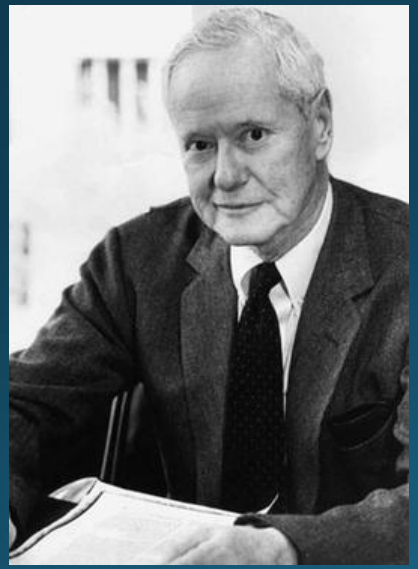
Course: Science, Technology and Society Studies

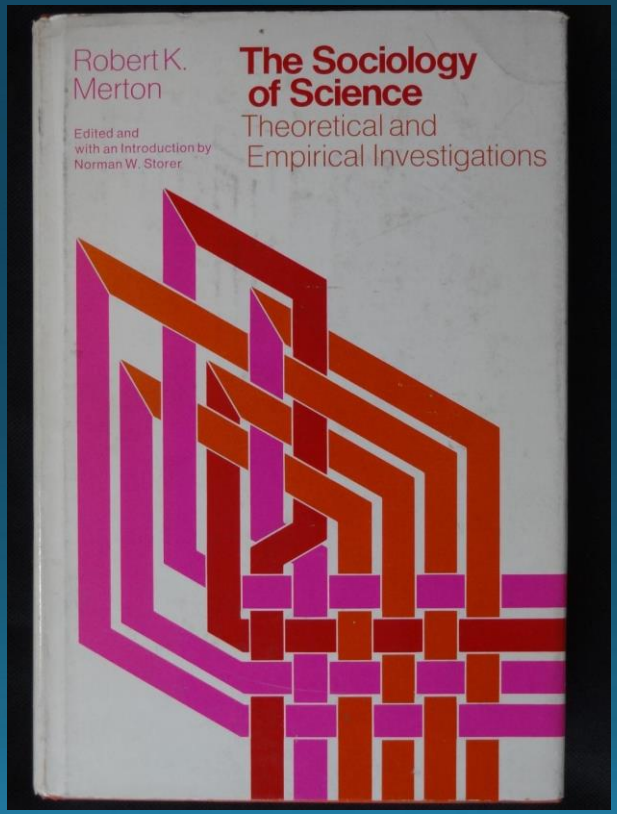
Lecture 2:

Structure and Functioning of the Scientific Community

The Structure of the Scientific Community

What are its values, rules and norms?





Growth of modern science (and the modern scientific community)

Links between science and Puritan values/sentiments:

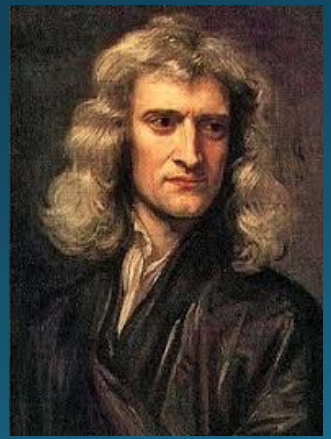
- All vocations as ‘callings’
- Disinterested engagement
- Rationality
- Working for the common Good of Man -> Utilitarianism
- Studying nature to unravel the Glory of God -> Empiricism

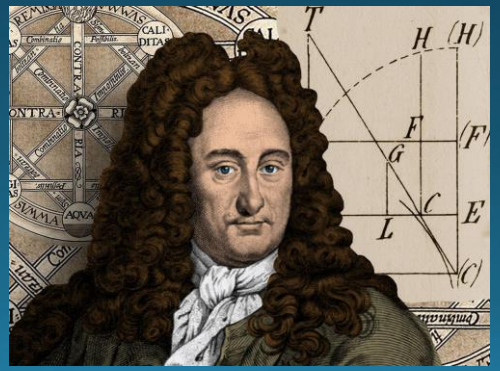
Conditions conducive for the growth of science; Puritans found doing science as amenable to their spiritual beliefs.

