

NSCI/PSY 342 | Consciousness Spring 2025

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Course Description

Consciousness has been considered one of the 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 scientists have begun to try to tackle the problem using modern scientific tools. 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 and philosophical concepts, as well as experimental and theoretical 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 discuss prevailing scientific theories of consciousness and how they are currently put to test. Finally, we will see recent advances on computational neural network models for consciousness and whether and how quantum mechanics is relevant for consciousness. We will debate whether free will exists; if artificial intelligence can be conscious and what this would entail related to ethics. Previous knowledge of neuroscience and/or philosophy and/or physics is preferred but not required.

Course Approach

The course topics, issues and questions will be explored via the readings, the lectures, the class discussions, an in-class experiment, two class debates and the team project for the final exam.

The key academic skills will be developed via written discussions on the readings, in-class presentations of the readings, literature research, analysis and interpretation of sources, in-class psychophysical experiment, team work on preparing and presenting the final project and participate at the class debates.

The students will work both individually - by writing comments on the readings, presenting at least one of them in class, actively participate in class discussions, conduct experiments in class - and in small groups – by preparing arguments and participate in the class debates, doing literature research, critically analyze resources, prepare and present the project for the final exam.

Learning Objectives

This course will primarily teach students to:

- Identify the different definitions of consciousness and how they are related to different theories of consciousness.
- Identify how humans have tried to answer this question throughout history, in philosophy and science.
- Explain what consciousness is and how it is related to the brain, in both health subject and patients with disorders of consciousness.
- Use presentation skills to communicate philosophical and scientific research related to consciousness.
- Examine critically the different theories of consciousness.
- Evaluate experimental evidence of behavior and brain activity related to consciousness.
- Reflect on what needs to be done in the future of the science of consciousness field and how it impacts society.
- Recognize that the problem of consciousness is still an open question, there are debates among contrasting views and it is an ongoing research program.

Course Requirements

Pdf annotations

Each class has a required ~30 pages reading (usually a research paper), and students are required to read it and make at least one comment, question or answer to other student's question, on the pdf annotation of the reading before the corresponding class.

In-class leading discussion

Depending on the size of the class, students will need to lead the discussion of at least one of the required readings by giving a ~15-minute presentation at the beginning of the corresponding class

Class debates

There will be two class debates. Students are required to participate in both, in one of them as debaters and in the other as audience. As debaters: in a group of 3 or 4 students, each of them will need to present at least one

argument in favor of one of the theses. During the debate they will need to critically assess and rebuttal the arguments of the other's group thesis. As an audience they will need to contribute to the discussion.

Participation

Students are required to actively participate in class activities and discussions.

Midterm exam

This is a written exam with 7 to 10 questions out of which students need to answer 5 with up to 500 words each.

Final exam

Work in groups of 3-4 students on a project for the final exam and present it in class. They will need to present one theory of consciousness and compare it to others. This should include definition of consciousness, evidence in favor and against the theory of choice, critical assessment of the research done so far and proposal of future research steps, as well their views based on arguments. All arguments based on literature need to be accompanied with the corresponding references.

Attendance

Students are required to attend the classes

The midterm grade will be calculated based on

- The comments on the pdf annotations
- The in-class leading discussion
- The participation in the class debate
- The participation in the class discussion
- The grade of the midterm exam

Evaluation and Grading

Your grade for this course will be based on the following distribution:

Percentages

- Pdf annotations – 10%
- In-class leading discussion – 10%
- Class debates – 10%
- Participation – 10%
- Midterm exam – 30%
- Final exam – 30 %

CYA Regulations and Accommodations

Attendance Policy

CYA regards attendance in class and on-site (in Athens or during field study trips) as essential. Absences are recorded and have consequences.

ePolicy on Original Work

Unless otherwise specified, all submitted work must be your own original work. Any ideas taken from the work of others must be clearly identified as quotations, paraphrases, summaries, figures etc., and accurate internal citations and/or captions (for visuals) as well as an accompanying bibliography must be provided.

