

PSYC G4485 -- Affective Neuroscience

Spring 2014

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I. Bulletin description

PSYC G4485: Affective Neuroscience

Where: 409 Schermerhorn Hall (MobbsLab)

When: Fall 2013, Tuesday 10.10 – 12noon

Office Hours: Tuesday 12-1pm and Wednesday 3-4pm

Prerequisites: PSYC W1001 plus W1010 or 2450 or equivalent, plus permission of the instructor.

This seminar explores the neural systems and behaviors that underlie human, and sometimes animal, emotions. Question will include: why we have emotions, what is their survival value, why do we find funny jokes rewarding, and why we envy, feel guilt or joyfully embrace love. We will review some of the latest literature on these topics and discuss implications for understanding human behavior. We will finally discuss disorders such as depression, anxiety, aggression, and psychopathy that are associated with disruptions to the neural systems that regulate healthy emotion.

II. Full course description:

Emotions are at the forefront of most human endeavours. Emotions aid us in decision-making (gut feelings), help us remember, torment us, yet have ultimately helped us to survive. Over the past few decades, we have begun to characterize the neural systems that extend from primitive affective response such as fight or flight to the complex emotions experienced by humans including guilt, envy, empathy and social pain. This course will begin with an in-depth examination of the neurobiological systems that underlie negative and positive emotions and move onto weekly discussions, based on assigned journal articles that highlight both rudimentary and complex emotions. The final weeks will be devoted to exploring how the neurobiological systems are disrupted in affective disorders including anxiety, aggression and psychopathy. In addition to these discussions and readings, each student will be required to write a review paper on a topic related to one of the emotions discussed in these seminars and its underlying neural mechanisms.

III. Rationale for giving the course:

PSYC G4485 is an advanced seminar, designed particularly for graduate students, for advanced undergraduates who are majoring in Psychology or in Neuroscience and Behavior, and for students participating in the Psychology Postbac Certificate Program. These students will have priority in registration, followed by junior majors followed by non-majors.

The seminar will be well suited to students who have completed at least one neuroscience course beyond W1001, such as W1010 (Mind, Brain, and Behavior) or W2450 (Behavioral Neuroscience). These seminars will help students to develop their oral, written, presentation and theorizing skills.

Students who complete this seminar will learn to: 1) understand experimental methods used in affective neuroscience; 2) will learn about the neural systems that underlie both complex and basic emotions; 3)

critically read and interpret the primary research literature and discuss the strengths and weaknesses of experimental results; 4) conduct literature searches and synthesize these searches into a comprehensive literature review/short movie.

Prof. Mobbs' permission to join the class is **required**. Attendance at the first day of class is **required**.

Each week, students will participate in a two-hour seminar. Class time will be devoted to the presentation and discussion of journal articles. The publications have been chosen to cover the classic and currently most exciting research in Affective Neuroscience, and to serve as a stimulus for discussion. **Two/three students sign up to present and lead the discussion each week.**

IV. Schedule of topics and readings [subject to revision]:

This course will systematically review the main topics of Affective Neuroscience such as:

- 1) **Introduction to Affective Neuroscience**
- 2) **The Anatomy of the Emotional Brain**
- 3) **Context and Emotion**
- 4) **Reward and control**
- 5) **Social Emotions**
- 6) **Emotion and Decision Making**
- 7) **Understanding Other's Emotions**
- 8) **Emotion and Cognition**
- 9) **Aggression and Psychopathy**
- 10) **Fear and Survival**
- 11) **Social Learning of Fear**
- 12) **Affective Disorders**

Two/three students will present the outlines of allocated papers, followed by open discussion.

The reading list and weekly schedule

Readings: No textbook is required, but assigned readings will be made available in pdf format through CourseWorks (<https://courseworks.columbia.edu>).

Week 1: Tuesday 21st January.

This is a lecture by Prof. J LeDoux from NYU. He gives a great overview of the emotional circuits we will talk about. Please view this before the next lecture.

Movie: <http://www.youtube.com/watch?v=tjhCPhhzBqQ>

Week 2: Tuesday 28th January

Introduction to Affective Neuroscience

Dalgleish T., Dunn. B., Mobbs, D. (2009). Affective Neuroscience: Past, present and future. Volume 1, Issue 4. *Emotion Reviews*.

