Class Description:

Fraud. Cutting corners. “Why Most Published Research Findings Are False.” Could this possibly be describing science today? We look to science to answer the big questions. And when it’s done right, it gets us closer to the answers. But lately, cracks in the scientific edifice have appeared. Retractions of scientific papers -- the “nuclear option” of correction -- are breaking records every year, and researchers in a number of fields are realizing that many of their highest-profile findings do not hold up. Some even refer to a “reproducibility crisis,” while others are concerned that such language erodes the public trust, particularly among those who may use science’s weaknesses to promote their own agendas. Starting with the writings of Kuhn and Merton, we will explore how scientists see themselves, and grapple with how the incentives and structures that govern scientific research have led us to where we are. This is not a science course, and should not intimidate students who are not studying science. This is a seminar about how science is done, and will offer a view into solutions that some researchers hope will make science even more robust.

Assignments:

There will be four written assignments in this seminar:

- A post-mortem of a news story, starting with the study, moving to the press release, and then finally analyzing the story itself (about three pages).
- An exploration of a study of your choosing, describing its methods, whether they appear to be reproducible, and how the resulting paper could be improved (about four pages).
- A critique of a retraction notice, following the story behind the story (about three pages).
- An analysis of how a either single field or a single country has grappled with reproducibility and fraud in recent decades (about 10 pages).

An optional assignment: A rewrite of any of the first three assignments. Provided that the original assignment was turned in by the due date, the grade on your rewrite will count, rather than the original grade. These are due on the last day of class.
Grading:

Grades will be assigned based on class participation (10%), and assignments (90% total, as follows: 20% news story post-mortem; 20% study critique; 20% retraction notice critique; 30% reproducibility analysis). Grades for late papers will be reduced by one-half a grade per 24 hours that it is late, starting as soon as it’s due, so a B paper will receive a B- after one day of lateness, a C+ after two, etc. I will not grade any paper that is more than two weeks late. This policy will be altered only in the case of an extenuating circumstance discussed with me. You will also have the chance to rewrite one of the first three assignments for an improved grade (see explanation under “Assignments” above).

Schedule:

January 30: Scientists are people, too

Readings from:

- Thomas Kuhn, *The Structure of Scientific Revolutions*
- Robert Merton, *The Sociology of Science*
- Karl Popper, *Conjectures and Refutations*

February 6: The role of the media

Assignment (due February 13):

- A post-mortem of a news story, starting with the study, moving to the press release, and then finally analyzing the story itself (about three pages).

Readings:

- Rachel Adams, “Randomised controlled trial of optimal press release wording on health-related news coverage” (ISRCTN Registry)
- Romana Haneef et al, “Interpretation of health news items reported with or without spin: protocol for a prospective meta-analysis of 16 randomised controlled trials” (BMJ Open)
- HealthNewsReview.org
- Ivan Oransky, “How Publish or Perish Promotes Inaccuracy in Science—and Journalism” (AMA Journal of Ethics)

Readings from:
Vincent Kiernan, *Embargoed Science*

February 13: How we got here
Also: In-class review of media assignments

Readings from:
- William Broad and Nicholas Wade, *Betrayers of the Truth*
- Richard Harris, *Rigor Mortis*
- Horace Freeland Judson, *The Great Betrayal*
- Alan Price, “Research Misconduct and Its Federal Regulation: The Origin and History of the Office of Research Integrity” (Accountability in Research)

February 20: How big a problem is this?

Assignment (due March 6): An exploration of a study of your choosing, describing its methods, whether they appear to be reproducible, and how the resulting paper could be improved (about four pages).

