Philosophy in Science

"There's no such thing as philosophy-free science. There's only science whose philosophical baggage is taken on board without examination."
- from *Darwin's Dangerous Idea* by Daniel Dennett

Duration:	Monday, Sept 16, to Friday, Nov 22	8 weeks total
	Skip week of Oct 14 (Indigenous People's Day)	
Time:	2:30 - 4:00 pm, Mondays & Thursdays	1.5 hours twice a week
Location:	Hess Center for Science and Medicine	
	Mondays: usually Hess **9**-101 (see syllabus)	
	Thursdays: usually Hess **8**-101 (see syllabus)	

Teaching Assistants (TAs)**:**	Alessandra Yu, M.Res.	alessandra.yu@icahn.mssm.edu
	Qi Xiu Fu, B.A.	qixiu.fu@icahn.mssm.edu
Director:	Daniela Schiller, Ph.D.	daniela.schiller@mssm.edu

Description

This course dives into the philosophical foundations of science, offering the opportunity to critically reflect on the theoretical underpinning of *your* own research. Science is inherently laden with theory. Theory shapes the questions we ask and how we choose to answer them. Moreover, not all questions are empirical ones. What should we do when two theories equally account for the observed data? While much of science depends on methodological advancement, these theoretical decision points often precede significant scientific breakthroughs and, with enough theoretical pressure, culminate in a paradigm shift.

However, without rigorous theoretical care, uncontrolled proliferation of theories and frameworks without them converging can threaten to overwhelm the scientific landscape of any subfield–fragmenting it and impeding scientific progress. This applies to the life sciences in particular and even more so to biomedical and neural sciences sitting at their intersection, given their multiscale and cognitive aspects. In these burgeoning fields, both our descriptions of *what* we study and our choices for *how* we study our objects of inquiry are both diverse and heavily debated. Even deeper, our motivations for *why* we study what we do and how we choose to study those phenomena are also diverse and rarely disclosed.

We invite you to embark on this theoretical journey through the most nuanced and foundational, yet slippery facets of science. By engaging with theoretical discussion and practical application, we hope you will emerge not only with a better understanding of your place in the field as a scientist, but with enhanced clarity into your own research framework.

- This course is designed for graduate-level students in the biomedical and neural sciences who are developing foundational thinking for their research interests. We encourage students to actively discuss and consult with their Principal Investigators (PIs) on the application of the topics and issues raised in this course to their own research, particularly between lecture and practical workshop components in order to get the most out of the course structure. Our aim is to foster a

deep interest in the philosophical underpinnings of science, highlighting the inherent role of theory in empirical research as well as the dynamics of scientific progress–and at times, stagnation. By implementing these concepts in concrete exercises made relevant to each student, we hope that theoretical discussion beyond the classroom is enriched and takes further root in the lab, where theory truly meets practice.

- ❖ Please be aware that all lectures will be recorded and made available online for open access.
- ❖ Lastly, this course is both an experimental and an evolving process. We value iteration and continuous improvement, particularly as we consider offering this course in future years. Please do provide feedback or share your thoughts on your experiences in integrating the course content with your research.

Objectives

- Identify and describe theoretical **debates** in your own subfield
- Reflect on your **motivations** for the choices you make in your science
- Outline **assumptions** shaping your own research
- Interpret neighboring **subfields** despite the differences in jargon in the literature
- Address **barriers** to theoretical understanding, discussion, and change in everyday science

Expectations

This course consists of **8 modules**, each 1 week long with two 1.5-hour sections.

Every week features a dual structure:

1. Mondays are **theoretical lectures**, occasionally with guest instructors, paired with heavy discussion. [These guests would be well-established researchers themselves, joining us from beyond Sinai, whose topic of research is the theoretical focus of the module.]
2. Thursdays are **practical workshops** focused on applying the principles of theoretical lecture to your own research with an opportunity to share with classmates and participating PIs.

Active participation is crucial for both segments throughout the course as both are designed to be highly interactive. This course aims to empower each student to build mastery in the theoretical nuances of their own research. It is up to every student to truly apply the principles learned in the theoretical portion not only in the practical workshops, but in their own lab research and broader scientific careers.