Science □ --□ Puritanism

- Distinction between a ‘religious ethos’ and an ‘explicit theology’: If actions reflect "proper" religious motivations, no need to worry about eventual impact of the actions.

Puritanism -> Prestige for the natural philosopher





The Question of Legitimacy

"Belief in the value of scientific truth is not derived from nature, but is the product of definite cultures"

- Weber

Belief can change to doubt or disbelief!

So HOW does science try to retain its preeminent position as arbiter of truth?

- Through the creation of certain CULTURAL conditions. Through establishment and practice of certain NORMS, VALUES and RULES.
- Through INSTITUTIONAL structures which embody the above.

Sources of Hostility

TWO sources of CULTURAL challenge to science:

- The idea that the results of science are inimical to the satisfaction of important values.
- The idea that sentiments connected with science are incompatible with other institutions.

"Conflict arises when the social effects of applying scientific knowledge are deemed undesirable, when the scientist's skepticism is directed toward the basic values of other institutions, when the expansion of political or religious or economic authority limits the autonomy of the scientist, when anti-intellectualism questions the value and integrity of science and when nonscientific criteria of eligibility for scientific research are introduced"

- Merton

Attacks on Autonomy

EXAMPLE: Elimination of non-Aryans, non-Nazis and 'White Jews' from scientific institutions in Nazi Germany.

- ❑Triumph of racial purity and national pride over utilitarian rationality.
- ❑Anti-Intellectualism.

Dilemma for scientists: Loyalty to State/Economy/Religion OR Science?

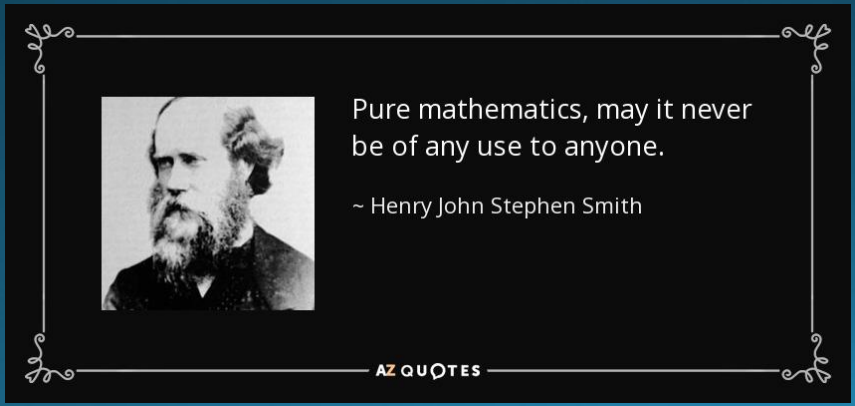
Intellectual honesty, integrity, organized skepticism, disinterestedness, impersonality are outraged by the set of new sentiments (ECONOMIC UTILITY, RELIGIOUS DOCTRINE, POLITICAL APPROPRIATENESS) imposed in the sphere of scientific research.

Attacks on Autonomy of Science

If autonomy is ceded, serious challenge to legitimacy of scientific institutions.

This is why defending VALUES and NORMS are important in science.

MOREOVER, Functional needs of science CREATE the structures required (embedded in the above) to implement them.



Science as a Knowledge Certification System

Functions of science:

It defines:

(1) a set of characteristic methods by means of which knowledge is certified

(2) A stock of accumulated knowledge stemming from the application of these methods

(3) a set of cultural values and mores governing the activities termed scientific

(4) any combination of the foregoing.

- Merton

Universalism

"Scientific claims need to stand independent of people who make them. Truth-claims, whatever their source, are to be subjected to *preestablished impersonal criteria*".

Beliefs:

- Nationality, Race, Class, Gender, Religion, Personal Qualities are irrelevant. Science as deeply IMPERSONAL.
- Also, discoveries can come from anyone/anywhere.

EXAMPLE: the tirade of 93 German scientists against others "masquerading as scientists" and displaying "nationalist" bias.

Question: WHY and WHEN does "nationalist bias" become a problem?

Universalism -> Inclusion of all with 'merit'. Might need explicit political intervention.

