Technology and Pragmatism:
From Value Neutrality to Value Criticality

Jeffrey Alan Johnson
Assistant Professor of Political Science
Cameron University

Department of History and Government
2800 W. Gore Blvd.
Lawton, Oklahoma 73505

Email: jajohnson@cameron.edu Phone: 508.581.2210
Web: http://www.cameron.edu/~jajohnson

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Abstract

This paper examines how pragmatism can enhance both the understanding of technology and social responses to the problems that technology creates. I begin by offering a superficial reading of the relationship between technology and values in John Dewey. Dewey appears to take an instrumentalist view of technology that sees technology as value-neutral. This view is seriously flawed, as shown especially well by scholars working in the Social Construction of Technology approach. I then develop a pragmatic/constructivist alternative approach to technology based on Charles Sanders Peirce's semiotics that sees technology as fundamentally constructed and therefore value-laden in ways quite similar to the SCOT program. But whereas the SCOT program is quite limited in its ability to criticize the values embedded in technology, the pragmatic/constructivist alternative is inherently critical because of the way it uses science, understood as hypothetical, experimental reasoning that is responsive to experience, to promote critical inquiry into technology.

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A Scottish Sheep named Dolly is the mascot of the 21st century. The first cloned mammal foretells a revolution in biotechnology and medicine every bit as profound as that brought about in communications and engineering by the first artificial satellite. Stanley Kubrick's *2001: A Space Odyssey* is almost prophetic in that the first scientific triumph of the new millennium, the cloning of a primate, could bring the next step in human evolution, a real life monolith that starts us on our own search for our origins and *homo novus*. But if Dolly is similarly promising, she is just as dangerous. Dolly raises the dark specter of a society of genetically manipulated people, selected and designed to be slaves or conquistadors, a vision of society before only possible in the imagination of science fiction writers. In both cases—and in many others in contemporary society—the technologies that make possible a brave new world of human progress and achievement also make possible a *Brave New World* of terror and oppression.

Modern society continually faces profound challenges from technology and technologies, often from the same ones that create the miracles of modern life. The great benefits of technology are often achieved only with significant harms accompanying them. The apparent challenge is thus that between having both the benefits and the harms—the expansion of agricultural production and the destruction of the environment—or foregoing the benefits to avoid the harms—eliminating poisonous pesticides at the cost of reducing the output of staple foods. In essence, we want to have our cake (or our food, our jobs, our health, or knowledge) and eat it too. Meeting this challenge demands crafting new ways to manage technology so that the benefits can be achieved while minimizing the harms. It demands, ultimately, a rethinking of

technology and its politics. How are we to prevent a society of Frankensteins, of Central London Hatcheries, of Big Brother, of Replicants, of the virtual reality Matrix?

This paper examines how pragmatism can enhance both the understanding of technology and social responses to the problems that technology creates. I begin by offering a superficial reading of the relationship between technology and values in John Dewey. Dewey appears to take an instrumentalist view of technology that sees technology as value-neutral. This view is seriously flawed, as shown especially well by scholars working in the Social Construction of Technology approach. I then develop a pragmatic/constructivist alternative approach to technology based on Charles Sanders Peirce's semiotics that sees technology as fundamentally constructed and therefore value-laden in ways quite similar to the SCOT program. But whereas the SCOT program is quite limited in its ability to criticize the values embedded in technology, the pragmatic/constructivist alternative is inherently critical because of the way it uses science, understood as hypothetical, experimental reasoning that is responsive to experience, to promote critical inquiry into technology.

Value-neutral Technology

What, precisely, do we mean when we speak of technology? Most views of technology focus on *technē*, paying little attention to *logos*. It is somewhat surprising that "technology" generally does not refer to the study of something. To some extent this is a function of how "-ology" has come to be used to designate that which has been studied as much as the study: the biology of the mollusk, the ecology of Arctic, the methodology of a study. It is perhaps endemic among contemporary society (and perhaps even modern life in general) that we confuse *logos* and

episteme, not only etymologically, but more importantly practically: in modern life, method is knowledge. No place is this more the case than with technology.