Requirements

- **Attendance** and **participation** are required (**40%**).
  - Students will be allowed up to one excused absence.
  - A personal electronic device should be brought to class for in-device polls and exercises.
- All **readings** must be completed every week prior to the theoretical lecture.
- All selected **exercises** must be completed prior to the end of the course.
  - This template can be used for all exercises (see Project below).
- The **project**, consisting of exercises (**30%**) and a reflection (**10%**), must be submitted at the end.
- All **feedback** forms must be completed following each week (**20%**).

Project

Deadline: Friday, November 22, 2024

The final project will have 2 components:

1. All your **exercises**, including a table outlining your theoretical assumptions for your research.
2. A 1-page **reflection** on your experience in this course and how it impacts your research going forward.

Submission Guidelines:

- Copying this template [File → Make a copy]
- Replacing 'Template' with your full name
- Uploading into this folder by the deadline

Syllabus

Module 0 Intro to Philosophy in Science: *What are we even doing?*

In this foundational module, students will be introduced to the goals and expectations of the course. This will begin with an introduction to philosophy *of* science, followed by delving into considerations of philosophy *in* science. Then, we will explore why scientists should care about philosophy and what barriers we face in practicing philosophy in science. Finally, students will be introduced to the template of assumptions that gives the course its structure–a scaffold that we will fill in and build on in each new module with the end result being an outline of each student's theoretical framework for their research. In essence, we introduce the question–*what are we even doing in our science*?–and provide a roadmap for answering it.

Theoretical Lecture *Monday, Sept 16, 2024* **Hess 9-101**

Instructors: Dr. Daniela Schiller, Qixiu Fu, & Alessandra Yu

To understand what we're doing, it helps to have an understanding of what science is. In this foundational module, we'll be delving into the core question in philosophy *of* science: what is science? We'll explore the range of topics within this overarching inquiry to get a handle on what's at stake in this question, including theoretical considerations in empirical research: philosophy *in* science. Then, we'll identify potential challenges that scientists face in embracing the full scope of our field and examine how these challenges influence theoretical considerations.

Suggested Readings

- ☐ Kampourakis & Uller (2020) - Philosophy of Biology: *Preface & Chapter 1* (pg 1-18)
- ☐ Bechtel & Huang (2022) - Philosophy of Neuroscience: *Introduction* (pg 1-2)
- ☐ Levenstein et al. (2023) - On the Role of Theory and Modeling in Neuroscience
- ☐ Schiller, Yu, et al. (2024) - The Human Affectome: Introduction (example of phil in sci)

In-Class Exercise

- ☐ Fill out a table with two columns on barriers to practicing philosophy in science:

- On the left, create a ranked list of barriers that scientists face when getting into theoretical discussion about their research.
- On the right, describe the barriers that you face with regards to theoretical issues in *your* particular research or in your corner of your subfield.

Practical Workshop *Thursday, Sept 19, 2024* **Hess 8-101**

For this initial practical workshop of the course, students begin the essential process of mapping out their research through a structured Table of Assumptions. This exercise is designed to help each participant explicitly articulate the foundational assumptions that underpin their scientific investigations. Students can take their first stab at the table and share it during the workshop. Each subsequent module will elaborate on a domain in the table, so we will keep coming back to it until the end of the course. This table summarizes domains of theoretical assumptions for their scientific framework which shapes the scientific theory each student uses.

Exercise

- ☐ **Table of Assumptions:** familiarize yourself with and fill out a table template of assumptions shaping your research:
  - **Motivation:** what are your reasons for studying what you do the way you do?
  - **Virtues:** what makes your theory good?
  - **Phenomenon:** what are you trying to study?
  - ***Construct:*** what are you studying practically?
  - **Mechanism:** how does what you're studying work?
  - ***Operationalization:*** how are you trying to study it practically?
  - **Purpose:** why do you think your phenomenon exists?

Feedback

- ☐ Please provide your feedback on **Module 0:** Intro to Philosophy in Science here. This will help us refine the course to better meet students' needs and expectations.

Module 1 Motivation: *Why study this phenomenon this way?*

This lecture dives into the essential *why*-questions that underpin all scientific inquiry, specifically examining the motivations behind studying certain phenomena in neuroscience. We will explore how these motivations are not just personal choices but are often deeply influenced by the broader context in which the research occurs. This module will help students recognize the complex interplay between individual interests and the historical, cultural, and academic contexts that shape these interests.

