AP/PHIL 3635 – Philosophy of Neuroscience – Fall 2021

Lecture W: 2:30pm-5:30pm Lassonde Building C

Professor: Javier Gomez-Lavin
Office: S438 Ross Building
Office Hours: T 3:00pm-4:00pm *via zoom*
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Course Description:

The scientific study of the brain has expanded in the past 150 years from a hobby-like side job for anatomists and coroners to a multi-billion dollar industry with tens of thousands of researchers working in tandem across the globe. What are these people doing? What are they studying? How do changing tools and innovations structure the ways in which neuroscience is done? How do neuroscientists make coherent, testable predictions and in so doing build better explanations about what is likely the most complex system known to humankind? Where might neuroscience go? This course takes methods from the philosophy of science broadly construed and applies them to the historical and present practices of scientists who intervene, observe, and experiment on the brain.

As such, the course will be divided into roughly three parts: First, we will begin with a primer on issues in the philosophy of explanation and experimentation alongside a general historical overview of the development of the neurosciences, then we will focus on the tools that have been devised to study the brain moving from lesion and electrophysiological interventions, to neuroimaging—ultimately taking a look at newer techniques including optogenetics and so-called "big-data" neuroscience, finally we will end by reflecting on some core philosophical fissures that still sit at the heart of neuroscientific work, including: What is the nature of neural activity? and, Are neuroscientific tools sufficient to explain mental phenomena?

Organization of the course:

Weekly seminar meetings (3 hours, with breaks). Class meetings will be conducted in-person and on-campus at the designated classroom. Some exceptions will be explicitly noted, especially the one-on-one meeting that students will have with the instructor in late November to discuss their final paper proposal.

Course Learning Objectives:

After completing this course, students should be able to:

1. Understand core positions in the philosophy of explanation, including mechanistic and interventionist views, and be able to apply or detect features of these views in contemporary empirical work in neuroscience.
2. Understand the historical progression of tools and techniques in the neurosciences.
3. Know the fundamentals of various key tools used in the neurosciences, from lesion studies to fMRI, alongside their development, and particular up- and down-sides.
4. Demonstrate a capacity to critically and charitably engage with contemporary empirical neuroscience.
5. Demonstrate an ability to write a succinct, clear, and charitable argumentative based essay analyzing the explanatory limits of a given tool or investigation-area in the neurosciences.

Course Prerequisites:

Prerequisite / Co-requisite: At least six credits in philosophy, or permission of the instructor. NOTE: This course is not open to any student who has successfully completed or who is taking AK/AS/SC/COSC3402 3.0, AK/AS/SC/COSC44013.0, AK/AS/SC/COSC4402 3.0, AK/AS/SC/COSE4302 3.0, A

Technical Requirements for Taking the Course:

This course will have a mixture of in-person (on-campus) and online components. We expect meetings to take place in-person and on-campus throughout the Fall semester. Students should be prepared for the possibility that the some or all meetings in the course become fully remote, with meetings being hosted on Zoom, as circumstances require. In order to fully participate in Zoom meetings, students should ensure that they have access to a stable, higher-speed internet connection, as well as a computer with a webcam and microphone, and/or a smart device with these features. Students should bring such a device to class as well, in order to complete in-class, online hosted assignments as needed.

All assignments except for in-class exams, the schedule of readings, course announcements, and course policies will be posted to the eClass site for this course. All assignments—including in class quizzes—will either be submitted via eClass, a York U hosted Qualtrics link created by the instructor, or completed within the eClass interface (e.g. posting on discussion forums). The instructor will also use eClass as their primary way of communicating with students.

Students are expected to follow the most up-to-date safety protocols laid out by the Province and by York University, including completing daily screenings. For more information, see: https://www.yorku.ca/bettertogether/students/. Students should be prepared for the possibility that class be held fully remotely, via Zoom, depending on the evolving circumstances of the COVID-19 pandemic.

The instructor will attempt to record all lectures using the PANOPTO software suite integrated with the course in eClass. This should allow students who cannot attend (e.g., because of isolation procedures) to view the lecture. Additionally, those students will be required to still complete the daily quiz hosted on eClass or Qualtrics. Further details will be provided on the first day of class.

Course Requirements:

Each week will feature at least three primary readings. These are often difficult texts and will reward multiple reviews. Expect to spend at least two hours outside of class on these texts per week.

