# UHNL 3999 – How to Science
Fall 2021, Tues 1-3:50pm

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| **Professor:** | jimi adams, PhD |
| **Email:** | jimi.adams@ucdenver.edu |
| **Office:** | North Classroom, 3025C |
| **Office Hours:** | Tue 4-5, Wed 1-2 (https://ucdenver.zoom.us/my/jimiadams, drop-in) |
| | or schedule an appointment (https://calendly.com/jimiadams, or email) |
| **NOTE:** | For fall, unless otherwise agreed, Office Hours will be held via Zoom. |

## Course Description

What do scientists do all day? Science and technology both shape and are shaped by our everyday lives in increasingly intertwined ways. We're often trained in the practices of science, without necessarily taking the time to consider how and why the approaches we take came to be the dominant approach. This seminar will therefore turn the analytic lenses of science onto science itself. That is, we're going to see how scientists have studied scientists and the practice of science. This will help us to better understand why science works the way it does, is structured the way it is, and why those questions matter. We'll engage with the history, philosophy, and sociology of science, and how those perspectives have been combined into modern approaches of "science and technology studies" (STS). Our approach will be broken up into 3 primary modules, addressing: (1) "What is science?" (2) "How is science done?" and (3) "How is science communicated?". In each of these modules we will address the theoretical bases and justifications for our current system, the pragmatic details of everyday practice, and several examples of how those have played out.

## Objectives

By the end of the course, participants should be able to:
- Describe key conceptual and theoretical claims about the nature of scientific practice.
- Account for how the structural organization of science promotes or inhibits achieving those aims.
- Explain how the aims and organization of science shape what questions are asked (and which are not), how we arrive at answers to those questions, and the certainty of those answers.
- Present and write more clearly than when you began the course.

## Assigned Readings

All required readings and supplemental materials will be available via Canvas.

## Course Structure & Requirements

First and foremost, this course will be organized as a seminar. ***This means that you will need to come to each class session having completed assigned readings and prepared to discuss the day's topic***. Much of our reading for this course will be primary peer-reviewed research articles. At times the content of these will be over your head. This is to be expected. Your aim will not be to fully interpret the minutiae of every aspect of these readings, but to extract the key dimension(s) of how science functions, and use those ideas to help the class formulate an informed discussion. I will provide guidance on strategies for how to optimize your reading for this class, particularly on how to extract key ideas from articles used for different aims in the course.

**Requirements**

**I – Participation Elements**

    **A. Active in-class participation (25 points, 5% of total grade)**

    This entails showing up for class sessions on time, ready to discuss the day's material, including assigned readings. You should be actively engaged in discussions (using devices only for class-relevant activity) and activities.

    **B. P**eriodic in-class activities (75 points max, 15% of the total)**

    We will occasionally have in-class brief written assignments. These will vary in format, with the vast majority graded only for completeness. No more than 75 accumulated points will be applied to your final grade.

**II – Reading Elements**

    More details are provided in separate handouts for each of these assignments.

    **A. Discussion Lead (50 points, 10% of total grade)**

    Each student will individually be in charge of introducing the discussion for a day's assigned reading(s). This will entail providing some summary and key questions to orient the in-class discussion for the day. The presentation itself will be informal, and should take no more than 15 minutes. You are welcome to consult with me on how best to structure your session.

    **B. Reading Responses (150 points, 30% of total grade)**

    For 7 class sessions, you will turn in a *brief* summary/reaction to the assigned reading(s) for the day. These should be approximately 300 words. Details will be described in a separate handout.

**III – Project Elements (200 points total. 100 points each, 40% of total grade).**
    **Pick *any* TWO of the following (due dates are listed on the course schedule):**

    **A. Historical Essay**

    For this option, you will examine library (and other reputable) sources to write a historical account of how a particular scientific discovery came to be, applying concepts from our class to interpret that process. This will not primarily recount what the finding was. Rather, you will provide a description of: (1) why the question was thought worth answering, (2) the process that led to the finding, (3) how the finding was communicated, and (4) a discussion of how it was received by the scientific and lay communities. You will accomplish this in 2 steps, producing an annotated bibliography of your sources (*at least* 8), then writing a paper (~6 pages) to summarize your findings. **No advance notice of using this option is required,** however you are encouraged to discuss planned options with me.

