

Consciousness and Cognitive Science

GU4224

4 points

Nora Isacoff, PhD (ni2237@columbia.edu)

Wednesdays, 2:10 - 4

Description

Our human experience is rich: the thrill of falling in love, the spark of a new idea, the zing of table salt, the sharpness of pain. For thousands of years, philosophers, artists, and religious scholars have tried to explain our subjective experience. More recently, neuroscientists and artificial intelligence experts have contributed to this discussion, weighing in on whether we are “more than meat” (as Descartes famously put it), and whether computers can ever be sentient. In this class, we will begin with the big questions and an interdisciplinary overview of consciousness, then delve into psychology’s role. Using literature from perception, memory, emotion, metacognition, attention, and symbolic development, among other areas of psychology, we will see what empirical evidence can tell us about who we are, what we are able to know, and why we even have an experience of the world at all.

General advice for success in this class

To quote the scholar Kyla Wazana Tompkins, “We aren’t here to learn what we already know.” In this spirit, I invite you to approach this class with deep curiosity and a commitment to jump into the messiness of an emerging science.

This class is intentionally interdisciplinary, both in the selection of readings and in your backgrounds. This means that depending on the topic for the week, you may find the readings hard or easy, fascinating or boring. All of this is okay.

When you’re reading, I encourage you to think about what level you want to read a particular paper on. If it’s on something you find particularly interesting, perhaps something that relates to an honors thesis you will be writing, then you may want to read it with a lot of detail, making sure you understand every nuance, even looking for other references that help you understand the article more deeply. If it’s on something that is very far from your core interests, or on which you have little background, you may want to read it in a more general way, thinking about how it might relate to your own interests and trying to grasp the main idea.

I believe that learning to read in these different ways is important, especially for interdisciplinary, collaborative work. What does it mean to read a paper that is outside your own field and to get out of it enough that you can effectively collaborate with someone in the field? This is something we can try out in our class this semester, thinking of our discussions as interdisciplinary collaborations.

To this end, we all need every one of you to be fully present in our discussions. If you don't understand something you'd like to understand, please ask. If you don't understand why we are even reading a particular paper, you are welcome to share that. I ask that you bring with you to class respect for each other and me, curiosity, an open mind, and all of your unique gifts and backgrounds, and let's see where this takes us.

Prerequisites

PSYC UN1001 The Science of Psychology, or an equivalent introductory course in psychology. It is recommended that students have also taken an additional course in Psychology, preferably one focusing on cognition, development, or research methods. Instructor permission is required.

Role in the Psychology Curriculum

GU4224 is a seminar open to graduate students and advanced undergraduate students. It fulfills the following degree requirements:

- For undergraduates pursuing a Psychology major or concentration in the College or GS or the Psychology Postbac certificate, it meets the Group I (Perception & Cognition) distribution requirement.
- For Psychology majors and Psychology Postbac students, it fulfills the seminar requirement.
- For undergraduates pursuing the Neuroscience & Behavior major, it fulfills the P5 advanced seminar requirement in the Psychology portion of the major.
- Graduate students in Psychology and junior and senior Neuroscience & Behavior and Psychology majors will have priority for registration.

Goals:

- Gain exposure to some of the deepest questions related to consciousness in psychology.
- Learn how psychology can inform and be informed by other areas within cognitive science such as philosophy, neuroscience, and artificial intelligence.
- Learn to challenge initial intuitions and analyze empirical papers critically to determine how well evidence supports a claim
- Develop strong oral and written communication skills that will benefit both interdisciplinary collaboration and independent research

