

**Psychology G4225x**  
**Consciousness and Attention** (seminar) 4 points  
Fall 2008. Thursdays 6:10-8 PM. Room 405 Schermerhorn Hall

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**Bulletin description**

Prerequisite: The instructor's permission (to be obtained *prior* to the 1st meeting). Typically the student should have completed an introductory course in cognitive neuroscience, or otherwise be ready for a seminar at the graduate level.

Discussion of current issues in the scientific studies of consciousness, including the search for the neural correlates of visual awareness, volition, and the various kinds of impairments of consciousness and attention as described in clinical cases. Specific topics may vary from year to year; may be repeated for credit.

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- I. The rationale for giving the course
  - II. A full description of the content of the course
  - III. The reading list and weekly syllabus
  - IV. Course requirements
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**I. The rationale for giving the course**

PSYC G4225 is an advanced seminar, designed particularly for undergraduates who are majoring in Psychology or in Neuroscience and Behavior, for students participating in the Post-bac Psychology Program, and for Psychology Graduate Students. Students with a background in the computational sciences and philosophy are also welcome to apply. In covering the cognitive and neural bases of consciousness and attention, the course provides an integrated perspective on topics of current interest in the fields of psychology and cognitive neuroscience. The course is intended to explore the ideas of interest in the broader context of liberal arts education, such as how contemporary philosophical ideas affect our understanding of ourselves as well as the development of science.

The seminar fulfills the following degree requirements:

- For Psychology Graduate Students, PSYC G4225 will apply toward the "two seriously graded seminars" requirement of the Master's degree.
- For the Psychology major or concentration in the College and in G. S., for the Psychology minor in Engineering, and for the Psychology Post-bac certificate, PSYC G4225 will meet the Group I (Perception and Cognition) distribution requirement.
- For the Neuroscience and Behavior joint major, G4225 will fulfill the 5<sup>th</sup> Psychology requirement: "one advanced psychology seminar from a list approved by the Psychology Department advisor to the program."
- For the Psychology post-bac certificate, PSYC G4225 will fulfill the 7th (advanced seminar) requirement
- For the science requirements of the College and GS, G4225 is numbered among the group of courses (3200s, 4200s, 3400s, 4400s) that are not designed for non-science majors but that do fulfill one term of the requirement. Graduate students, and students who are majoring in Psychology or in Neuroscience and Behavior, will

have priority over students who wish to take the course for the science requirement, and we anticipate that it will rarely be used for that purpose.

- For the Barnard Psychology major, PSYC G4225 will fulfill the senior seminar requirement.

## II. A full description of the content of the course

Modern theories attempt to characterize the human mind in terms of information processing. But machines that process information do not seem to *feel* anything; a computer may for instance receive inputs from a video camera, yet it would be hard to imagine that it *sees* or experiences the vividness of colors like we do. Nobody has yet provided a convincing theory as to how to explain the subjective nature of our mental lives in objective physical terms. This is called the problem of consciousness, and is generally considered to be one of the last unsolved puzzles in science. Philosophers even debate whether there could be a solution to this problem at all.

In this seminar we take stock of what has happened in this exciting field of research over the last couple of decades. We review standard cognitive models of consciousness, and look at how they are applied to the interpretation of data collected using the tools of modern cognitive neuroscience. Advances in neuroimaging allowed great strides to be made in this area, and one particular focus in this course would be on the neural correlates of conscious visual perception, a topic on which competing theories abound. The emphasis, however, is not on the biological details of the neural mechanisms, but on how different empirical hypotheses bear on conceptual issues.

The seminars take the follow form: We meet for a roughly two-hour session every week. In the first part we discuss some recent data published in journal articles. Usually we focus on a particular key article, and we try to critically evaluate the results and the interpretations in details so that everybody will be able to take a stance as to whether they are acceptable and appropriate. Then, in the second half of the session, a student will give a presentation, based on a suggested or otherwise approved topic. Graduate students or undergraduate students involved in research can present their on-going work if it is relevant to the topic of the seminar. The presentation will be followed by discussions.

## IV. Reading list and syllabus for Fall 2008 (subject to revision)

Students should familiarize themselves with the background readings, especially the "essential" ones, *before* the first meeting. They must also read carefully the debate paper for the first week in order to participate.

### Background Readings: (\*\* = essential)

\*\*Chalmers D (1995) The Puzzle of Conscious Experience Scientific American 273(6):80-6;

\*\*Rees G, Kreiman G, Koch C (2002) Neural correlates of consciousness in humans. Nat Rev Neurosci 3(4):261-70

\*\*Sergent C, Dehaene S (2004) Neural processes underlying conscious perception: experimental findings and a global neuronal workspace framework. J Physiol Paris. 98(4-6):374-84

\*\* Heeger's lecture notes on signal detection theory <http://www.cns.nyu.edu/~david/handouts/sdt/sdt.html>

Koch C, Tsuchiya N. (2007) Attention and consciousness: two distinct brain processes. Trends Cogn Sci. 11(1):16-22

Lau HC (in press) Volition and the functions of consciousness, in Gazzaniga's (ed.) Cognitive

Neurosciences (latest edition)

Lau HC (2008/in press) Are we studying consciousness yet? In Frontiers of Consciousness (OUP) Edited by Davies M and Weiskrantz L (22 pages double-spaced)

Lau HC. (2008) A higher order Bayesian decision theory of consciousness. Prog Brain Res. 168:35-48.

Debate papers:

**Sep 4** – Goldberg II, Harel M, Malach R. (2006) When the brain loses its self: prefrontal inactivation during sensorimotor processing. Neuron. 50(2):329-39.

