STS-5024 Introduction to Science and Technology Studies
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Mid-Term Exam

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Contents

Essay 1 - Interdisciplinary Approach

Question C)

A key feature of STS scholarship is its interdisciplinary approach. While STS as a field draws from history, philosophy, anthropology, sociology, and other fields, it often integrates these methods. Select a key work (or works) from the syllabus thus far and explain how and why it utilizes a hybrid methodology to make its case.

Introduction

In an article examining the area of ideological boundary-work and discipline demarcation, Thomas F. Gieryn employs historical, sociological, and philosophical arguments to describe how science is often distinguished from other intellectual activities. He notes how some consider demarcation a pseudo-problem (Gieryn 1983: p. 781), but Gieryn argues practical application of distinction assists scientists in acquisition of intellectual authority. While he argues science is not free from demarcation, he also sees demarcation as a tool not isolated to science.

In this paper I will show examples of how Gieryn makes his argument using history, sociology, and philosophy as methods to clarify his position. I will also point to some assumptions he makes which may be questioned.

Historical Reference

Gieryn expounds many of the sociological and philosophical arguments through the lens of historical movements. One prominent example he shares comes in the form of John Tyndall (1820-1893) who sought to bring the profession of science into a position of authority and prestige (Gieryn 1983: p. 784). In the wake of Charles Darwin's publication of *The Origin of Species* in 1859 came a 'struggle for authority' between science and religion, and Tyndall played a prominent leadership role on the side of science. By 'the church' Gieryn specifically refers to

the Catholic Church in that many universities of the period were church-sponsored. Clergy controlled curriculum.

In the Victorian period Tyndall also had to contend with the prominance of engineering (known then as mechanics). His time was a time of invention. Many inventors were not formally educated and seemed to create the industrial revolution almost independent of scientific theory.

Phrenology and anatomy became popular in the early nineteenth century. As competing disciplines, scientists drew distinction among themselves, anatomists referring to phrenology as pseudo-science. Gieryn refers to these camps as “alternative images of science” (Gieryn 1983: p. 788). He notes how “Anatomists accused phrenologists of relying on popular opinion to validate theories” and “ignoring opinions of scientific ‘experts’” (Ibid.: p. 789). Gieryn shows how anatomists eventually were successful at putting a boundary between the two movements and have phrenology relegated to a position outside of established academia.

Another historical context shared by Gieryn was the national day of prayer. In the latter part of the century the Privy Council often called for such an event to help with some specific problem. One example was in 1871 when a young Prince Edward contracted Typhoid. When the prince was healed clergy pointed to prayer’s effectiveness. Tyndall encouraged prayer for a specific hospital to see if the mortality rate there would improve. The experiment didn’t happen, but Gieryn points to this as an example of how determined scientists like Tyndall were in their quest for prestige (Gieryn 1983: p. 784).

Sociological Reference

Under the heading *Social Theories of Ideology*, Gieryn compares and contrasts *strains theories* with *interests theories* (Gieryn 1983: p. 782). He explains strains in terms of evaluative integration in the face of conflicting demands, competing expectations, and inevitable ambivalences. Interests, Gieryn says, are social levers or weapons to further political and economic goals. They encompass universal struggles for power and advantage. He argues these differing sociological approaches can both act at the same time, but to understand the forces requires a more encompassing theory. "Both strain and interest theories direct attention to social functions of ideologies" while ignoring patters of "formulations and figurative languages of ideologists" (Ibid.).

Another area Gieryn shares is sociologically related to the interesting interplay between church control, the rise of engineering, and Tyndall's arguments for the preeminence of science. Gieryn compares the dogmatic and financial control by the church with the methodical approach of science. One of Tyndall's points was that science accepts "no authority other than the facts of nature" (Gieryn 1983: p. 785). Modern STS scholars beg to differ, showing how scientific knowledge is created as much as discovered. For example, H.M. Collins' review of the development of the TEA laser shows how important tacit knowledge is to 'discovery' (Collins 1974).

