

NSCI342/PSY342 The Biology of Consciousness FALL2019

Instructor:
Nicholas Hatsopoulos

Course Description

Consciousness has been considered one of great mysteries in human existence. Historically, psychologists and neuroscientists have largely ignored the problem of conscious awareness because it was considered subjective falling outside the realm of scientific inquiry. However, over the past several decades beginning in the late 80's scientists have begun to try to tackle the problem using modern scientific tools. In fact, several years ago, a new journal was established entitled *Neuroscience of Consciousness*.

In this course, we will begin by trying to define the term and consider the so-called "hard" and "easy" problems of consciousness. A brief history of ancient civilizations' views on mental experience will be discussed with particular attention to Greek thinkers from the classical period. We will then go over basic neuroscientific concepts and methods that are being used to study the neural correlates of consciousness. We will explore different states of consciousness and disruptions of consciousness in human patients. We will touch on the related problems of intentionality and free will. Finally, we will discuss prevailing scientific theories of consciousness. Previous knowledge of neuroscience is preferred but not required.

Assignments and Grading

- Midterm test: 20%
- Final paper: [~10-15 pages, double-spaces]: 30%
- In-class presentations: 20%
- Class participation and debates: 30%

1 hour of lecture followed by 30- to 40-minute presentation of a paper/book chapter(s) by one student with discussion from the whole class.

Grades are intended to give you a sense of the quality of a particular piece of work: roughly speaking, a B means that you have done a good job with the writing, the ideas, and the organization of the work; a C conveys that the work lacks some important qualities and has some problems, while an A means that the work is exemplary in some key ways: the writing is particularly clear, the ideas thoroughly treated, the organization of the presentation well considered and effective. (for more details, see attached rubric)

Class Participation: Your attendance and in class writing and analysis – is vitally important to your success in this course.

Use of Laptops: In-class or on-site use of laptops and other devices is permitted if that facilitates course-related activities such as note-taking, looking up references, etc. Laptop or other device privileges will be suspended if there are not used for class-related work.

Attendance: Students are expected to report for classes promptly. CYA regards attendance in class and on-site as essential. Absences are recorded and have consequences. Illness or other such compelling reasons which result in absences should be reported immediately in the Student Affairs Office.

Policy on Original Work: Unless otherwise specified, all submitted work must be your own, original work. Any excerpts from the work of others must be clearly identified as a quotation, and a proper citation provided. (Check Student handbook, pg. 9)

Accommodations for Students with Disabilities: If you are a registered (with your home institution) student with a disability and you are entitled to learning accommodation, please inform the Director of Academic Affairs and make sure that your school forwards the necessary documentation.

Class Schedule

Week 1: History and Philosophical Perspectives on Consciousness

Lecture 1: Definition of consciousness:

- a) Commonsense definition
- b) Behavioral definition: Glasgow coma score
- c) Neuronal definition

Easy and Hard problems of consciousness

Neural Correlates of Consciousness: The Astonishing Hypothesis

Ancient civilizations and historical view of the mind

Lecture 2: Dualism versus Materialism, and Functionalism

P-zombies

Evolution of consciousness: What is the function of consciousness and what survival value does it provide?

Justice and consciousness in the animal world

Readings:

Gross, C. G. (1998). *Brain, Vision, Memory: Tales in the History of Neuroscience*. Cambridge: MIT Press, Chapter 1.

Koch, C. (2012). *Consciousness: Confessions of a Romantic Reductionist*. MIT Press: Cambridge. Chapter 3.

Chalmers, D.J. (1996). *The Conscious Mind: In Search of a Fundamental Theory*. Oxford: Oxford University Press. Chapters 1 and Chapter 3.

Week 2: Neuroscience basics and Methods

Lecture 1: Basic cortical and subcortical organization

What part(s) of the brain are necessary for consciousness? Cerebral cortex versus the cerebellum

Electrical stimulation of the brain elicits conscious experience.

Lecture 2: Scientific methods for studying consciousness

PET, fMRI, TMS, electrophysiology, self-report

Readings:

Dale, A.M. & Halgren, E. (2001). Spatiotemporal mapping of brain activity by integration of multiple imaging modalities. *Current Opinion in Neurobiology*, 2001,11, 202-208

Walsh, V. & Cowey, A. (2000). Transcranial magnetic stimulation and cognitive neuroscience. *Nature Reviews Neuroscience*, 1, 73-79.