Use of Laptops

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

Class Schedule

Class Day	Day/Date/Place (if applicable)	Topic / Readings / Assignments Due
1	Tue Jan 28	Introduction and history of consciousness Reading Dehaene 2014 - Introduction and Chapter 1: "Consciousness and the brain: deciphering how the brain codes our thoughts" Stanislas Dehaene - New York: Penguin Books, 2014

2	Thu Jan 30	<p>Philosophy of consciousness</p> <p>Reading Nagel 1974: "What is it like to be a bat?" Thomas Nagel - The Philosophical Review, 1974</p> <p>Recommended van Gulick 2014 - Section 2: "Consciousness" Robert van Gulick - Stanford Encyclopedia of Philosophy, 2014</p>
3	Tue Feb 4	<p>Cortical and subcortical organization</p> <p>Reading Glasser et al. 2016: "A multi-modal parcellation of human cerebral cortex" Matthew F. Glasser, Timothy S. Coalson, Emma C. Robinson, Carl D. Hacker, John Harwell, Essa Yacoub, Kamil Ugurbil, Jesper Andersson, Christian F. Beckmann, Mark Jenkinson, Stephen M. Smith, David C. Van Essen - Nature, 2016</p>
4	Thu Feb 6	<p>Neuroscience experimental methods</p> <p>Reading Dale and Halgren 2001: "Spatiotemporal mapping of brain activity by integration of multiple imaging modalities" Anders M. Dale, Eric Halgren - Current Opinion in Neurobiology, 2001</p>
5	Fri Feb 7	<p>Theoretical and computational neuroscience</p> <p>Reading Wang et al. 2020: "Computational neuroscience: a frontier of the 21st century" Xiao-Jing Wang, Hailan Hu, Chengcheng Huang, Henry Kennedy, Chengyu Tony Li, Nikos Logothetis, Zhong-Lin Lu, Qingming Luo, Mu-ming Poo, Doris Tsao, Si Wu, Zhaohui Wu, Xu Zhang, Douglas Zhou - National Science Review, 2020</p>
6	Tue Feb 11	<p>Unconscious processing and the function of consciousness</p> <p>Reading Dehaene 2014 - Chapters 2: "Consciousness and the brain: deciphering how the brain codes our thoughts" Stanislas Dehaene - New York: Penguin Books, 2014</p> <p>Recommended Dehaene 2014 - Chapter 3: "Consciousness and the brain: deciphering how the brain codes our thoughts" Stanislas Dehaene - New York: Penguin Books, 2014</p>
7	Thu Feb 13	<p>Neural signatures of consciousness</p> <p>Reading Dehaene 2014 - Chapter 4: "Consciousness and the brain: deciphering how the brain codes our thoughts" Stanislas Dehaene - New York: Penguin Books, 2014</p>
8	Tue Feb 25	<p>Where in the brain is consciousness?</p> <p>Reading Boly et al. 2017: "Are the neural correlates of consciousness in the front or in the back of the cerebral cortex? Clinical and neuroimaging evidence" Melanie Boly, Marcello Massimini, Naotsugu Tsuchiya, Bradley R. Postle, Christof Koch, Giulio Tononi - Journal of Neuroscience, 2017</p> <p>Recommended Odegaard et al. 2017: "Should a few null findings falsify prefrontal theories of conscious perception?" Brian Odegaard, Robert T. Knight, and Hakwan Lau - The Journal of Neuroscience 2017</p> <p>Michel 2022: "Conscious Perception and the Prefrontal Cortex A Review" Matthias Michel - Journal of Consciousness Studies, 2022</p>
9	Thu Feb 17	<p>Wakefulness, sleep, dreaming, coma, vegetative state</p> <p>Reading Laureys et al. 2004: "Brain function in coma, vegetative state, and related disorders" Steven Laureys, Adrian M. Owen, Nicholas D. Schiff - The Lancet, 2004</p> <p>Recommended Windt 2013: "Reporting dream experience: Why (not) to be skeptical about dream reports" Jennifer Windt - Frontiers in Human Neuroscience, 2013</p>
10	Tue Mar 4	<p>Anesthesia, drugs and enhancing consciousness</p> <p>Reading Schiff et al. 2007: "Behavioural improvements with thalamic stimulation after severe traumatic brain injury" N. D. Schiff, J. T. Giacino, K. Kalmar, J. D. Victor, K. Baker, M. Gerber, B. Fritz, B. Eisenberg, J. O'Connor, E. J. Kobylarz, S. Farris, A. Machado, C. McCagg, F. Plum, J. J. Fins, A. R. Rezai - Nature, 2007 Recommended Pollan 2018 - Chapter 5: "How to Change Your Mind" Michael Pollan - New York: Penguin Press, 2018</p>