Simultaneously 'mechanicians' were busily building the industrial revolution. Tyndall argues such engineering feats are dependent on science. Others argue that such technical advances were built by self-educated people who work mostly by trial-and-error, Rayvon Fouché shares such examples (Fouché 2003). Science came along to explain phenomena only after the

technologies were developed. Tyndall notes how, unlike engineering, science is objective knowledge, free from private interests, among other motivations (Gieryn 1983: p. 785). This argument could be seen as an endorsement of Robert Merton's scientific norms (Merton 1973 / 1942). Ian Mitroff would argue that the counter-norms Tyndall ascribes to the builders of industry apply just as much to scientists (Mitroff 1974). Michael Mulkay offers Gieryn a potential 'more encompassing theory' by defining norms and counter-norms as vocabularies of justification (Mulkay 1976). Given Gieryn's historical descriptions of Tyndall's approach one could side with Mulkay.

Where Tyndall made distinction between science and religion, and separately between science and mechanics, if there is any sort of sociological separation between religion and mechanics it would appear to be ambiguous. Gieryn doesn't mention it at all. Although religion and mechanics may also not have been specifically allied, yet the result was Tyndall and others affronting two well-established traditions, each with institutions, finances and power. Post-Tyndall science has become more of a partner with engineering, if not religion. In fact it's hard to separate the two. Science does not advance without physical instruments that are engineered, and scientific instruments are outcomes of previously accepted science. Bruno Latour and Steve Woolgar call the adaption of physical tools in a physical environment the "reification of scientific ideas" (Latour and Woolgar 1986 / 1979: p.68).

One last example of Gieryn's use of sociology revolves around national security. A very specific quandary faces science, "How to retain control over the use of these material resources by keeping science autonomous from controls by government or industry" (Gieryn 1983: p. 789). Funders of scientific research often seek practical outcomes. Basic science research may be

supportive of such goals, but is not focused on them. This is a strains theory case for sure. The tension is between getting funding without micromanagment. Likewise there is a desire in scientific norms to share knowledge. This norm is opposite those concerned with national security. Langdon Winner similarly points out while some argue technology outcomes (artifacts) hold some level of politics in that they embody forms of power and authority, in reality it is the "social circumstances of their development, deployment, and use" where politics resides (Winner 1980: p. 122).

Philosophical Reference

As one reviews each of the examples to this point, it is difficult to extract philosophical issues from the sociological. Tyndall's contention that invention is the beneficiary of science has historical examples of the opposite happening. The field of thermodynamics was not a specialty until after the steam engine. On the other hand, sub-atomic theory was a precursor to nuclear power and 'the bomb'. In terms of this chicken-egg debate Gieryn takes no side, but puts it on display through Tyndall.

Gieryn speaks to what science is not. Tyndall's arguments include that science is not-religion, and is not-mechanics. Gieryn clarifies that in the eyes of many, the aims of science are knowledge production and prominence. He eludes to distinguishing itself in this way heightens contrast between science and other knowledge pursuits. "Both 'strains' and 'interests' help to explain the ambiguous content of scientists' ideologies" (Gieryn 1983: p. 792). Yet he further claims that ideologies intrudes on construction of scientific knowledge, at one point noting that science actually *is* an ideology (Ibid.: p. 783).

In discussing opposing belief systems, such as Tyndall's, the church and mechanics examples, Gieryn shows how as much as science considers supportive ideology, others consider ideology as liberation from science.

Some of Gieryn's Assumptions

Not unlike Bruno Latour's argument that knowledge production is about building networks of support (Latour 1987), Gieryn concludes that by demarcation of knowledge production separate from knowledge application, science is able to exclude rivals and claim exemption from responsibility of consequences. He questions if such demarcation is a zero-sum game. Despite these assumptions, his argument that such demarcations are ambiguous does not deny their existence.

Gieryn accepts that ideological theories around strains and interests explain ambiguous content of scientists' ideologies. In fact he further notes that strains enable alternative repertoires (Gieryn 1983: p. 792). Admitting that the demarcation of alternative repertoires are ambiguous (fuzzy) is essentially agreeing the demarcation exists, even if difficult to define.

