Ethics and Politics in Science and Technology

STS-011
Tuesday 9am -11am in 24-121
Recitations Thursday 10-11am in 2-132 and 66-160

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COURSE OBJECTIVES

This class has two objectives.

A - We study a variety of cases, from 17th century dispute over the meaning of experimental science to recent controversies over the commodification of body parts, and for each of them we try to understand the scientific, ethical, and political issues at stake. Instead of hastily reading into these controversies a lack of rationality from some actors, this course adopts a different principle: we learn how to analyze uncertainties and dilemmas that are objects of advanced technical expertise while simultaneously intensely entangled with legal, moral, economic and social questions. We call these technoscientific controversies. They are interesting to study in as much as they force actors – scientists, engineers, politicians, militants – to articulate their positions: in these moments, we can better understand the role of social, ethical, and political in the scientific choices.

B - In this class, in addition to the cases we will read, you will team up by late September with other class members and conduct your own investigation of a current technoscientific controversy. That is where your initial exposure to cases helps you to refrain from siding with any of the actors involved, but rather to account for the whole range of positions, how the debate evolves, the engaged arguments, their dissemination and transformation through the various media, as well as for the reasons of these evolutions. The controversy can be a local or more international one: the only requirement is that the issue needs to be public and you need to be able to retrieve the important scientific and social data about it. Each group must produce a website that presents the findings of your 2 month investigation and helps a non-expert navigate the controversy. Content and formal aspects will be assessed on an equal measure. A series of assignments/exercises will help you build the material for your website. When the exercises are done properly, setting up the website "only" entails writing a narrative around the evidence that you will have produced.

You will receive assistance at each and every step of your investigation (definition of a good case to study, collection of data, analysis of data - both

quantitative and qualitative, writing and presentation of your case) and the recitations are organized around exercises that will help you do the website.

EXPECTATIONS

This course will mix (1) readings, guests presentations and documentaries that will expose you to the variety of possible ways that technoscientific controversies can take place, (2) investigation of a case with collection/organization of data and quantitative analysis of this dataset, (3) personal reading and collective endeavors.

In consequence, I expect students taking it to be open to different methodologies and ideas and to be eager and willing to work within groups of fellow students. I will lecture about the reading assignments but I will also launch the discussion and welcome your insights. These lecture cases are not meant to turn you into specialists of their scientific issues but to familiarize you with a method that is quite different from what you learn in other MIT classes.

On the contrary, you must become experts in the controversy your group has chosen and be able to talk authoritatively about it. The recitation sections, initially organized around the discussion of materials read for the lecture, will slowly focus towards your group final project. A series of milestones/deadlines will make sure you progress in time towards the completion of the project.

Unless otherwise mentioned, all the readings are on the stellar website, accessible at http://stellar.mit.edu/S/course/STS/fa11/STS.011/materials.html.

If the exercises are done on a weekly basis, assembling the website will be effortless.

COURSE REQUIREMENTS

Writing assignments: (50% of the final grade)

During the course of the term, you are expected to write 3 papers and to re-write the last of these papers. The first three papers will be single authored ; the rewriting will be "collective". A member of your project team will rewrite yours and you will rewrite his.

In terms of writing discipline, extensions are granted at the discretion of the TA if contacted ahead of time. Unexcused late work accepted within 48 hours of original due date with 50% penalty, nothing accepted more than 48 hours late.

October 4: Paper 1 (4 pages essay on Part 1 of the syllabus) [20% of the writing assignments]
October 25: Paper 2 (4 pages essay on your controversy) [20% of the writing assignments]
November 3: Paper 3 (5-10 pages on your controversy) [30% of the writing assignments]
November ~~24~~ 22: Rewrite of paper 3 (5-10 pages) [30% of the writing assignments]

In-class/group participation: (20% of the final grade)

This means engaging with your classmates, their project ideas, and the reading materials in thoughtful, critical, and productive ways. You may be called upon to

express your understanding of the reading materials and to voice your agreement or concerns with the methods. I welcome all opinions as long as they are articulate and grounded in a serious engagement with the texts and documents. When you have joined a project group by mid October, you will be expected to actively participate in all the discussions taking place there.

Final Project + Presentations: (30% of the final grade)
Each group will have to make a 30mn presentation of the findings.

COURSE SCHEDULE

Thurs. 9/8 - Presentation of class, partner universities and competition
BEWARE: The two recitations group meet in 66-160

PART 1 – LABORATORIES: SCIENCE BEHIND CLOSED DOORS
Tues. 9/13 – Lecture
Who needs a lab? Hobbes and Boyle on experimental methods
Guest lecturer: Tom Schilling (MIT)
Reading: Schaeffer, Simon, and Steven Shapin. 1985. *Leviathan and the Air-Pump : Hobbes, Boyle and the Experimental Life*. Princeton: Princeton University Press. Chapters 2 and 8.
Listen to Schaffer and Shapin (episode 1) on CBC How to Think about Science at http://www.cbc.ca/ideas/episodes/2009/01/02/how-to-think-about-science-part-1---24- listen/

Thurs. 9/15 – Recitation
What is a socio technical controversy
A few examples from previous years
Check Fracking, Yuca Mountain, Stem Cell
BEWARE: The two recitations group meet in 66-160

Tues. 9/20 – Lecture
Labs as centers of calculation. Pasteur as a capitalist of science
Reading: Latour, Bruno. 1983. Give me a laboratory and I will raise the World in K. Knorr and M. Mulkay (editors) *Science Observed*, Sage, 1983, pp.141-170.
Listen to Bruno Latour (episode 1) on CBC How to Think about Science at http://www.cbc.ca/ideas/episodes/2009/01/02/how-to-think-about-science-part-1---24- listen/

Thurs. 9/22 – Recitation
Methods to follow the capitalists of Science.
Readings: Tommaso Venturini. 2009. Diving in Magma: How to Explore

Controversies with Actor-Network Theory. *Public understanding of Science*. 20:1-16.
Tommaso Venturini. 2011. Building on Faults. How to Represent Controversies with Digital Methods. *Public understanding of Science*.

Tues. 9/27 – Lecture
Secrecy and the ethos of science
Documentary segments. *Secrecy* by Robb Moss and Peter Galison.
Reading: Merton, Robert. 1951. Science as values, in the *Handbook of Sociology*. Cambridge: Harvard University Press.

Thurs. 9/29 - Recitation
Selection of controversy by groups
BEWARE: The two recitations group meet in 66-160

Tues. 10/4 – Lecture
Universities, corporations, peers, panels and public agencies
Reading: Mirowski, Phil. *Science-Mart. Privatizing American Science.* Cambridge: Harvard University Press.
Reading: David Willman, "The National Institutes of Health: Public Servant or Private Marketer?" *Los Angeles Times* (22 December 2004).
Documentary segment on BPA by PBS
http://www.youtube.com/watch?v=8wXGrzDIcr8

Thurs. 10/6 – Recitation
Exercise: Web cartography and introduction to issuecrawler
Reading: "Coming to Terms" by Richard Rogers and Anat Ben-David

FIRST PAPER DUE

Tues. 10/11 - COLUMBUS DAY HOLIDAY

Thurs. 10/13 – Recitation
Exercise: Narrating science. Introduction to Zeega by Tom Schilling.

PART 2 - EXPERTISE: STANDARDS OF PROOF, REPLICATION AND PRECAUTION
Tues. 10/18 – Lecture
Mobilizing against experimentation on animals
Guest lecturer: Ryan Shapiro (STS Program)
Reading: Singer, peter. 1974. *Animal Liberation. A New Ethics for our Treatment of Animals*. New York: random House. Preface, Chapter 1 & 2.

Thurs. 10/20 – Recitation
What is a spokesperson in science and technology controversies?

Tues. 10/25 – Lecture
Risk Society and citizens mobilization
Guest Speaker: Shahriar Kahn (NYU) on the BU biohazard lab
Reading: Beck, Ulrich. 1986. *Risk Society*. Excerpts Preface and Chapter Listen to Ulrich Beck (episode 5) on CBC How to Think about Science at http://www.cbc.ca/ideas/episodes/2009/01/02/how-to-think-about-science-part-1---24- listen/
Reading: Wynne, Brian. 1996. "Misunderstood misunderstandings: social identities and public uptake of science" in Alan Irwin and Brian Wynne (editors) *Misunderstanding science? The public reconstruction of science and technology*. Cambridge: Cambridge University Press.
Reading: Wynne, Brian. 1996. "May the sheep safely graze? A reflexive view of the expert-lay knowledge divide" in Lash, Scott, Bronislaw Szerszynski and Brian Wynne (editors) *Risk, environment and modernity. Towards a new ecology*. London: Sage Publications.