A useful place to begin understanding technology pragmatically is thus with the word itself. Technology, Larry Hickman notes, literally means inquiry into technique. But it is used more commonly to designate (a) techniques, tools, and artifacts; (b) systems of these; and (c) applied science. When techniques, technical systems, and applied science work well there is no need for inquiry into them. It is when they fail in some sense that inquiry into them is necessary, i.e., that we need technology. Technology, in strict speech, is thus "invention, development, and cognitive deployment of [physical and intellectual] tools and other artifacts brought to bear on raw materials and intermediate stock parts, with a view to the resolution of perceived problems."[1] We can use as a convenient shorthand for this "systematic inquiry into technique."

But the problems of technology that we see are (or at least appear to be) found in areas defined by more conventional definitions of technology. They arise in techniques themselves. The problem is whether a particular technique should be used for a particular purpose, whether some people should be allowed to use a technique, whether a technique poses a threat to a particular social value. This, of course, raises the question of what constitutes a technique. In Hickman's interpretation of Dewey we see him focusing on "tools and other artifacts brought to bear on raw materials and other intermediate stock parts," that is, on tools that we use to interact with the world, both as it is given by nature and created by us. The emphasis is on artifacts themselves. But we use these tools to carry out certain actions, to complete specific tasks. There is thus a *technē*, a craft or technique, to every artifact. It is when we conduct inquiry into these crafts we engage in technology, that is, in the study of technical things.

[1] Larry A Hickman, *Philosophical Tools for Technological Culture: Putting Pragmatism to Work* (Bloomington, Indiana: Indiana University Press, 2001), p. 12.

Here we see a great divergence from conventional definitions of technology. In conventional definitions, as suggested above, technology is ultimately an artifact of some sort, usually a physical one but sometimes a manual one. Even in the latter case, the technique reduces the human to machine, carrying out tasks as if human practitioners are automata, reducing the human to an artifact. But if technology is about technique rather than artifact, then technology is rooted not in physical processes but in human action. Technology is not the development of artifacts and manipulations of them. It is a human action. Technology is to be understood as a specific type of doing: doing through techniques developed through systematic inquiry. When we develop treatments for Parkinson's disease based on stem cell research we are not simply creating an artifact. We are in fact creating an institutionalized action developed through systematic inquiry.

Technology is thus, ultimately, not simply *applied* science. It *is* science, the science of technique. As such pragmatic technology should look much like pragmatic science, and from a pragmatic perspective the two terms can be used somewhat interchangeably. And herein lies the problem. The pragmatic philosophy of science found especially in Dewey suggests, at least on the surface, a neutralist stance toward technology. Technologies are in important ways morally ambiguous.[2] They can be good or bad, and most often both. The thesis of technological neutrality is built on the ambiguity of technology. It is a vision of technology that begins with Bacon's *New Atlantis*[3] and is reflected quite strongly in popular discourse about technology. Its basic premise

[2] Andrew Feenberg, *Critical Theory of Technology* (New York: Oxford University Press, 1991).

[3] One might claim that Bacon's view is of technology as ameliorative rather than as neutral. This would be folly. The point of *New Atlantis* is not to say that technology is unambiguously good; if it were we would have to take Bacon as both hopelessly naïve from the perspective of contemporary technological practice and also blind to the social problems that technology created in his own time. Surely this is not the case; Bacon most certainly would have recognized that technology could be harmful. We should thus take *New Atlantis* as positing the possibility of a technological utopia as the best of the possibilities that technology presents.

is that technology is value-neutral. Technologies are simply physical and intellectual tools that have no intrinsic value. They can be used in different ways, some of which are good and some bad. It is human action that assigns value to a technology. Thus the normative evaluation of technologies focuses not on the technologies themselves but on what one does with them. Actions, not technologies, hold moral values.[4] The neutrality thesis can thus be stated as follows: *Technologies are value-neutral tools that are used to fulfill valued functions; therefore moral characteristics can be attributed only to uses of technologies and not to technologies themselves.* This view is seriously deficient, as I will show below; nonetheless, it remains the dominant view in contemporary western culture.