**Sep 11** - Soon CS, Brass M, Heinze HJ, Haynes JD.(2008) Unconscious determinants of free decisions in the human brain. Nat Neurosci. 11(5):543-5.

**Sep 18** - Chen Y, Martinez-Conde S, Macknik SL, Bereshpolova Y, Swadlow HA, Alonso JM. (2008) Task difficulty modulates the activity of specific neuronal populations in primary visual cortex. Nat Neurosci. 11(8):974-82.

**Sep 25** - No debate; guest lecture by Prof Shohamy

**Oct 2** - Pearson J, Clifford CW, Tong F. (2008) The functional impact of mental imagery on conscious perception. Curr Biol. 18(13):982-6

**Oct 9** - Sigman M, Sackur J, Del Cul A, Dehaene S. (2008) Illusory displacement due to object substitution near the consciousness threshold. J Vis 21;8(1):13.1-10.

**Oct 16** - Nakamura K, Dehaene S, Jobert A, Le Bihan D, Kouider S. Task-specific change of unconscious neural priming in the cerebral language network. (2007) Proc Natl Acad Sci U S A. 104(49):19643-8.

**Oct 23** - Kouider S, Eger E, Dolan R, Henson RN. (2008) Activity in Face-Responsive Brain Regions is Modulated by Invisible, Attended Faces: Evidence from Masked Priming. Cereb Cortex.

**Oct 30** - Bahrami B, Carmel D, Walsh V, Rees G, Lavie N. (2008) Unconscious orientation processing depends on perceptual load. J Vis 8(3):12.1-10.

**Nov 6** - No debate; guest lecture by Dr Ody

**Nov 13** -van Gaal S, Ridderinkhof KR, Fahrenfort JJ, Scholte HS, Lamme VA.(2008) Frontal cortex mediates unconsciously triggered inhibitory control. J Neurosci. 28(32):8053-62.

**Nov 20** - Schiff ND, Giacino JT, Kalmar K, Victor JD, Baker K, Gerber M, Fritz B, Eisenberg B, Biondi T, O'Connor J, Kobylarz EJ, Farris S, Machado A, McCagg C, Plum F, Fins JJ, Rezai AR. (2007) Behavioural improvements with thalamic stimulation after severe traumatic brain injury. Nature. 448(7153):600-3

**Nov 27** - No meeting; Thanksgiving

**Dec 4** - Saenz M, Koch C. (2008) The sound of change: visually-induced auditory synesthesia. Curr Biol.18(15):R650-1

Suggested topics for presentation:

The readings associated are only suggestions. Some lists are shorter because they involve review papers. The students should independently look for other sources of support to make their own arguments.

**Are metacognitive behavioral measures of awareness useful?**

Persaud N, McLeod P, Cowey A. (2007) Post-decision wagering objectively measures awareness. Nat Neurosci. 10(2):257-61.

Galvin SJ, Podd JV, Drga V, Whitmore J. (2003) Type 2 tasks in the theory of signal detectability: discrimination between correct and incorrect decisions. Psychon Bull Rev. 10(4):843-76.

Schurger A, Sher S. (2008) Awareness, loss aversion, and post-decision wagering. Trends Cogn Sci. 12(6):209-10

Clifford CW, Arabzadeh E, Harris JA. (2008) Getting technical about awareness. Trends Cogn Sci. 12(2):54-8.

### **What is the function of consciousness?**

Lau HC (in press) Volition and the functions of consciousness, in Gazzaniga's (ed.) Cognitive Neurosciences (latest edition)

Rosenthal D (2008) "Consciousness and Its Function" (uncorrected proofs), Neuropsychologia, 46, 3: 829-840.

### **Can we be aware of stimuli to which we pay no attention?**

Koch C, Tsuchiya N. (2007) Attention and consciousness: two distinct brain processes. Trends Cogn Sci. 11(1):16-22

Dehaene S, Changeux JP, Naccache L, Sackur J, Sergent C. (2006) Conscious, preconscious, and subliminal processing: a testable taxonomy. Trends Cogn Sci. 10(5):204-11.

### **What are the roles of neural synchrony in awareness and attention?**

Engel AK, Fries P, Singer W. (2001) Dynamic predictions: oscillations and synchrony in top-down processing. Nat Rev Neurosci. 2(10):704-16.

Uhlhaas PJ, Singer W. (2006) Neural synchrony in brain disorders: relevance for cognitive dysfunctions and pathophysiology. Neuron. 52(1):155-68.

### **How do remember/know judgments in memory relate to conscious awareness?**

Wais PE, Mickes L, Wixted JT. (2008) Remember/know judgments probe degrees of recollection.

J Cogn Neurosci. 20(3):400-5.

Diana RA, Reder LM, Arndt J, Park H. (2006) Models of recognition: a review of arguments in favor of a dual-process account. Psychon Bull Rev. 13(1):1-21. Review.

## **IV. Course requirements (subject to revision)**

Before each class (including the first), everybody should carefully read the target paper for debate. One must take a stance as to whether the results and interpretations are acceptable and appropriate. The 'positive' and 'negative' sides would engage in an informal debate.

One student would lead the debate. At the beginning of the session, the student would need to briefly explain the methodology, what is done, and take us through the figures in the paper. This presentation should take about 15 minutes.

The second part of each meeting is a more formal presentation. After the first meeting, everybody will choose to present in one of the following weeks. The presentation should last for 30-40 minutes, but *not* longer. Clarity and logic count most; fancy, beautiful slides count very little.

A term essay of no more than 3000 words is also required. Alternatively, students could choose to write a research article. This could be shorter in length but must be of publishable quality.

The final grade is determined in the following way: The formal presentation counts for 50%, the presentation that opens the open counts for 20%, participation in the debate counts for 15%, the term paper counts for 10%, general participation counts for 5%.