Exams: 2 x 25% There will be two exams throughout the semester. The first exam will be held in-class on October 20th. The Final exam has not been scheduled yet. Each exam will feature a series of short-answer and lengthier essay questions. No aids (e.g., notes, books, electronic devices etc.) are permitted unless otherwise specified by the University's Student Accessibility Services ("SAS"). Any student seeking accommodations (e.g., extra-time, alternative test-location etc.) must have communicated with SAS and completed their required procedures *prior* to the test date.

Paper: 1 x 25% One 1500-2500 word paper on will be due in class, as a hard-copy and submitted via eClass on December 1st. Late papers may be docked 5% of your total grade each day the paper is late (e.g., if you turn your paper in three days late, then your maximum possible paper grade is a 10/25). The paper **will be broken down and graded into component parts**. I will pass around topics and a rubric on October 27th. Each student will be required to submit a choice of topics and bibliography on November 3rd, and submit a 150-200 word abstract with a thesis statement on November 10th. Together these will count for 1/5 of the paper grade. Students will be expected to submit a detailed outline November 17th for a further

1/5th of their grade. Each student will have to meet one-on-one (via zoom) with the instructor for a 15-minute meeting between November 24th and November 30th (which will be scheduled in advance). Finally, the first draft will be due December 1st. Rewrites may be possible. Plagiarism (e.g., using language and materials of another without proper citation) **will not be tolerated**.

Weekly quizzes, attendance and participation: 25% Ten short answer quizzes will be administered at the beginning of class – via an eClass or Qualtrics link. Each quiz is worth 2% of your total grade. If you have a valid excuse (e.g., illness, religious observance etc.) you will be provided a secondary link to a similar quiz to be completed within an agreed upon timeframe. You are still responsible for knowing the material covered in class (e.g., by asking other students or watching the panopto recording). The following 5% of your grade will be calculated via participation and attendance in class. You are expected to be in each class. Failure to attend, or egregious tardiness will be noted and may require a discussion about your status and future in this course.

Policies:

- I only allow incompletes for genuinely extraordinary reasons.
- I do not provide extra-credit opportunities.
- Keep in mind that I may not respond to your email outside of business hours (e.g., in the evening, over holidays, or during weekends).
- **Plagiarism and Cheating**: Under no circumstances will plagiarism or cheating be tolerated. \

Attendance: Attendance is mandatory, with exceptions due to illness, permitted excuses as required by university policy, and failure to pass the YU screen daily screening. In the event you cannot attend in person class, you must still complete the daily quiz during the start of our class time, as it will be made unavailable shortly afterwards. You would also be strongly advised to consult the recorded PANOPTO lecture, if available. If you continuously miss class, I may contact you to discuss options for your future in the course. Attendance and active engagement are the keys to successfully completing the course.

Exam makeups: Alternative arrangements and makeups will not be allowed, except as required by university policy: e.g., if you fail the screening or the course is required to move online, alternative arrangements (e.g., an essay exam delivered via eClass or Qualtrics) will be devised.

Assignment Submissions: Assignments will be submitted via eClass or qualtrics. Additionally, I will request that you print out and hand in hardcopies of your papers and their subcomponents at the relevant point in the semester.

Papers: Late papers may be accepted at the instructor's discretion, if there are circumstances calling for an extension. Papers turned in late without reasonable mitigating circumstances will incur at least a 10% reduction in your score. It best that you contact me as soon as possible if you're going to be late (preferably before the due date).

Contacting the instructor: You should contact the instructor via email or the eClass direct message function. Please note that we will be responding to messages within 24 hours during working days (i.e. not on weekends or holidays).

Academic honesty and integrity: In this course, we strive to maintain academic integrity to the highest extent possible. All submitted coursework must be an expression of the student's own understanding and ideas. Please familiarize yourself with the meaning of academic integrity by completing SPARK's Academic Integrity module at the beginning of the course. Breaches of academic integrity range from

cheating to plagiarism (i.e., the improper crediting of another's work, the representation of another's ideas as your own, etc.). All instances of academic dishonesty in this course will be reported to the appropriate university authorities, and can be punishable according to the Senate Policy on Academic Honesty.

Turnitin: To promote academic integrity in this course, students will be normally required to submit their written assignments to Turnitin (via the course eClass) for a review of textual similarity and the detection of possible plagiarism. In so doing, students will allow their material to be included as source documents in the Turnitin.com reference database, where they will be used only for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin service are described on the Turnitin.com website.