Example presentation

Mobbs, D., Yu, R., Eich, H., Rowe, J., FeldmanHall, O., Dalgleish, T. (2010). Neural activity associated with monitoring the oscillating threat value of a Tarantula. *Proc Natl Acad Sci. USA*. 107(47):20582-6.

Week 3: Tuesday 4th February.

Brief anatomy lesson (Prof. Mobbs).

The anatomy of the emotional brain

NAME: Kim Hodges

Price, J. L., and Drevets, W.C. (2010). Neurocircuitry of Mood Disorders. *Neuropsychopharmacology*, 35, 192-216.

NAME: Gloria Dimino

Haber, S. N., Knutson, B. (2010). The reward circuit: Linking primate anatomy and human imaging. *Neuropsychopharmacology*, 35, 4-26.

Week 3: Tuesday 11th February.

NAME: Jaclyn Willner

Context, Memory and Emotion

Schachter, S., & Singer, J. (1962). Cognitive, Social, and Physiological Determinants of Emotional State. *Psychological Review*, 69, pp. 379–399.

NAME: Chelsea Ryan

Dutton, D. G. and Aron, A. P. (1974). Some evidence for heightened sexual attraction under conditions of high anxiety. *Journal of Personality and Social Psychology*, 30(4), 510–517.

NAME: Sonalee Rau

Schiller, D., Kanen, J.W., LeDoux, J.E., Monfils, M.H., & Phelps, E.A. (2013). Extinction during reconsolidation of threat memory diminishes prefrontal cortex involvement. *Proceedings of the National Academy of Sciences*

Week 4: Tuesday 18th February.

Reward and control

NAME: Denzel Woode

Hare, T.A., Camerer, C.F., Rangel, A. (2009) Self-control in decision-making involves modulation of the vmPFC valuation system. *Science*, 324:646-648.

NAME: Benjamin Schechner

Morewedge, C.K. Young E. Vosgerau. J. Thought for Food: Imagined Consumption Reduces Actual Consumption. *Science* 10 December 2010: 1530-1533.

Week 6: Tuesday 25th February.

Confidence

NAME: Loxley Bennett

Somerville, L. H., Kelley, W. M., & Heatherton, T. F. (2010). Self-esteem modulates medial prefrontal cortical responses to evaluative social feedback. *Cerebral Cortex*, 20 (12), 3005-3013.

NAME: Chelsea Ryan

Kruger, Justin; David Dunning (1999). "Unskilled and Unaware of It: How Difficulties in Recognizing One's Own Incompetence Lead to Inflated Self-Assessments". *Journal of Personality and Social Psychology* 77 (6): 1121–34.

Week 7: Tuesday 4th March
Emotion and Decision Making

NAME: G. Dimino

Anderson, E., Siegel, E. H., Bliss-Moreau, E., & Barrett, L. F. [The visual impact of gossip](#) (2011). *Science*, 332, 1446-1448.

NAME: Ryan Barrera

Zaki, J., & Mitchell, J. (2011). Equitable decision making is associated with neural markers of subjective value. *PNAS*, 108 (49), 19761-19766.

NAME: Katie Lee

Wimmer, G.E. & Shohamy, D.(2012) Preference by association: How memory mechanisms in the hippocampus bias decisions. *Science*, 338, 270-273.

Week 8: Tuesday 11th March
Emotion, Control and Cognition

13) NAME: Adam Zerihoun

Berkun, M. M., Bialek, H. M., Kern, R. P., & Yagi, K. (1962) Experimental studies of psychological stress in man. *Psychological Monographs*, 76(15, Whole No. 534).

NAME: Sonalee Rau

Chib, V. S., De Martino, B., Shimojo, S., & O'Doherty, J. P. (2012). Neural mechanisms underlying paradoxical performance for monetary incentives are driven by loss aversion. *Neuron*, 74(3), 582-594.

Optional Background Reading:

Wegner, D. M. (2009). How to think, say, or do precisely the worst thing for any occasion. *Science*, 325, 48-51.