Thurs. 10/27 - Recitation
Exercise: Analyzing a text and analyzing a large corpus of texts.

SECOND PAPER DUE

Tues. 11/1 – Lecture
Natural Gas and the Fracking controversy
Guest lecturer: Sara Wilye (MIT)

Thurs. 11/3 – Recitation
Exercise: semantic analysis of your controversy

Tues. 11/8 – Lecture
Food expertise: taste and safety at the table
Guest lecturer: Heather Paxson (MIT) and Cristina Grasseni (Harvard, Radcliffe and Universita di Bergamo)

Thurs. 11/10 – Recitation
Exercise: Scientometric analysis of your case. Mapping heterogeneous networks. Presentation of cortext (www.cortext.org)
Reading: Schwed, Uri and Peter Bearman. 2010. "The Temporal Structure of Scientific Consensus Formation". *American Sociological Review* 75(6): 817-840.

Tues. 11/15 – Lecture
Experts in courts: Cole on fingerprinting
Reading: Cole, Simon A. 1998. Witnessing Identification: Latent Fingerprinting Evidence and Expert Knowledge *Social Studies of Science*, Vol. 28, No. 5/6, Special Issue on Contested Identities: Science, Law and Forensic Practice pp. 687-712.

Thurs. 11/17 – Recitation
Presentation of projects from Sao Paulo University students.

PART 3 - EXPERIMENTATION AND PERFORMANCE
Tues. 11/22 – Lecture
Experimentation on Human Subject
Guest lecturer: Natasha Schull (MIT)
Reading: Schull, Natasha. 2011. *Addiction by Design. Machine Gambling in Las Vegas*. Princeton: Princeton University Press. Introduction.
American Gaming Association. 2009. Demystifying Slot Machines. White Paper.

THIRD PAPER DUE

Thurs. 11/24 - THANKSGIVING HOLIDAY

Tues. 11/29 - Lecture
Normalizing the population
Documentary segment: PBS Frontline – *The medicated child* (7-10;16-21; 27-34; 38-49)
Documentary segment: PBS Frontline – *Medicating kids* (23-30; 41-47)
Reading: Pettus, Ashly. 2006. Psychiatry by Prescription, *Harvard Magazine*, July-August 2006: 38-46.
Reading: Richard J. DeGrandpre and Stephen P. Hinshaw. 2000. ADHD: Serious Psychiatric Problem or All-American Cop-out? Cerebrum. The Dana Forum on Brain Science 2(3). Listen to Allan Young (episode 22) on CBC How to Think about Science at
http://www.cbc.ca/ideas/episodes/2009/01/02/how-to-think-about-science-part-1---24- listen/

Thurs. 12/1 – Recitation
Group meetings

Tues. 12/6 – Lecture
Engineered body parts and property rights
Reading: Scheper-Hughes, Nancy. "The Last Commodity: Post-Human Ethics and the Global Traffic in 'Fresh' Organs." 2005. In *Global Assemblages: Technology, Politics, and Ethics as Anthropological Problems*, edited by Aihwa Ong and Stephen Collier, 145-167. Oxford: Blackwell Publishing, 2005.
Reading: Lepinay, Vincent Antonin. 2007. "Stem Cells' Two Families. Challenges to the Body and the Body Politics in the US Stem Cell Controversy" in Gregory Mallard and Catherine Paradeise (ed.) *Global Science and National Sovereignty: Studies in Historical Sociology of Science.* London: Routledge.
Reading: Moore vs Regents of University of California, 51 Cal.3d 120 Supreme Court of California, July 9, 1990 available at
http://online.ceb.com/CalCases/C3/51C3d120.htm

REWRITE OF THIRD PAPER

Thurs. 12/8 – Recitation
Group meetings

Tues. 12/13 - Lecture
Final presentation of the projects

STS.011 1st Class

9/8

(5 min late)
(Prof has accent)

Thinking about science + technology

Create website
- group
- analysis of current controversity
- structure of website not structure of term paper (like they always seem to be)
- pros + cons
- wide range of positions
- Global warming: industry pays scients
- don't immediatly side w/ 1 side
- collect + analyze data
- present finding

Many guest lectures
Reading 1st month
Project 2nd + 3rd months

(2)

You rewrite Someone else's paper

17th century; Royal Societies big
today "a joke" - built knowledge
Scientists don't agree today
(are funded by companies
not before
activits / lobbies

[Ideas: gov spending / stimilus / HSR / CA HSR)
[Don't do something campus - based]

Also teaching class in Brazil - San Palo
I will see their presentation
Paris, - stuted their, he brought it here
London

(3)

Scientists who say global warming no big deal
are fairly isolate
insolar

- Shows less likly to be right
- expose ~~Small~~ conflicts of interests

Wants group meetings w/ teams (5-6 people
1 hr every 3 weeks

Laptops Ok
Cell phones - No
All chap scanned
No books to buy - 1 optional one he likes
"Science in action"
$40, easy read

Leviathan + Air Pump

9/10

On WP!

Famas

Won a prize

Acceptable means of knowledge production

Leviathan and the Air-Pump

From Wikipedia, the free encyclopedia

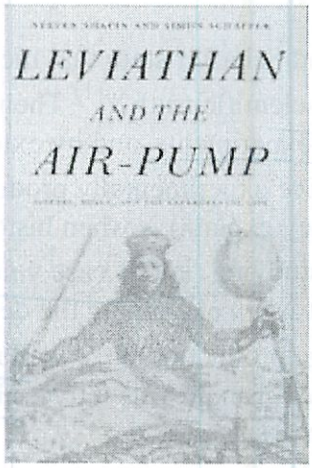
Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life (published 1985) is a book by Steven Shapin and Simon Schaffer. It examines the debate between Robert Boyle and Thomas Hobbes over Boyle's air-pump experiments in the 1660s. On a more theoretical level, the book explores the deeper issue of acceptable methods of knowledge production. It also focuses on societal factors related to the different knowledge systems promoted by Boyle and Hobbes. The "Leviathan" in the title refers to Hobbes's book on the structure of society, *Leviathan, or The Matter, Forme and Power of a Common Wealth Ecclesiasticall and Civil* and the "Air-Pump" refers Robert Boyle's invention which is the central topic of debate for the contemporaries under study.

The book also contains a translation by Schaffer of Hobbes's *Dialogus physicus de natura aeris*, which attacked Robert Boyle and others who were forming themselves into a society for experimental research, the Royal Society.

In 2005, Shapin and Schaffer were awarded the prestigious Erasmus Prize for the book.

Contents

Leviathan and the Air-Pump



Author(s)	Steven Shapin and Simon Schaffer
Country	USA
Language	English
Publisher	Princeton University Press, Princeton, New Jersey
Publication date	1985
ISBN	0691083932
OCLC Number	21974013 (http://worldcat.org/oclc/21974013)
Dewey Decimal	533/.5 19
LC Classification	QC166 .S47 1985

- 12 External links

Chapter I: Understanding Experiment

Shapin and Schaffer state that they wish to answer the question, "Why does one do experiments in order to arrive at scientific truth?"[1] Their aim is to use a historical account of the debate over the validity of Boyle's air pump experiments, and by extension his experimental method, to discover the origins of the credibility that we give experimentally produced facts today. The authors wish to avoid "'The self-evident'"[2] method, which (they explain) is when historians project the values of their current culture onto the time period that they are studying (in this case valuing the benefits of empiricism). They wish to take a "stranger's"[2] viewpoint when examining the debate between Hobbes and Boyle because, in the 1660s, both methods of knowledge production were well respected in the academic community[3] and the reasons that Boyle's experimentalism prevailed over Hobbes's natural philosophy would not have been obvious to contemporaries.

? what is this exactly, not thinking about things?

They explain that, traditionally, Hobbes's position on natural philosophy has been dismissed by historians because historians perceived Hobbes as "misunderstanding"[4] Boyle's work. Thus, in *Leviathan and the Air-Pump*, Shapin and Schaffer aim to avoid bias and consider both side's arguments with equal weight. In addition, they comment on the social instability of Restoration society post-1660. They aim to show that the debate between these two contemporaries had political fallout beyond the intellectual sphere, and that accepting Hobbes or Boyle's method of knowledge production was also to accept a social philosophy[5].

what sort of philosophy?