Conclusion

I have shown a number of examples employed by Thomas F. Gieryn to make his basic argument how theories around strains and interests explain ambiguity of ideological boundaries of science. I have shown how Gieryn and other STS scholars use interdisciplinary approaches to argue their position. In Gieryns's case he even uses words like 'sociology' and 'ideology' in a section titles, then gives detailed historical examples to make his case.

Essay 2 – High Church, Low Church

Question E)

In "Science and Technology Studies and an Engaged Program," Sergio Sismondo explores the notions of a "high church" and "low church" to characterize STS approaches to knowledge and expertise, and intervention. What do these church distinctions mean? Are they valid, and if so, why? Where do *you* hope to situate your own work with respect to expertise and engagement? Please use examples from our readings on the politics of expertise to make your case.

Introduction

In an article describing the idea of an 'engaged program', Sergio Sismondo refers to the ideas of a 'high church' and 'low church' in the discipline of Science and Technology Studies (STS). With these monikers he draws upon a distinction made by Steve Fuller (Sismondo 2008: p.13). Sismondo then clarifies that such distinction, "ignores the numerous bridges between the Churches" (Ibid.) and argues against the idea.

In this paper I will attempt to explain what the distinctions are, and what they mean. I will argue that despite Sismondo's concept of bridges between the two 'churches' there is still value in at least some degree of separation.

The High Church

Sismondo describes the churches as areas of research focus. The so-called High Church is "focused on the interpretation of science and technology" having developed 'sophisticated tools' about the "stabilization of knowledge and artifacts" (Sismondo 2008: p. 18). This 'church' is more epistemological than practical. Areas of study emphasize scientific or technical knowledge production. Philosophers in the field of STS associated with the High Church differ on even a seemingly fundamental question such as whether knowledge is constructed or discovered.

In a seminal High Church STS work, Thomas Kuhn describes knowledge creation as a collective act that fills a need to explain scientific questions that current thinking (an established paradigm) cannot answer. When enough questions go unanswered, scientists offer a new theory that seems to clear things up, and a new paradigm is established (Kuhn 2012 / 1962). From Kuhn's perspective science seeks to explain what humans perceive in nature, but not necessarily finding an elusive truth.

Robert Merton attempts to understand the motivation of scientists in seeking knowledge. He describes science as a combination of methods to certify knowledge, a stock of accumulated knowledge, and a set of cultural values and mores (Merton 1973 / 1942: p. 268).

The Low Church

Continuing the analogy of churches, Sismondo clarifies the Low Church as focused on "making science and technology accountable to public interests" (Sismondo 2008: p. 18). He argues Low Church proponents are "concerned with ties among science, technology, the military, and industry" (Ibid.). By 'concerned with' Sismondo clarifies how researchers in this area seek to understand the social nature of science, as well as promotion of 'socially responsible' science. Low Church advocates suggest science and technology should be focused on some practical (often political) purpose, and not just gaining knowledge for knowledge's sake.

Ian Mitroff examines Merton's scientific norms and offers a contradictory list of counter-norms (Mitroff 1974). Merton offered his norms as altruistic High Church motivation. Mitroff's counter-norms show scientific motivation as more self-serving and practical which he argues indicates 'sociological ambivalence' in science (Ibid.).

Three exemplar analytical studies speak to the practical application of scientific and technical knowledge in the form of expertise. Rayvon Fouché shows how systemic racism plays a role in determining individual motivation and success in a technical field (Fouché 2003). His documented examples shows how three specific engineers used expertise to advance personal goals, and how others used both expertise and power to usurp or quash advances by each of the three.

Dorothy Nelkin shares two project stories, construction of a nuclear power plant and the addition of an airport runway (Nelkin 1975). In both of these histories she points out how scientists and engineers were brought into debates for and against the projects. Those who would build each of these projects used experts to argue how society would benefit and how risks involved were limited and unlikely. Those who were against each project brought in experts of their own to call into question the motives and position of their counterparts. Nelkin points out how the latter needed only to create doubt in the minds of local citizenry to nullify the arguments of the former.