11	Thu Mar 6	<p>Split brain patients and many minds</p> <p>Reading</p> <p>Turk et al. 2002: "Mike or me? Self-recognition in a split-brain patient" David J. Turk, Todd F. Heatherton, William M. Kelley, Margaret G. Funnell, Michael S. Gazzaniga, C. Neil Macrae - Nature Neuroscience, 2002</p> <p>Recommended</p> <p>Roelofs 2016: "The unity of consciousness, within subjects and between subjects" Luke Roelofs - Philosophical Studies, 2016</p>
12	Tue Mar 11	<p>Midterm exam</p>
13	Thu Mar 13	<p>Class Debate 1: Does Free Will exist?</p>
14	Thu Mar 27	<p>Animal consciousness</p> <p>Reading</p> <p>Birch et al. 2020: "Dimensions of animal consciousness" Jonathan Birch, Alexandra K. Schnell, Nicola S. Clayton - Trends in Cognitive Sciences, 2020 Recommended</p> <p>Michel 2019: Fish and microchips: on fish pain and multiple realization" Matthias Michel - Philosophical Studies, 2019</p> <p>Theodoni et al. 2022: "Structural Attributes and Principles of the Neocortical Connectome in the Marmoset Monkey" Panagiota Theodoni, Piotr Majka, David H. Reser, Daniel K. Wójcik, Marcello G. P. Rosa, Xiao-Jing Wang - Cerebral Cortex, 2022</p>
15	Fri Mar 28	<p>Feature deficits: Achromatopsia & Akinetopsia</p> <p>Reading</p> <p>Bouvier and Engel 2006: "Behavioral deficits and cortical damage loci in cerebral achromatopsia" Seth E. Bouvier, Stephen A. Engel - Cerebral Cortex, 2006</p> <p>Recommended</p> <p>Zihl et al. 1983: "Selective disturbance of movement vision after bilateral brain damage" J. Zihl, D. von Cramon, N. Mai - Brain, 1983</p>
16	Tue Apr 1	<p>Merged sensation and lack of awareness: Synesthesia, Blindsightedness</p> <p>Reading</p> <p>Nunn et al. 2002: "Functional magnetic resonance imaging of synesthesia: activation of V4/V8 by spoken words" J. A. Nunn, L. J. Gregory, M. Brammer, S. C. R. Williams, D. M. Parslow, M. J. Morgan, R. G. Morris, E. T. Bullmore, S. Baron-Cohen, J. A. Gray - Nature Neuroscience, 2002</p> <p>Recommended</p> <p>Rafal et al. 1990: "Extrageniculate vision in hemianopic humans: Saccade inhibition by signals in the blind field" R. Rafal, J. Smith, J Krantz, A. Cohen, C. Brennan - Science, 1990</p>
17	Thu Apr 3	<p>Object recognition deficits, prosopagnosia and capgras delusion</p> <p>Reading</p> <p>McCarthy and Warrington 1986: "Visual associative agnosia: a clinico-anatomical study of a single case" R. A. McCarthy, E. K. Warrington - Journal of Neurology, Neurosurgery, and Psychiatry, 1986</p>
18	Tue Apr 8	<p>Attentional deficits</p> <p>Reading</p> <p>Bisiach and Luzzatti 1978: "Unilateral neglect of representational space" Edoardo Bisiach, Claudio Luzzatti - Cortex, 1978 Recommended</p> <p>Webb et al. 2016: "Cortical networks involved in visual awareness independent of visual attention" Taylor W. Webba, Kajsa M. Igelströma, Aaron Schurgerb, Michael S. A. Graziano - PNAS, 2016</p>
19	Thu Apr 10	<p>Scientific theories of consciousness I</p> <p>Reading</p> <p>Signorelli et al. 2021: "Consciousness science and its theories explanatory profiles of models of consciousness - towards a systematic classification" Camilo Miguel Signorelli, Joanna Szczotka, Robert Prentner - Neuroscience of Consciousness, 2021</p> <p>Recommended</p> <p>Seth and Bayne 2022: "Theories of consciousness" Anil K. Seth, Tim Bayne - Nature Reviews Neuroscience, 2022</p>

