Consciousness and Cognitive Science
GU4224
4 points
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Wednesdays, 2:10 – 4
200C Schermerhorn

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 that 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, By 1pm the day before each class (Tuesday), 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. (25% of grade)

2. **Leading class discussions.** During the first class, we will divide up the readings so that everyone leads one class discussion (1 longer reading or 2 shorter readings). If you are in charge of a reading, 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. Everyone who is responsible for a reading that day will also help me co-lead that day's discussion. (25% of grade)
3. **Independent study.** The goal of this assignment is to consider how data can be used to explore big questions within consciousness and cognitive science; to grapple with supposedly conflicting arguments in the literature; and to immerse yourself in a topic that excites you. The end "product" is a 10-12 page double-spaced paper on any topic within relating to the class, but I hope that you truly will think of this project as an independent study. It's more important that you explore than that you come to a definitive conclusion about anything. General advice is that narrower topics tend to be more successful. I will provide you with a very rough "rubric" to give you some concrete suggestions, and we can also discuss individually and/or in class. There are 3 parts to this assignment (all due at 11:59pm). If you choose to submit any of them early, I can give you feedback earlier so you have more time for the next component.
    a. By February 13, students should 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. (10% of grade)
    b. By April 18, 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. (20% of grade)

c. By May 3, students should submit a final draft of the term paper, incorporating in feedback from the rough draft. (20% of grade)

Class Format

In general, each class will contain 2 parts. I'll begin by giving you some background on the day's topic. (I'm calling this the "lecture" part, but you are welcome and encouraged to contribute questions and comments, as you would in any seminar). Then, we will move onto the day's articles, with a student (or occasionally, 2 students) presenting.

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.

Birch, J., Schnell, A.K., & Clayton, N.S. (2020). Dimensions of animal consciousness. *Trends in Cognitive Science*, 24 (10), 789 – 801.

This week, we'll explore relevant philosophical positions, such as Cartesian dualism, property dualism, emergentism, idealism, functionalism, identity theory, and eliminitivism, noting the strengths and weaknesses of each. The first paper will help us begin to discuss the extent to which empirical approaches can and cannot address these positions. The second paper will ask what consciousness is by looking at diversity within the animal kingdom.

Week. 3. Neurocognitive perspectives

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

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.

Merker, B. (2005). The liabilities of mobility: A selection pressure for the transition to consciousness in animal evolution. *Consciousness and Cognition* (14), 89 – 114.

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 split-brain patients and to evolution 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.

Epstein, Z., Levine, S., Rand D.G., & Rahwan, I. (2018). Who gets credit for AI-generated art? *iScience*, 23(9), 101515, 1-16.

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, asking whether machines can be conscious and whether they can create art.

Week 5. Perception and consciousness

Chapter 7

Blake, R., Brascamp, J., & Heeger, D.J. (2014). Can binocular rivalry reveal neural correlates of consciousness? *Philosophical Transactions of the Royal Society: B.*, 369, 20130211, 1 – 9.

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 papers at the intersection of consciousness and perception and consciousness and object recognition.

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

Heyes, C., Bang, D., Shea, N., Frith, C.D., & Fleming, S.M. (2020). Knowing ourselves together: The cultural origins of metacognition. *Trends in Cognitive Science*, 24(5), 349-362.

Optional: Onishi K.H., Baillargeon R. (2005). Do 15-month-old infants understand false beliefs? *Science.* 308: 255-258. (Not for presenting. I'll discuss in the lecture.)

Optional: Gergely, G., Bekkering, H., & Király, I. (2002). Rational imitation in preverbal infants. *Nature, 415*(6873), 755-756. (Not for presenting. I'll discuss in the lecture.)

Some consciousness researchers have argued that the driver of consciousness is our ability to represent our own minds and the minds of others. This week, we'll discuss the role of metacognition in consciousness. We'll also discuss two very short, optional empirical papers suggesting that infants have a theory of mind.

Week 9. Collective Consciousness

(No lecture this week, just paper discussions)

Banissy, M.J. & Ward, J. (2007). Mirror-touch synesthesia is linked with empathy. *Nature: Neuroscience*, 10(7), 815-816.

Cioffi, M.C., Banissy, M.J., & Moore, J.W. (2016). Am I moving? An illusion of agency and ownership in mirror-touch synaesthesia. *Cognition*, (146), 426-430.

Hatfield, E., Bensman, L., Thornton, P.D., & Rapson, R.L. (2014). New perspectives on emotional contagion: A review of classic and recent research on facial mimicry and contagion. *Interpersona*, 8(2), 159-179.

How is individual consciousness affected by the consciousness of others? We will look at mirror neurons, including mirror-touch synesthesia, as well as facial mimicry and emotional contagion to explore this question.

Week 10. 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.

Wegner, D.M. (2003). The mind's best trick: how we experience conscious will. Trends in Cognitive Science, 7(2), 65-69.

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, at a set of studies demonstrating a strong correlation between consciousness and folk conceptions of free will, and the role of causal reasoning in the experience of free will.

Week 11. Altered states of consciousness

Chapter 12 and 13

Bayne, T. & Carter, O. (2018). Dimensions of consciousness and the psychedelic state. *Neuroscience of Consciousness*, 4(1): niy008, 1-8.

Horton, C. (2017). Consciousness across sleep and wake: Discontinuity and continuity of memory experiences as a reflection of consolidation processes. *Frontiers in Psychiatry*, 8(159), 1-10.

This week focuses on altered states of consciousness from sleep, dreams, drugs, meditation, and hypnosis. We will read one paper focused on psychedelic states and another on dreams.

Week 12. Attention, awareness, and consciousness

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

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.

This week, we will try to tease apart the concepts of attention, awareness, and consciousness. The first paper makes the case that awareness and attention are dissociable. The second paper challenges the global access hypothesis, suggesting that consciousness is not necessary for accessing and integrating information across cortical regions.

Week 13. 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. (2011). On the need for embodied and dis-embodied cognition. *Frontiers in Psychology*, 1(242), 1-13.

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. (This paper is not for presenting. I'll discuss in the lecture.)

What is the relationship between our mind as a processer 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 14. Atypical Consciousness

(No lecture this week, just paper discussions)

Curwen, C. (2018). Music-colour synaesthesia: Concept, context, and qualia. Consciousness and *Cognition*, 61, 94-106.

Thaler, L. & Goodale, M.A. (2016). Echolocation in humans: An overview. *WIREs Cogn Sci*, 7, 382-393.

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. Of course, if you are sick (even with a cold) you should stay home, but staying in touch with me about this with be very helpful. 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. Late reading responses will get a maximum of 1 point and cannot be turned in after we have discussed them in class. For your independent study: In my experience, when students do not hand this in on time, it is because they are overwhelmed with the prospect of working on an independent study. Remember that I'm available to discuss your project with you throughout the semester. Be in touch with me as you're working on it, and I'd be glad to talk through ideas with you.

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).