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 class we review the latest developments in the fields of cognitive neuroscience and psychophysics that are related to these important questions (though often the current research does not directly address them). We focus on the latest articles on attention, vision psychophysics, subjective perception and confidence ratings, etc.

Discussion will be related 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.

A crucial aspect of this seminar is to help students develop their ability to critically read and evaluate the latest published research in this field.

Prerequisites
Open to Ph.D. students in the Psychology department and graduate students in other related departments, with instructor’s permission. Open to advanced undergraduate students who have taken
an introductory course in neuroscience or cognitive psychology (e.g., UN2430), with instructor’s permission.

**Full Description:**
What is consciousness, and what does it mean to be conscious of something; what are non-conscious processes. Can we perceive without paying attention about what we perceive? What happens if the connection between the brain and the sensory systems is disrupted or damaged? After briefly reviewing the historical philosophical debate that dominated the study of consciousness (weeks 1 and 2), this seminar will then focus on contemporary investigations of consciousness, including major challenges and pitfalls. By the end of the seminar, students should have learned about major theories of consciousness and contemporary neuroscientific methodologies that allows to study this cognitive function.

Specifically:
- The course will introduce theories, research, and experiments that provided the basis for most debates on consciousness and mind;
- Overview of structure and function of sense organs and discussion on the role of psychophysical and neurophysiological experiments in providing insights in our understanding of consciousness;
- Further, the seminar will stream through a variety of cognitive functions who are important to achieve and maintain over time a “conscious state”, from emotion, to the relationship between attention-sleep-mind wandering, to altered state of consciousness associated with brain lesions or psychopharmacological interventions (including substance abuse and induced states of unconsciousness during medical treatments);
- The data from both the behavioral and neurobiological sources are melded together for each topic to show our current thinking on how consciousness is instantiated in the brain, and how it is mapped onto specific brain networks and the nature of the calculations performed in the different nodes within these networks.
- Students will also participate in discussions of neuropsychological patient case studies with the goal of demonstrating how data from patients with specific types of brain damage provide important insights into the neural bases of normal cognitive functioning.

**Learning Objectives:**
By the end of the course, students are expected to demonstrate their knowledge of:
- The history and methods used in the science of consciousness.
- The structure of the major sensory systems.
- The transduction and transmission processes for the major sensory systems.
- Behaviorally-based models and theories of consciousness.
- The neurobiological bases of normal and abnormal conscious states.
Role in the Psychology curriculum
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 5th 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.

Readings: There is no textbook required for this course
Readings will comprise scientific articles from peer-reviewed journals, literature reviews, and commentaries in the fields of consciousness and attention. The readings listed in the Schedule below are provisional but illustrative of the types of articles we will be reading and discussing. All readings will be posted in PDF form on CourseWorks.

Schedule
The calendar below details topics, readings, and assignments for each class period. It may be subject to changes to reflect interests of students. Students are responsible to be prepared to discuss the assigned readings for each class period. Typically, each class period will begin with a short lecture providing the background in neuroscience necessary to better explore the issue of the day. The majority of class time will be devoted to student presentations and student-led discussions (detailed in Course Requirements).

As an example, for the class on Attention and Consciousness (week 10), the Instructor will give a brief lecture on the neural correlates of attention and of consciousness, providing an overview of the field and highlighting recent findings from empirical research. Then students will present the findings and implications of the Posner 2012 article, another might present the findings and implications of the Tallon Baudry 2012 article, and another one the Sergent et al., 2013 article, and so on. Then, the remainder of class time will be devoted to a discussion addressing questions related to the weeks’ topic. Optional, supplementary readings are also included for those who might be interested in exploring the topic of a specific class more in depth, and students are encouraged to do so, especially by contributing to the discussion with more recent knowledge.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topics and Assignments</th>
<th>Readings</th>
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</thead>
<tbody>
<tr>
<td>Week 1 Tue Jan 22nd</td>
<td><strong>Introduction to the Seminar:</strong> review of Syllabus and overview of the topic</td>
<td>Watch this video: Antonio Damasio: The quest to understand consciousness</td>
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</tbody>
</table>
**Supplementary Readings**  
**Supplementary Videos** |
<table>
<thead>
<tr>
<th>Week 3</th>
<th>Theoretical approaches to the study of consciousness Part II</th>
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<tbody>
<tr>
<td>Tue Feb 5th</td>
<td>Reading response due</td>
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<tr>
<td></td>
<td><strong>Supplementary Readings:</strong></td>
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<tr>
<td></td>
<td><strong>Supplementary Videos:</strong></td>
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<tr>
<th>Week 4</th>
<th>Theoretical approaches to the study of consciousness Part III</th>
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<tbody>
<tr>
<td>Tue Feb 12th</td>
<td>Reading response due</td>
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</table>

