

## Trevor Pinch's Social Construction of Science and Technology Revisited

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Review of *Entanglements: Conversations on the Human Traces of Science, Technology, and Sound*, by Simone Tosoni with Trevor Pinch. Cambridge, MA: MIT Press, 2016; hardback, 199 pp., \$35; ISBN 9780262035279.

In *Entanglements: Conversations on the Human Traces of Science, Technology, and Sound*, media studies expert Simone Tosoni conducts an extended interview with Trevor Pinch, the Goldwin Smith Professor of Science and Technology Studies (STS) at Cornell University and a leading figure in the field of STS. Through the discussion, we learn of Pinch's academic career.

Pinch is one of the founders of the Social Construction of Technology (SCOT), a leading theoretical and research perspective within the wider field of STS, and *Entanglements* offers an introduction and genealogy of the field and its milestones. The book describes how Pinch and Wiebe Bijker adapted the Empirical Program of Relativism (22–23), developed by the Bath School (11–48) to study the social construction of scientific facts, to apply to the social construction of artifacts. While most approaches in the sociology of technology looked at the impact of technology on society, SCOT looks how society can impact technology.

Pinch and Bijker's (1984) groundbreaking article "The Social Construction of Facts and Artefacts: Or How the Sociology of Science and Sociology of Technology might Benefit Each Other" helped lead to the development of the SCOT perspective (77). The article analyses the historical context of the high-wheeled ordinary bicycle which served as a 'macho bike' for the young men of "means and nerve" (85). Yet when the phenomena of this model of bike is analyzed, we see that certain social groups could not use it safely, and gender norms of Victorian fashion discouraged women from riding it. Society shaped the evolution of this bike technology by giving rise to the 'safety bicycle.' Later studies by Paul Rosen

of the more recent model of the sport 'mountain bike' (87) are also deconstructed to reveal how a particular instance of technology, bikes in general, as apparatuses of social structures are entangled in political, cultural, economic, and social webs of meaning (1993). This technology is not per se an object of technological innovation, but a matrix of complex social relationships. This seminal article led to the influential book *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (1987), co-authored by Pinch, Bijker, and Thomas Hughes, which would go on to sell more copies than any other edited volume from MIT Press.

Over the course of this conversation between Tosani and Pinch, many important questions are raised. How is good science done? How does science evolve from A to B? Does it occur as Kuhn proposes in his seminal work, *The Structure of Scientific Revolutions* (Kuhn 2012), in paradigm shifts such as that by Copernicus, who Jeremy Brown (2013) shows not only displaced the geocentric model with the heliocentric model, but whose impact is felt to this day? Or does science proceed in slow methodical developments that are based on previous findings that follow a certain course of slow progressivism, as in the view of French philosopher of science Dominique Raynaud (2015)? What are the dangers of the false smugness of techno-Utopias? How does embodied knowledge constitute a form of tacit knowledge (116), whereby technology is revealed not as instances of contraptions and what Heidegger calls constructed fabrications of things and objects that control via 'Gestell' or establishing boundaries, limits, and frame of reference (Heidegger 1977), but is instead entangled in a social hierarchy and web of relationship which bring out (116–18)? What is the role of experts in science in a democratic process that helps the public to better understand and be better informed of technological issues? What social-economic and political impacts are at stake scientifically in developments in technology? What is the relationship between media studies, representations, and materiality (118)? What are some important current topics and issues in STS today?

The questions do not end there. The book also asks: how does media contribute to the construction of public spaces versus private spaces? For example, does wi-fi access at a Starbucks represent a social public space where communities can form, or is it just a business with profit as the bottom line? What dangers and risk do we face as a global community today when moral agency, accountability, responsibility, and decision-making are attributed to machines and technological objects rather than human beings? If nothing moral is inherent in technological objects per se (as Heideggerian fabrications made out of materials such as plastic,

magnets, and electricity), then from where does social responsibility derive (120)? In broad terms, the book asks what happens when we open the "black box" of technology (80) or the black box of scientific knowledge itself (9–11)? Is post-modern technology a Pandora's box, or can it be a source of redemption when properly employed? Or perhaps as cast in Hölderlin's poem "Patmos," is technology a two-edged sword which, for instance, on the one side bio-technologies and organ transplants can foster quality and longevity of life, but on the other side the military defense industry allows politicians to blow the world up a million times via Nuclear Armageddon? As Hölderlin writes in "Patmos," "Wo aber Gefahr ist, wächst das Rettende auch"—where the danger is there is the saving power too (as cited in Heidegger 1977).

