STS C200, Week 7:
The Social Construction of Technology

Orr Paradise

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1 Do Artifacts Have Politics? / Langdon Winner [5]

Winner explores the ways in which technical artifacts affect and are affected by political power. While he rejects an absolute social determination of technology,[1] the main point is that some technological systems are, one way or another, political. Specifically, he presents two schemes in which technology interplays with politics: a simple scheme, which is that certain technologies are realized in a way which is politically relevant, and a complex scheme, which is that certain technologies are *inherently* political.

Before I describe these two schemes in detail, let me spell out the considerations that guide Winner in his argument, and point out connections to the rest of this week's reading. Winner considers the *momentum* of large-scale sociotechnical systems, which is explicitly presented in Hughes's account of the evolution of technological systems [**?**]. Winner also considers the adaptation of human ends to technical means, which I view as a form of *performativity*, an important attribute of Mackenzie's work [3]. Lastly, Winner considers the *response* of society to a technological problem; the relation between social groups and the problem that a technology attempts to solve is one of three relations central to the Social Construction of Technology [**?**].

Back to the interplay of technology and politics, starting from the simple scheme (or observation) that certain technologies have effects that reside on the political spectrum. Winner distinguishes between effects that are intentional to those that are not. A technology invented with the intent of affecting political change may sound conspiratorial, but Winner supports his argument with convincing examples, such as bridges in Long Island that were purposefully designed to be too low for buses, rendering certain areas inaccessible to lower-class populations. But political change can also happen unintentionally, as in the case of the development of tomato harvesters in the twentieth century that radically changed the socioeconomics of agriculture.

From this simple scheme, Winner distills a question (or decision-)based approach to measure and better understand the political effects a technology may generate: Will our society develop a certain technology? Once this technology is developed, will it be adopted? Once it is adopted, how will it be implemented? The point is that the answer to each of these questions can be political, or have political ramifications. The conclusion is that technologies create order in our world, and the answer to these questions reveal what kind of order this will be.[2]

The second scheme describes technology that is *inherently* political; that is, adopting such a technology is always a political act, as opposed to the previous scheme in which the political act was the specific way in which a technology was used.[3] For example, the atomic bomb was an inherently political invention,

[1] Briefly: Technology itself does not matter, only the social system in which it exists does.

[2] I interpret Winner as suggesting that these questions should be asked by a social scientist in retrospect, rather than by a politician or regulator. Indeed, society is not a central organism that chooses to develop a certain technology; the process of technological development and adoption is complex and rarely centralized.

[3] In the example of the Long Island bridges: a bridge is not inherently political, but the specific implementation of bridges in Long Island had political effects.

because its potential for total annihilation can only be contained by a society with a certain amount of authoritarianism.

The atomic bomb is an example of technology that *requires* certain sociopolitical conditions. Winner also identifies a weaker version of inherently-political technology, one which is merely *highly compatible* with a certain social order. An example of this weaker version is solar energy, which Winner claims is highly compatible with a democratic, decentralized society.

The conclusion of the scheme is that the key question is one of necessity. This is a moral question that weighs practical necessity against other moral claims (e.g., it is morally beneficial to decentralize control over energy sources). Thus, the incorporation of an inherently-political technology can be seen as an example of practical necessity outweighing other moral considerations. However, Winner observes that technological development is not often viewed as a battle between the practical and the moral. This is because of a belief in the separation from power structures inside corporations and the power structures governing public, political institutions. The final point is that the political structure of corporations will eventually affect the broader political map via inherently-political artifacts.

The Social Construction of Technological Systems / Wiebe Bijker, Thomas Hughes, Trevor Pinch

This collection of works aims to evaporate the distinction between science, technology, politics and society. Due to space constraints, I will only be able to discuss the work of Bijker and Pinch.

The goal of the authors is to analyze science and technology using a unified social constructivist approach. They start with a literature review of works on science and technology, and then describe two programmes, the Empirical Programme of Relativism and the Social Construction of Technology. The first programme is somewhat familiar from our readings on the sociology of scientific knowledge, whereas the second programme is a novelty of this work. The new programme is instantiated with a concrete example (the bicycle), and the work concludes with a highlight of how the studies of science and technology can benefit from a closer relationship.

The literature review that opens the work is a welcome foundation to the analysis and meta-analysis that follows. There is not much point in me summarizing it here, so I will highlight some connections to previous readings.

In a review of literature on the studies of science, I was not surprised to see the Strong Programme take a central place. Interestingly, in their brief description of the Programme, the authors mention causality, impartiality and symmetry, but not reflexivity (which has occupied most of our discussion a few weeks back!). The authors also mention a focus on scientific controversy, but do not mention Shapin and Schaffer's *Leviathan and the Air Pump* [4]. I wonder whether this is because the polemics of Boyle and Hobbes are not considered controversial, or if it is because of the notably mild reception of Leviathan at the time; Bijker and Pinch published their text just two years after Shapin and Schaffer.