We can see this dominance most strongly in discussions of the responsibility of scientists and technologists for their creation. Two common (though ultimately flawed) arguments from neutrality identify a very limited scope for responsibility among scientists for their work. Both rely strongly on the ambiguity in use of technology. The first suggests that the fact that technologies have both good and bad uses shows that a technology is neither good nor bad; goodness and badness attach to use. Since, the argument seems to assume, science can only gain value through technology (in this case understood as "applied science") the neutrality of technology implies the neutrality of science and thus the freedom of the scientist from moral responsibility. Responsibility lies with those who use technologies, not those who create them. A second argument suggests that the same body of scientific knowledge can lead to different technologies, some good and some bad. Since science can lead to both good and bad technologies, then it must be neutral itself. Again the scientist is exempt from moral

[4] Mary Tiles and Hans Oberdiek, *Living in a Technological Culture: Human Tools and Human Values* (London and New York: Routledge, 1995) 13-17.

responsibility by the neutrality of their work.[5] In the first argument, the value-neutrality of technologies directly insulates scientists from responsibility because it places responsibility on those who use the technology. In the second, the value-neutrality is shifted from technology to science, but the ambiguity of technology remains.

Dewey seems to hold such a view, suggesting that science is, in fact, value neutral in the ways posited by the neutrality thesis. Dewey is quite explicit on this point in *Philosophy and Civilization*:

> The fact is that it is foolish to try to draw up a debit and credit account for science. To do so is to mythologize; it is to personify science and impute to it a will and an energy on its own account. In truth science is strictly impersonal; a method and a body of knowledge. It owes its operation and its consequences to the human beings who use it. . . . The *neutrality of science to the uses made of it* renders it silly to talk about its bankruptcy, or to worship it as the usherer in of a new age. . . . In the larger human sense it is a means, a tool. For what ends shall it be used?[6]

This view has been the source of significant criticism. Hickman notes that both Max Horkheimer and Langdon Winner see Dewey's position as an instrumentalist position in which technology is used to bring about pre-established and exogenous values;[7] Marion Smiley criticizes Dewey's scientism for its apolitical character that ignores social conflicts.[8] Even Hickman himself, who generally sees Dewey as offering a much more critical view of technology, seems to suggest this:

> The key to understanding Dewey's work as a contribution to the philosophy of technology is, I suggest, an appreciation of his contention that all inquiry or deliberation that involves tools and artifacts, whether those tools and artifacts be abstract or concrete,

[5] John Forge, "Responsibilty and the Scientist," in *Science Technology and Society: An Introduction*, ed. Martin Bridgstock, et al. (New York: Cambridge University Press, 1998).

[6] John Dewey, *The Philosophy of John Dewey: Two Volumes in One*, ed. John J. McDermott (Chicago: University of Chicago Press, 1981), pp. 389-390; emphasis added.

[7] Hickman, *Philosophical Tools*, p. 72.

[8] Marion Smiley, "Pragmatic Inquiry and Social Conflict: A Critical Reconstruction of Dewey's Model of Democracy," *Praxis International* 9 (1990).

> tangible or intangible, should be viewed as instrumental: in other words, as a form of technology.[9]

Hickman here equates the instrumental itself with technology in Dewey's view. Dewey's position seems thus to privilege technology in ways that are not particularly critical.

This is all the more surprising because science is essentially contextualist for Dewey, and technology is intimately connected with the ends at which it aims. Both of these claims should move Dewey away from this instrumentalist approach. John J. McDermott holds that Dewey's instrumentalist view of science as expressed in *Philosophy and Civilization* conflicts directly with his contextual epistemology, expressed variously in 1910s *The Influence of Darwin on Philosophy* and 1938s *Logic*.[10] In *Influence of Darwin*, Dewey holds that "there is no apprehension (however slight) without some context."[11] He argues that knowledge comes not from a catalog of information or reflection on abstract principles but from the "fulfilling experience," the use of knowledge in practice to answer questions about the existential world. We do not *know* so much as we *know that.*[12] He concludes that "'Truth' is an abstract noun, *summarizing* a quality presented by *specific* affairs in their own *specific* contexts. . . . Truth denotes truths, that is, specific verifications, combinations of meanings and outcomes reflectively viewed."[13] In the absence of specific context one has no knowledge, only a summary of what knowledge looks like in a range of similar situations.

This point is made again in Dewey's *Logic*, coming nearly three decades later and neatly bracketing *Philosophy and Civilization*. "All inquiry," Dewey holds, proceeds within a cultural

[9] Hickman, *Philosophical Tools*, p. 27.

[10] Dewey, *Philosophy of Dewey*, p. 388 headnote.

[11] Dewey, *Philosophy of Dewey*, p. 177.

[12] Ibid., pp. 180-182.