"Closed-book" policy: It is expected that students will complete in-person quizzes and exams on their own without help from any other person, and without access to notes, articles covered in class, or other materials that have been provided over eClass. These quizzes and exams are designed so that you can complete them without referring to minutia in the text, and doing so with consume valuable time that would be better used in thinking through the essay and answer prompts. In the event that the course is moved online, quizzes and exams may be "open book" at the instructor's discretion. In this event, more information will be provided. Intellectual property: All course material (this syllabus, power points, assignments, paper rubrics, etc), except the outside assigned articles, is the intellectual property of the course instructor and cannot be reproduced in any way without my permission. Assigned articles are the intellectual property of their respective copyright holders and usually cannot be reproduced or posted publicly.

Course recordings: Any recordings for this course should be used for educational purposes only and as a means for enhancing accessibility. Students do not have permission to duplicate, copy and/or distribute the recordings outside of the class (these acts can violate not only copyright laws but also FIPPA).

Student conduct: All students are expected to treat their fellow students and the instructor with respect and charity, both in class in person and on any of our online platforms. Especially through mediums like Zoom and the course eClass, no form of harassment, trolling, or disrespect will be tolerated.

Grading: The grading scheme for the course conforms to the 9-point grading system used in undergraduate programs at York (e.g., A+ = 9, A = 8, B+ - 7, C+ = 5, etc.). Assignments and tests* will bear either a letter grade designation or a corresponding number grade (e.g. A+ = 90 to 100, A = 80 to 90, B+ = 75 to 79, etc.). Final course grades may be adjusted to conform to Program or Faculty grades distribution profiles.

If and only if we must move to zoom:

Zoom sessions: For those attending the live Zoom classes, you are not allowed to take any screenshots or recordings of any kind. This is to respect the privacy of your fellow students. Recordings of the lecture portions (which only involve myself) and my slides will be made available on eClass. You also do not have permission to reproduce any lecture recordings on any platforms or websites outside of eClass.

Video policy: I understand that some of you might have privacy concerns about using your video during Zoom classes, and that others might have limited internet bandwidth that might make live-streaming difficult. Therefore, it is not required that students have their videos on if meetings must be moved online. That being said, having video cameras on can make a big difference in terms of creating a sense of community within our class, so that we feel more like a normal, in-person classroom. For this reason, I do very sincerely encourage you to use your video as much as possible if privacy or tech issues are not preventing you from doing otherwise. If you do need to keep your video off, please be sure to put a profile photo on your Zoom account, so that your classmates feel like they are talking to a person, rather than a black box with a name in it.

Zoom Chat policy: If meetings are held on Zoom, the option to privately message other students in the chat will be disabled. Messages in the public chat should be respectful and stay on point.

Student Accommodations: We are committed to fairly accommodating students with disabilities. Please contact the instructors and Student Accessibility Services (https://accessibility.students.yorku.ca/) as soon as possible, and we will all work together to find a fair accommodation. Note that in addition to sending the letter, accommodations for individual assignments must specifically be requested well ahead of the assignment's deadline.

Texts

Papers and readings will be posted on our eClass site. It is your responsibility to check the eClass site for new readings as they are made available.

READING LIST DRAFT 1

	Date	**Topic**	**Reading**	**A. 1**	**A. 2**
	8-Sep	syllabus day	- selections from twitter & **Jerry Fodor** (*not to be read in advance)*	Q1	-
2	15-Sep	- Historical origins of modern neuroscience - How neurons work - Staining & Lesioning as Methods	1. **Boring, Edwin**. (2008/1929). A History of Experimental Psychology Volume 1, Chapter 4 "Physiology of the Brain: 1800-1870" p. 58-76. 2. **Churchland, Patricia**. (1986) Neurophilosophy, Chapter 1 "The science of Nervous Systems: A Historical Sketch" p 13-34, & Chapter 2 "Modern Theory of Neurons" Sections 2.1, 2.2. & **2.3*** p, 36-77. *Optional:* **James, William** (1890/1918).The Principles of Psychology Vol.1, Chapter 2 "The Functions of the Brain" p 10-39	Q2	
3	22-Sep	- Explanation and values in (Neuro)science	1. **Stinton, Catherine** & **Sullivan, Jacqueline** (2017). "Mechanistic explanation in neuroscience" p. 375-388 2. **Longino, Helen** (2004), "How values can be good for science", p. 127-142 3. **Craver, Carl** (2020) "Levels of Mechanisms" p. 427-439	Q3	
4	29-Sep	- The Neuron Doctrine - Electrophysiology as Method	1. **Cao, Rosa** (2014). "Signaling in the brain: In search of functional units" p. 891-901. 2. **Wurtz, Robert** & **Sommer, Marc** (2006) "Single Neurons and Primate Behavior" p.123-139 3. **Hubel** & **Wiesel** (1959) "Receptive fields in cat striate cortex" p. 574-591	Q4	