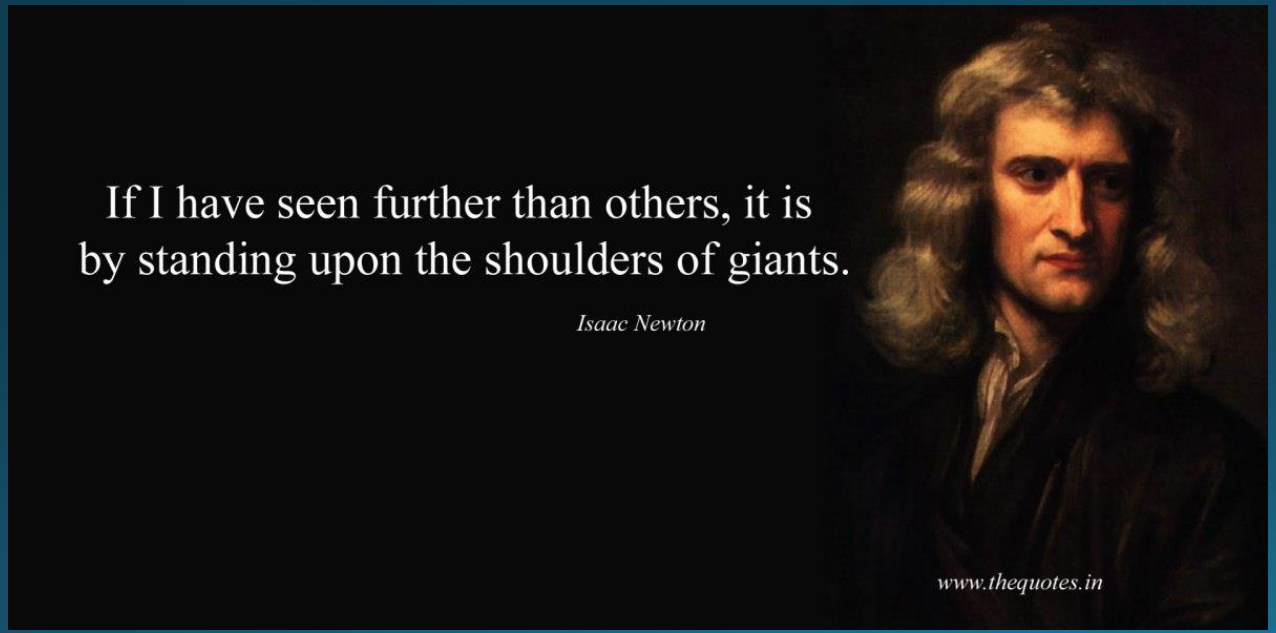
Communism

"The substantive findings of science are a product of social collaboration and are assigned to the community. They constitute a common heritage in which the equity of the individual producer is severely limited"

- Beliefs:
  - Scientists cannot decide what happens to the knowledge they produce.
  - Science is inherently social.
- All that an individual scientist can claim is recognition, prestige and esteem. Property rights are whittled down to a minimum.
- Scientific Priority then becomes a NATURAL RESPONSE to Communism.
- Communism -> Condemnation of the suppression of scientific discovery ("selfish", anti-social").

Communism

Science as a CO-OPERATIVE, COLLABORATIVE and CUMULATIVE exercise.



Disinterestedness

Scientists should make claims based on verifiable, unbiased methods, not based on their interests. Dispassionate pursuit of knowledge, idle curiosity.

Beliefs: a) Scientists CAN be dispassionate b) Data CAN be obtained without interests interfering.

Disinterestedness -> “Distinctive pattern of institutional control”. Rigourous policing.

Constant evaluation by peers. NOT by laymen.

Reduces the possibility of exploiting the credulity, ignorance, and dependence of the layman.

Reduces chicanery, fraud, quackery, irresponsible claims.

Organized Skepticism

BOTH a methodological and institutional mandate.

"Scientific claims should be exposed to critical scrutiny before being accepted: both in methodology and institutional codes of conduct"

Underlying beliefs:

- Scientists don't always get it right
- Science needs questions and rebuttals to find flaws
- Scientists need freedom of speech and license for free investigation.

CUDOS work as GUIDELINES for developing practices and as ETHICAL ADVICE.