Assignments and grades

1. **Reading reflections.** By 1pm the day before each class, students should submit a reading reflection on our Canvas discussion board. Reflections should be at least half a double-spaced page and, rather than merely summarize the readings, should raise points that we can discuss in our seminar. These might include connections to other readings we have read in our seminar or that you have read in other classes; critiques of the methodology and/or how well the results of an experiment support the authors' claims; and/or a description of something you are having trouble understanding or would like to know more about and how you are going about trying to learn more (e.g., you weren't familiar with a statistical analysis the authors used, so you found an article explaining it, and you want to share what you are learning). Reflections may also/instead be responses to other students' postings. Each reading response will be graded on a scale from 0-2, with 0 points if you do not make an attempt at all, 1 point if you attempt a response but do not do so completely, and 2 points if you fully reflect on the reading in a way that demonstrates you are truly engaging with it. I will give you feedback on your responses in writing and/or in class discussions so that these reflections are an opportunity for real growth. (25% of grade)
2. **Leading class discussions.** Each student will help lead the class discussion once. If you are in charge of the readings for that day, you should prepare an introduction to make sure everyone is on the same page and to raise key issues for discussion. I strongly suggest you prepare slides or a handout to guide your introduction, and if you do, I will post this on Canvas so that everyone has access to it. You will then help lead the discussion for that class period. (25% of grade)
3. **Independent study.** Students will have the opportunity to explore a topic that excites them within "consciousness and cognitive science." The goal of this project is to consider how empirical data can be used to explore big questions within this field and to grapple with supposedly conflicting arguments in the literature. General advice is that narrower topics tend to be more successful. This project will culminate in a 10-12 page double-spaced paper. There are 3 parts to this assignment (all due at 11:59pm), and I will be available throughout the semester to provide guidance and give feedback.
 - a. February 12: Students should submit a proposal detailing a specific research question. The proposal should be about 1 page in length and might include 2 competing hypotheses about the research question and an example of the type of evidence that could bear on this question, or it might simply spell out some sub-questions that the student is interested in investigating. It should also include at least 2 sources that the student plans to read. I highly suggest you spend some time before this deadline beginning to work on your project so that I can give you specific feedback and you can get on the right track from the beginning. I am available to meet individually before this deadline if you would like to discuss ideas you are considering. (10% of grade)
 - b. March 19: Students should submit a rough draft of the term paper including the research question and any sub-questions, explaining experimental methods and results that relate to the research question, and trying to make sense of conflicting

results and positions within the literature. You also have the option of proposing a new experiment at the end of your paper. Students should cite at least 5 sources, and this should be a complete attempt at a paper, meaning at or close to the length of the final paper, proofread, etc. I will give extensive feedback on this draft so that students have the opportunity to achieve greater sophistication in their research methods and writing styles. (20% of grade)

- c. April 16: Students should submit a final draft of the term paper, incorporating in feedback from the rough draft. (20% of grade)

Topics and Readings

We will be using Arne Dietrich's phenomenal (pun intended) book *Introduction to Consciousness* as a base and then reading journal articles each week to ground our discussions in psychological data.

Week 1. Overview: What is consciousness?

Required: Preface and Chapter 1; Optional: Chapter 2

This first week, we'll set the scope for the rest of the semester, noting the explanatory gap between brains and qualia, and asking such questions as: What is consciousness? How is it related to physical matter? Who possesses it? What is its function? How can it be studied empirically?

Week 2. Philosophical perspectives

Chapter 3

Velmans, M. (2008). How to separate conceptual issues from empirical ones in the study of consciousness. In: Rahul Banerjee and Bikas K. Chakrabarti, eds. *Models of Brain and Mind: Physical, Computational and Psychological Approaches*. 168 Amsterdam: Elsevier, 1-9.

This week, we'll explore relevant philosophical positions, such as Cartesian dualism, property dualism, emergentism, idealism, functionalism, identity theory, and eliminativism, noting the strengths and weaknesses of each. We'll then begin to discuss the extent to which empirical approaches can and cannot address these positions.

Week 3. Neurocognitive perspectives

Chapter 4 (all), Chapter 6 (106 – 117)

Barron, A. B., & Klein, C. (2016). What insects can tell us about the origins of consciousness. *Proceedings of the National Academy of Sciences*, 113(18), 4900–4908.

Wolford, G., Miller, M. B., & Gazzaniga, M. (2000). The left hemisphere's role in hypothesis formation. *The Journal of Neuroscience*, 20(6), RC64, 1-4.

We'll gain an understanding of the concepts in neuroscience most relevant to consciousness such as neural correlates, binocular rivalry, the binding problem, competitive models, contributions from physics, the global workspace theory, and the notion of the interpreter. We'll then look to insects for insight on the evolution of consciousness and to split-brain patients to better understand the anatomy of consciousness.

Week 4. Artificial intelligence perspectives

Chapter 5

Dehaene, S., Lau, H., & Kouider, S. (2017). What is consciousness, and could machines have it? *Science*, 358(6362), 486–492.