-	13-Oct	no meeting	*Fall break*		
6	20-Oct	*midterm*	*In class short answer and essay midterm*	Q5	
7	27-Oct	- Society in the brain - Is addiction a Brain disease? - Is the brain gendered?	1. **Churchland, Patricia**. (1986) Neurophilosophy, Chapter 2 "Modern Theory of Neurons" Sections 2.4 p, 77-97. 2. **Jordan-Young, Rebecca** & **Rumiati, Raffaella** (2012) "Hardwired for Sexism? Approaches to Sex/Gender in Neuroscience" p. 305-315. 3. **Leshner, Alan** (1997) "Addiction is a Brain Disease and it matters" p. 45-47 4. **Grifell, Marc** & **Hart, Carl** (2018). "Is drug addiction a brain disease?" p. 160-167. 5. **Hart, Carl** (2017) "Viewing addiction as a brain disease promotes social injustice" p.1 6. **Bedi, G.** et al. (2017) "Addiction as a brain disease does not promote injustice" p.610 *Optional:* **Hart, Carl** (2020) "Exaggerating harmful drug effects on the brain is killing black people" p. 215-218. **Rippon, Gina** et al. (2014) "Recommendations for sex/gender research in neuroimaging" p. 1-14.	Q6	*Intro to paper writing, topics and timeline*
8	3-Nov	- Neuroimaging as method - the Univariate Doctrine - Introduction to Multivariate methods	1. **Bandettini, Peter** (2006) Chapter 9 "Functional Magnetic Resonance Imaging" p. 193-223. 2. **Haxby, James** (2010) "Multivariate pattern analysis of fMRI data" p.55-68 3. **Poldrack, Russ** (2010) "Subtraction and Beyond" p. 147-159 4. **Haynes, John-Dylan** (2015) "A Primer on pattern-based approaches to fMRI" p.257-270.	Q7	topics
9	10-Nov	Case studies: - Default mode network - Working memory	1. **Raichle, Marcus** (2015) "The Brain's Default Mode Network" p. 433-447. 2. **Klein, Colin** (2014) "The brain at rest" p. 974-985. 3. **D'Esposito, Mark** & **Postle, Bradley** (2015) "The Cognitive Neuroscience of Working Memory" p. 115-142 4. **Postle, Bradley** (2006) "Working memory as an emergent property of the mind and brain" p. 23-38	Q8	abstract

			5. **Gomez-Lavin, Javier** (*ms*) "Why cognitive science needs to let working memory go"		
10	17-Nov	"Activity Silent" states and Type Two Errors in Neuroscience	1. **Lewis-Peacock, Jarrod** & **Postle, Bradley** (2012) "Decoding the internal focus of attention" p. 470-478. 2. **Stokes, Mark** (2015) "'Activity-silent' working memory in prefrontal cortex" p. 394-405. 3. **Barbosa, Joao** et al. (2020) "Interplay between persistent activity and activity-silent dynamics in the prefrontal cortex underlies serial biases in working memory" p. 1016-1024 4. **Postle, Bradley** (2021) "Cognitive neuroscience of visual working memory" p. 333-357	Q9	outline
11	24-Nov	*zoom meetings*	*No in person class – students will make required appointments via zoom*		
12	1-Dec	The limits of neuroscientific explanation.	1. **Jonas, Eric** & **Kording, Konrad** (2017) "Could a neuroscientist understand a microprocessor?" p. 1-24. 2. **Krakauer, John** et al. (2017) "Neuroscience needs behavior: Correcting a reductionist bias" p. 480-491 3. **Smit, Harry** & **Hacker, Peter** (2014) "Seven misconceptions about the mereological fallacy" p. 1077-1097	Q10	draft due