Stratification in Science

- Role of Communal Validation in the reward system of science. Impact on scientists' self-image and public image.
- Graded recognition: Accorded by peers based on perceptions of contribution towards research. Quantity/Quality of research. Generally, quality > quantity.
- The "41st chair Phenomenon": Many deserving individuals excluded by the system.

EXAMPLES: Descartes, Pascal, Rousseau, Saint-Simon, Proust. History can correct the mistake. But not always.

Dimitri Mendeleev

Stratification in Science

- Ratchet effect: Once a Nobel winner, always one. Yet, leads to sustained efforts. No rest at the top. Pressure from peers -> stress.
- Class structure in science:
  - Stratified distribution of chances (of research facilities, access to labs, resources etc.).
  - Differential access to MEANS of scientific production.
  - Big Science (genome, space, nuclear) needs expensive and centralized research facilities. Class Structure becomes all the more important.

"There is thus a continuing interplay between the status system, based on honor and esteem, and the class system, based on differential life-chances, which locates scientists in differing positions within the opportunity structure of science".

Matthew Effect

"*The world is peculiar in this matter of how it gives credit. It tends to give the credit to [already] famous people*".

The problem of "misallocation" of credit:

- Well-known scientists get disproportionately credited for their work, as compared to other lesser known scientists.
- The problem of getting someone to run experiments to test your theory.

" *For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath*".

Matthew Effect

Double injustices – to the unknown scientists are unjustifiably victimized and famous ones, unjustifiably benefited.

Impact beyond injustices to individuals?

- Misallocation actually helps science communication. A more famous name promoting a theory will convince more people and attract more attention.

  So is the Mathew effect actually performing a social function?

- Accumulation at the institutional level (in Ivy League colleges etc.)

Deviance from Norms

- 4 instances in 1980.
  - Fabrication of research data
  - Data-manipulation and faking
  - Alteration of patient records
  - Plagiarism

Setting up of the "Subcommittee on Oversight and Investigation", US House of Representatives, House Committee on S&T. Chaired by Al Gore.

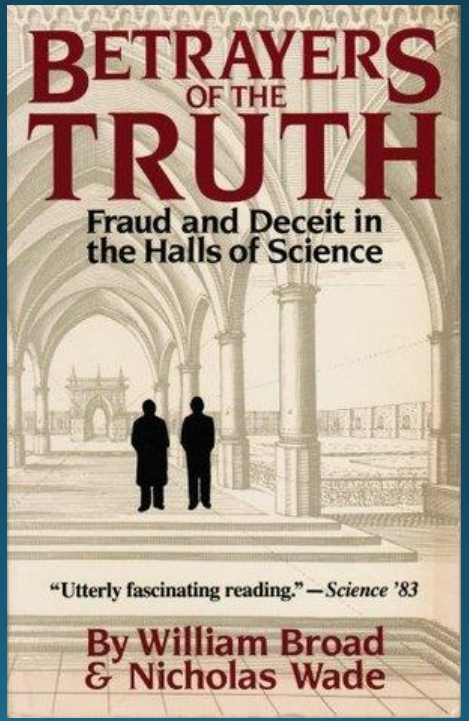
RE-EVALUATING ETHICAL STANDARDS

Fraud in Science: How Much, How Serious?

by PATRICIA WOOLF

Deviance from Norms

- Widespread fraud, not adequately accounted for.
- Scientists are NOT guided by logic and rationality ALONE. Role of rhetoric, propaganda, personal prejudice.
- Poor self-policing, apprehension of fraud.
- Response from the community: Denial, “Arrogance”, “Potential Perjury”, “Schizophrenia”, “Double Attitude”.



Scientific 'Dissent' as Deviance from Norms

Dissent NOT merely a position, but a PRACTICE.

HOW is as important as WHAT.

THREE phases/types of dissent and dealing with dissent:

- CONTRARIAN science: Contesting/challenging established ideas in science.
- IMPEDANCE: Resistance to contrarian science. HOW does the scientific establishment respond to contrarianists?
- SCIENTIFIC DISSENT:
  - Agonistic engagement: Use of 'conventional' strategies - building evidence, recruiting scientific allies and negotiating disciplinary territory
  - Dissident science: Use of *explicitly* political practices that merge intellectual struggle with social action. 'Politicized' version of scientific dissent that challenges knowledge claims AND calls for reform in the relationships among science, politics and the 'public'.