Chapter II: Seeing and Believing: The Experimental Production of Pneumatic Facts

Chapter two outlines Boyle's theory of knowledge production, which revolves around the creation of the "matter of fact"[6]. This refers to an experimentally generated piece of knowledge separate from a universal theory and that was based on probability. This is in direct opposition to Hobbes (discussed in chapter 3), who required "absolute certainty" based on "logic and geometry" to consider a phenomenon a fact[7]. In the eyes of Boyle and his colleagues, the abandonment of absolute certainty was not "a regrettable retreat from more ambitious goals; it was celebrated as a wise rejection of a failed project"[8]. Thus, because "matters of fact" did not have to be absolute, universal assent was not necessary for the production of knowledge. Boyle made use of three knowledge-producing technologies in order to produce knowledge: "a *material technology* embedded in the construction and operation of the air-pump; a *literary technology* by means of which the phenomena produced by the pump were made known to those who were not direct witnesses; and a *social technology* that incorporated the conventions that experimental philosophers should use in dealing with each other and considering knowledge-claims"[9].

& his logic

So he rolled those things in as "producing knowledge"

Importantly, Shapin and Schaffer give a description of the "material technology," the air-pump itself, essentially a suction pump attached to a replaceable glass bulb. When the pump was set in motion, the air would be evacuated from the glass bulb thus creating what we now consider to be a vacuum, but what for contemporaries was a space of great debate (explained below). However, the integrity of the pump was far from perfect and this leaking is central to the arguments both for and against experimentalism. Shapin and Schaffer assert that three important points should be taken into account when considering the pump itself:

"(1) that both the engine's integrity and its limited leakage were important resources for Boyle in validating his pneumatic finding and their proper interpretation; (2) that the physical integrity of the machine was vital to the perceived integrity of the knowledge the machine helped to produce; and (3) that the lack of its physical integrity was a strategy used by critics, particularly Hobbes, to deconstruct Boyle's claims and to substitute alternative accounts"[10].

The arguments about experimentally generated knowledge revolve around two of Boyle's experiments. The first experiment is the Torricellian apparatus placed within the exhausted receiver (the bulb). The result is that the liquid in the inverted tube of the Torricellian apparatus falls, but not to the level of the liquid in the dish at the base of the inverted tube. For Boyle, the water level fell because the air was being evacuated from the bulb and thus its spring and weight were no longer acting on the liquid around the base of the tube holding the liquid in the inverted tube up. The fact that the water did not fall completely to the bottom of the tube was explained (for Boyle) by the existence of air in the bulb that occurred due to leakage[11]. However Boyle was careful not to commit to saying that a vacuum existed in the bulb; he stated only that when air was sucked out of the bulb the level of the liquid in the inverted tube fell[12] - this was the nature of a matter of fact. The second experiment was based on the theory of cohesion - that "two smooth bodies, such as marble or glass discs, can be made spontaneously to cohere when pressed against each other"[13]. Boyle's idea was that if two cohered discs were placed in the receiver of the air-pump they would spontaneously separate without the air's pressure to keep them together. However, when the receiver was evacuated, they did not separate - a result which Boyle blamed on leakage and the fact that he could not get enough air out of the receiver to reduce the air's pressure to an appropriate level. It should be noted here that Boyle's definitions of "pressure" and "spring" were never clearly defined[14], which we shall see is one of Hobbes's major complaints.

The air-pump granted access to a whole new branch of "elaborate" experiments. In order to witness the phenomena produced by the pump, one had to have access to a pump - which was vastly expensive and difficult to build. However, the space in which the existing pumps did work was arguably a public space - albeit a restricted one. "The laboratory was, therefore, a disciplined space, where experimental, discursive, and social practices were collectively controlled by competent members"[15]. The collective viewing of the air-pump experiments avoided the problem of single eye-witness testimony (which was unreliable), and it offered a space for discourse. This social space for discourse had two important restrictions: "dispute over matters of fact" was not allowed, and "the rules of the game by which maters of fact were experimentally produced" was not to be disputed[16]. "In Boyle's view the capacity of experiments to yield matters of fact depended not only upon their actual performance but essentially upon the assurance of the relevant community that they had been so performed"[17]. In order to expand his audience (and credibility) Boyle recommended to the academic community that replication was crucial, though he admitted that others "[would] find it no easy task"[16]. As such, the literary technology was used to create "virtual witnessing"[17] - a technique in which description of the experimental scene is written so that the reader can envision the experiment. "Stipulations about how to write proper scientific prose were dispersed throughout [Boyle's] experimental reports of the 1660s, but he also composed a special tract on the subject of 'experimental essays.'"[18] Everything about how Boyle instructed other experimentalists to write stressed honesty. He wanted readers to read circumstantial accounts of failed experiments as well as successes, and he asserted that all physical causes should be stated as only "probable."[19]

In sum, Boyle's theory of knowledge production revolves around assent. All three technologies work towards allowing as many people as possible to come to an agreement about a "matter of fact."

Chapter III: Seeing Double: Hobbes's Politics of Plenism before 1660

The third chapter centers on Hobbes' side of the debate for the effective production of knowledge. However, unlike Boyle, Hobbes denies that natural philosophy can be separated from politics and religion. In the previous chapter, Boyle's "matter of fact" worked towards separation from church and state by remaining objective and probabilistic. For Hobbes, however, "the boundaries Boyle proposed to erect and maintain were guarantees of continued disorder, not remedies to philosophical dissension"[20]. Hobbes also argued for "proper metaphysical language", in contrast to Boyle's reluctance to address the issue of a vacuum and his vague concept of air "pressure." Hobbes was motivated by three things in his attack on Boyle: (1) to save his own reputation as a natural philosopher, (2) to develop a system of knowledge production that secured order and maintained proper goals for natural philosophy (namely precision instead of probability) and (3) to be sensitive to the needs of Restoration society (discussed in more detail in chapter 7)[21].

? How was church involved?

Hobbes' denial of a vacuum stems in part from a need for political stability. It follows logically that if there can be a space which is devoid of matter, then that is proof of "incorporeal substance"[21] - an idea that was adopted by priests to gain the allegiance of the people by promising the safety of this substance, the immortal soul. This splits the allegiance of each person in a country between the Church and the Monarch, which creates social instability and ultimately, for Hobbes, the risk of civil war [22]. He considered incorporeal substance a priestly conspiracy to "usurp power" from the true and legitimate leader - the King[23]. The conflict could be resolved "by collapsing the hierarchy [spiritual government and material government] in favour of matter"[24]. "It was to that end that Leviathan proffered a materialist and monist natural philosophy."[24].

Leviathan also instructs that the way to produce good theories is through good definition of terms, the use of materialist and monist theory, and the equal importance of ontology and epistemology ("Show men what knowledge is and you will show them the grounds of assent and social order"[25]). Hobbes works from a model of geometry, and the aims of his natural philosophy share the same precision as geometry. That is why, for Hobbes, good definition is extremely important. Hobbes also rejects the idea that the senses were reliable enough to be able to provide factual knowledge[26] because "the same impressions could be obtained dreaming or waking, by the motions of matter in real external object or by rubbing the eyes"[26]. Instead, Hobbes posits that man's own agency is the place for natural philosophy, once again drawing on geometry: "'as we know, that, if the figure shown be a circle, then any straight line through the centre shall divide it into two equal parts.' 'And this,' Hobbes said, 'is the knowledge required in a philosopher.'"[26] Thus, belief played no part in Hobbes' concept of a fact, and this ran in opposition to Boyle because Boyle's "matters of fact" required the consensus of a group of witnesses who all believed the same thing[27]. "Knowledge was constituted when all believed alike. Likewise for Boyle's clerical allies, religion was a matter of belief and giving witness to that belief...[Hobbes] strategy was one of behavioural control, not one of internal moral control. It was not that the control of belief was wrong; it was that such control was impractical and an inadequate surety for order."[28]

Proofs

Artfully, this chapter ends, "For Hobbes, the rejection of vacuum was the elimination of a space within which dissension could take place."[29]

Chapter IV: The Trouble with Experiment: Hobbes versus Boyle

As the chapter title suggests, this chapter focuses on how these two historical figures interacted. It starts with a list of Hobbes' criticisms of Boyle:

- [Hobbes] was skeptical about the allegedly public and witnessed character of experimental performances, and, therefore, of the capacity to generate consensus, even within the experimental rules of the game.
- He regarded the experimental programme as otiose. It was pointless to perform a systematic series of experiments, for if one could, in fact, discern causes from natural effects, then a single experiment should suffice.
- He denied the status of "philosophy" to the outcome of the experimental programme. "Philosophy", for Hobbes, was the practice of demonstrating how effects followed from causes, or of inferring causes from effects. The experimental programme failed to satisfy this definition.
- He systematically refused to credit experimentalists' claims that one could establish a procedural boundary between observing the positive regularities produced by experiment (facts) and identifying the physical cause that accounts for them (theories).
- He persistently treated experimentalists' "hypotheses" and "conjectures" as statements about real causes.
- He contended that, whatever hypothetical cause or state of nature Boyle adduced to explain his experimentally produced phenomena, an alternative and superior explanation could be proffered and was, in fact, already available. In particular, Hobbes stipulated that Boyle's explanations invoked vacuism. Hobbes's alternatives proceed from plenism.
- He asserted the inherently defeasible character of experimental systems and therefore the knowledge experimental practices produced.[30]