Wilson, A. D., & Golonka, S. (2013). Embodied Cognition is Not What you Think It Is. *Frontiers in Psychology*, 4, 1-13.

Last week, we looked at consciousness in our brains, but do we need a brain to be conscious? Is there any reason there can't be a conscious machine? We'll explore basic concepts in artificial intelligence. Then, we'll return to human consciousness, first looking more closely at two types of information-processing computations in the brain: the selection of information for global processing and the self-monitoring of those concepts, then introducing the idea of embodied cognition.

Week 5. Perception and consciousness

Chapter 7

Vetik, S. et al (2020). Among the two kinds of metacognitive evaluation, only one is predictive of illusory object perception, *Perception*, 0301006620954322, 1-14.

Hviid Del Pin, S., et al. (2020). Comparing theories of consciousness: Object position, not probe modality, reliably influences experience and accuracy in object recognition tasks. *Consciousness and Cognition*, 84, 1-10.

As it says in Chapter 7, “A cardinal rule in psychology is that perception is not physics.” We'll look at visual perception, the perception of pain, and subliminal perception, asking what these processes can tell us about consciousness. We'll then look at confidence judgments around visual perception to further our discussion.

Week 6. Memory and consciousness

Chapter 8

Atas, A., Faivre, N., Timmermans, B., Cleeremans, A., & Kouider, S. (2014). Nonconscious learning from crowded sequences. *Psychological Science*, 25(1), 113–119.

Begg, I., Maynard, A., and Farinacci, S. (1992). Dissociation of processes in belief: Source recollection, statement familiarity, and the illusion of truth. *Journal of Experimental Psychology: General*, 121(4), 446-458.

This week, we will contrast the explicit and implicit memory systems (i.e., our conscious and nonconscious memories). After this overview, the first paper will explore learning of sequential regularities through the nonconscious temporal integration of perceptual information. The second will demonstrate a relationship between familiarity and the illusion of truth.

Week 7. Emotion and consciousness

Chapter 9

Gaillard, R, Del Cul, A., Naccache, L., Vinckier, F., Cohen, L., & Dehaene, S. (2006). Nonconscious semantic processing of emotional words modulates conscious access. *Proceedings of the National Academy of Sciences of the United States of America*, 103(19), 7524–7529.

Schnall, S., Haidt, J., Clore, G. L., & Jordan, A. H. (2008). Disgust as embodied moral judgment. *Personality and Social Psychology Bulletin*, 34(8), 1096–1109.

After a brief overview of the role of emotion in consciousness, we will discuss a paper about the relationships between conscious perception, semantics, and emotion. We'll then read a second paper demonstrating that people nonconsciously use emotion in moral decision making, although they cite non-emotional reasons post hoc.

Week 8. Metacognition, theory of mind, and consciousness

Chapter 10

Onishi K.H., Baillargeon R. (2005). Do 15-month-old infants understand false beliefs? *Science*. 308: 255-258.

Gergely, G., Bekkering, H., & Király, I. (2002). Rational imitation in preverbal infants. *Nature*, 415(6873), 755.

Some consciousness researchers have argued that the driver of consciousness is our ability to represent our own minds and the minds of others. After discussing the role of metacognition in awareness, we will look at two empirical papers suggesting that infants have a theory of mind.

Week 9. Free will and consciousness

Chapter 11

Saigle, V., Dubljević, V., and Racine, E. (2018). The impact of a landmark neuroscience study on free will: a qualitative analysis of articles using Libet and colleagues' methods. *Ajob Neurosci.* 9, 29–41.

Shepherd, J. (2012). Free will and consciousness: experimental studies. *Consciousness and cognition*, 21, 915-927.

We'll begin by looking at neural correlates of motion, the Libet experiment, the feeling of conscious will, and distortions of volition. We will then look at a current meta-analysis of Libet and colleagues' methods, and then at a set of studies demonstrating a strong correlation between consciousness and folk conceptions of free will.

Week 10. Altered states of consciousness

Chapter 12 and 13

Corlett, P.R. et al (2019). Hallucinations and strong priors. *Trends in cognitive science*, 23(2), 114-127.