Finally, Gwen Ottinger shared how variations in scientific and technical communication made a difference in community acceptance of oil refinery operations (Ottinger 2013). Although expert testimony was used in each case, communities differed in supporting corporate management of the various refineries. In some cases, technical decisions were made, then justified to local communities. In other Ottinger examples, community concerns were incorporated into technical decisions and local leaders were often briefed on changes and results. In each of these cases expertise was used to communicate with the public as a means to an end.

Communication approach may have had more to do with community support than the expertise itself.

Inter-Church Bridges

An example of a boundary-blurring 'bridge' Sismondo is writing about could be Kuhn's idea of a paradigm shift. Although questions causing a paradigmatic crisis may be 'scientific', generation of the questions often comes from practical problem-solving research efforts scientists are engaged in.

Michael Mulkay offers a bridge between Merton's norms and Mitroff's counter-norms (Mulkay 1976). For Mulkay a normative structure is really a vocabulary of justification. Defining norms is an attempt to show special political status (Ibid. pp. 653-654).

Speaking of the boundary between ideology and science, Thomas Gieryn notes how authors seek to explain the influence of each on the other. He notes that the works he examines document how science obtains intellectual authority. He asks, "What images of science do scientists present to promote their authority over designated domains of knowledge?" (Gieryn 1983: p. 783). This question implies a mixing of ideology (High Church concern) and practical motivation (Low Church concern).

In an article on HIV-AIDS activism, Steven Epstein examines the changing definition of what counts as credibility in scientific research (Epstein 1995). He argues credibility in Weberian terms, defining it as "combining aspects of power, dependence, legitimation, trust, and persuasion" (Ibid.: p. 411). He later shares a section in the article of specific ways activists can add credibility in order to gain symmetry with the established expertise of clinical scientists. In

this approach Epstein equates knowledge with power (High Church concern) and specific steps used to influence medical advancements in the treatment of HIV and AIDS (Low Church concern).

Validity of Distinction

Disagreement abounds on whether the distinction of High Church and Low Church even exists. Sismondo shares examples of both positions, yet he finds the field of STS may extend "the terrain of technoscientific politics" (Sismondo 2008: p. 26). After listing some specific research areas associated with both the High and Low Church he notes, "these programs need not be unified" (Ibid.). Is this statement true? In his article, and in this paper, one finds a number of examples of distinction between the 'churches' and 'bridges' connecting them. If one accepts Sismondo's assertion that STS is large and encompassing enough to allow investigation of both the distinction and the interaction, then one must also accept that such distinction, such boundary work, is also valid.

Thomas Gieryn considers efforts to distinguish science and scientists in the High-Church sense from 'outsiders' as a rhetorical tool in a Low-Church expansion of authority or expertise (Gieryn 1983: p. 791). Demarcation in science, he claims, is ambiguous and flexible, among other similar adjectives (Ibid.: p. 792), yet arguing in favor of a blurry salient essentially confirms its existance.

Expertise and Engagement

Considering my own future research in the STS discipline, this author is interested in the concepts related to defining 'public interest'. A recent regulatory example might be reallocation of mid-band spectrum (specifically 3.7GHz to 4.2GHz also known as C-band) in the Continental

United States (CONUS) by the Federal Communications Commission (FCC). For decades this band was reserved for exclusive use by fixed point-to-point stations (FS) and satellite uplink earth stations (FSS). The FCC decided to move to a shared model that includes terrestrial use of the same spectrum by mobile wireless operators for 5G phones (Federal Communications Commission 2020). Expertise is the central tool used to argue better use of the regulated asset of spectrum, but yet how does one define 'better'? All potential users of the spectrum claim some sort of public benefit and technology advancement (High Church), and simultaneously stand to benefit themselves financially (Low Church) as competing industries (satellite and wireless broadband). In an academic role I would be less interested in actively swaying practical decisions since these are situated (limited) in time and location such as the mid-band spectrum example.

Conclusion

Science and Technology Studies is an interdisciplinary field that naturally lends itself to a variety of topics. The combination of philosophy, sociology, history, anthropology and policy by definition includes Fuller's description of both High Church and Low Church areas of focus. Distinguishing between theoretical and practical can give helpful context as one studies the intertwining, Sismondo's bridging, between the two.

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