The book is called *Entanglements* for a number of reasons. It asks how do assumptions about society get embedded within technology? How do cultural, economic, social, and political factors influence the development of new technologies, and how should those technologies be understood in a historical context? For example, the invention of the Moog synthesizer revolutionized not only post-modern music, as well as the very function and role of a musical instrument, but at the same time it was enabled by the cultural phenomena of electrified music celebrated by the countercultural rock music milieu, and new discoveries in sound studies (87). Just as the new synthesizer influenced societal groups, the synthesizer was invented to meet the needs of specific societal groups in the history of rock and roll music. This technological invention has changed musical roles, music itself, and the phenomena of sounds that can be produced (and thus heard by the human ear) that represent an auditory *novum*.

Pinch deconstructs the social relationships implicated by the introduction of the Moog synthesizer onto the music market. He not only considers the impact of the engineers and designers of this technology but also those agents that are influenced by and in turn influence its further development. Thus in deconstructing the social matrix of the Moog synthesizer Pinch considers players involved in its functioning such as: 1. marketers, 2. testers (104–08), 3. repair people (103–04), 4. sellers, 5. investors, and 6. outsourced manufacturers (103), as well as 7. its consumers in the music industry. As Bernard Lightman notes in his edited book, *Science in the Marketplace*, one cannot escape the economic and cultural frames that surround new technologies (Lightman 2007).

Pinch's work also has implications for the history of science by historically contextualizing technological inventions. For example, SCOT can give us greater understanding of the development of electrical power. It can place its origins in

Thomas Edison's discoveries but also the social economic context of Edison's marketing of his products on Wall Street to raise money for his companies research, thus taking on an embeddedness in legal and economic processes. As Pinch notes, Hughes's (1983) book, *Networks of Power*, is an important study in the development of electrical power, studying the ways this technological phenomenon was influenced by political concerns in the cities of Chicago, London, and Berlin (82–83). Gabrielle Hecht (2011) and Sara Pritchard (82) take Hughes work further by considering not only the political influence on electrical power but its environmental dimension. Pinch also considers the development of the automobile in rural America. The Ford assembly line mode of production represented a major change in how items are manufactured. However, in an age of flexible production Pinch now speaks of a post-Fordian economic model or paradigm.

Pinch is also interested in the embedded nature of digital technologies in the age of the internet and open sources, such as with Wikipedia, a collaboratively authored work that is always in flux, continuously updated, but not peer reviewed (93). He considers the shift from LPs and CDs to iTunes, which changed the modes of distribution of music. Pinch however finds continuity by noting that while the materiality may be different, the basic processes of music consumption may be the same, even if a revolution in Information and Communication Technologies (ICT) has begun. In the music industry the question of royalties is of concern in an age where the pirating of music is rampant. Jointly with Ling Fei Lin (143), Pinch considers why laptop production is performed often in Korea or China, besides the reasons that labor is less expensive there as labor laws are not bound by expensive US Unions (Lin 2010).

Pinch also finds fascination in the work of Joshua Greenberg (102) who studied how the VCR changed social interaction (Greenberg 2008). When folks went to a movie theater, there was a social dimension to watching films. Now with the household VCR, the family turns inward and is more insular. Today films on demand through site like Netflix have also continued the pattern of turning inward to the private domain as opposed to a public theater. Looking back to history, photography and film made it so that it was not only kings who could afford to have private theaters and orchestras, but the wider public was brought within the reach of great art and creativity.

Pinch also references the work of Susan Omrod and Cynthia Cockburn who study the invention of the microwave with its influence on social relationships, and with implications for gender studies (Omrod and Cockburn 1993; Cockburn 1994). Ruth Schwartz Cowan and Nelly Oudshoorn (89–90) also explore a femi-

nist scholarly focus on technology, employing domestication theory, cultural studies, and gender analysis of how technologies have effects on relationships amongst men and women (Cowan 1983; Oudshoorn and Pinch 2003). Often class analysis is considered in tandem with gender bias, reflected in technologies, as women demand equal status and pay for comparable work performed by their male colleagues in the struggle for gender equality.