Akire, M., Hudetz, A., and Tononi, G. (2008). Consciousness and anesthesia. *Science*. 322(5903), 876-880.

This week focuses on altered states of consciousness from sleep, dreams, drugs, meditation, and hypnosis. We will then read a paper demonstrating the ability of Bayesian priors to predict hallucinations in typical populations, suggesting a continuum between normal and aberrant perception, as well as a paper on consciousness under anesthesia.

Week 11. Attention, awareness, and consciousness

Block, N. (2007) Consciousness, accessibility, and the mesh between psychology and neuroscience. *Behavioral and brain sciences*, 30 (5-6), 481-498.

Naccache, L. (2018). Why and how access consciousness can account for phenomenal consciousness. *Philosophical Transactions*, 373(1755), 1-9.

Webb, T. W., & Graziano, M. S. A. (2015). The attention schema theory: a mechanistic account of subjective awareness. *Frontiers in Psychology*, 6, 1 – 11.

This week, we will try to tease apart the concepts of attention, awareness, and consciousness. The first two papers provide contrasting perspectives on the relationship between phenomenal

and access consciousness. The third paper contrasts attention and awareness as they relate to consciousness.

Week 12. The symbolic mind and consciousness

Brown, R., Lau, H., & LeDoux, J. E. (2019). Understanding the higher-order approach to consciousness. *Trends in Cognitive Sciences*, 23(9), 754–768.

Dove, G. (2009). Beyond perceptual symbols: A call for representational pluralism. *Cognition*, 110, 412-431.

Deloache, J. et al (1997). The Credible Shrinking Room: Very Young Children's Performance with Symbolic and Nonsymbolic Relations, *Psychological Science*, 8(4), 308-313.

What is the relationship between our mind as a processor of symbols and our mind as a creator of phenomenal consciousness? We'll return to our study of functionalism and materialism in this context, looking at the higher-order theory of consciousness, the use of grounded and ungrounded symbols, and the development of symbolic reasoning.

Week 13. Final thoughts on consciousness

Scott, R.B., Samaha, J., Chrisley, R., Dienes, Z. (2018). Prevailing theories of consciousness are challenged by novel cross-modal associations acquired between subliminal stimuli. *Cognition*, 175, 169-185.

Birch, J., Schnell, A., & Clayton, N. (2020). Dimensions of Animal Consciousness. *Trends in cognitive science*, 24(10), 789-801.

Naccache, L. (2018). Minimally conscious state or cortically mediated state? *Brain*, 141(1), 949-960.

In this last week, we'll consider the various perspectives we've studied and finish by reading a paper challenging the global workspace theory, a paper on developing a taxonomy of consciousness in humans and other animals, and a paper with insights from a neurologist about vegetative states.

Additional Information

Academic integrity. As a member of the academic community, one of your responsibilities is to uphold principles of honesty and integrity. This means that you can only present your own work on assignments and presentations — plagiarism is strictly prohibited, as is presenting work as your own when it was done by someone else. Doing so compromises your academic integrity and potentially your academic standing. If you are falling behind, don't understand the material, or are not confident about your writing or presentation, talk to me as soon as possible instead of

taking measures that go against principles of academic integrity. [Columbia's Honor Code in Columbia's Guide to Academic Integrity (<http://www.college.columbia.edu/academics/academicintegrity>)].

Attendance. Class participation is the foundation of any seminar course, including this one. If you need to miss a class, please notify me as soon as possible. One absence will not negatively affect your grade. More than one absence will generally mean that your grade will drop by a +/-, although additional absences may be excused on a case-by-case basis and with provided documentation. You will still be responsible for the work due in a class you miss, e.g., reading response and interim paper deadlines. Please let me know if you have any questions about this policy.

Late assignments. It is not fair for you to get more time on your assignments than your peers. If there is an appropriate reason for turning an assignment in late, please discuss it with me well in advance so that we can work together on a plan. Unless we have agreed that there is a strong justification, late assignments will lose 5 points for each day they are late (e.g., from 20 points to 15 for the final paper). Late reading responses will get a maximum of 1 point and cannot be turned in after we have discussed them in class.

Students with disabilities. If you are a student with special needs and require accommodation, meet me before the first class to discuss your needs. You must also contact Disability Services before the first class to register for specific accommodations (<https://health.columbia.edu/disability-services>).