Instructor: Alfredo Spagna, Ph.D.  
Class Meets: Tuesday: 12.10AM – 2PM  
Room: Zoom  
Linkedin: Alfredo Spagna  
Office: Zoom  
Office Hours: Tuesday 3 – 5PM  
Email: as5559@columbia.edu  
Twitter: @spagnaphd

Course Bulletin Description
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 attention and perception. The readings listed in the Schedule below are divided into five categories: **History, Review, Original Research, Method, Supplementary**, labels that briefly describe each article. All readings will be posted in PDF form on CourseWorks, and each week you will be asked to read at least one article from each category. So, in total, you will be asked to read a maximum of five articles per week. Although this may sound like a lot, it is the **best and easiest** way to learn about science, while at the same time improving
your writing skills by delving into other authors’ writing and to expand your background knowledge. Trust me, it works!

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, conducted by the Instructor. 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>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td><strong>Introduction to the Seminar:</strong> review of Syllabus and overview of the topic</td>
<td>Watch this video:</td>
</tr>
<tr>
<td>Tue Jan 12</td>
<td></td>
<td><em>Antonio Damasio: The quest to understand consciousness</em></td>
</tr>
<tr>
<td>Week 2</td>
<td><strong>Theoretical approaches to the study of consciousness Part I</strong></td>
<td><strong>Category: History</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Category: Review</strong></td>
</tr>
<tr>
<td>Week 3 Tue Jan 26</td>
<td>Theoretical approaches to the study of consciousness Part II Reading response due</td>
<td>Category: History</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>--------------------</td>
</tr>
</tbody>
</table>


**Category: Method**


**Category: Opinion**


**Category: Supplementary**


8. **What is Consciousness? with Stanislas Dehaene**
<table>
<thead>
<tr>
<th>Week 4</th>
<th>Theoretical approaches to the study of consciousness Part III</th>
<th>Category: History</th>
</tr>
</thead>
</table>

**Category: Method**


**Category: Supplementary**


9. How do you explain consciousness? | David Chalmers

10. Daniel Dennett on the Evolution of the Mind, Consciousness and AI

---

**Week 5**  
**Tue Feb 9**  
**Theoretical approaches to the study of consciousness**  
**Part IV**  
*Reading response due*  

**Category: History**  

**Category: Review**  
<table>
<thead>
<tr>
<th></th>
<th>Beyond the theories of Consciousness: Information Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reading response due</td>
</tr>
<tr>
<td></td>
<td>Deadline for Topic Proposal</td>
</tr>
<tr>
<td>Week 6</td>
<td>Tue Feb 16</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Category: Method**


**Category: Supplementary**


**Week 7**
**Tue Feb 23**

**Consciousness and Perception**

*Reading response due*

**Category: History**


**Category: Original Research**


**Category: Method**
5. Edlow, B. L., Mareyam, A., Horn, A., Polimeni, J. R., Witzel, T., Tisdall, M. D., ... & Tirrell, L. S. (2019). 7 Tesla MRI of the ex vivo human brain at 100 micron resolution. Scientific data, 6(1), 1-10.

**Category: Supplementary**


---

**Week 8 - SPRING BREAK**

**Week 9**

**Tue Mar 9**

**Theoretical approaches to the study of Attention**

Reading response due

**Category: History**


**Category: Review**


**Category: Original Research**

**Category: Method**


**Category: Supplementary**


---

**Week 10**

**Tue Mar 16**

<table>
<thead>
<tr>
<th>The Neural Bases of Attention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reading response due</strong></td>
</tr>
<tr>
<td>Deadline Manuscript Draft</td>
</tr>
</tbody>
</table>

**Category: Review**


**Category: Original Research**


<table>
<thead>
<tr>
<th>Week 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue Mar 23</td>
</tr>
<tr>
<td><strong>Consciousness and Attention Part I</strong></td>
</tr>
<tr>
<td><em>Reading response due</em></td>
</tr>
</tbody>
</table>

