - *Cryan, John F., and Timothy G. Dinan. "Mind-altering microorganisms: the impact of the gut microbiota on brain and behaviour." Nature Reviews Neuroscience 13.10 (2012): 701-712.*
  - *Prado, Elizabeth L., and Kathryn G. Dewey. "Nutrition and brain development in early life." Nutrition reviews 72.4 (2014): 267-284.*
- Wed Oct. 29 Activity and movement
  - *Vaynman & Gomez-Pinilla (2006). Revenge of the sit: how lifestyle impacts neuronal and cognitive health through molecularly systems that interfaces with*

*energy metabolism with neuronal plasticity. Journal of Neuroscience research, 84, 699-715.*

- Fri Oct. 31 Let's get physical
  - Downey, Greg. "Scaffolding Imitation in Capoeira: Physical Education and Enculturation in an Afro-Brazilian Art." *American Anthropologist* 110.2 (2008): 204-213.
  - Calvo-Merino, Beatriz, et al. "Action observation and acquired motor skills: an fMRI study with expert dancers." *Cerebral cortex* 15.8 (2005): 1243-1249.
  
- Mon Nov. 3 Neuroenhancement: Big brains, big money
  - Greely, Henry, et al. "Towards responsible use of cognitive-enhancing drugs by the healthy." *Nature* 456.7223 (2008): 702-705.
  - <http://www.radiolab.org/story/9-volt-nirvana/>
  
- Wed Nov. 5 Neuroenhancement: Big brains, big money
  - <http://www.scientificamerican.com/article/neurofeedback-increases-affection-builds-empathy/>
  - Fox, Douglas. "The limits of intelligence." *Scientific American* 305.1 (2011): 36-43.
  - Optional: <http://www.scientificamerican.com/podcast/episode/how-physics-limits-intelligence-11-06-17/>
  
- Fri Nov. 7 Religious and ritual behaviors
  - Brewer, Judson A., et al. "Meditation experience is associated with differences in default mode network activity and connectivity." *Proceedings of the National Academy of Sciences* 108.50 (2011): 20254-20259.
  - <http://www.theatlantic.com/health/archive/2014/06/the-dark-knight-of-the-souls/372766/>

### **Section 7: Culture happens: Effects of culture on brain structure and function**

- Mon Nov. 10 Neuroanthropology: introduction
  - *Context and Complexity in Human Biological Research*; T. Leatherman and A. Goodman; in McKinnon, Susan, and Sydel Silverman, eds. 2005. *Complexities: Beyond nature and nurture*. Chicago: Univ. of Chicago Press. [highlighted portion only]
  - Ch. 2 *Neuroanthropology and the Encultured Brain*. in Lende, Daniel and Downey, Greg, eds. 2012. *The Encultured Brain*. Cambridge, UK: The MIT Press.
  - Optional: Domingues Duque SCAN 2010; *Neuroanthropology: a humanistic science for the study of the culture–brain nexus*

- **Wed Nov. 12 Guest speaker: Daniel Lende (Public talk in PAIS at 4:00 on Thursday, Nov. 13)**
  - *Ch. 13 Addiction and Neuroanthropology. in Lende, Daniel and Downey, Greg, eds. 2012. The Encultured Brain. Cambridge, UK: The MIT Press.*
- Fri Nov. 14 Neuroanthropology: embodiment
  - *Ch. 9 Embodiment and Male Vitality in Subsistence Societies. in Lende, Daniel and Downey, Greg, eds. 2012. The Encultured Brain. Cambridge, UK: The MIT Press.*
- Mon Nov. 17 Neuroanthropology: mental illness in context
  - *Luhrmann, Tanya. 2012: 'Living with Voices.' American Scholar. Summer: 49-60. <http://theamericanscholar.org/living-with-voices/#.U8k6AvldV8E>*
  - *Luhrmann, Tanya. 2012: 'Beyond the brain.' Wilson Quarterly Summer: 28-34. [http://archive.wilsonquarterly.com/sites/default/files/articles/Luhrmann\\_Schizophrenia.pdf](http://archive.wilsonquarterly.com/sites/default/files/articles/Luhrmann_Schizophrenia.pdf)*
- Wed Nov. 19 Neuroanthropology: mental illness in context
  - Movie day: Shadows and Illuminations (2010)
  - **Take home assignment #5 (due the following class): see BB for instructions**
- Fri Nov. 21 Cultural Neuroscience
  - *Han, S., Northoff, G. (2008). Culture-sensitive neural substrates of human cognition: a transcultural neuroimaging approach. Nature Reviews Neuroscience, 9, 646–54.*
  - *Chiao et al (2010). Theory and methods in cultural neuroscience. SCAN, 5, 356-361.*
- Mon Nov. 24 Cultural Neuroscience
  - *Kim & Sasaki (2014). Cultural Neuroscience: biology of the mind in cultural contexts. Annual Review of Psychology, 65, 487-514.*
  - *Han, Shihui, and Yina Ma. "Cultural differences in human brain activity: A quantitative meta-analysis." NeuroImage (2014).*
- Wed Nov. 26 No class (Thanksgiving)
- Fri Nov. 28 No Class (Thanksgiving)
- Mon Dec. 1 **Final paper proposal and outline due (see BB for details)**
  - Discussion of final paper proposals. Come prepared to give a 5 minute synopsis of your topic and what you've learned so far in order to get feedback. Also be prepared to give feedback to your classmates.
- Wed Dec. 3 Cultural Neuroscience

- Chiao, Joan Y., et al. "Cultural specificity in amygdala response to fear faces." *Journal of Cognitive Neuroscience* 20.12 (2008): 2167-2174.
- Chiao, Joan Y., et al. "Dynamic cultural influences on neural representations of the self." *Journal of Cognitive Neuroscience* 22.1 (2010): 1-11.
- Fri Dec. 5 Wrap up
  - Seligman, Rebecca, and Ryan A. Brown. "Theory and method at the intersection of anthropology and cultural neuroscience." *Social cognitive and affective neuroscience* 5.2-3 (2010): 130-137.
  - <http://www.radiolab.org/story/runners/>
  - **Take home assignment #6 (due at the beginning of this class): see BB for instructions**
  
- Mon Dec. 8 (Last class)
  - Wrap-up: what have we learned?

**Tuesday, December 16<sup>th</sup> 8:00 am** Final Exam: Final paper due