One key area of the conversation in this book entails the field of Sound Studies (147–50; 154–61), an area of technological research that studies the material production of sound, noise, and silence. Pinch is interested in the sounds of economic exchange such as the opening and closing of the bells of the stock exchange. Pinch considers the acuity of the “broker’s ear” (146) to detect the trends in an economic market day based on the sounds from the stock market exchange floor. In the transition to electronic trading, Pinch considers the effects of sounds on computer software. Pinch references Caitlin Zaloom’s (2010) work, *Out of the Pits*, which views sound as part of the materiality of selling. Pinch considers the new technologies on music and recognizes that sound plays an important role in science, technology, and medicine. Besides the Moog synthesizer, Pinch explores the inventions of the player piano and intonarumori by Luigi Russolo in 1910 as instances of technological inventions. Pinch considers how silence is generated in a stadium event by commemorating a disaster. Reflecting the book’s overarching theme of “entanglements,” so too in sound studies Pinch notes that the materiality of sound studies creates an entanglement with the culture of sound products and consumption.

Pinch considers whether modernity should be understood to have its own soundscape (155), a subject of *Relentless Evolution*, a book by John Thompson (2013). On this Pinch references the work of Jonathan Sterne (2003), which considers the technology of the MP3 format. Sterne contextualizes sound in historical perspective by showing the development of the stethoscope, telegraph, and telephone in media history, and up to more recent audio files in the commodification of sound within social processes. And Pinch considers whether there are certain sounds that are determined by class structures. For instance, is there a bourgeois sound, an aristocratic sound, and working class sound? Are there geographical sounds such as those of the industrial revolution versus the rural south?

The book raises important ethical questions. Pinch offers a powerful critique of Latour’s work via a deconstruction of Latour’s example of the materiality of the “speed bump” (Latour and Weibel 2005). Latour posited that this material object, the speed bump, encodes an aspect of morality in technological objects.

For Pinch this is a category error. Pinch understands that objects cannot make ethical decisions and be held morally accountable and responsible, as only human beings can. According to Pinch, the fact that the speed bump slows down drivers in traffic is all that matters for Latour. That is, for Latour the Machiavellian end or outcome is all that is important. He is interested only in the linear sequence of actions. And he is not concerned that a driver of a vehicle might slow down on the speed bump to avoid a fine, or not damage their car. However, Pinch urges that we as social scientists not forget that the true ethical reason for the speed bump is to prevent an innocent person from being killed in a traffic accident. For Pinch, ethics demands that we understand the speed bump more than only in terms of the results of slowing down traffic. We must understand that a slowing down for the right reasons—in a Kantian moral sense—can be embedded in a social moral matrix.

The book reveals why SCOT is important for what Jean-Francois Lyotard (1979) calls the postmodern condition, characterized by technological revolutions we are living through and experiencing in the information age. Like Lyotard, Pinch could be considered a postmodern philosopher, especially in his work as a sociologist of science raising epistemological questions of the status of knowledge in our age. Pinch is skeptical of the turn to ontologies in philosophy. He holds that the ontological turn (161–67) does not distinguish between ontology and epistemology. He notes that any ontological attempt to say what is “there” is in reality an epistemological frame of reference that involves classification, categorization, and distinguishing what is in the world and what is not. Thereby even ontologies cannot escape the Platonic understanding of representations of epistemology. Ontologies are thus still entangled in Kant’s 3 Critiques. Knowledge or human knowledge is a construction of the mind dependent on relational properties that are organized by a frame of reference of a classification system. Even our understanding of knowledge and epistemological limits of what can be known, and how can I know anything is prescribed by social constructions. For Pinch objects and phenomena are entangled epistemologically with practices and meaning in language (hermeneutics). What Wittgenstein describes as forms of life shows the entanglement of language-objects-practices in human constructed frames of meaning (165). For Pinch there is no ontology without epistemology and SCOT plays a role in this epistemological project of knowledge by asking “how could it be otherwise?”

This book will be of interest to sociologists, philosophers, historians of technology and science, as well as allied disciplines, including scholars in fields as

diverse as urban studies, media studies, body studies, and cultural studies seeking to enrich their own investigations.

Summing up: highly recommended! *Entanglements* is a fascinating, thoughtful, interdisciplinary, insightful, engaging read that will expand the horizon of consciousness for scholars and nonprofessionals alike.

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