Theoretical Lecture *Monday, Sept 23, 2024* **Hess 10-101**

Instructor: Dr. Daniela Schiller

In this lecture, we will explore the motivations driving scientific inquiry and how these motivations shape research methods and outcomes. We will discuss the pragmatic aspects of science, focusing on how the context of research affects the questions asked and the explanations provided. The lecture will highlight the role of philosophy in understanding scientific motivation and pragmatism, delving into the *why*-questions that underpin research. We will also examine biases stemming from local research

traditions, practical observation methods, and audience interests. By the end, students will gain insights into the philosophical and pragmatic challenges influencing their research.

Suggested Readings

- ☐ Van Fraasen (1980) - *The Scientific Image*, Chapter 6: The Pragmatic Theory of Explanation
- ☐ Smaldino & McElreath (2016) - The natural selection of bad science

Practical Workshop *Thursday, Sept 26, 2024* **Hess 8-101**

In this practical workshop, students will apply the concepts discussed in the theoretical lecture to their own research motivations. Through the completion of a reflective exercise, students will explore the underlying reasons for their research focus and how historical and contextual factors have shaped these motivations. During the workshop, students will share their completed exercises to spur discussion. This session is designed to deepen students' understanding of the philosophical and pragmatic drivers of their scientific inquiries, fostering a more introspective and comprehensive approach to their work.

Exercise (select 1)

- ☐ Reflect on all your reasons for being in science and studying what you're interested in.
- ☐ Track the history of motivations in your subfield (i.e., *why ask a particular qu*), either:
  - Summarize a short history of the *motivations* in your subfield and reflect; **OR**
  - Identify a historical review and reflect on the *implicit motivations* of your subfield.
- ☐ Trace your academic lineage while highlighting the contextual motivations influencing each researcher that came before you.
  - Use Neurotree to see your neuroscience family tree.

Feedback

- ☐ Please provide your feedback on **Module 1:** Motivation here.

Module 2 Virtues: *What makes your theory good?*

This week, we focus on the theoretical virtues that determine the robustness and quality of scientific theories. Students will explore how empirical data often fail to resolve disputes between competing theoretical frameworks, necessitating an examination of the underlying virtues that guide theory selection. By the end of the module, students will understand the key qualities that make a theory scientifically valuable and how to apply these criteria to their own research.

Theoretical Lecture *Monday, Sept 30, 2024* **Hess 9-101**

Instructor: Alessandra Yu

In this lecture, we will explore the concept of *theoretical virtues*—features that define a good scientific theory. We will examine classic and contemporary perspectives on these virtues, such as simplicity, explanatory power, and coherence, and discuss how they help arbitrate between competing theories. The lecture will include discussions on Ockham's Razor and Sober's interpretations of different kinds of simplicity. By the end of the session, students will gain insights into how these virtues influence scientific debates and theory development.

Suggested Reading

- ☐ Keas (2017) - Systematizing the Theoretical Virtues
- ☐ Ivanova & Farr (2020) - Methods in Science and Metaphysics

Practical Workshop *Thursday, Oct 3, 2024* **Hess 8-101**

For this workshop, students will apply their understanding of theoretical virtues to real-world scientific debates. By completing the exercise below for the workshop, students can learn to critically assess the strengths and weaknesses of different theoretical frameworks and foster a deeper appreciation for the role of virtues in scientific inquiry, with the content of each student's exercise driving workshop discussion.

Exercise

- ☐ Describe the underlying theoretical argument in a debate in your field (in light of theoretical virtues):
  - Compare and contrast the theoretical sides in the debate in a table.

Feedback

- ☐ Please provide your feedback on **Module 2:** Virtues here.

Module 3 Phenomenon: *What are you trying to study?*

This week, we delve into the nature of scientific phenomena and the metaphysical assumptions that underpin them. As scientific communities grow, divergent assumptions about what constitutes a phenomenon can lead to theoretical divisions. Students will explore how different academic communities define and approach phenomena, shaping their research questions and methodologies. By the end of the module, students will have a clearer understanding of how to identify and frame the phenomena they study.

Theoretical Lecture *Monday, Oct 7, 2024* **Hess 9-101**

Instructor: Qixiu Fu

In this lecture, we will examine the philosophical concept of phenomena and how different assumptions about their nature can influence scientific theories. We will discuss the metaphysical foundations of scientific phenomena, focusing on how different academic communities define and study these constructs. The lecture will explore key philosophical literature on scientific explanation and the abstraction of phenomena, providing students with a framework to understand and articulate the phenomena central to their research. Additionally, we will highlight an example of a phenomenon where philosophical considerations significantly altered scientific understanding through the insights of our guest speaker, Dr. Paul Linton.