**Supplementary Readings**

**Supplementary Videos**
7. [How do you explain consciousness? | David Chalmers](https://www.youtube.com/watch?v=VUvIz7zXbks)
8. [Daniel Dennett on the Evolution of the Mind, Consciousness and AI](https://www.youtube.com/watch?v=Q5jYJnzXzE)

### Week 5
**Tue Feb 19th**

<table>
<thead>
<tr>
<th><strong>Theoretical approaches to the study of consciousness</strong></th>
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<tr>
<td><strong>Part IV</strong></td>
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<tr>
<td><strong>Reading response due</strong></td>
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**Supplementary Video**
5. [Chris Frith (University College London): “What’s the Use of Consciousness?”](https://www.youtube.com/watch?v=VUvIz7zXbks)

### Week 6
**Tue Feb 26th**

<table>
<thead>
<tr>
<th><strong>Beyond the theories of Consciousness: Information Processing</strong></th>
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<tr>
<td><strong>Reading response due</strong></td>
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<tr>
<td><strong>Deadline for Topic Proposal</strong></td>
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**Supplementary Readings**


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### Week 7
**Tue Mar 5**

**Consciousness and Perception**

*Reading response due*


**Supplementary Readings**


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<tr>
<th>Week 8</th>
<th>Theoretical approaches to the study of Attention</th>
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<tr>
<td>Tue Mar 12th</td>
<td><em>Reading response due</em></td>
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**Supplementary Readings**


<table>
<thead>
<tr>
<th>Tue Mar 19th</th>
<th>SPRING BREAK</th>
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<tr>
<th>Week 9</th>
<th>The Neural Bases of Attention</th>
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<tbody>
<tr>
<td>Tue Mar 26th</td>
<td><em>Reading response due</em></td>
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**Supplementary Readings**


<table>
<thead>
<tr>
<th>Week 10</th>
<th>Tue Apr 2^{nd}</th>
<th>Consciousness and Attention Part I</th>
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<tr>
<td></td>
<td></td>
<td><em>Reading response due</em></td>
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<tr>
<td></td>
<td></td>
<td><strong>Deadline for Paper Draft</strong></td>
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**Supplementary Readings**


| Week 11  | **Consciousness and Attention**  
| **Part II**  
| *Reading response due*  
| **Paper proposal due**  |
|
| Week 12  | **Consciousness, Default Mode Network, and sleep**  
| *Reading response due*  |


**Supplementary Readings**


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<table>
<thead>
<tr>
<th>Week 13</th>
<th>Minimally conscious states and neurological disorders</th>
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<tbody>
<tr>
<td>Tue Apr 23rd</td>
<td>Reading response due</td>
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<td></td>
<td>First draft due</td>
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</table>


**Supplementary Readings**

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<tr>
<th>Week 14</th>
<th>Tue Apr 30th</th>
<th>Propose your Reading!</th>
<th>There is no assigned reading for this week, but students are invited to propose articles related to the topic (and on which they are writing their draft) to share and review with other classmates and instructor!</th>
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<tbody>
<tr>
<td>Week 15</td>
<td>Tue May 7th</td>
<td>Final Paper Due</td>
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**Course Requirements:**

1. **Class preparation and participation:** The assigned readings are designed to expand your knowledge on the latest advancement in the field of neuroscience of consciousness and to hone your critical thinking skills. The topics discussed during the seminars are complex, leaving plenty of space to discuss and debate. Strong preparation and participation will enable us to have high-level, thought-provoking discussion.

2. The day before each class period you will be asked to submit a short (one-paragraph) reading response to CourseWorks by 5:00pm. Goals of these reading responses are to help you keep current on course topics and to help me understand where students may have had difficulty with the readings and which topics students were most intrigued by and, therefore, which areas may warrant more focus during class time. Each reading response should be no more than a short paragraph, either discussing something interesting you found in the readings or asking substantive questions about concepts in the reading you found challenging. As the goal of these assignments is to keep you up to speed and to help guide my teaching and our class discussions, the assignments will just be graded on a pass/fail basis. (I can only accept responses submitted before the deadline.)

3. Thorough reading enables thoughtful discussion. It is important to engage with the material during class discussions, since your active participation in these discussions will contribute to your final grade. If you feel that regularly contributing to class discussions is difficult for you, you should raise
this issue with me as soon as possible. In such cases, we might be able to work out a way for you to participate thoughtfully through your reading responses.

Generally speaking, effective class preparation and participation could include:

- Asking insightful or clarifying questions.
- Connecting the reading to other reading we've done in the course or reading you've done on your own, drawing parallels and/or contrasts among findings.
- Actively listening to fellow classmates and responding to their ideas.
- Offering thoughtful critiques of the research methodology and providing suggestions for how it might be improved.
- Bringing in outside sources – potentially from the news media or other sources – that shed light on neuroscience findings or that illustrate ways in which these findings are interpreted and applied.

