

## **IDST 89: Science and Society: The hidden forces that drive scientific inquiry**

First Year Seminar – Fall 2019 – 3 Credits

Class location and time: Hanes 107, MWF 10:10am-11:00am

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### **Course Content**

Many people believe that scientifically derived knowledge represents the ultimate unbiased truth, free from outside influence. While it is true that scientific methods have revolutionized what we know about our world, these methods are far from unbiased; there are powerful cultural and psychological forces that shape the production, interpretation, and application of scientific knowledge.

Led by a three-person teaching team with expertise in science policy, psychology, and biophysics, this interdisciplinary seminar will examine well-known (but often misrepresented) scientific events throughout history and controversial ongoing scientific debates (e.g. climate change, gene editing, and vaccine programs). We will use these case studies to explore what distinguishes science from other ways of knowing the world, and how society shapes scientific inquiry over history and in daily life. We divide these case studies into four thematic modules titled “religion,” “trust,” “ethics,” and “politics.” Each module unpacks how scientific discoveries are generated, how they are received by the scientific community, and why they are accepted or denied by the public at large.

This course will use thought papers, in-class discussions, debates and a semester-long paper project to introduce students to reliable sources of scientific information and build practical skills of critical thinking, critical reading, public speaking, and persuasion. These skills will enable students to be more discerning and engaged consumers of scientific information as students, citizens, and future professionals.

### **Instructional Procedures**

This course will feature a combination of lectures, class discussion, and small group activity. Significant instructional time will also be dedicated to developing students’ critical thinking, reading, and writing skills—skills that students require regardless of major.

### **What Will I Get Out of This Course?**

By the end of this course, you will be able to:

1. Critically evaluate science; read scientific papers and identify strengths and weaknesses
2. Locate and access scientific materials for literature review
3. Debate and rhetorically argue scientific positions
4. Write about scientific research for general and specialized audiences
5. Understand the process of science: how ideas are generated and evaluated
6. Gain an understanding of major scientific achievements from different viewpoints and with historical context
7. Critically evaluate popular press, news articles about science, and scientific debates
8. Incorporate feedback from peers and mentors on written work

### How is the Course Graded?

Activity	Percent of total grade	Due dates
Participation and Attendance	15%	
Discussion Boards	15%	Each day with reading, 9:00am
4 News Responses (500 words)	10%	Last day of each unit, midnight
Debate	20%	Group assigned dates
Policy Brief/Discovery Analysis	40% total	
<i>3 Paper Ideas</i>	3%	10/9 in class
<i>Paper Proposal</i>	3%	10/16 midnight
<i>Paper Outline and Background</i>	5%	10/28 midnight
<i>Paper Draft</i>	8%	11/11 midnight
<i>Response to Instructor Feedback</i>	3%	12/4 midnight
<i>Final Paper (1500-2000 words)</i>	18%	12/4 midnight

Students will receive the assignment descriptions, detailed instructions regarding the writing and submission of essays, and a statement of evaluation guidelines well in advance of the due dates.

#### UNC Grading scale

A = 100 – 93%	B- = 82.99 – 80%	D+ = 69.99 – 67%
A- = 92.99 – 90%	C+ = 79.99 – 77%	D = 66.99 – 60%
B+ = 89.99 – 87%	C = 76.99 – 73%	F = <59.99%
B = 86.99 – 83%	C- = 72.99 – 70%	

**Participation and Attendance:** You are expected to have completed the assigned readings listed on the syllabus and come to class prepared to contribute to class discussion. A sign-in sheet will be circulated at the beginning of class in order to assess attendance. Up to 4 absences are excused if they are due to illness, family emergency, class/professional trips, or religious reasons. However, if you will miss a class, you must email the instructors before the missed class. A student who attends all classes and regularly contributes to discussions will earn a strong participation grade.

**Discussion Boards:** For each set of assigned readings, you must write a short response to assigned questions OR comment on two other students' responses. Questions and forums for responses will be located on Sakai. Discussion board posts should be approximately 200 words. Strong posts will show that the student has done the readings and reflected critically on the content.

**News Thought Papers:** For each of the four modules, you must write a 500-word reflection paper on a news article that is recent and relevant to the module. You can choose articles from popular science forums such as *Science Direct* or *Nature News*, or newspapers such as *New York Times* or *Washington Post*, but the articles must summarize scientific research that pertains to the module. If you are not clear about whether a source qualifies, please check with us. Strong thought papers will show that a student has thoroughly read the focal news article and tied it to class themes.