Guest Speaker: Dr. Paul Linton

Paul Linton is a neuroscientist and philosopher specializing in 3D vision. He received his PhD in 2021 from the Center for Applied Vision Research, City, University of London, where his research challenged our understanding of distance perception by showing the visual system is unable to triangulate distance using the two eyes. He was also part of the DeepFocus team at Meta Reality Labs. Paul is the author of The Perception and Cognition of Visual Space (Palgrave Macmillan, 2017). Before vision science, he was

a stipendiary lecturer in law at St Hilda's College, Oxford University, and a teaching fellow in philosophy at University College London. As a Presidential Scholar, Paul will develop his new two-stage theory of 3D vision using the latest techniques in machine learning and fMRI in the hope of explaining how we experience the 3D world.

Suggested Readings

- ☐ Bogen & Woodward (1988) - Saving the Phenomena
- ☐ SEP (2021) - Scientific Explanation
- ☐ *Firestone & Scholl (2015) - Cognition does not affect perception: Evaluating the evidence for "top-down" effects*
- ☐ *Oliver Sacks (2006, New Yorker) - Stereo Sue*

Practical Workshop *Thursday, Oct 10, 2024* **Hess 8-101**

In this workshop, students will apply the concepts from the theoretical lecture to their own research. Prior to the workshop, students are expected to complete one of the exercises below in order to guide and drive the discussion during the workshop, helping students critically assess how different constructions of phenomena influence scientific inquiry.

Exercise (select 1)

- ☐ Draw a conceptual map of either:
  - Your phenomenon and related phenomena (i.e., your ontology)
  - Your construct and related constructs (i.e., your conceptual map)
  - **Your phenomenon you're trying to study related to the constructs you're studying**
- ☐ Consider the underlying theoretical argument in the debate regarding psychiatric diagnosis.
  - Compare and contrast the theoretical sides in the debate in a table (i.e., DSM vs. RDoc).

Feedback

- ☐ Please provide your feedback on **Module 3:** Phenomenon here.

No module during the week of Oct 14, 2024.

Module 4 Mechanism: *How does the phenomenon work?*

This week, we explore the mechanisms underlying scientific phenomena, focusing on how different assumptions about these mechanisms shape scientific theories. Students will examine how scientific phenomena arise and the methods used to observe and measure these processes. The module will also address the challenges of studying living phenomena, particularly in the context of emergence and complexity. By the end of the week, students will have a deeper understanding of how to operationalize and investigate the mechanisms underlying their research topics.

Website

Theoretical Lecture *Monday, Oct 21, 2024* **Hess 9-101**

Instructor: Alessandra Yu

In this lecture, we will delve into the concept of mechanisms in science, exploring how different theoretical assumptions about these mechanisms influence scientific explanations. We will discuss classic and contemporary views on the mechanisms of phenomena, examining how they arise, function, and can be observed and measured. Special emphasis will be placed on the unique challenges posed by living phenomena, such as the concept of emergence and the debate over whether complexity alone is sufficient to account for life. We will explore how these ideas impact the operationalization of scientific theories and the methodologies employed in empirical research. By understanding these underlying mechanisms, students will be better equipped to develop and refine their scientific investigations. Finally, we will hear from Dr. John Morrison on how philosophical considerations can influence our understanding and study of mechanism:

Guest Speaker: Dr. John Morrison

Dr. *John Morrison* is a professor of philosophy at Barnard College, Columbia University, where he is the department chair and founding director of the cognitive science program. He is also affiliated with Barnard's Neuroscience and Behavior Department, Columbia's Mind Brain Behavior Institute, and Columbia's Center for Theoretical Neuroscience, and mentors in Columbia's Neurobiology and Behavior Graduate Program. His research primarily focuses on the philosophy of mind, especially cognitive neuroscience, and the history of modern philosophy, with secondary interests in metaphysics, medieval philosophy, and the philosophy of language. Morrison's current projects include developing an abstract framework for understanding brain functions by focusing on global features such as representation and inference, and exploring the foundations of Spinoza's metaphysics. His work has been supported by prestigious organizations such as the National Endowment for the Humanities, National Science Foundation, Mellon Foundation, and Data Sciences Institute. Additionally, Morrison serves as an editor for the Journal of Philosophy.