4. Leading discussions: You will be responsible for presenting an article and leading the class discussion for at least three class meetings. I’ll provide more information and give a demonstration of the sort of presentation I’m looking for in the first week of class. But, briefly, you’ll walk us through your assigned article, describing the methods and results, highlighting any strengths or weaknesses of the study design, and giving your thoughts on the meaning and importance of the findings. I’ll ask you to complete a handout and email that to me at least two days before the date of your presentation, so that I can provide feedback in advance of your actual presentations. As the goal is for you to become more skilled in presenting research findings and leading discussions, in calculating grades, the second presentation will be weighted more heavily than the first.

5. Research paper: The culmination of this course is the creation of a novel research proposal relating to the material of the class. Good writing is good thinking, and a primary goal of this assignment is to help you hone your writing and critical thinking skills. The process of writing the research paper follows three steps:

a) Early in the course you will be asked to identify a topic related to the class. As soon as you identify it, you are expected to email me stating your research topic, so that together we can decide whether it is appropriate. Such topic proposals should include a short paragraph about your intended topic and a list of at least five (and no more than 10) references you intend to use. I will make suggestions regarding focus, potential sources, etc. Deadline for Topic Proposal is set to Tuesday February 26th.

b) Once your topic is approved, you will begin work on a first draft of the paper. Generally, you want to choose a topic that is appropriately narrow to address in an 8-10 pages paper (not including references). The paper will first introduce the topic, then review recent knowledge and advancements in the field, and then discuss future directions / breakthroughs you identify. Deadline for Paper Draft is set to Tuesday April 2nd.
Towards that end, I will provide comments and suggestions on your first draft, and you will be expected to make substantive changes – not just copyediting, but rather larger edits such as, reworking entire sections, drawing on new sources, and providing more analysis. The final draft of the paper will be graded not only as a standalone paper but also in how it demonstrates improvement upon the earlier draft. **Deadline Tuesday May 7th.**

**Grading**

Grades will be calculated based on the percentages outlined below.

A. Class preparation and participation..........................................................20%
   - Reading responses 10%
   - Contribution to class discussion 15%

B. Discussion leading.....................................................................................40%
   - First presentation 10%
   - Second presentation 15%
   - Third presentation 15%

C. Research paper.........................................................................................40%
   - Proposal 5%
   - First draft 10%
   - Final draft 25%

**Class policies: Important Information below – please read carefully!**

☞ **Special needs:** If you are a student with special needs and require any type of accommodation, please make an appointment with me before the first class to discuss your needs. You should also contact the office of Disability Services ([https://health.columbia.edu/disability-services](https://health.columbia.edu/disability-services)) before the first class to register for specific accommodations. If you have problems reading specific kinds of text (e.g., based on font or text size), please see me so I can make you exams (and a syllabus, and anything else you need) that you can more easily read.

☞ **Religious observances:** If you are going to miss class(es) due to religious holidays, you must notify me during the first week of class so that accommodations may be made.

☞ **Academic integrity:** As members of this academic community, we are responsible for maintaining the highest level of personal and academic integrity: “Each one of us bears the responsibility to participate in scholarly discourse and research in a manner characterized by intellectual honesty and scholarly integrity.... The exchange of ideas relies upon a mutual trust that sources, opinions, facts, and insights will be properly noted and carefully credited. In practical terms, this means that, as students, you must be responsible for the full citations of others’ ideas in all of your research papers and projects... [and] you must always submit your own work and not that of
another student, scholar, or internet agent” (from the Columbia University Faculty Statement on Academic Integrity) [http://www.college.columbia.edu/academics/academicintegrity](http://www.college.columbia.edu/academics/academicintegrity). Cheating and plagiarism – whether intentional or inadvertent – is a serious violation of academic integrity. Plagiarism is the practice of claiming or implying original authorship of (or incorporating materials from) someone else’s written or creative work, in whole or in part, without adequate acknowledgement. If you have any questions about what constitutes plagiarism and/or how to properly cite sources, please come to me. I am more than happy to help. Similarly, if you put yourself in a situation in which you think your best option might be to cut some corners, see me. If you feel like you are falling behind, don’t understand the material, or are not confident about your ability to take tests, talk to me as soon as possible instead of taking measures that go against principles of academic integrity. We are here to learn, not to merely judge. It is a far better option to come talk to me than compromise your academic integrity and potentially put your academic standing in jeopardy.

Sexual Respect: Any form of gender-based misconduct will not be tolerated. Columbia University is committed to fostering an environment that is free from gender-based discrimination and harassment, including sexual assault and all other forms of gender-based misconduct. Visit this website for more information: [http://sexualrespect.columbia.edu/](http://sexualrespect.columbia.edu/)

Attendance: Coming to class is meaningless if class time is spent inappropriately. Chatting with friends, watching videos online, and browsing social media are not appropriate activities for the classroom. Also, remember to silence your cell phone before class. Generally, eliminate distractions as much as possible to respect your classmates, as well as increase your chance of staying focused and learning the material during class.

Changes to the Syllabus might happen during the course. The most recent version will always be posted to Courseworks.