Hobbes criticized Boyle's experimental space for being private (as it was exclusive to everyone but empiricists) and insisted that the space had a "master"[31] - which undermined Boyle's concept of free discourse and consensus to generate matters of fact. Also he criticized the fact that, since the whole experimental community must come into agreement before a "matter of fact" can be produced, the whole experimental community must view the same demonstration at the same time. This was an obvious impossibility and was problematic for Boyle because "If they were not witnessed simultaneously and together, then in what ways was the evaluation of experimental testimony different from the evaluation of testimony generally?"[32]

Hobbes also criticized the air-pump itself, saying that "the physical integrity of the machine was massively violated."[33] He asserted that "it was impossible to understand the air-pump experiments 'unless the nature of the air is known first.'"[34] This was important for three reasons: (1) because Hobbes said the fluidity of the air ruled out the ability to produce an impermeable seal (2) because describing the air as mixture allowed Hobbes to explain the pumps actions (drawing out the course aspects of the air and leaving behind the more subtle fluid) and (3) because Hobbes said that, since Boyle could not offer a cause for the spring of the air, that made him an inadequate natural philosopher[34]. Indeed, it was Boyle's recommendation to ignore causes that Hobbes found intolerable[35]. It was not an objection to the empirical method. Hobbes only ever doubted the senses as a reliable source of information. He makes an example of the motion of a person's blood, "for no one feels the motion of their blood unless it pours forth,"[36] as proof of the unreliability of the senses. Yet he did not object to Harvey's work to prove the motion of the blood - rather he even considered himself a "methodological ally" of Harvey's "both denying the foundational nature and of personal experience."[36]

"Thus for Hobbes, the task of the natural philosopher was to approach as near as he could to the products of the geometer and the civic philosopher"[37] while "Boyle's compulsion was only partial; there was room to differ and tolerance was essential to the maintenance of this partial and liberal compulsion. Managed dissent within the moral community of experimentalists was safe. Uncontrollable divisiveness and civil war followed from any other course."[38]

Chapter V: Boyle's Adversaries: Experiment Defended

While the previous chapter focuses on the attacks of Boyle's main opponent (Hobbes), this chapter focuses on Boyle's actions in the face of more general adversity. The three main opponents to Boyle were Hobbes, Linus and More, and Boyle's response to each in turn reflects his opinion of their ideas and shows what parts of his own ideas he deemed essential and what parts he deemed less so. The figures can be divided into two groups: Linus - who conformed to the model of the experimental programme but did not agree with Boyle's explanation of the air-pump experiments, and Hobbes and More - who attacked the experimental programme as an institution.[39]

"Linus said there was no vacuum in the Torricellian space. This was apparent because one could see through that space; if there were a vacuum, 'no visible species could proceed either from it, or through it, unto the eye."[40] Linus offered a nonmechanical solution to the sustained height of the liquid in the Torricellian apparatus. He suggested that "a certain internal thread (funiculus) whose upper extremity was attached to the finger [blocking the top of the inverted tube] and whose lower extremity was attached to the surface of the mercury."[40] He also explained that, in the marble disc experiment, the fault was not with the air-pump but rather with Boyle's theory of the spring of the air.[41] Thus, as far as experimental procedure was concerned, Linus was following the rules. So how would Boyle respond? While Boyle's response contained a restatement of the rules of experimentation, a restatement of the boundaries of experimental philosophy, a defense of his mechanical interpretation, and a particular defense of the spring of the air, Boyle took great pains to "make clear that he generally approved of Linus's manner of constructing and delivering his criticisms."[42] Linus was fully welcomed into the experimental community despite his difference of opinion. Thus, "in his *Defense* Boyle would therefore demonstrate not merely that Linus was wrong, but also how experimental controversies ought to be conducted."[43] In his *Defense*, Boyle restated that "he could not understand why Linus, like Hobbes, had attacked him as a vacuist when he had explicitly declared his nescience on the matter and had identified the question as metaphysical in character" and thus out of the range of experimental exploration.[44]

How long did this all take?

Hobbes on the other hand attacked the validity of the experimental programme itself. "Boyle's response to Hobbes was fundamentally a defense of the integrity and value of experimental practices."[45] Boyle's reply included a technical response detailing the changes he had made to the pump (immersing it in water), a reiteration of the rules of experimental discourse, "an experimental programme devoted to clearing up the troubles which Hobbes had pointed to in his comments on New Experiments," and an ideological rejection of Hobbes's natural philosophy.[46] In his reiteration of the rules of experimental discourse he defended his empirical method by asserting that the argument was over the interpretation of matters of fact and not the facts themselves, thus keeping the experimental way of life out of the line of fire. In response to Hobbes's criticism that the air had a subtler part that permeated the pump, Boyle stated that "this aether must either be demonstrated by experiment to exist or it was to be regarded as a metaphysical entity"[47], which Boyle has excluded from the scope of the experimental method.

Henry More had three main arguments in relation to Boyle: "(1) that matter itself was passive, inert and stupid; (2) that its motion was guided by 'some Immaterial Being that exercises its directive Activity on the Matter of the World'; (3) that mechanism alone was an inadequate way of accounting for Boyle's phenomena."[48] He insisted that natural philosophy could be used "as [a weapon] in theology"[49] which we have seen is an area that Boyle wished to keep separate from the experimental method. Thus, in response, Boyle "defended the autonomy and status of his [experimental] community" as separate from other social bodies (such as the Church)[50] and wrote "of 'the doctor's grand and laudable design, wherein [he] heartily wish[ed] him much success of proving the existence of an incorporeal substance.'"[51] "Boyle argued that because More's spirit was not a physical principle it could not be part of the language of organized experimenters."[51]

Thus, from this chapter we see that above all Boyle wished to defend his experimental method, it's separation from other bodies of knowledge, and lastly his personal claims about the spring of the air.

Chapter VI: Replication and Its Troubles: Air-Pumps in the 1660s

Chapter 6 is an evaluation of the technologies stated in chapter 2 and their role in replication - namely replication of the material technology and the utility of virtual witnessing.[52] The chapter focuses on the propagation of the pump via the experimental community.

The air-pump was first developed in Oxford and London with the help of the Royal Society (and in response to Hobbes criticism) beginning in 1659. It was during its development that Robert Moray wrote to Christiaan Huygens (Holland) detailing the changes Boyle would be making to the original design of his pump. Huygens rejected Boyle's changes and set about making his own alterations. "Christiaan Huygens was the only natural philosopher in the 1660s who built an air-pump that was outside the direct management of Boyle and Hooke."[53] At the end of Huygens development, Huygens claimed that "my pneumatic pump was begun to work since yesterday, and all that night a bladder stayed inflated within it [which was a test for the goodness of a pump]...which Mr. Boyle was not able to effect."[54]

Indeed, he discovered a phenomenon called anomalous suspension (the suspension of water in a Toricellian apparatus when the water was purged of air, but when a bubble was introduced the water fell) "whose outcome measured the excellence of any air-pump...[and] to interpret this calibration phenomenon, Huygens had summoned into existence a new fluid and challenged the sufficiency of the weight and spring of common air. The effect of this fluid was only visible in good pumps."[55] However, "for more than eighteen months neither of Huygens' claims were granted the status of matters of fact" and it is in this time period that we see how the troubles of replication were dealt with by contemporaries. The dispute resulted in a flurry of letters between Boyle and Huygens, each attacking the integrity of the other's machine (and by extension the theories of their makers). "So in March and April 1663 it became clear that unless the phenomenon could be produced in England with one of the two pumps available, then no one in England would accept the claims Huygens had made, or his competence in working the pump"[56] - full and complete breakdown of the technology of virtual witnessing. Thus, Huygens travelled to London and became part of the Royal Society and replicated his matter of fact[57].

Another problem with replication was that the pumps were constantly being rebuilt, and so results would vary with each reconstruction[58].

According to Shapin and Schaffer there were two main problems with replication in the 1660s. (1) "The

accomplishment of replication was dependent on contingent acts of judgment. One cannot write down a formula saying when replication was or was not achieved" and (2) "if replication is the technology which turn belief into knowledge, then knowledge-production depends not just on the abstract exchange of paper and ideas but on the practical social regulation of men and machines."[59] Thus, "the effective solution to the problem of knowledge was predicated upon a solution to the problem of social order."[60]

what problem is that?