Mobbs, D., Hassabis, D., Seymour, B., Marchant, J., Weiskopf, N., Dolan, R.J., Frith, C.D. (2009). Choking on the money: Incentive-induced performance decrements in a reward pursuit task. *Psychological Science*. 20 (8), 955.

Ochsner, K. N. & Gross, J. J. (2005). The cognitive control of emotion. *Trends in Cognitive Sciences*, 9(5), 242-249

Week 9 Tuesday 18th March NO CLASS
Spring Recess (March 17th-21)

Week 10: Tuesday 25th March
Understanding Other's Emotions

NAME: Ryan Barrera

Harenski, C. L., Thornton, D. M., Harenski, K. A., Decety, J., & Kiehl, K. A. (2012). Increased fronto-temporal activation during pain observation in sexual sadism. *Archives of General Psychiatry*, 69, 283-292.

NAME: Katie Lee

Zaki, J., Weber, J., Bolger, N., & Ochsner, K. (2009). The neural bases of empathic accuracy. *PNAS*, 106(27), 11382-11387.

NAME: Denzel Woode

Weng, H. Y., Fox, A. S., Shackman, A. J., Stodola, D. E., Caldwell, J. Z. K., Olson, M. C., Rogers, G. M., & Davidson R. J. (2013). Compassion training alters altruism and neural responses to suffering. *Psychological science*, 24(7), 1171-80

Optional Background Reading:

Zaki, J., & Ochsner, K. N. (2012). The neuroscience of empathy: Progress, pitfalls and promise. *Nature Neuroscience*.

Week 11: Tuesday 1st April (MOVIE/PAPER OUTLINE DUE)

Morality and decision making

NAME: Loxley Bennett

Rand DG, Greene JD, Nowak MA (2012) Spontaneous giving and calculated greed. *Nature*, 489, 427–430.

NAME: Jaclyn Willner

Shenhav, A., Greene, J.D. (2010). Moral judgments recruit domain-general valuation mechanisms to integrate representations of probability and magnitude. *Neuron*, 67, 667-677.

Optional Background Reading:

Buckholtz, JW, Kiehl KA. 2010. Inside the Mind of a Psychopath. *Scientific American Mind*.

Week 12: Tuesday 8th April

Fear and Survival

NAME: Adam Zerihoun

Satpute, A. B., Wager, T. D., Cohen-Adad, J., Bianciardi, M., Choi, J-K., Buhle, J., Wald, L. L., & Barrett, L. F. (2013). Identification of discrete functional subregions of the human periaqueductal gray. *Proceedings of the National Academy of Sciences*, 110, 17101-6

NAME: Benjamin Schechner

Somerville, L. H., Whalen, P. J., & Kelley, W. M. (2010). Human bed nucleus of the stria terminalis indexes hypervigilant threat monitoring. *Biological Psychiatry*, 68 (5), 416-424.

Optional Background Reading:

Ledoux, J.E. (2012) Rethinking the Emotional Brain. *Neuron*, 73, Issue 4, Pages 653-676.

Week 13: Tuesday 15th April .

Social Learning of Fear

NAME: Anastasia Anazonwu

Olsson, A. & Phelps, E. A. (2004). Learned Fear of 'Unseen' Faces after Pavlovian, Observational, and Instructed Fear. *Psychological Science*, 15(12), 822-828.

NAME: Samantha Ayoub

Eisenberger, N.I., Master, S.L., Inagaki, T.I., Taylor, S.E., Shirinyan, D., Lieberman, M.D., & Naliboff, B. (2011). Attachment figures activate a safety signal-related neural region and reduce pain experience. *Proceedings of the National Academy of Sciences*, 108, 11721-6.

Optional Background Reading:

Olsson, A. & Phelps, E. A. (2007). Social Learning of Fear. *Nature Neuroscience*, 10, 1095-1102.

Week 14: Tuesday 22nd April .

Missed talks

Week 15: Tuesday 30th April .

Fear, Anxiety and Depression

NAME: Samantha Ayoub

Nili U, Goldberg H, Weizman A, Dudai Y (2010). Fear thou not: activity of frontal and temporal circuits in moments of real-life courage. *Neuron* 66, 949-962.