**Debate:** Once per semester, you will participate with a group of fellow students in a debate about a scientific topic. You will be graded on the quality of research that goes into the points

you make, and your willingness to participate in making and rebutting arguments. High grades will not necessarily go to debate winners, but instead to students who have a strong grasp on debate material.

**Final Paper:** There are two options for the final paper: (1) A *discovery analysis* or (2) an *extended policy brief*. The discovery analysis is expected to synthesize the context of a scientific discovery, and discuss the reasons why the scientific discovery was ultimately adopted or not adopted. The extended policy brief will take on a current science policy problem, analyze alternatives, and make recommendations. You must integrate themes discussed throughout the semester into your paper. To prepare for this paper, there will be scheduled “milestones” throughout the semester where you will (a) propose your paper, (b) develop an outline of your paper, (c) prepare a full draft of your paper, and (d) revise a final draft.

### **Student Expectations:**

- Be prepared for class:
  - Please print assigned articles and bring them to class for reference.
  - Come to class prepared to engage in discussion and with assigned reading completed.
  - Attend all classes, and arrive on time for each class period.
  - Complete class assignments by the listed due dates.
- Engage in respectful discussion:
  - Approach all material and other students with respect, thoughtfulness, and an open mind.
  - Please come prepared to debate and be critical of ideas; however, help foster a collegial environment by listening with respect to everyone's ideas.
  - Questions/comments should address larger ideas and not a particular individual in class.
- To minimize distraction for yourself and classmates, please turn off cellphones at the beginning of class and do not use laptops during class without prior instructor approval.
- Always act with integrity and adhere to the UNC Honor Code.

### **Accommodations Statement**

We would like to make our class an accessible space for everyone. You are invited to optimize your classroom experience in a way that will maximize your learning, while still respecting the needs of others to do the same. You may sit wherever you like in the classroom, bring in food or beverages, make audio recordings of class with the instructor’s permission, photograph notes on the board, use assistive devices, etc. Lastly, if there is something we, as a class, can do to improve our learning environment, please do not hesitate to ask.

### **Honor Code**

All students are to follow the UNC Honor Code. Please bring any questions or concerns about the Honor Code or violations to our attention during office hours. For details, click on the following link: <https://studentconduct-unc-edu.libproxy.lib.unc.edu/honor-system/philosophy>

### **Changes to the Course**

The instructors may make changes to the syllabus, including project due dates and test dates (excluding the officially scheduled final examination), when unforeseen circumstances occur. These changes will be announced as early as possible so that students can adjust their schedules.

Day	Class Name / Assignments	Readings
Wednesday August 21 <sup>st</sup>	Introduction to course	
Friday August 23 <sup>rd</sup>	Discussion: <i>What makes a scientist?</i> Leader: Chad	
<b>1. How Beliefs Shape Science</b>		
Monday August 26 <sup>th</sup>	Lecture on Unit Themes: <i>How do we know what we know?</i> Leader: Josh  Logical Fallacies, Cognitive Biases, Falsifiability	Firestein, Ignorance, Chapters 1-2  Vedantam, “How Science Spreads: Smallpox, Stomach Ulcers, And 'The Vegetable Lamb Of Tartary'”, Hidden Brain Podcast  <i>Optional:</i> Popper, The Open Society and its Enemies, Chapters 23-24
Wednesday August 28 <sup>th</sup>	Discussion: <i>The evolution of a theory (1)</i> Leader: Josh	Darwin, Descent of Man, Chapter 2
Friday August 30 <sup>th</sup>	Discussion: <i>The evolution of a theory (2)</i> Leader: Josh	Gould, Mismeasure of Man, Chapter 5
Monday September 2 <sup>nd</sup>	Labor Day, no class	
Wednesday September 4 <sup>th</sup>	Discussion: <i>You can't un-scare people</i> Leader: Kate	Gross, A broken trust: lessons from the vaccine-autism war, PLOS Biology  Godlee, et al. Wakefield's article linking MMR vaccine and autism was fraudulent. BMJT
Friday September 6 <sup>th</sup>	<b>Skills Day 1:</b> <i>Reading scientific articles critically</i> Leader: Kate	Wakefield, A. J., et al. RETRACTED: Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. Lancet.  Rao & Andrade, The MMR vaccine and autism: sensation, refutation, retraction and fraud  <i>Optional:</i> du Prel, et al., Critical appraisal of scientific articles, Deutsch Arztebl.
Monday September 9 <sup>th</sup>	<b>Field Trip 1:</b> <i>Planetarium</i>	<i>Optional reading:</i> Gillispie, The Edge of Objectivity, pg. 16-27