Chapter VII: Natural Philosophy and the Restoration: Interests in Dispute

I think this needs to be defined

"Hobbes and Boyle used the work of the 1640s and 1650s to give rival accounts of the right way to conduct natural philosophy"[61] and, in chapter 7, Shapin and Schaffer show how those models were interpreted and supported by Restoration society. "The experience of the War and the Republic showed that disputed knowledge produced civil strife...Boyle's technologies could only gain assent within a secure social space for experimental practice...[while] Hobbes assaulted the security of that space because it was yet one more case of divided power."[60]

In essence, Boyle's theory and Hobbes's theory are inspired by the same problem: what to do when people can't agree on the truth. Boyle's supporters "Wilkins and Ward were ejected from the universities...they argued against each other about the virtues of toleration or suppression of Dissent. Wilkins attacked the Uniformity Act as too coercive: he would have preferred that the Church 'stand without whipping.'"[62] "These exchanges give considerable point to the proposals that Boyle and his allies produced for the establishment of a social space in which dissent would be safe and tolerable."[62] In addition, "Sprat's *History of the Royal Society* (1667) labeled Hobbesian dogmatism as tyranny, and uncontrolled private judgement as enthusiasm. Such dangers were to be excluded from the community - otherwise debate would not be safe."[62] "The works of Barlow, Pett, and Dury argued that the balance of disputing sects was better than a state that included a cowed and disaffected party coerced into silence."[63] "With Hobbes in view...Glanvill insisted that 'dogmatizing is the great disturber both of our selves, and the world with-out us: for while we wed an opinion, we resolvedly ingage against every one that opposeth it...hence grow Schisms, heresies, and anomalies beyond Arithmetick."[64]

→ what was that

Adversaries of the experimental method took offense in two ways. The first was to "satirize the low status of experimental labour" and label their discipline as little more than children playing with toys.[65] And the second, more social ingrained argument, was that the division between Church and the discovery of "matters of fact" "would weaken, rather than strengthen, the fortunes of the Church."[66] "Boyle portrayed the work of experiment as distinct from that of the Church. Yet its work was also valuable for the churchmen. If the rules of the experimental game were obeyed, then the game would work well for the godly. These were the aspects of experimental philosophy that More and his allies found useful at the Restoration."[67] As we have seen previously, this allied relationship between natural philosophy and the clergy was unacceptable to Hobbes because it undermined the political authority of the King and caused social instability by splitting the allegiances of the his subjects between his own temporal authority over their bodies and the spiritual authority harnessed by the clergy[67]

I'll go back to right of kings

Chapter VIII: The Polity of Science: Conclusions

In the final chapter of *Leviathan and the Air-Pump*, Shapin and Schaffer condense their vastly complicated

picture of Restoration society and how it interacted with the development of modern science to three points. "First, scientific practitioners have created, selected, and maintained a polity within which they operate and make intellectual product; second, the intellectual product made within that polity has become an element in political activity and in the state; third, there is a conditional relationship between the nature of the polity occupied by scientific intellectual and the nature of the wider polity."[68] In proving those three points they say they had three things to connect: "(1) the polity of the intellectual community; (2) the solution to the practical problem of making and justifying knowledge; and (3) the polity of the wider society" and that they did so by connection three things: "(1) that the solution to the problem of knowledge is political...(2) that the knowledge thus produced and authenticated become an element in political action in the wider polity...[and] (3) that the contest among alternative forms of life and their characteristic forms of intellectual product depend on the political success of the various candidates in insinuating themselves into the activities of other institutions and other interest groups. He who has the most, and the most powerful, allies wins."[69] This is a departure from the "self-evident" scholars who attribute the victory of the empirical method to its inherent "goodness" (discussed in chapter 1).

They end by relating their examination of Restoration society to their current social climate in the late twentieth century: "As we come to recognize the conventional and artifactual status of our forms of knowing, we put ourselves in a position to realize that it is ourselves and not reality that is responsible for what we know. Knowledge, as much as the state, is the product of human actions. Hobbes was right."[70]

Criticisms of Leviathan and the Air-Pump

J.L. Heilbron credits Shapin and Schaffer with picking important aspects of the development of experimental culture that are still relevant today, citing specifically the problems with replication. However, he casts doubt upon the strength of the relationship between politics of the greater society and the politics within the Royal Society. In addition, Heilbron laments the absence of comparisons to the development of empiricism in the rest of Europe because it blinds the reader to what may have been peculiar to England's case.[71]

Anna Marie Roos, on the other hand, writes that Shapin and Schaffer do indeed draw a connection between the history of science and the history of political thought, and that their strict resolution to remain impartial when examining the argument between Hobbes and Boyle forces historians of science and politics alike to recognize the relationship between the two branches of knowledge.[72]

Lawrence M. Principe, in *The Aspiring Adept: Robert Boyle and His Alchemical Quest*, provides numerous demonstrations that many conclusions reached by Shapin and Schaffer rest on inaccurate and at times presentist conceptions of Boyle's work.

Editions

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Notes

1. ^ Shapin & Schaffer 1985, pp. 3
2. ^ *a b* Shapin & Schaffer 1985, pp. 4
3. ^ Shapin & Schaffer 1985, pp. 8
4. ^ Shapin & Schaffer 1985, pp. 12

5. ^ Shapin & Schaffer 1985, pp. 14
6. ^ Shapin & Schaffer 1985, pp. 22
7. ^ Shapin & Schaffer 1985, pp. 23
8. ^ Shapin & Schaffer 1985, pp. 24
9. ^ Shapin & Schaffer 1985, pp. 25
10. ^ Shapin & Schaffer 1985, pp. 30
11. ^ Shapin & Schaffer 1985, pp. 44
12. ^ Shapin & Schaffer 1985, pp. 45
13. ^ Shapin & Schaffer 1985, pp. 47
14. ^ Shapin & Schaffer 1985, pp. 54
15. ^ Shapin & Schaffer 1985, pp. 39
16. ^ *a b* Shapin & Schaffer 1985, pp. 60
17. ^ *a b* Shapin & Schaffer 1985, pp. 55
18. ^ Shapin & Schaffer 1985, pp. 63
19. ^ Shapin & Schaffer 1985, pp. 67
20. ^ Shapin & Schaffer 1985, pp. 81
21. ^ *a b* Shapin & Schaffer 1985, pp. 83
22. ^ Shapin & Schaffer 1985, pp. 94
23. ^ Shapin & Schaffer 1985, pp. 96
24. ^ *a b* Shapin & Schaffer 1985, pp. 98
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27. ^ Shapin & Schaffer 1985, pp. 104
28. ^ Shapin & Schaffer 1985, pp. 105
29. ^ Shapin & Schaffer 1985, pp. 109
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32. ^ Shapin & Schaffer 1985, pp. 114
33. ^ Shapin & Schaffer 1985, pp. 115
34. ^ *a b* Shapin & Schaffer 1985, pp. 117
35. ^ Shapin & Schaffer 1985, pp. 121
36. ^ *a b* Shapin & Schaffer 1985, pp. 127
37. ^ Shapin & Schaffer 1985, pp. 151
38. ^ Shapin & Schaffer 1985, pp. 152
39. ^ Shapin & Schaffer 1985, pp. 156
40. ^ *a b* Shapin & Schaffer 1985, pp. 157
41. ^ Shapin & Schaffer 1985, pp. 159
42. ^ Shapin & Schaffer 1985, pp. 163
43. ^ Shapin & Schaffer 1985, pp. 155
44. ^ Shapin & Schaffer 1985, pp. 168
45. ^ Shapin & Schaffer 1985, pp. 169
46. ^ Shapin & Schaffer 1985, pp. 170
47. ^ Shapin & Schaffer 1985, pp. 181
48. ^ Shapin & Schaffer 1985, pp. 211
49. ^ Shapin & Schaffer 1985, pp. 212
50. ^ Shapin & Schaffer 1985, pp. 215
51. ^ *a b* Shapin & Schaffer 1985, pp. 217
52. ^ Shapin & Schaffer 1985, pp. 225
53. ^ Shapin & Schaffer 1985, pp. 235
54. ^ Shapin & Schaffer 1985, pp. 237
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56. ^ Shapin & Schaffer 1985, pp. 249
57. ^ Shapin & Schaffer 1985, pp. 251
58. ^ Shapin & Schaffer 1985, pp. 260
59. ^ Shapin & Schaffer 1985, pp. 282
60. ^ *a b* Shapin & Schaffer 1985, pp. 283
61. ^ Shapin & Schaffer 1985, pp. 284
62. ^ *a b c* Shapin & Schaffer 1985, pp. 301
63. ^ Shapin & Schaffer 1985, pp. 302
64. ^ Shapin & Schaffer 1985, pp. 305
65. ^ Shapin & Schaffer 1985, pp. 307
66. ^ Shapin & Schaffer 1985, pp. 308
67. ^ *a b* Shapin & Schaffer 1985, pp. 310
68. ^ Shapin & Schaffer 1985, pp. 332
69. ^ Shapin & Schaffer 1985, pp. 342
70. ^ Shapin & Schaffer 1985, pp. 344
71. ^ Heilbron http://www.pubmedcentral.nih.gov/picrender.fcgi?artid=1035825&blobtype=pdf
72. ^ Roos http://www.h-net.org/reviews/showrev.cgi?path=25967955484936