Suggested Reading

- ☐ SEP (2019) - Mechanisms in Science
- ☐ *Bassett & Ross (The Transmitter, 2024) - What are mechanisms? Unpacking the term is key to progress in neuroscience*

Practical Workshop *Thursday, Oct 24, 2024* **Hess 9-101**

In this workshop, students will apply the theoretical concepts discussed earlier in the week to their own research. Students will complete an exercise designed to analyze the mechanisms in their subfield or research. During the session, they will use their reflections to foster discussion and gain deeper insights into operationalizing these mechanisms. This hands-on approach will help students critically evaluate different theoretical perspectives and develop robust research strategies.

Exercise (select 1)

- ☐ Transform your phenomenon or construct map into a mechanism and/or operationalization map.
- ☐ Design a study to parse between the conflicting theoretical sides in your subfield's debate.
- ☐ Suggest a third alternative to the DSM and the RDoc.

Feedback

- [ ] Please provide your feedback on **Module 4:** Mechanism here.

Module 5 Purpose: *Why does the phenomenon exist?*

This week, we delve into the teleological aspects of scientific phenomena, examining the underlying purposes behind their existence. Understanding the purpose of phenomena is crucial for integrating and comparing different theoretical frameworks. Students will explore how teleological principles help bridge metaphysical and mechanistic assumptions, providing a cohesive framework for scientific inquiry. By the end of the module, students will be able to articulate the purpose of their research phenomena and evaluate theories in light of this understanding.

Theoretical Lecture *Monday, Oct 28, 2024* **Hess 9-101**

Instructor: Alessandra Yu

In this virtual lecture, we will explore the concept of purpose in scientific phenomena, distinguishing between extrinsic and intrinsic purposes. We will discuss how understanding the purpose of phenomena can help bridge gaps between different metaphysical and mechanistic theories. The lecture will highlight how a teleological framework can organize and evaluate theories, integrating scholarly and theoretical values to achieve a comprehensive understanding of phenomena. Additionally, we will examine the role of algorithms in identifying and modeling the purposes of phenomena, discussing how computational approaches can enhance our understanding of teleological principles. Students will learn to distinguish purpose from function and goal and understand the significance of teleological assumptions in scientific research.

Suggested Reading

- [ ] SEP (2020) - Teleological Notions in Biology
- [ ] SEP (2024) - Levels of Organization in Biology
- [ ] SEP (2020) - Emergent Properties
- [ ] Levesley (under review) - A Classification in Teleology in Biology & Cosmology (*do not share*)
- [ ] Dennis Noble (2024 book review) - It's time to admit that genes are not the blueprints for life

Practical Workshop *Thursday, Oct 31, 2024* **Hess 9-101**

In this workshop, students will reflect on the purpose of their research phenomena, considering whether the purpose is intrinsic or extrinsic. Prior to the workshop, students are expected to complete the exercise, which involves critically evaluating the teleological aspects of their phenomena. During the session, students will share their reflections, and guiding discussions on how understanding purpose can bridge their metaphysical and mechanistic assumptions. This collaborative exploration will deepen students' appreciation of the role of teleology in scientific inquiry. **ADD NICHOLE PAPER**

Exercise

- [ ] Use the provided table to reflect on the purpose of your phenomenon, through each of the possible classificatory aspects, and consider whether it is intrinsic or extrinsic.

Feedback

- ☐ Please provide your feedback on **Module 5:** Purpose here.

Module 6 Framework: *How do we choose to do science?*

This module examines the underlying frameworks guiding scientific inquiry, focusing on how implicit assumptions influence every stage of the scientific process, from experimental design and methodology to analysis and interpretation. Students will reflect on and modify their research frameworks based on insights gained throughout the course, culminating in presentations that showcase their refined approaches to scientific inquiry, split between Monday and Thursday workshop sections.

Exercise

- ☐ Return to the framework table you created in Module 1 and modify based on what's come out of the recent workshops.

Practical Workshop 1 Presentations *Monday, Nov 4, 2024* **Hess 10-101**

In this workshop, students will revisit the framework table they created in Module 1, incorporating new insights and modifications based on the recent workshops. This session will involve presenting and discussing these updated frameworks, allowing students to receive feedback and refine their approaches further. The goal is to ensure that each student's framework is comprehensive and well-grounded in the theoretical and practical concepts covered in the course.