[13] Ibid., p 185, 192; emphasis added.

matrix which is ultimately determined by the nature of social relations."[14] Dewey holds that scientific statements are related in terms of meaning, not simply observation or theory, and these meanings are primarily symbolic in nature, created by a culture *in* the process of inquiry rather than prior to it. An abstract statement has no practical meaning, as Hickman notes in his discussion of Dewey's exploration of the question of what it means to say that 2 + 2 = 4. Mathematical propositions as such have no existential referent and thus no meaning in themselves outside of mathematical systems. They are true or false only in reference to a particular existential situation. Hickman refers to the example first proposed by Philip Davis and Ruben Hersh: 2 + 2 = 4 when we put two apples on a table that already has two apples on it, but it does not when we add two cups of milk to two cups of popped popcorn (which results in slightly more than two cups of soggy popcorn).[15]

In *Logic* Dewey goes beyond merely showing that context is necessary. Dewey identifies the key characteristic of that cultural matrix: the ends for which inquiry is pursued:

> An idea of an end *to be* reached, and end-in view, is logically indispensable in discrimination of existential material as the evidential and testing facts of the case. Without it, there is no guide for observation; without it, one can have no conception of what one should look for or even *is* looking for.[16]

Inquiry takes place for some purpose; it is meaningless apart from it. As a form of inquiry, technology would be very closely tied to these ends-in-view, which leads Hickman quite correctly to the conclusion that Dewey concludes that technological revolution is not about

[14] Ibid., p. 398.

[15] Hickman, *Philosophical Tools*, pp. 49-50.

[16] Dewey, *Philosophy of Dewey*, p. 407; emphasis in original.

distinguishing technological artifacts from the ways in which we use them, because technological artifacts *are* the ways we use them."[17]

And yet in *Philosophy and Civilization* this context and the ends-in-view associated with it, so essential for the workings of science, is assumed to impart no values to either science or technology, which Dewey in fact calls on society to use for such ends-in-view as it may choose. While Hickman is right to claim that these values are central to Dewey's view of technology, it remain nonetheless clear that Dewey sees them as exogenous to technology, since he criticizes the use of technology without deliberately choosing such ends.[18] And Dewey's explicit use of the phrase "neutrality of science to the uses made of it" is unqualified. It seems, then, that Dewey maintains both epistemological contextualism and technoscientific instrumentalism despite a fundamental inconsistency between them.

Even if this contradiction were resolved, the more important problem here is that thesis of technological neutrality is widely regarded as failing. If technology is more than just a tool to be used for whatever purpose one chooses, if ends are part of the artifact, its claim to value-neutrality becomes unsupportable. To assert that technology on the whole is permeated by embedded values and that using technologies embeds those values in society at large is a central claim of modern critical theories of technology. Martin Heidegger argues that technology sees the world as standing reserve and ultimately leads to humans understanding other humans as such. Herbert Marcuse focuses our thinking on the role of technology in upholding bourgeois rule and encouraging commodification. Michel Foucault demonstrates the role of technology in imposing discipline and normalization. Richard Merelman shows that the political values

[17] Hickman, *Philosophical Tools*, p. 184.

[18] Dewey, *Philosophy of Dewey*, pp. 391-393.

implicit in modern technologies are fundamentally different from those in postmodern technologies.[19] These all suggest that technology is itself value-laden, and that by implementing technology in any form one implements values.

The Social Construction of Technology (SCOT) approach is one of the more promising recent approaches to understanding technology that recognizes its value-ladenness. SCOT agrees with the various critical perspectives on technology that values are inherent features of technologies. But it does so in a far more sophisticated way. The SCOT program treats the development of technology not as a processed fixed by nature (as the neutrality thesis assumes) or universal social forces (as Heidegger, Marcuse, and Foucault do in various ways). Technologies are created in a historically contingent process in which scientists and technologists make choices that are rooted, implicitly or sometimes explicitly, in non-scientific judgments.