    **B. Podcast or Vodcast**

    Individually, or in teams of 2, you will produce a podcast (audio only) or vodcast (with visuals) of 15-20 minutes applying ideas from the course to interpret a scientific controversy of your choosing. More details for this assignment will be made available in a separate handout. If you choose to do this assignment with a partner, both team members will receive the same grade. **Your topic (& partnership) for this option should be confirmed with me by Oct 5th.**

    **C. Exam over Modules 1 & 2**

    The exam option will be taken online. It will be made available for one week, and will be required to be completed in one sitting of no more than 90 minutes. All material covered in Modules 1 & 2 will be fair game for this exam. It will consist of a mix of multiple choice, short

answer, and essay questions. **No advance notice of this option is required, however you cannot opt out of it after beginning the exam.**

D. **Data Analysis, Write-up, & Reflection**
This assignment asks you to identify a question of relevance to your own substantive interests, then: (1) procure "raw data" (whether gathered yourself, or acquired from secondary sources), (2) conduct an original analysis of those data to address an analytic question, (3) write up a description of that analysis and interpretation of your finding, then (4) interpret how well the process was able to align with your originally intended aims. Further details of this option will be provided in a separate handout. You should confirm a plan for this option with me no later than **Nov 16th**.

E. **Dealer's Choice**
If you have a particular skillset or interest that may be used to demonstrate mastery over our course material in a way other than those listed above, let's chat. We can negotiate an equivalent option that you can complete to satisfy **ONE** of the project options. If you plan to make use of this option, we must have agreed upon a plan by **Nov 1st**.

## Grading

**Maximum Potential Points (500):**

| Participation (20%, 100 points) | Reading (40%, 200 points) | Projects (40%, 200 points) |
|---|---|---|
| Active engagement (25 points) | Discussion Lead (50 points) | Option 1 (100 points) |
| In-class activities (*up to* 75 pts) | Reading Responses (150 points) | Option 2 (100 points) |

**Final Grade Computation**:
Your final grade will be determined by summing the number of points earned from each of the above categories. Letter grades will be determined from your point total as follows:

| Letter Grade | Points Range | Letter Grade | Points Range | Letter Grade | Points Range |
|---|---|---|---|---|---|
| A | 468+ | B | 412-437 | C | 362-387 |
| A- | 450-467 | B- | 400-411 | C- | 350-361 |
| B+ | 438-449 | C+ | 388-399 | D | 300-349 |

Any student accumulating 299 or fewer points will receive an F for the course.

**Grading Expectations**:
Participation, presentation, and paper grades you earn will reflect how thoroughly your work demonstrates the assignment requirements *and* overall course aims, which will correspond to the following sets of expectations:

F    Work that **fails to address** an assignment's **minimum requirements** will earn grades in the F range.

D    Work that **incompletely addresses** an assignment's **minimum requirements** will earn grades in the D range.

C    Work that **addresses only** an assignment's **minimum requirements** will earn grades in the C range.

B    Work that, **in addition to** meeting an assignment's **minimum requirements**, also *occasionally* reflects **engagement** with other material from the course where appropriate, in ways that **meet course objectives** will earn grades in the B range.

      A    Work that, **in addition to** meeting an assignment's **minimum requirements**, also *consistently* reflects **engagement** with other material from the course where appropriate & in ways that **exceed course objectives** will earn grades in the A range.

Please note now that there are NO extra credit opportunities in this course. For this course to be successful—and therefore for you to be successful in this course—we need everyone keeping up with requirements throughout the semester.