External links

- Understanding Experiment: Shapin and Schaffer's *Leviathan and the Air Pump* (http://www.h-net.org/reviews/showrev.cgi?path=25967955484936)
- Richard C Jennings' Review (http://www.jstor.org/stable/687218?seq=1)
- J.L. Heilbron's Review (http://www.pubmedcentral.nih.gov/picrender.fcgi?artid=1035825&blobtype=pdf)

Retrieved from "http://en.wikipedia.org/wiki/Leviathan_and_the_Air-Pump"
Categories: 1985 books | Philosophy of science literature | Books about the history of science | Science studies

Podcast

9/12

How science via experiment came to start

Started science history study 70s

experiments was new

STS.011 Lecture 1

9/13

First part: Air pump

2nd part: 2002-04 MIT controversy

tension of experimental sci: secret vs checking claims

before 1980s

book: people as geniuses - working individually

~~Podcast: like engineers~~

Themes

- Secrecy vs openness
- ~~prob~~ private vs public
- artificial vs natural
- laboratory vs field

- Paradox of labs

The podcast presented the scientists as engineers

Thought experiment: Science w/o labs

How do we define public space, what is a public good?

- Hobbes + Boyle most interested it

(2)

What's at stake?

What was before lab?

- Republic of letters
  - set of virtues, ethical principles
  - Scients was not professionalized
    - it was a gentleman
  - mostly through Jesuits - brokers
  - goal: discovery of truth - copied at letters + sent out
  - "natural philosophers"
  - decentralized
  - tried to be independent
- Virtues
  - Disinterestedness
  - communism
  - Organized skepticism
  - Universalism
- ~~Sort of~~
- This fell out today

(3)

But in 1450s virtues reasserted at moment of crisis

How open was the Republic of Letters?

- Invisable boundaries
- Social capital is primary currency
  - trust
- Not really neutral

Rt machine changes something

What is difference b/w tool + machine?

- (Lots of answers from class)

Hobbs we can detect who is right + wrong w/o extra tools + machines - just judgement

This class is boring - thought it would be more practical
- patent reform
- etc

Who is in charge shifts in RoL - w/ experimenter - he is in charge

(9)

So reduction in autonomy

New set of skills to maintain air pumps

Politics of seeing

- primary way of conveying w/ world
- who can see experiment
- temporary - is there
- organizing ← writing scientific accounts
- Second order empericism - watching a needle not thinking about common experiences

Hobbes is a purist - does not want any intermediation

Jesuits lose centrality of being broker

If instrument not wrong (leaking) how can trust it?

Tom: MIT Grad student - was in a dispute 2002-2004

- reading + interpiting machine results

(5)

AFM microscope – nano technology

All via tool → Microscope

Is what you see real or an artifact?

Becomes question of group loyalty

Still need job - etc

Want to be right all the time

Next week: give me lab + I will change the world

80s - researching scientists not just lab studies - but larger context like an anthropologist

Often much smaller Contraversity - face to face

not just ~~there~~ is global warming happening?

If want to consolidate support

- need to "enroll" other people to your thinking
- so part of political power
- to establish authority
- police boundries of space

(6)

Rarely dealing w/ outright fraud

People have best intentions

Trying to enroll, not deciere

(same thing Top Secret America lady)

Managing fuzzy data

Trying to make big claims to raise $

Stressful

No hard boundry scientific vs social pressures

Sci try to make dramatic claims

That visable lab on corridor

- actually it needs to be in a very quiet place

Machine not very visably accurate

- Gerecates pictures
- But not always accurate

Topographic image

(7)

Tip scans sample that moves back + forth

Shines laser on photodie

Tip goes up + down w/ item

Their experiment - if you could customize chem on molecules would be very good for drug delivery

Is that what they found?

Not really trained much on machines

- need to learn the tricks of each machine

Retracting on paper is killer to your prof

Other guy in group tries to distance himself

- so his career is not dragged down

(This is much more interesting
- more relevant to me)

They started seriously grading data

- opposet of how science is supposed to work

Now the article is sucessful

300 citations

(8)

Scientific images misused in popular press

STS011 Recitation

9/15

Recitations: mix of discussing + project work
People should ask qs during lectures
Give people a sense of working in groups
- Will rate other group members after semester
- May find project topic might not be good
Being bored is not all that bad
- sometimes don't like topic
- stick to it

Projects
3-6 people
collect data, analize, visualize
Don't just use Google
Interpret data
Local papers more urgent on fracking

Class Website demoscience.org
- coordinates b/w the classes

Problem: Too much data

How do you know what top journal is?
- what is credit in your case

Need to sort out what is relevant

Can link to all papers, since its online

Narrate your evidence - don't just print
- List of actors
- Resources of actors (funding, etc)
- Discourse of actors
- Timeline (measures intensity)
  - click on date

People try to downplay issue

Conflicts of interest

Variety of methods

Scientometrics
- Citation as credit
- Co-authorship
- institutional affiliations - map of research

(3)

Web Cartography
- Hyperlink analysis
- Morphology of controversies

Semantic Analysis
- large corpus
- co-occurance analysis - changes of issues

Usually people used templates

One group did word cloud of reports from diff agencies

Time series - how field changes over time

People's Ideas for Topics

- building more nuclear plants
- genomic sequencing discrimination
- patefing genes
  - a lot there, coming up w/ new perspectives hard
- Space ex

(4)

Genetic eng. agri

Viruses labs

- ways labs linked interesting

Me: Biz model patents
Prof

- is there enough data?

Role of tech in 3rd world co

- OLPC

STS.041

9/20

Paster - building his world

Later - critiquing how science was investigated
- deconstructing genius of Paster
- scale of natural interests

1930s movie about Louis Paster
1936

- portrays him as dirty, messy lab in his house
- no that what something else

No Pasture talks about clinics
- Doctors don't like it

Doctors don't value chemists

Doctors don't want to wash their hands

Pasture: try + try again

Invited to empaer

kinda brash just when someone died

(2) Convincing people by looking at slides at microbes

Doctors thinks silly small animals can kill people

Emporie thinks w/ doctors

Continues his work outside of Paris

Trial in [small town
- not affected by plague

Emporie: See why

Doctor: We've heard thousands of ideas
Not really into investigation
(Hollywoodize)

Now Pastor insulting

Why is doctor so set in his ways?

Love subplot

Miccobes found near dead animals

Newspaper: bring your animals to Arbois
(but that is not the problem)

Try to convince people are bad

(3)

Assistant goes to academy of ~~mine~~ medicine
Always attacks on credibility
Then one proposes an experiment
- thinks it will prove him wrong

2 seperet pens
- signs + banners

Den all over news
Benefits of science are not for science, are for humanity

Big festival atmosphere
Experiment a Sucess
- all alive + healty
Dr. Lister working in antisects

Now humans i witchery Curie?
oh cause of Rabes

Much bigger lab now

(4)

Not same for Antrax
Louis infects himself w/ pluge?

Got elected to academy
- now respected more
- Science vs medicine

Want to visit him

He says no cure yet

Doctor takes some Cobes injection
- but in perfect health
- ridiculing Pasteur

14 day old virus

Child comes - has no other cure ideas
- experiment on him?
- but has no alternative
- would mean Gitean if fails
- head doctors does not think experimenting is great idea

(5)

- does experiment in secret
Runs assistants too hard
- Try on Russian volunteers

Daughter has baby
- Convince doctor to boil his instruments
- in return for publishing that got injection + not sick
(They didn't get the subities of experimental results)
?He is starting to get sick
- or tired

Got academy approval for Russians
People better
Trying different ages

Finally accepted into academy
labs + libraries
Everything has opposition

(6)

After

Latour
- diff theory of geniuses

Deal w/ other ways of narrating scientists

Bombarded w/ stories about science

Presents theory of genius

Latur: genius can assemble pieces of puzzle

Schafer: piece on Latutur

Decode stories about scien
- ways science is sold to us

Science: destroying world + humanity

What characters are in film - that are not in Latur?