Technological development, in the SCOT approach, is seen as a process of variation and selection that is guided by the meanings given to the artifacts by social groups. These meanings are historically contingent social factors at work in the development of the technology. Key to this process is the idea of the interpretive flexibility of a technological artifact. Relevant social groups, those who have some role in the process of development, hold competing social meanings of the artifact. The artifact is, in essence, underdetermined by natural characteristics like its physical operation, use, or utility in ways very similar to how constructivist approaches to science see scientific theories and empirical observations as underdetermined by nature. As the technology develops to its final form, these contingent meanings are lost through a process of

[19] Michel Foucault, *Discipline and Punish: The Birth of the Prison* (New York: Vintage Books, 1979); Martin Heidegger, "The Question Concerning Technology," in David Farrell Krell, ed., *Basic Writings*, revised and expanded ed. (HarperSanFrancisco, 1993), pp. 307-341; Herbert Marcuse, *One Dimensional Man* (Boston: Beacon Press, 1964), Richard M. Merelman, "Technological Cultures and Liberal Democracy in the United States," *Science, Technology, and Human Values* 25:2 (Spring 2000), pp. 167-194.

stabilization in which the interpretive flexibility is gradually reduced by social processes rather than natural characteristics as some form of the artifact becomes dominant. Closure of the technological development process results in a technology that appears to be fully natural and developed through a linear, teleological process. But the SCOT program shows that there is nothing inevitable in a technology: "'successful' stages in the development are not the only possible ones," [20] and the selection of successful and unsuccessful stages are to be explained symmetrically by appealing to the social meanings at work in the choices that scientists and technologists make. Meanings, not nature, function, or utility, are the ultimate determinants of the form of a technology.

Both the critical political theories of technology and the SCOT empirical program lead to the same conclusion. Rather than being value-netural, technologies embody and institutionalize certain values. Technologies are value-laden. The neutrality thesis cannot be maintained, and a fundamental contradiction in the superficial pragmatist understanding of technology is exposed. If this reading of pragmatism is correct about the character of science and technology then technology should be value-neutral; that it is not shows that something is seriously wrong with this reading of pragmatism and, to the extent that it accurately reflects the underlying beliefs of pragmatists like Dewey, with pragmatism itself.

Value-laden Technology

There is an alternative reading of pragmatism, however, that is consistent with the critique of the neutrality thesis. Dewey seems to exempt, without explanation, the question of scientific and technological values from the general structure of knowledge in ways that erroneously assert an

[20] Wiebe E. Bijker, "Technology, Social Construction of," in Neil J. Smelser and Paul B. Baltes, eds., *International Encyclopedia of the Social and Behavioral Sciences* (Amsterdam and New York: Elsevier, 2001), pp. 15522-15527.

instrumental view of them. When this privileging of science and technology is lifted however, one finds that science and technology become value-laden in precisely the same way that constructivists and critical theorists argue. The pragmatism of Charles Peirce shows us that the practices of technology are theory-laden, and the underlying theories are both empirical and normative.

A pragmatic understanding of technology that recognizes the place of values in it begins with Peirce's semiotic theory. Peirce's semiotic theory is intended to be both a theory of cognition in that it describes the process by which sense experience of physical characteristics are built into coherent thought constructs, and a general theory of meaning in that it relates signs to both their signifiers and other signs and signifiers.[21] But it also provides an ontological perspective that synthesizes the relationship between the natural and the social, showing how values are essential features of technology.

Peirce's semiotics is based on the threefold distinction among sign, object, and interpretant.[22] "A sign," Peirce argues,

> . . . is something which stands to somebody for something in some respect or capacity. It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign. That sign which it creates I call the *interpretant* of the first sign. The sign stands for something, its *object*.[23]

This distinction is rooted in the more general distinction among firstness, secondness, and thirdness as ontological categories. In *A Guess at the Riddle*, Peirce summarizes the three categories and their relations:

[21] Michael Shapiro, *The Sense of Grammar: Language as Semiotic* (Bloomington, Indiana: Indiana University Press, 1983); Douglas Greenlee, *Peirce's Concept of Sign* (Paris: Mouton, 1973).

[22] Charles Sanders Peirce, *Philosophical Writings of Peirce*, Justus Buchler, ed. (New York: Dover Publications, 1955) pp. 99-100

[23] Ibid., p. 99.

> The First is that whose being is simply in itself, not referring to anything nor lying behind anything. The Second is that which is what it is by force of something to which it is second. The Third is that which is what it is owing to things between which it mediates and which it brings into relation to each other.[24]

For Peirce, each element of the semiotic triad corresponds to one of the ontological elements.

> A Sign, or *Representamen*, is a first which stands in such a genuine triadic relation to a Second, called its *Object*, as to be capable of determining a Third, called its *Interpretant*, to assume the same triadic relation to its Object in which it stands itself to the same Object.[25]

The sign is thus the wholeness of the thing. The thing exists as an object as opposed to as a set of unrelated material qualia only because of its relation to the sign. Without the sign, we have only unrelated separate qualia as independent firstnesses. The interpretant links the two by establishing a relationship between the wholeness of the object—its sign—and the object itself through the practical connections to other objects and signs.