## Course Expectations

**What I expect from you:**
**1 –** *Make a concerted effort to bring the best you can to the course.* This means doing readings before class, bringing materials you need to actively participate in class sessions, putting forth effort into the evaluated elements of the course. It also means taking ownership over the grades you earn.
**2 –** *Treat others in the class with respect.* This includes simple norms of regular interaction (listening when others are speaking, giving due attention to others when presenting that you would expect in return, etc.) and thoughtfully considering the contributions of others. At times we'll potentially cover material of a sensitive nature; being able to respect other's expressed opinions makes critical discourse possible.

**What you can expect from me:**
**1 –** *Make a concerted effort to bring the best I can to the course.* This means leading a class appropriate to its level, selecting "up to date" material that helps illustrate the course's key aims, regularly being available for interaction within and (to a reasonable extent) outside the classroom, and adapting as is appropriate for the needs of the class.
**2 –** *Treat others in the class with respect.* This includes being prepared for class, returning graded materials in a timely manner with useful feedback, striving to be impartial in the assessment of student work, while holding that work to the standards of the course and honors program. It also means fostering an environment where diverse perspectives can comfortably be shared in class.

**What we all can expect from each other:**
*Behave in a manner reflecting common courtesies.* Show up to class on time; don't leave early. If something arises, and you need to leave class, do so in a way that minimizes distractions to others. Show up to office hours or other appointments as scheduled. Maintain professionalism in all electronic communication (e.g., email/Canvas messages). Use laptops/tablets **for class purposes only** (e.g., to access readings or take notes). Any other uses will lead you to lose this privilege. All other devices (phones, etc.) should be silenced for the duration of class.

**Due Dates & Late Assignments:**
- <u>Reading Responses</u> are due on Canvas **before** the class meeting in which they are to be discussed. Because you have 14 options of when to choose to complete the 7 required responses, no late responses will be accepted. However, you can submit an 8th response if you are unsatisfied with your performance on these, and only your top 7 will be included in the final grade calculations.
- <u>Discussion Lead</u> are in-class presentations. These cannot be rescheduled within a week of the assigned presentation slot without an excused absence.
- <u>In-class Activities</u> are due at the time they are collected in class. No makeup opportunities are made for In-Class Activities, because I will provide enough opportunities for these in class so that up to two could be missed and full credit still achieved.

**Course Communication:**
- *The Syllabus* has answers to the most common questions pertaining to the course. Be sure check the syllabus first, before asking me about due-dates, assignment requirements, etc.
- *Office Hours* are available to add to your experience in this course. **Please make use of them.** These are meant to supplement required course work and in-class elements. As such, while I am happy to discuss course materials or other aspects of science/academia in general with you during this time, they should not be viewed as an opportunity to ask, "What did I miss in class?" (You should find peers in the class with whom you can share notes for that purpose.)
- *Canvas* will be used for the majority of communication in this course. You can find a copy of the syllabus, additional assigned readings, and all assignments there. I will also post any lecture notes after each class. To make your experience in this course successful, you should expect to make this resource a *regular* part of your preparation for this course.
- *E-mail* should be used for quick communications (things that can be responded to in a few sentences); use office hours for anything requiring more depth. Please use your UCD email account for communication related to this course; I will not read/reply to emails from your personal accounts (e.g., Yahoo!, Hotmail, etc). Please consider e-mail as subject to the same standards of communication as you would all other forms written material in this course (i.e., you should use complete sentences, proper punctuation, etc.). I will typically respond to email within **48 hours** (weekdays). I will **NOT**, **under any circumstances** discuss grades over email.