Readings:
- Colin Camerer et al, “Evaluating replicability of laboratory experiments in economics” (Science)
- Leonard Freeman et al, “The Economics of Reproducibility in Preclinical Research” (PLOS Biology)
- John P. A. Ioannidis, “Why Most Published Research Findings Are False” (PLOS Medicine)
- Open Science Collaboration, “Estimating the reproducibility of psychological science” (Science)

February 27: The explosion of retractions
Also: Journal Club (in-class review of a contemporary scientific study)

Assignment (due March 13): A critique of a retraction notice, following the story behind the story (about three pages)

Readings:
- Adam Marcus and Ivan Oransky, “Is There a Retraction Problem? And, If So, What Can We Do About It?” (In: The Oxford Handbook of the Science of Science Communication)
- Retraction Watch
- Richard van Noorden, “Science publishing: The trouble with retractions” (Nature)
A contemporary scientific study (TBD)

March 6: Journal Club (aka in-class review of study critiques)

Readings:
- Your classmates’ study critiques, along with the original studies

March 13: Incentives (aka Impact Factor)

Readings:
- Alison Abritis and Alison McCook, “Cash bonuses for peer-reviewed papers go global” (Science)
- Mario Biagioli, “Watch out for cheats in citation game” (Nature)
- Stephen Curry, “Let’s move beyond the rhetoric: it’s time to change how we judge research” (Nature)
- Simine Vazire, “Our obsession with eminence warps research” (Nature)

March 20: The structure of scientific publishing
Also: In-class review of retraction critiques

Assignment (Outline/first draft due April 10):
- An analysis of how a either single field or a single country has grappled with reproducibility and fraud in recent decades (about 10 pages).

Readings:
- ASAPbio, “What is a preprint?”
- Paul Ginsparg, “It was twenty years ago today…” (arXiv)
- Erin McKiernan et al, “How open science helps researchers succeed” (eLife)
- Peter Suber, “Removing the Barriers to Research: An Introduction to Open Access for Librarians”

Readings from:
- Melinda Baldwin, Making Nature
- Alex Csiszar, The Scientific Journal: Authorship and the Politics of Knowledge in the Nineteenth Century

March 27: No class (Spring Break)

April 3: Peer review
Readings:
  ● Christie Aschwanden, “Science Isn't Broken” (FiveThirtyEight)
  ● Richard Smith, “Peer review: a flawed process at the heart of science and journals” (Journal of the Royal Society of Medicine)

Readings from:
  ● Peer Review Congress

April 10: Predatory publishing

Readings:
  ● Esme Deprez and Caroline Chen, “Medical Journals Have a Fake News Problem” (Bloomberg)
  ● David Moher et al, “Stop this waste of people, animals and money” (Nature)
  ● Paul Basken, “Why Beall’s List Died — and What It Left Unresolved About Open Access” (Chronicle of Higher Education)
  ● Lauren Vogel, “Researchers may be part of the problem in predatory publishing,” (Canadian Medical Association Journal)

April 17: Open Science and Open Data

Assignment: Final draft of final paper (due May 8)

Readings:
  ● Colleen Flaherty, “Publication by design” (Inside Higher Ed)
  ● Erin Foster and Ariel Deardorff, “Open Science Framework (OSF)” (Journal of the Medical Library Association)
  ● Charles Piller, “Failure to report: A STAT investigation of clinical trials reporting” (STAT)

April 24: The Sleuths

Readings:
  ● Susan Dominus, “When the revolution came for Amy Cuddy” (New York Times Magazine)
● Cat Ferguson, “One in 25 papers contains inappropriately duplicated images, screen finds” (Retraction Watch)
● Kerry Grens, “What To Do About ‘Clare Francis’” (The Scientist)
● Adam Marcus and Ivan Oransky, “The Data Thugs” (Science)
● Jennifer Couzin-Frankel, “Bringing image manipulation to light” (Science)
● Adam Marcus and Ivan Oransky, “How the Biggest Fabricator in Science Got Caught” (Nautilus)

May 1: Efforts to Fix The Problem

Readings:
● Brian Nosek and Tim Errington, “Making sense of replications” (eLife)

May 8: The Weaponization of Transparency
Also: The way forward, with presentations of your final papers

Readings:
● Karen E.C. Levy and David Merritt Johns, “When open data is a Trojan Horse: The weaponization of transparency in science and governance” (Big Data & Society)
● Michael Schulson, “A Remedy for Broken Science, Or an Attempt to Undercut It?” (Undark)