Take, for example, a television set. The sign "television set" identifies the whole object, yet without any of its particular features. The sign is the semiotic firstness of a television set. The television set, as an object, exists only as a set of physical qualities. In the absence of the sign "television set," the object as a whole does not exist; it is mere an assemblage of separate perceptions. The qualia exist as a television set only "by force of something to which [they are] second," that is, only because they are unified by the sign "television set." To think of a television set without the sign is as if we thought of a disassembled television set as a "television set" in the same sense as we do a home theater during the World Cup. The sign is the unity of the object's physical characteristics in a single existence. In the absence of the unity that the sign

[24] Charles Sanders Peirce, *The Essential Peirce: Selected Philosophical Writings*, 2 vols., Nathan Houser, Christian Kloesel, (vol. 1) and the Peirce Edition Project (vol. 2), eds. (Bloomington, Indiana: Indiana University Press, 1992/1998), vol. 1, p. 248

[25] Peirce, *Philosophical Writings*, pp. 99-100.

gives the parts of the television set, the thing as such does not exist, though its physical traits remain.

Thirdness connects the two by relating the sign and object to other signs and objects, such as “television program,” “remote control,” “World Cup,” and “150 channels but nothing on television.” The Third relates sign and object by giving it context, by associating the two with each other and with the rest of the world, and by mediating between sign and object. Thirdness tells us what the object does, how to operate it, what its various parts do in relation to the whole, and most importantly what practices we build around it. If the television set is sitting in the living room, Thirdness tells us that we can watch television programs on it, that the remote control changes the channel, that leaving it on when we are not home wastes electricity, and that there is no reason to watch *Dancing with the Stars.* If we disassemble the television set, Thirdness tells us what the picture tube does, how the circuit boards operate, and that we need to find a new place to watch *Desperate Housewives.*

Real things as understood by humans are both natural and social, because sign, object, and interpretant are all real in the sense that they are essential features of both cognition and meaning. As much as an object becomes something new when it changes physically, it does so as well when our idea of it or its relationship to other things changes. In unifying sign and object through practice, interpretant unifies the natural and social aspects of reality in a single entity. The ideal is inexorably linked to the material in the sign-object-interpretant relationship. The reality of the object is linked just as inexorably to sign through interpretant. Interpretant—which we should think of as sign and object in practice—thus serves to link the natural (object) and the social (the signs that we create for these objects) into a single fabric of reality.

How can Peirce treat ideas, objects, and practices all as real? Peirce argues that "knowledge is never absolute but swims, as it were, in a continuum of uncertainty and of indeterminacy."[26] The physical universe, the universe of material objects and empirical occurrences, holds out many possibilities for understanding. Sandra Rosenthal notes that Peirce distinguishes between the ideal world of the conceptually possible and the world of actual occurrences, and holds that the world as we understand it is a world in which we assign a meaning to the occurrence:

> Reality independent of our thinking exerts an influence on our ways of thinking about it, but what facts and objects it contains is partially dependent upon the conceptual framework in terms of which we delineate objects and facts within the backdrop of a world.[27]

This very much echoes the major concerns of the SCOT program. Peirce sees that the world as we understand it, the world as it is real to us, as underdetermined. We must provide ideas that organize the world, ideas that are socially constructed and not simply empirical in nature. But those ideas must be consistent with the world as we experience it. The material world bends to our ideas but if we try to force its square peg into the round hole of our ideas, it will be our ideas that break. The possibilities in the construction of the sign-object-interpretant relationship is thus bounded by the objective qualia of the object as much as by the existing socially determined limitations on sign and interpretant. We cannot construct a reality in which pigs fly unassisted any more than *Homo erectus* could construct a reality that included the airplane.

[26] Peirce, *Philosophical* Writings, p. 365

[27] Sandra Rosenthal, *Charles Peirce's Pragmatic Pluralism* (Albany, New York: State University of New York Press, 1994), p. 6.