Practical Workshop 2 Presentations Continued *Thursday, Nov 7, 2024* **Hess 8-101**

The second workshop session will continue with student presentations, allowing those who did not present on Monday to share their refined frameworks. This ensures that all students have the opportunity to present their updated approaches and receive constructive feedback from peers and instructors. By the end of this session, students will have a solidified understanding of their scientific frameworks and how to critically evaluate and enhance them.

Exercise for Both Workshops:

- ☐ Present your modified framework table, demonstrating how your understanding and approach to scientific inquiry have evolved over the course. This comprehensive presentation will highlight the integration of theoretical and practical knowledge, showcasing your ability to critically evaluate and enhance your scientific frameworks.

Feedback (optional)

- ☐ Please provide your feedback on **Module 6:** Framework here.

Module 7 Beyond: *How else can we do science?*

In this final module, we will explore alternative conceptualizations of science and consider new directions for scientific inquiry. While this course has focused on certain philosophical positions, it is important to acknowledge that there are diverse perspectives on what science is and how it can be conducted. Students will be introduced to various approaches, including neurophenomenology and the role of subjectivity in

science, and will discuss ways to overcome barriers to theoretical discussion and change within neuroscience. This module encourages students to think beyond traditional frameworks and embrace innovative approaches to scientific research, fostering a more inclusive and dynamic scientific community.

Theoretical Lecture *Monday, Nov 11, 2024* **Hess 10-122**

Instructors: Dr. Daniela Schiller & Alessandra Yu

In this lecture, students will be introduced to alternative philosophical perspectives on science that challenge conventional methodologies. We will consider the concept of science being atheoretical, where empirical data is prioritized over theoretical frameworks. The lecture will also cover neurophenomenology, which integrates subjective experiences with objective neuroscience to provide a holistic understanding of the mind and brain. Additionally, we will explore the role of the self in scientific inquiry, questioning how perception and agency can be incorporated into our science and influence research outcomes. Students will be encouraged to critically evaluate these perspectives and consider how they might integrate these alternative approaches into their own scientific practice. Finally, Dr. Nedah Nemati will share the case of sleep, illustrating how philosophical considerations can shape scientific understanding and research methodologies:

Guest Speaker: Dr. Nedah Nemati

Nedah Nemati researches the role of lived experience in neuroscientific experimentation and the influence of such experience in characterizing behavioral and cognitive concepts. Her doctoral work parlayed this interest into an examination of how behavioral neurobiologists have drawn from many kinds of experiences to develop and understand the concept of ‘sleep’. This scholarship is informed by Nedah’s prior laboratory research on the relationship between circadian rhythms and addiction in rodents at the University of Mississippi Medical Center (UMMC), and on sleep deprivation and death in Drosophila melanogaster (common fruit fly) at Harvard Medical School. She received philosophical training at Millsaps College (BSc), earned her MSc in biological sciences at UMMC, and received a PhD in history and philosophy of science from the University of Pittsburgh.

Suggested Reading

- ☐ Ward (2017) - The Varieties of Enactivism

Exercise

- ☐ Suggest ways that the field of neuroscience can break down the barriers for theoretical discussion, pushback, and change.

Feedback

- ☐ Please provide your feedback on **Module 7:** Beyond here.

Practical Workshop *Thursday, Nov 14, 2024* **Hess 8-101**

In this final workshop, students will reflect on how their revised scientific frameworks influence their writing and communication strategies. During the workshop, students will complete an exercise that involves orienting a reader in their scientific writing, whether in the first paragraph of their own work or a review. During the session, students will share their approaches and discuss how their frameworks guide the way they present and communicate their research. Additionally, this session will gather valuable feedback from students about their course experience, aiming to improve future iterations of the course.

Suggested Reading

- ☐ Matthews (2014) - *Successful Scientific Writing* - Chapter 1: Start with a Plan

Exercise (select 1)

- ☐ Pick the first paragraph from your own writing and discuss: how would you orient a reader?
- ☐ Write the first paragraph of your own review and discuss: how would you orient a reader?

Feedback

- ☐ Please provide your feedback on the **entire course** based on your experience here for future iterations.

Project Due *Friday, Nov 22, 2024* See full project description above.

Please **submit** your Google Doc with the items below in this folder by the deadline:

- ☐ All **exercises** from Module 0-7
- ☐ A 1-page **reflection** on your experience in the course and how it impacts your scientific research and your approach to it moving forward