In their review, the authors suggest that the history of technology was, at the time, mostly asymmetric, as it focused mostly on *successful* technological developments. I found this noteworthy, considering how Bloor, through the Strong Programme, calls for symmetry due to an opposite complaint: he notes that sociologists study only *failed* attempts at knowledge development. This impressed upon me a picture that, until the eighties, historians focused on success, and sociologists on failure. Such an absurdity would certainly strengthen the author's case for an interdisciplinary study of technology and science.

Let's jump ahead to the comparison between the Empirical Programme of Relativism (EPOR) and the Social Construction of Technology (SCOT). The authors compare the more-established EPOR (based in the sociology of knowledge) to their new SCOT programme (that is technology-first). The comparison follows the three stages that each programme conveniently follows.

The first stage of EPOR is *interpretive flexibility*, meaning that nature alone does not determine the outcome of a scientific debate. In SCOT, the first stage is, similarly, a *flexibility* in how people think about the artifact, but also in how it is designed. Importantly, EPOR and SCOT both consider the content of the

knowledge and artifact themselves (not just people's perceptions of these).

The second stage of EPOR is understanding the *closure* of the scientific debate, i.e., the arrival at a consensus on a scientific "truth". SCOT adapts this concept to the technological setting by examining the *stabilization* of an artifact. Stabilization can be seen as a form of closure, namely, a shift in society into viewing a (technological) problem as "solved". But stabilization also includes a redefinition of the problem, e.g., by reevaluating the criteria that determine the validity of a solution.

According to the authors, the third and final stage in each programme *should* be to relate the content of the analysis back to the wider sociopolitical context. However, the authors note that this stage is missing from EPOR analyses to date. SCOT, though, is more conducive to this generalizing stage, because SCOT itself already focuses on social groups, norms and values.

An Equation and Its Worlds / Donald MacKenzie

MacKenzie studies the Black–Scholes equation, a seminar result in economics. Its story ties into familiar concepts of bricolage (briefly touched in [1]), exemplars ([2]) and disunity, and to the new (to me) concept of performativity.

MacKenzie portrays Black and Scholes as *bricoleurs*: creative scientists gathering from a range of (theoretical) materials, rather than working within an existing framework. That said, the bricolage was an attempt to find a solution that is analogous to existing ones – there was not full freedom. In other words, the bricolage was not random, but followed existing exemplary and paradigmatic solutions. Eventually, it was to be an exemplar itself: subsequent solutions (even to seemingly non-economic problems) were shaped in its form (this is an instance of performativity, discussed later).

The author prefers the term 'exemplary' to 'paradigmatic' to avoid a confusion with a different (arguably more common) use of Kuhn's paradigm—a constellation of beliefs and norms—that might miss the *disunity* in opinions and views that surrounded the development of Black–Scholes. More generally, this alternative understanding of 'paradigm' misrepresents science (in this case, economics) as an entirely unified body. In fact, as was the case with Black–Scholes, disunity is a source of strength: knowledge derived from disunity is robust, as it holds when viewed from diverse perspectives.

Lastly, the author observes the *performative* nature of the work of Black and Scholes: it was developed to describe the world, but made itself truer by altering it. A strong example of this is in how the 'ideal' assumptions made by the Black–Scholes had in fact realized themselves, for example through the lobbying of economists. It is interesting to note that Black and Scholes used 'ideal' in the mathematical sense (these assumptions make the problem tractable), but the assumptions turned out to be 'ideal' in a second sense: this is how the world should be.

Questions and topics for discussions

- Thomas Hughes [**?**] describes the pattern of the evolution of a technological system. One of the phases in this pattern is the phase of *invention*. Hughes distinguishes between 'conservative' and 'radical' inventions. These sound to me very much like Kuhn's normative and revolutionary science. Is there a difference, or is Hughes's notions just an adaptation to the technological setting?
- Hughes frames Heidegger as arguing that technology is an ordering of the world as an on-demand problem-solving resource (means to an end). Considering the prime directive of [**?**] (a blurring of lines between science and technology), does this mean that science inherently attempts to shape the world? Alternatively, is Heidegger's definition useful for a demarcation between science and technology?

References

[1] Mario Biagioli, 'Galileo the Emblem Maker', Isis, 1990, 81:230-258.

[2] Thomas Kuhn, The Structure of Scientific Revolutions[1962], Chicago: Chicago University Press, 1996.

[3] Donald MacKenzie, 'An Equation and Its Worlds: Bricolage, Exemplars, Disunity and Performativity in Financial Economics', Social Studies of Science, 33: 2003, 831-868.

[4] Steven Shapin and Simon Schaffer, Leviathan and the Air-Pump: Hobbes, Boyle and the Scientific Life, Princeton: Princeton University Press, 1985.

[5] Langdon Winner, 'Do Artifacts have Politics?'Daedalus, 1980, 109:121-136.