Wednesday September 11 <sup>th</sup>	Discussion: <i>Religion at the center of the universe</i> Leader: Chad	Hossenfelder, Lost in Math, Ch. 1
Friday September 13 <sup>th</sup>	<b>Field Trip 2/Skills Day 2:</b> <i>House Undergraduate Library</i>	
Monday September 16 <sup>th</sup> <b>*News response due*</b>	<b>Debate 1:</b> <i>Is natural selection a falsifiable theory?</i> Moderator: Josh	
<b>2. How Integrity Shapes Science</b>		
Wednesday September 18 <sup>th</sup>	Lecture on Unit Themes: <i>Keeping science honest</i> Leader: Chad  Reproducibility, scientific responsibility, proving ideas	Beyond Sputnik, Chapter 14 Scientific Ethics and Integrity, Pages 228-236
Friday September 20 <sup>th</sup>	Discussion: <i>A crisis in reproducibility (1)</i> Leader: Josh	Open Science Collaboration, Estimating the reproducibility of psychological science, Science
Monday September 23 <sup>rd</sup>	Discussion: <i>A crisis in reproducibility (2)</i> Leader: Josh	Dominus, When the revolution came from Amy Cuddy, NYT.
Wednesday September 25 <sup>th</sup>	<b>Skills Day 3:</b> <i>How to give a presentation</i> Guest lecturer: Dr. Kurt Gray	
Friday September 27 <sup>th</sup>	Discussion: <i>Ego over evidence</i> Leader: Chad	Chan, et al. Intensive serial biomarker profiling for the prediction of neutropenic Fever in patients with hematologic malignancies undergoing chemotherapy: a pilot study. Hematology reports.
Monday September 30 <sup>th</sup>	Discussion: <i>Ego over evidence</i> Leader: Chad	Rago, Elizabeth Holmes: The Breakthrough of Instant Diagnosis, WSJ  Carreyrau, Hot Startup Theranos Has Struggled With Its Blood-Test Technology, WSJ.
Wednesday October 2 <sup>nd</sup>	Discussion: <i>Self-regulation: infectious agents</i> Leader: Kate	Selgelid, "Governance of dual-use research: an ethical dilemma, Bulletin of the World Health Organization  Malakoff, In dramatic move, researchers announce moratorium on some H5N1 researchers, Science

Friday October 4 <sup>th</sup>	Discussion: <i>Self-regulation: gene editing</i> Leader: Kate	Mukherjee, <i>The Gene: An Intimate History</i> , pgs. 225-235, and 476-479.  Berg, Asilomar 1975: DNA modification secured, <i>Nature</i>
Monday October 7 <sup>th</sup>	<b>Field Trip 3:</b> <i>Laboratory tour (CISMM Biophysics Lab)</i>	Explore <a href="http://cismm.web.unc.edu/">http://cismm.web.unc.edu/</a>
Wednesday October 9 <sup>th</sup>	<b>Writing Workshop:</b> <i>Discussion of paper topics</i>	
	<b>*3 paper ideas due in class*</b>	
Friday October 11 <sup>th</sup>	<b>Debate 2:</b> <i>Should we only trust expert opinions?</i> Moderator: Chad	
	<b>*News response due*</b>	
<b>3. How Ethics Shapes Science</b>		
Monday October 14 <sup>th</sup>	Lecture: <i>Keeping people safe from science</i> Leader: Kate  Consent, human subjects, research ethics	Beyond Sputnik, Chapter 14 Scientific Ethics and Integrity, Pages 237-244
Wednesday October 16 <sup>th</sup>	Discussion: <i>Human subject abuses (1)</i> Leader: Josh	Milgram, Behavioral Study of Obedience, <i>Journal of Applied Social Psychology</i>  Blum, <i>The Lifespan of a Lie</i> , Medium.
	<i>Midcourse eval</i> <b>*Paper proposal due*</b>	
Friday October 18 <sup>th</sup>	Fall break, no class	
Monday October 21 <sup>st</sup>	Discussion: <i>Human subject abuses (2)</i> Leader: Kate	Emanuel, et al. What makes clinical research ethical? <i>JAMA</i>  Brandt, <i>Racism and Research: The Case of the Tuskegee Syphilis Study</i> , The Hastings Center Report
Wednesday October 23 <sup>rd</sup>	Discussion: <i>Financial conflict of interest (1)</i> Leader: Chad	Bol, et al. The Matthew effect in science funding, <i>Proceedings of the National Academy of Sciences</i>