Week 3: Consciousness versus unconsciousness

Lecture 1: Unconscious processing

Freud and the unconscious

Sensation for action versus sensation for perception

Unconscious skills versus conscious deliberation

Lecture 2: Theory of Mind and mirror neurons

Week 4: States of Consciousness

Lecture 1: Arousal, Sleep and dreams

Cortical oscillations

Persistent vegetative state

Lecture 2: Anesthesia, Drugs, Enhanced consciousness

Week 5: Disruptions in Consciousness: Sensory Perception

Lecture 1: Feature deficits: Achromatopsia, Akinetopsia, Synesthesia

Lecture 2: Lack of awareness: Blindsight, Deaf Hearing

Week 6: Disruptions in Consciousness: Cognition

Lecture 1: Object recognition deficits: Apperceptive, Integrative, and Associative Agnosias; Binocular Rivalry; Prosopagnosia and Capgras delusion

Lecture 2: Attentional deficits: Hemi-neglect, Balint's syndrome
Attention versus Awareness

Week 7: Intentionality and Free will

Lecture 1: Intentionality and agency

Lecture 2: Free will: Does it exist?

Readings:

Desmurget, M., Reilly, K.T., Richard, N., Szathmari, A., Mottolese, C., Sirigu, A. (2009). Movement intention after parietal cortex stimulation in humans. *Science*, 324, 811-3.

Libet, B., Gleason, C.A., Wright, E.W., Pearl, D.K. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential): The unconscious initiation of a freely voluntary act. *Brain*, 106, 623-642.

Caspar, E. A. & Cleeremans, A. (2015). "Free will": are we all equal? A dynamical perspective of the conscious intention to move. *Neuroscience of Consciousness*, 2015, 1-10.

Week 8: Lateralization and Language

Lateralization of conscious experience
Split-brain patients and dual consciousness

Week 9: Scientific Theories of Consciousness I

Global Workspace Theory
Dynamic Core Hypothesis

Readings:

Baars, B.J. (2005). Global workspace theory of consciousness: toward a cognitive neuroscience of human experience. *Progress in Brain Research*, 150, 45-53.

Edelman, G.M. (2003). Naturalizing consciousness: A theoretical framework. *Proceedings of the National Academy of Sciences*, 100, 5520-5524.

Week 10: Scientific Theories of Consciousness II

Integrated Information Theory of Consciousness
Damasio's Theory: Protoself, Core Consciousness, Extended Consciousness

Readings:

Tononi, G. (2004). An information integration theory of consciousness. *BMC Neuroscience*, 5, 42-63.

Massimini, M., Ferrarelli, F., Huber, R., Esser, S.K., Singh, H., Tononi, G. (2005). Breakdown in effective connectivity during sleep. *Science*, 309, 2228-2231.

Damasio, A.R. (1999). *The Feeling of What Happens: Body and Emotion in the Making of Consciousness*. New York: Harcourt Brace.

Week 11: Embodied Cognition and Brain Machine Interfaces

Consciousness includes the body and brain.
Cognitive brain machine interfaces and enhanced consciousness.
Consciousness is not in the brain.

Readings:

Noe, A. (2009). *Out of Our Heads. Why you are not your brain, and other lessons from the biology of consciousness*. New York: Hill and Wang.

Week 12: In-class Debates

Debate 1: Dualism versus Materialism
Debate 2: Does Free Will Exist?

Bibliography

Baars, B.J. (2005). Global workspace theory of consciousness: toward a cognitive neuroscience of human experience. *Progress in Brain Research*, 150, 45-53.

Caspar, E. A. & Cleeremans, A. (2015). "Free will": are we all equal? A dynamical perspective of the conscious intention to move. *Neuroscience of Consciousness*, 2015, 1-10.

Chalmers, D.J. (1996). *The Conscious Mind: In Search of a Fundamental Theory*. Oxford: Oxford University Press.

Dale, A.M. & Halgren, E. (2001). Spatiotemporal mapping of brain activity by integration of multiple imaging modalities. *Current Opinion in Neurobiology*, 2001, 11, 202-208.

Damasio, A.R. (1999). *The Feeling of What Happens: Body and Emotion in the Making of Consciousness*. New York: Harcourt Brace.

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Koch, C. (2012). *Consciousness: Confessions of a Romantic Reductionist*. MIT Press: Cambridge.

Libet, B., Gleason, C.A., Wright, E.W., Pearl, D.K. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential): The unconscious initiation of a freely voluntary act. *Brain*, 106, 623-642.

Massimini, M., Ferrarelli, F., Huber, R., Esser, S.K., Singh, H., Tononi, G. (2005). Breakdown in effective connectivity during sleep. *Science*, 309, 2228-2231.

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Walsh, V. & Cowey, A. (2000). Transcranial magnetic stimulation and cognitive neuroscience. *Nature Reviews Neuroscience*, 1, 73-79.

Course schedule, in terms of subjects and readings, may be subject to change to benefit student learning and in keeping up to date with current research

Course Readings: Full Bibliography

- Author (Year). *Title*. City, Country: Publisher

ANNEX I-II

Rubrics:

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