Movie	Latur
selfless	keep experiments going
Solving world's problems	Solving his problems
	were problems as serious as in movie
humble	
Lab seems more natural	Lab more prestaged

(1)

Competition set up by others

Performance
- Competition for his benefit

How hollywoodized is movie?
- Historians do compete
- Scientists who are also capitalist
- can't say which is more accurate

TA: Marie skipped over
That Pasteur had a big following
Had a good PR

~~Bad~~ Stole ideas

~~Theory~~ Results inevitable
- w/ big lab would find
- advantages of lab
- much more likely to solve problem

(8) Tragic hero
World is againts him

Stake: funding
Sooner rather than later
Played the game well

Compasionate

Why Later like that?
- wanted to
- Creative in writing history

Scale problem

In US people very obsessed w/ Pasteur

Scaling up from treating 1 person to world
- Later neglects - Pastur was famos already

Like a rockstar
- People waiting outside
Whole range of scales

Nice old man

(9)

Eurkea
moment

Academy accepts when
he has proof

Accumulation of credit
+ arm twisting

Guy not alone
is a politicans
Worked in lab

STS.011 Recitation

9/22

(2 min late)

Can talk about personal experiences
- if can link w/ lab

Write a ~~pro~~ few pages about Schaffer on Latour
- is the treatment fair?

Goal - agree/disagree?
- don't have to say something totally new
- but pull blocks together

Later papers are about our topic
- integrate your topic into what we read

Latour

Science as enterprise/action vs Science as passion

Schafer: harder to read

Moving to micro items to larger questions of representation

driving wedge in way of science taught ~~in~~ 1700s 1900s

US way of science vs Soviet
- civilized, liberty, rationality

(2)

Pasteur has no bounds on methods
- bend allies, enroll enemys

Latour: Scients don't have specific methods - just enroll people

Interesting that sci are creative, not rigid

Pasteur is not rational - has convincing

Science is trial of strenght
- Does not fit w/ 50s+60s rationality + liberty

Context of discovery vs Context
- they can't get bone in house

They just happen
- ensure scients free, have time, low politics

Context of proof - scients can actually prove what they have done

Interesting of science: not mess of discovery by the proof

---

representation → Spokesperson
→ inscription

Var of Trial of strength

Rationality
Methods
Context of discover vs context of proof

(3)

Once we prove, path is straight

Latter has no interest in methods

no interest in Context of Discovery

vs

Context of Proof

Discovery of science = discoveries in world

Why are scientists so powerful

~~That~~ To convince people of what they publish

Scients work to build networks

Student: Is it inevitable that dog will get bone in
- Same for lab

Other: Pauster setup induced discovery
- but not guarenteed

Other: Latter; just messing w/ new toy

Prof: 2 ways to get people to work w/ new individuals who are similar to you
- same network

(4)

Instruments / Machines in Lab

Why do you build a social network?
- fragmented

Do groups have to feel as one?
Spread viewpoints
- reduce distance

People have something in common before network
Later disagrees people just go after their interests
you tell people what to talk about on network
- moderate conversations to be on-topic

What do people share when they form this network?
What if people don't have interests?
Why do people manage to coexist together?
- Tea Party: people congregate over shared interest

People have something in common
Democrats: no as a society we have stuff in comon
Someone: Scients have no common ~~work~~ by
~~have~~ build connections into creating pov viewpoint

(5)

Spokesperson: Want to make sure 1 voice
1 person to simplify
Make a conversation on simple terms

Votes + Representation
- 2000 election
- How to you go from farm to article w/ easy convincing bottom line

~~Lab~~ the Lab in real world; bring it to you
- easy to understand
- tied to their interests

Lauter; simplify mess of individuals
" " " data (well for what you had)

2008 Caucus - local?
- broadcasting live
- very messy
- can't really count handy
- how do ya represent voters - stand / sit
- how large of a size will work?

(6)

someone; Lab simplifies too much

Same for calcs

Even more for machine

- no one knows how it works
- Not open source
- promise; no more reviewing

Projects

Genetic Engineering of Bacteria

- is it 1st synthetic genome
- $100 million for biofuels

2 groups on Biotech

Industry funding in academics

Nuclear Saftey

- economics
- effectiveness vs climet change
- [that would be a good one]

Patent

- Bilsky
- Could put someone in touch w/

STS Controversies Research Planning

9/[illegible]/25

Can we do net neutrality?

Emailed prof about what defines science + limits of scientific Controversies

Pfizer Overseas medical trials
- less standards

Taking pics in public

Rise of security state
- is this a science one

Physician assisted suicide
- that's a big one

GMO crops + biolabs getting a lot of people

Research biz model more

Patents
- Trials
- Biz Model
} 2 different

(2)

Biz model seems to be more legal issue

Yeah how is that scientific

I think net neutrality would be good

Review next how patent law changed

Patent contracts would require me to learn the terms

Could do is new patent law good

Is new health care law good

Online (demo science.org)

- Penn Station (architecture school)
- HSR
- Long Tail
  - Erik B is on it!
- Many are dam
- Nuclear waste management
- Space ex

③ Prof big on Mapping
- used to be STS.015 Mapping Controversies

I think is more than that!

~~Which~~ Where should we go

→ moon
→ mars
→ deep space

Diff actors have diff positions.

* Oh so point is not to say is one side right or really even to present their issues
- But looking at their biases + how that might explain their positions

STS.041 Lecture

9/27

Project - see Google Doc

Sci + Tech - write about a lot, available online
- lots of theories

Sci + Engineers + Economists - publish a lot
huge claims

Deficit / infrastsure spend - very good project
- lots of discussion

Not obsessed w/ scientists - just convienent

Who is working on what Thur

Today: Documentry on removing info
- guy writes extensivly
- has an intrest on secrecy
- how knowledge is removed

Merton: Read about virtues of science
- transparency
- Skepticism

(2)

How do we describe sci secrets?

This is 50s + 60s,
- when secrecy infrastructure 1st being built
- when Merton writing

What is nature of scientific knowledge.
"Polanie"
One person: saw loss of creativity in 60s
went against norms of Merton
Com
things are public - up for discussion - tacit knowledge
~~can't be distinct~~
hard to write about everything
- taken for granted by other scients
its not public knowledge
- public would not realize
Value of science is weakend b/c of this
- knowledge can not be communicated
- huge gap b/w reading about bike riding + actually doing

(3)

When communicating about science: can't just publish methods
- if just publish method, no one will use it
- results have been discovered

So let scientists do science
Can't report in rational ways
Will mislead us
Scients are irrational

Scients organized in strict ways
Gov + Corps telling scientists what to do
→ Trying to attach quick results is bad
- Sci can't give clear reports

Now movie

- Look at all the modes of secrecy

Secrecy protects effective Counterterrorism
- like on Flight 93

Other POV: Media always thinks less secrecy
Losing leads for intell
Reporters think they are patriotic
Misjudging what type of society trying to protect

(4)

Fact WMD falling apart was secret

Secret B-52 plane crash 1940s
- gov refused to produce accident report

Start of secrecy
- nuclear self-censorship
- then Manhatten project
- to keep from other agencies & Congress
- would interfear w/ progress of work

9/11 Commission: too much secrecy hurt us
- did not share info w/ FBI
- too much highly classified

If new war - what is new about it

George W Bush sets up whole special trial system
- no law here

German wrongly imprisioned
- newspaper
- covered w/ State Secrets Privilige
Lairforce crash

(5)

We were scared at that time
Russians have svr tech
But who polices that
Classification - from Industrial Age
- does not work in Info Age

Kicking people out of their trial
- No limit on pres power
- what they claimed
Publicity Caught Unibomber

Psychology of keeping secrets

On secret Airforce report no secret equipment
Just that AF negligent
US not having to answer up + take responsibility
- So lose grounding

(6)

Rules say can't use it to conceal crimes

CIA ~~agent~~ says Abu Graddbe bad

but can't share tatics

Can't stack down military commissions

Can Pres power are Sept 12

But years later?

(Movie not really talking about too many secrets)

(or the waste of $)

Turf + power + economics pushing secret

- no countervailing power

~~Cost~~

w/ secrecy can live lives w/o thinking about this

Movie over

Way sci accessed now

- labs
- corp sponsored

(7)

Knowledge restricted
- need special knowledge to understand

Creating black boxes
- special tool
- needs special training to use

Can create totalerian regime

Democracy can't seclede knowledge
Don't want to make mail box public
So why is science secrecy a problem?