20	Tue Apr 22	<p>Scientific theories of consciousness II</p> <p>Reading</p> <p>Dehaene 2014 - Chapter 5: "Consciousness and the brain: deciphering how the brain codes our thoughts" Stanislas Dehaene - New York: Penguin Books, 2014 Recommended</p> <p>Block 2009: "Comparing the major theories of consciousness" Ned Block - in M. S. Gazzaniga et al. The cognitive neurosciences (p. 1111–1122)</p> <p>Lau and Rosenthal (2011) "Empirical support for higher-order theories of conscious awareness" Hakwan Lau, David Rosenthal - Trends in Cognitive Sciences, 2011</p> <p>Panagiotaropoulos et al. 2020: "Prefrontal cortex and consciousness: beware of the signals" Theofanis I. Panagiotaropoulos, Abhilash Dwarakanath, Vishal Kapoor - Trends in Cognitive Sciences, 2020</p>
20	Thu Apr 24	<p>Testing theories of consciousness</p> <p>Reading</p> <p>Melloni et al. 2021: "Making the hard problem of consciousness easier: Championing open science, an adversarial collaboration aims to unravel the footprints of consciousness: Lucia Melloni, Liad Mudrik, Michael Pitts, Christof Koch - Science 2021</p>
21	Tue Apr 29	<p>Neural network models of consciousness</p> <p>Reading</p> <p>Theodoni et al. 2011: "Cortical microcircuit dynamics mediating binocular rivalry: the role of adaptation in inhibition" Panagiota Theodoni, Theofanis I. Panagiotaropoulos, Vishal Kapoor, Nikos K. Logothetis, Gustavo Deco - Frontiers in Human Neuroscience, 2011</p> <p>Recommended</p> <p>Wang 2022: Theory of the Multiregional Neocortex: Large-Scale Neural Dynamics and Distributed Cognition" Xiao-Jing Wang - Annual Review of Neuroscience, 2022</p> <p>Klatzmann 2022: "A mesoscale connectome-based model of conscious access in monkey cortex" Ulysse Klatzmann, Sean Froudish-Walsh, Daniel P. Bliss, Panagiota Theodoni, Jorge F Mejías, Meiqi Niu, Lucija Rapan, Nicola Palomero- Gallagher, Claire Sergent, Stanislas Dehaene, Xiao-Jing Wang - bioRxiv 2024</p>
22	Tue May 1	<p>Quantum mechanics and consciousness</p> <p>Reading</p> <p>Koch and Hepp 2006: "Quantum mechanics and the brain" Christof Koch, Klaus Hepp - Nature, 2006 Recommended</p> <p>Manousakis 2012: "Quantum formalism to describe binocular rivalry" Efstratios Manousakis - Biosystems 2012</p> <p>Chalmers and McQueen 2021: "Consciousness and the Collapse of the Wave Function" David J. Chalmers, Kelvin J. McQueen - arXiv 2022. In Shan Gao, Consciousness and Quantum Mechanics. Oxford University Press (forthcoming)</p>
23	Thu May 8	<p>Class Debate 2: Can AI be sentient and what would this entail?</p>
24	Thu May 15	<p>Final Exam</p>

N.B.: The course schedule, in terms of subjects and readings, may be subject to change to benefit student learning and to keep up to date with current research.

COURSE BIBLIOGRAPHY

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David Chalmers "The Conscious Mind: In Search of a Fundamental Theory" – Oxford University Press, 1998

Ned Block "The Border Between Seeing and Thinking" – Oxford University Press, 2023

Anil Seth "Being You: A New Science of Consciousness" – Dutton, 2021

Nagel 1974: "What is it like to be a bat?" Thomas Nagel - The Philosophical Review, 1974

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- Odegaard, Robert T. Knight, and Hakwan Lau – The Journal of Neuroscience 2017
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