**Category: Method**


**Category: Supplementary**


**Category: History**


**Category: Review**


**Category: Original Research**


**Category: Method**


**Category: Supplementary**


<table>
<thead>
<tr>
<th>Week 12</th>
<th>Consciousness and Attention Part II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue Mar 30</td>
<td><em>Reading response due</em></td>
</tr>
</tbody>
</table>

**Deadline for Peer Review**

**Category: Review**


Category: Method


Category: Supplementary

<table>
<thead>
<tr>
<th>Week 13</th>
<th>Reading response due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue Apr 6</td>
<td>Consciousness, Default Mode Network, and sleep</td>
</tr>
</tbody>
</table>

### Category: History

### Category: Review
2. Mak et al 2017 - The Default Mode Network in Healthy Individuals A Systematic Review and Meta-Analysis

### Category: Original Research


<table>
<thead>
<tr>
<th>Week 14</th>
<th>Tue Apr 13</th>
<th><strong>Minimally conscious states and neurological disorders</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Reading response due</strong></td>
</tr>
</tbody>
</table>

**Category: Method**


**Category: Supplementary**


**Category: Review**


**Category: Original Research**


4. Demertzi, A., Tagliazucchi, E., Dehaene, S., Deco, G., Barttfeld, P., Raimondo, F., ... & Schiff, N. D. (2019). Human consciousness is supported by dynamic


**Category: Method**


**Category: Supplementary**


**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. **Reading Response:** 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. **Participate in Discussion:** 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. **Presentation and Leading discussions:** You will be responsible for presenting two articles and leading a follow-up class discussion at 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. Note important info below:
  a. You must send your presentation to the Instructor ahead of time (deadline for full credit is the Saturday before your presentation day), so that I can provide feedback in advance of your actual presentations.
  b. You are expected to implement that feedback in your presentation, therefore making your slides clearer and more accessible.
  c. Also, Upload the slides on Piazza the night before class, so that everyone has the slides beforehand.

As the goal is for you to become more skilled in presenting research findings and leading discussions, in calculating grades, successive presentations will be weighted more heavily than the previous (see grading scheme).
5. **Research manuscript**: 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 happens entirely on Coursework and follows three steps:

   a) **Topic Proposal**: 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 post on the associated page on CourseWork 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 16\(^{th}\) at 11:59 PM.**

   b) **Manuscript Draft**: 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 the Manuscript Draft is set to Tuesday March 16\(^{th}\) at 11:59 PM.** You will receive comments from the Instructor within a two-week time-frame from your submission.

   c) **Anonymous Peer Review**: In order to make this activity also an opportunity for students to actively learn, one of the steps in the revision process will be a round of “anonymous peer review,” in which each student will be asked to review the drafts of at least two of their colleagues. This will put each student in the position of the “reviewer,” by critically analyzing and understanding pitfalls, shortcomings, but also strengths of the writing of their peers; this is expected to influence also the student’s own writing by adjusting the focus and clarifying potential issues. Students will be randomly assigned to anonymously peer review the drafts written by two other students. Comments and suggestions from the peer-review process should be appropriately considered when writing the final manuscript based on the student’s judgment. Students will be evaluated on their own writing, the feedback provided to other students, as well as their ability to incorporate the feedback into their work. Make sure you provide valuable feedback to your peers in order to get full points on the final writing assignment. **Deadline for the Anonymous Peer Review to Tuesday March 30\(^{th}\) at 11:59 PM.**

   d) **Final Submission**: 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 for the Final Submission is Tuesday April 20\(^{th}\).**

**Grading**

Grades will be calculated based on the percentages outlined below.
Class preparation and participation ...................................................... 20%
  Reading responses 50%
  Contribution to class discussion 50%
Presentation and Discussion leading ...................................................... 40%
  First presentation 40%
  Second presentation 60%
Research Manuscript ............................................................................ 40%
  Proposal 10%
  First draft 20%
  Peer Review 20%
  Final draft 50%

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) 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. 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.**