Mei: Delegation + Abstracts
- Crowd of experts
- no formal delegation / org

"body" - is that formal or abstract grouping
- or both

Secrecy: Preventing peer review

Dangers of weponization

(8)

If keep secrecy around stuff world not have nuclear bomb
- Nuclear industry spin off

(One student very anti sci- as weapon)

Crowd vs expert
- can we trust;
- common expertise
- what is def of expert
- and legitimite empower
- define bandry of crowd
- open source actually orged

Control; Who has it
- W/ Manhatten Project - gov + buraucracy decides which direction to move

Trade Secrets
- if don't protect, will harm commerce
- disincentive to be creative
- Yochai Benkler - Behavior - Crowd Saving

(9)

Software / SmartPhones Patents

- So Fundamental
- competition w/o them
- ↑ since market works fast
- get market power in other ways
  - lock in
  - app compatability
- that 20 years patenting feels too long

Customer + Producers are same people

- not a relevant distinction
- can't screw customer
- since would screw themselves

Completly diff from manhatten project

- Saftey of citizens

Democracy has to be delagative

Manhatten

- We want largest advantage

Me: Economics

- can do all secret yourself if spend $
- Or build on others - achieve more - bigger pie
  - ~~perhaps~~ not ~~more~~ just - bigger slice

STS.011 Recitation

9/29

6 people per group = target
6-8 people

Can have more than 1 group per topic

Prof: net neutrality
- would endorse
- have interests
- what is neutrality

- Carbon neutrality
  - Prof likes
  - Compare neutrality on web to carbon

- aquaculture
  - raising fish
  - science out in wild

- patent trolls
  - Intellectual Vetures
  - what is the claim
  - very legal question
  - good or bad for invention?

(2)

Prof: Purpose is not to settle controversy
but to summarize

Patenting mobile stuff
Is it good for society

GM crops
- environmental risks
- terminator gene

Bee ~~keeper~~ colony collapse
- Bees have been designed

Voting for 2

10/4

STS.011

Universities + Corps

- Science - Mart
  - seems provoaking
  - but actually more reasonable underneath
- BPA Video
  - dealing w/ technical stuff
  - trying to map controversy
  - don't just weave story w/ headlines
    - dive into tech
  - needs to make sence to non-scientists
- Will
  - Video has lots of fat
    - too much extra, too long
  - kinda biased
  - but watch how conducted investigation

Group meetings start next week
Recitations splitting

(2) Want a group PM

Talk 1st

Science - Mart

- visions of science + labs
- history of lab
- changing shape of lab
  - military
  - large corporations
  - universites in US
- legal structure
  - big moments in changes
  - ~~corps~~
  - University licensing
- different ways of doing science

Has it changed ± ways?

Poor i nothing has changed

(3)

Vision that scientist were at One point free in ivory tower

- actual always had patrons
- always messy
- Shapin - dean ~~of~~ of Sci at Harvard
- had to negiotated
- maybe could do it for a few yea
- always been commercial

EE Dept chair industry telling us what to do is no different than gov telling what to do

Slipery slope

~~Ripper~~

Has $ flowing into labs subverted sci?

Sold their soul?

No more Mertan virtue of sci

Corps want return on investment

(4)

Was their golden age of science where stuff was pure?

Sci as business and sci as good not on economist radar since 1960s + 1970s

- science becomes information
- information messy for economists

A scientist is a guy who does biz

- has 2 choices - going public or private

When you invest in a lab need to for a few years

Think Virtue are belonging to scientists

- not institutions

1890 - 1940 slide

- Simultaneous rise of unis + industrial labs
- industrial labs allow getting around anti-trust
  - patents prevent competition
- can claim helping society
- foundations shape uni labs like industry labs

(5)

US Unis started focused on lab science 1940

before that moral edu for the rich

A series of decisions about how inventions assigned

- allowed employers to claim employee patents
- science is a collective enterprise
- ~~Bve~~ tired over in 1910

1920s - birth of big foundations

- start to invest in ~~United~~ universities
- pick a few
- foundations set up labs there - model industry labs
- need to report back

Cold War

Linear model - pure confined science requisites for applied science

No mix of pure + commerical science

After war - vacuum

Military keeps funding scientists + labs

Now military funding starting to share in industrial labs

Oxymoronic: relatively open science - but secrecy

In industry move away from 1 line of biz

- instead have multi division cos
- starting to acquire other cos
- So have multiple labs for each line of biz
  - again largly public funded

Military Secret - but allows basic research

So people feel like it is ~~bas~~ golden era of science

1980s/End of Industrial Lab

- end of military funding
- end of Chandlerian corps
  - vertical integration
  - multiple divisions
  - in-house labs
- outsource R+D

(7)

Physics labs at MIT still very defence-oriented

Growing influence of Chicago school of econ
- that econ can't be org.
- state can't fund universities as well
- Reagan economics

Corps: large corps too big
move towards smaller
dismantle them
outsource their research to university labs

New IP regime
- Bayh-Dole act - can patent stuff w/ paid for w/ federal $
- can make sure research is done right
- ("when ya tell people they can make $ - they become smarter")
- also later extended to private co's research

(8)

Legislators had in mind help private cos w/ Bayh-Dole

Thought ga more efficent than federal gov

Took 3 years

Vacuum left after WW2

Prevent co from falling into recession

Needed continued funding

Freedom of sci only created w/ DoD bubble

Foundation training not only scientists tech 'knowledge - but how to do science

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~~[illegible]~~

1890s Monopolies: had too much pricing power

Today " : allows us to research

new products good

Can be dethroned any time

(9)

PBS BPA video

Hard clear plastic bottles
Metal ~~the~~ can linings
Endocrin cancer in animals
In Humans
Set site on regulator agencies
- they said it was safe
Advocacy got bill passed
EPA will investigate
EPA - foot dragging
- didn't investigate anything in 11 years
- diffidult to deal with
- Spent $80 million
Some labs found problems
Industry said its fine
- $M cited studies they paid for
Trying to create uncertainty

(10)

Giving EPA add. studies tries it up

They claim they help fund the EPA

Where Who authors?

Institute?

Funded? → Gov? which agency?

How many animals? Which?

Looked at 258 studies

88% found harm

3/4 found of industry studied funded by industry

~~What~~

Doses used?

Methods critical - some written by industry

No clarification or retraction

Story exploded

Congress started taking over

Removing from childrens products

(11)

Companies rushing to vol. get out of DPA biz

FDA ~~EPA~~ used industry studies

- not designed to eval safety in industry
- also lifted passages from industry study

Pick a chair that has big chem donation

- But board voted agains FDA

International Finance Reg

- say it was anti-American
- have to keep a little of what ya get

Only Industry knows how to regulate itself

Business Freedom + American freedom

tied together

Anti-American to regulate

Regulator looks negitive

No one said that in 50s

Innovation is all that counts

Paper 1

Michael E Plasmeier

From: Vincent Antonin Lepinay <lepinay@MIT.EDU>
Sent: Friday, September 30, 2011 10:49 PM
To: Vincent Antonin Lepinay
Subject: [STS.011] A message about the first essay

Follow Up Flag: Follow up
Flag Status: Flagged

Dear all,

We've received a lot of questions about the first essay assignment lately. To clear up the ambiguity, here's a list of instructions and expectations to get you started.

For starters, remember that this essay is supposed to be an argument, not just a description. Try to come up with a question of your own based on our readings (or other related readings if you've already cleared them with me), and make sure to formulate this question clearly in the introduction of your essay so we know what you plan to talk about. Again, we're not looking for a "book report" or just a short summary of the points from the readings - we've read the books, so we already know what they say!

We want you to develop and critique the points that are important for answering your question, and, if you like, to support these points with outside evidence from other contemporary events/controversies/etc.

If you use outside information, you must cite it appropriately (all direct quotations in "quote marks," all paraphrasings and borrowed arguments footnoted) so we know where it came from.

Finish your essay with a conclusion, including a final summary of your argument. The assignment length is listed as four pages (double spaced), but try to make sure your essay falls between 1100-1500 words.

Mechanics are important here, as they will be on your final project websites: grammatical errors and typos will result in lost points. Format is important, too: make sure to give your essay an original title, and to include a header or footer with page numbers and your last name on each page. And make sure you print out your paper before coming to class so you can hand in a hard copy: don't make Professor Lepinay and I go to the trouble of printing your paper for you. One final note: make sure you've read the late paper policy outlined in the syllabus.

We realize that these instructions - original question, intro, conclusion, cited evidence - will sound pretty obvious, and maybe even patronizing, to most of you, but the main purpose of this assignment is to make sure you know how to formulate a reasonable problem, and that you can structure an argument in a bounded and readable way. By the time you're writing everything up for your websites, these skills will be crucial for you if your group wants to be able to assemble all of its information and arguments in a logical and interesting way.

Please us me know if you have any questions. And good luck!
Vincent and Tom