		Mervis, Data check: U.S. government share of basic research funding falls below 50%, Science
Friday October 25 <sup>th</sup>	Discussion: <i>Financial conflict of interest (2)</i> Leader: Josh	Etcoff, Cosmetics as a feature of the extended human archetype, Plos One  Oreskes & Conway, Merchants of Doubt, Chapter 1
Monday October 28 <sup>th</sup>  <b>*Outline and background due*</b>	<b>Field Trip 4 / Skills Day 4:</b> <i>Writing center visit and writing workshop</i>	
Wednesday October 30 <sup>th</sup>	Discussion: <i>Consent for pediatric research</i> Leader: Kate	Taylor et al, Recontact and Recruitment of Young Adults Previously Enrolled in Neonatal Herpes Simplex Virus Research, The American Journal of Bioethics  Melvin et al, Research Recruitment of Adult Survivors of Neonatal Infections: Is There a Role for Parental Consent?, The American Journal of Bioethics  McKinney, A Knotty Problem of Intertwined Rights, The American Journal of Bioethics
Friday November 1 <sup>st</sup>	Discussion: <i>DNA ownership from HeLa to 23andMe</i> Leader: Kate	Roberts, Progressive Genetic Ownership, pgs. 1123-1133 (EXCERPT)
Monday November 4 <sup>th</sup>  <b>*News response due*</b>	<b>Debate 3:</b> <i>Should HPV vaccination be mandatory?</i> Moderator: Kate	
<b>4. How Politics Shapes Science</b>		
Wednesday November 6 <sup>th</sup>	Lecture: <i>When science conflicts with self interest</i> Leader: Kate  Freedom, anti-intellectualism, politics, privacy	Achenbach, Why is science so hard to believe, The Washington Post  Blake, Americans' increasing distrust of science - and not just on climate change, The Washington Post  Editorial, Scientists must rise above politics, Nature

Friday November 8 <sup>th</sup>	Discussion: <i>The political climate of climate change</i> Leader: Chad	Druckman & McGrath, The evidence for motivated reasoning in climate change preference formation, Nature Climate Change  Waldman, Retired physicist leading new Trump effort to question climate threat to security, Science
Monday November 11 <sup>th</sup>  <b>*Full draft due*</b>	Guest lecture: <i>Public health vs. personal freedom: Eugenics in NC</i> Guest: Anna Krome-Lukens Leader: Kate	Mukherjee, The Gene: An Intimate History, pgs. 64-77, 272-277.
Wednesday November 13 <sup>th</sup>	<b>Field Trip 5:</b> <i>Wilson Library, Eugenics in NC</i> Location: Special Collection Learning Center	
Friday November 15 <sup>th</sup>	Discussion: <i>Dual use research—private vs. governmental</i> Leader: Chad	Tyson, Inside DARPA – Sci-Fi Meets National Defense, StarTalk. <a href="https://www.startalkradio.net/show/inside-darpa-sci-fi-meets-national-defense/">https://www.startalkradio.net/show/inside-darpa-sci-fi-meets-national-defense/</a>
Monday November 18 <sup>th</sup>	Discussion: <i>How different are men and women, really? (1)</i> Leader: Josh	Buss, The Evolution of Desire, Chapter 1  Damore, Google’s ideological echo chamber: how bias clouds our thinking about diversity and inclusion.
Wednesday November 20 <sup>th</sup>	Discussion: <i>How different are men and women, really? (2)</i> Leader: Josh	Eagly, The Science and Politics of Comparing Men and Women. American Psychologist.  Vedantam, Nature, Nurture, And Our Evolving Debates About Gender, Hidden Brain Podcast
Friday November 22 <sup>nd</sup> <b>*News response due</b>	<b>Debate 4:</b> <i>Academics’ roles: impartial scientists or policy advocates?</i> Moderator: Josh	
Monday November 25 <sup>th</sup>	<b>Writing workshop</b>	
Wednesday November 27 <sup>th</sup>	Thanksgiving, no class	
Friday November 29 <sup>th</sup>	Thanksgiving, no class	
Monday December 2 <sup>nd</sup>	Special Topics	
Wednesday December 4 <sup>th</sup> <i>Course eval</i> <b>*Final papers due*</b>	Special Topics	