Contrarian Science

Contrarian scientists

- Challenge accepted theories
- Introduce revolutionary methods
- Expose inconsistencies in assumptions
- Blur traditional disciplinary boundaries

IMPACT:

- Infuriate, motivate or provide reassurance (depending on political and intellectual position)
- Potentially disruptive but conducted with the HOPE of convincing a mainstream scientific community of a new fact or approach.

Impedance in Science

Impedance: Processes that prevent knowledge claims from becoming accepted as scientific facts and knowledge-makers from becoming credible spokespersons for truth

KEY TARGET AREAS: Raise questions on

- Research Methodology
- Interpretation of Data
- Application of theories
- *Credibility of the contrarian scientists*
- Appropriateness of the research question
- Forum of announcement
- Implications of the findings for policy and action

Agonistic engagement and Dissident Science

AGONISTIC engagement

- Downplays political motivations
- Downplays political/economic factors
- Defends the legitimacy of Science even while scientists attack a particular piece of science
- Engagement over data, methods, and interpretation
- Do NOT violate 'norms' of scientific communication

DISSIDENT science

- Highlights personal and inter-personal dynamics in the production of science
- Explicitly acknowledges the politics within and around scientific controversy
- Advocates new relationships among scientists, the public, interest groups, and academic institutions.
- Enrolls non-traditional allies.

The DAVID QUIST case

Researcher at UC Berkeley. Claimed that transgenic DNA had ALREADY entered maize populations in Mexico. Published as a letter in the '*Nature*' journal.

- Contrarian Science
  - Findings disrupted scientific assumptions related to GM crops. Indicated that 'crop genes might be able to spread across geographic areas'.
  - 'Contamination' of Mexican maize showed technical and institutional limitations. NO USE of an 'official' moratorium on GM maize.
  - New scientific methods: Use of molecular science for understanding ecological phenomenon. Expanding *scale* of ecological studies on GM crops, analyzing downstream impacts of GM.
  - Challenged the idea that gene transfers happen only though whole-scale transfers of genes.
  - Challenged the idea that biotechnology is precise, under control and easily regulated.

The DAVID QUIST case

Impedance:

- Public threats by the Mexican Biosafety Commissioner before publishing of research.
- Conducting of other tests to show NO contamination.
- Editorials in influential journals (*Transgenic Research*) which tore apart methodology and analysis.
- Letter signed by 100 pro-GM scientists arguing that the results shown by contrarians was both 'inevitable' and 'welcome'.
- Spurious 'replies' and emails from FALSE ids (of non-existent scientists) appeared on sites of scientific journals. Traced to the Bivings Group, a public relations firm hired by Monsanto.
- 5 technical critiques submitted to *Nature*, two of which were published. *Nature* withdrew support from the original publication (which is fairly unprecedented).
- Refusal of tenure to David Quist by UC Berkeley.

Role of MEDIA, UNIVERSITY ADMINISTRATIONS, CORPORATIONS and POLITICAL AGENTS.

The DAVID QUIST case

Quist's INITIAL response – Agonistic engagement

- Challenged existing 'facts' but NOT science and the scientific method.
- Disputed facts and provided additional evidence.
- Opened a new disciplinary territory (transgenic ecology)

LATER response: DISSIDENT Science

- 'Open Office Hours' for 5 days outside UC Berkeley's main administrative building.
- 'Black Canvas' protest.
- Panel discussion on the 'Pulse of Scientific Freedom', with other dissenting scientists (NOT from his field).

Highlighted academic/scientific independence and political, economic forces at work. Used tactics that seemed like 'activism' BUT distanced himself from NGOs and 'activist' groups.

Strategies of Dissident Science

- Expose the opposition. Target their intentions as well as their science.
- Make 'Politics' explicit – economic, political
- Expand the network BEYOND the scientific community
- Involve the 'public'
- Use tactics of social movements
- Shift the intellectual terrain of the debate
  - Move #1: The academic-industrial complex hinders the production and dissemination of contrarian science.
  - Move #2: Creating space for contrarian science is an issue of academic freedom.
  - Move #3: Politics cannot be disentangled from the practice of science.
  - Move #4: The boundary separating the public from science-making has become problematic, both from a political point of view and from the perspective of the quality of knowledge production.