## University & CLAS Policies

For relevant university deadlines and procedures & academic support services, visit: https://clas.ucdenver.edu/faculty-staff/sites/default/files/attached-files/student_services_and_calendar.pdf

**Academic Dishonesty (**CLAS Academic Dishonesty Policy): Students are required to know, understand, and comply with the CU Denver Academic Dishonesty Policy as detailed in the Catalog and on the CLAS website. A university's reputation is built on a standing tradition of excellence and scholastic integrity. As members of the University of Colorado Denver academic community, faculty and students accept the responsibility to maintain the highest standards of intellectual honesty and ethical conduct. Academic dishonesty consists of plagiarism, cheating, fabrication and falsification, multiple submission of the same work, misuse of academic materials, and complicity in academic dishonesty. If you are not familiar with the definitions of these offenses, go to http://www.ucdenver.edu/academics/colleges/CLAS/faculty-staff/policies/HandlingAcademicDishonesty/Pages/Definition-of-Academic-Dishonesty.aspx).

**Disability Services Information:** The University of Colorado Denver is committed to providing reasonable accommodation and access to programs and services to persons with disabilities. Students with disabilities who want academic accommodations must register with Disability Resources and Services (DRS) in Academic Building 1, #2116, Phone: 303-315-3510, Fax: 303-315-3515. Website: http://www.ucdenver.edu/student-services/resources/disability-resources-services/Pages/disability-resources-services.aspx. I will be happy to provide approved accommodations, once you provide me with a copy of DRS's letter.

**Grades of Incomplete:** The current university policy concerning incomplete grades will be followed in this course. Incomplete grades are given only in situations where unexpected emergencies prevent a student from completing the course. Students have up to one year (three semesters) to complete course requirements. Dr. adams is the final authority on whether you qualify for an incomplete. Incomplete work must be finished within the time allowed or the "I" will automatically be recorded as an "F" on your transcript.

**Course Schedule**

| Date | Topic | Readings | Assignment |
|------|-------|----------|------------|
| Aug 24 | 1. Introductions & Overview | NA | |
| | **Module 1 – What is Science?** | | |
| Aug 31 | 2. A Brief History (of Experimentalism) | • Shapin 2006<br>• Rothchild 2006 -or-<br>  Reichertz 2013<br>• de Souza Leão & Eyal 2019 | |
| Sep 7 | 3. Explanation vs. Prediction | • Hofman et al. 2021<br>• Sprenger 2016 | |
| Sep 14 | 4. Falsification, Incrementalism & Paradigms | • Popper 1963<br>• Kuhn 1962 | |
| Sep 21 | 5. A Culture | • Merton 1973<br>• Bourdieu 1975 | |
| | **Module 2 – How is science done?** | | |
| Sep 28 | 6. Laboratory Life | • Latour & Woolgar 1986 | |
| Oct 5 | 7. Uncertainty & Quantification | • Star 1985<br>• Schüll 2016 -or-<br>  Berman & Hirschman 2018 | |
| Oct 12 | 8. Iteration & Correction | • NASEM 2019 (ch 2)<br>• Ecker et al. 2017 | Option A |
| Oct 19 | 9. Science Education | • Morgan 2021 -or-<br>  Riegle-Crumb et al. 2011<br>• NRC 2007 | |
| Oct 26 | 10. Interdisciplinarity (& friends) | • Frickel & Gross 2005<br>• adams & Light 2014 | |
| Nov 2 | 11. Science-Lay Intersection | • Jasanoff 1987 -or-<br>  Gieryn 1983<br>• Epstein 1995 -or-<br>  Shim 2005 | Option B |
| | **Module 3 – Science Communication** | | |
| Nov 9 | 12. Memoing | • NASEM 2019 (ch 3)<br>• Shreier et al. 2006 -or-<br>  Wilson et al. 2017 | Option C |
| Nov 16 | 13. Visualization | • Joyce 2005 -or-<br>  Lynch 1985<br>• Healy & Moody 2014 | |
| Nov 23 | <span style="color:red">**NO CLASS – Thanksgiving**</span> | | |
| Nov 30 | 14. Publication | • Edwards 2014<br>• Likis & Swett 2019 -or-<br>  Simons-Morton 2012 | |
| Dec 7 | 15. Translation | • Weisberg et al. 2021<br>• Bode & Vraga 2017 | |

| Dec 14 | Finals Week | | Option D (due 12/14) |
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## Full Reference Information for Required Readings

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