NAME: Anastasia Anazonwu

Mayberg HS, Lozano A, Voon V, McNeely H, Seminowicz D, Hamani C, Schwalb J, Kennedy S (2005). Deep Brain Stimulation for Treatment Resistant Depression; *Neuron*, 45:651-660.

NAME: Kim Hodges

Indovina, I., Robbins, T., Nunez-Elizalde, A., Dunn, B., Bishop, S.J. (2011) Fear-Conditioning Mechanisms Associated with Trait Vulnerability to Anxiety. *Neuron* 69, 563-571.

Optional Background Reading:

Ressler KJ, Mayberg HS (2007). Targeting abnormal neural circuits in mood and anxiety disorders: from the laboratory to the clinic, *Nature Neuroscience* 10(9):1116-1124.

V. Course requirements and grading [subject to revision]:

Participation in Journal Article Discussions (20%): All students are expected to participate in weekly discussions. As participation in seminar courses is of paramount importance, it is assumed that students will make every effort to attend each seminar meeting. If medical or other emergencies keep a student from attending class, an email (dm2912@columbia.edu) or phone call (212-854-5318) is required before class to explain the absence.

Presentation of Journal Articles (40%): Each student will be required to present two assigned journal articles . Students are expected to present a “walk through” of the article’s Introduction, Methods, Results, and Discussion. During Week 1, students will be provided with examples of how these presentations should be conducted.

Choice of short movie OR Literature Review:

Outline of literature review or movie transcript (10%): Each student should submit a short 1 page outline of their topic. This includes a title, and 1 to 3 sentences under 5 sections:

- (1) Introduction
- (2) Main question of importance
- (3) Neural systems that underlie this question
- (4) Briefly describe the main studies (e.g. two most important studies)
- (5) Critical evaluation of these studies.

This outline is due **Tuesday 1st April . No exceptions will be made for this deadline.**

OPTION 1: Literature Review (30%): Students are required to write an original, independent literature review. The topic of the review is chosen by the student, but will require approval of the instructor. Rather than simple regurgitation of previous studies and theories, emphasis will be on the creative thinking and theoretical advances of the paper. These literature reviews will be 10-15 pages in length (double-spaced, 1in margins), have at least 15 citations, written in accordance with the APA style guidelines, and submitted on the final day of class, **Tuesday 22nd April.** No exceptions will be made for this deadline.

OR

OPTION 2: Short Movie (30%): All students are required to produce a short movie which should accompany a **transcript** of what is said in the short movie. The topic of the review is chosen from a set of brain structures/circuits provided by the instructor. These short movies will be around 10 minutes and submitted (Via Dropbox) on the final day of class **Tuesday 22nd April** No exceptions will be made for this deadline.

Details of the Short movie:

Each subject will write a transcript and present it on camera. The movie will be on a specified brain structure and should be between 5-10 minutes long. These include the following:

Amygdala, Periaqueductal gray, Hypothalamus, Ventromedial prefrontal cortex, Dorsal raphe nuclei, Bed nucleus of the stria terminalis, Ventral tegmental area, Insula, Subgenual anterior cingulate cortex, Habenula, Posterior cingulate cortex, MPFC network.

Like the literature review, the movie will begin with an (1) introduction and present the (2) location and structure of the brain area (e.g. sub nuclei, neurotransmitters types [dopamine, etc], Brodmann areas if cortical); (3) its basic connections to/from other brain structures, (4) its functions (e.g. what it does). Finally, (5) the movie should contain some critical thinking (e.g. what we don't know about the brain area, problems with the methods used [functional MRI vs optogenetics etc]). When submitting the movie, it should also be accompanied with the transcript. The transcript should be around between 10 pages long (double-spaced, 1in margins) and have at least 10 citations. The movie and transcript will be graded on the five sections mentioned above.

The movie will be graded on content rather editing/movie making abilities. The goal of the movie is to gain the skill of speaking on camera. The movie can include images but this will not be part of grade.

Given the recent advances in technology, iPhones and the like, should provide adequate resolution and sound quality. On request, Prof. Mobbs can provide a digital camera and a location to record. To edit the movie, I recommend iMovie.

Examples of short movies can be found at: <http://www.cell.com/current-biology/home>