Hence the understanding of technology must go beyond its physical character. Technology as pragmatists understand it is comprised not just of objects but more importantly of signs and interpretants. Our technologies have meaning—and therefore can be cognized, and therefore known to us—only insofar as they constitute relationships among signs, objects, and interpretants. This shows that technology necessarily includes the development of signs and systems of sign-objects, and hence the development of concepts and conscious practices that link idea, artifact, and practice. Technologies, built with concepts and practices in mind, become necessarily social, rooted in concepts deriving from humanity, not merely impersonal nature. They are constructed, but that process of construction is constrained by a physical world that underdetermines the cognitive world and by a social world that artificially limits the interpretive possibilities for the physical world. As such, the pragmatic understanding of technology implies the precise opposite of the neutrality thesis. Technologies are shaped by normative social factors, not only by natural forces or a naturalized concept of utility. Ideas about the good, the beautiful, the healthy, the profitable are as much a part of technologies as the physics or chemistry of the artifact. Artifacts are designed and practices developed with these goals in mind, and these are ontologically part of the technologies as much as their physical characteristics. Far from seeing technology as value-neutral, pragmatism properly understood finds values inherent in technologies.

What might these values look like? An analysis of the role of values in technology based on the pragmatic-constructivist framework leads to four ethical claims about the structure of technological values. The first is that values are embedded in technologies and thereby in society as a whole as well. A technology is not a value-neutral material tool because it is part of a structure of value-laden meanings. As Pinch and Bijker explain, “Obviously, the sociocultural

and political situation of a social group shapes its norms and values, which in turn influence the meaning given to an artifact. . . . [D]ifferent meanings can constitute different lines of development."[28] Pragmatists and constructivists agree that these meanings are ontologically part of the associated technologies (i.e., the technology cannot exist in its current state separately from these meanings) and embed the underlying values in technologies. If values are embedded in technologies, those values become embedded in society as well when the technology is implemented in society. As actors practice the technology, they bring about the consequences of the values embedded in it regardless of the values that the user holds. Implementing a technology is thus, Feenberg argues, the act of choosing "civilizational alternatives,"[29] different societies differentiated by the values embedded in them by technologies.

A second conclusion is the imposition of values comes with *each* technology, not just with technology in general. Technologies do have common features. If technologies are built by common social structures, the values of those structures should be embedded in the technologies that result. If technology itself has some common value—for example, understanding improvement as increased efficiency—that value should be present in all technologies. But the common features of technology do not exhaust the set of embedded values. Understanding the social place of a technology demands understanding it specifically, as each will be composed of different meanings and therefore embed different values than others. A concept of human psychology is at work in both medical testing and mass media, but it is a very different one:

[28] Trevor J. Pinch and Wiebe E. Bijker, "The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other," in Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch (eds.), *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge, Massachusetts: The MIT Press, 1987), pp. 17-50.

[29] Andrew Feenberg, *Critical Theory of Technology* (New York: Oxford University Press, 1991).

rational action is embedded in medicine, while unconscious motivation is embedded in television commercials. Each specific case demands its own analysis.

The third point is closely related. If specific technologies, and not just technology in general, can embed values, then each will embed somewhat different values based on the contingencies of the relevant social groups, the process of stabilization, and the contingencies of the experiences that underlie the sign-object-interpretant relationships. The embedded values of specific technologies and of technology in general will thus be pluralistic rather than monistic. Technology in general can be standing reserve, commodified and bourgeois, and normalizing simultaneously. Online shopping may encourage normalization through advertising at the same time that it empowers consumers to express their individual sense of style by expanding their choices. It is possible to embed many different values in a technology, and even to embed conflicting ones. Understanding the social consequences of technology requires understanding the complex patterns of value in each specific technology rather than (or at least in addition to) a general monistic theory of technology.

The final point is the most consequential for political practice: the values embedded in *how* we do (that is, the technology) can conflict with those of *what* we do (the action itself or its larger social context) when the neutrality thesis guides our understanding of the technology. The multiple values that could be embedded are now seen as either choices that individuals make in deciding how to use a "mature" technology or the natural (and therefore value-neutral) features of the technology itself. But if values are embedded in the technology, then the choice is made not in choosing how to use the technology but in the design process itself. In practice the original values remain embedded in the technology, and implementing it remains an act that implements those values as well. By the time that the technology is ready for use (and thus ripe for the kinds

of choices that the neutrality thesis focuses on) the values that it will embed in society will already be embedded in the technology by the process of constructive stabilization. Using the technology in any sense will embed those values whether we actually hold those values or not, choosing the resulting society whether we want it or not. The result is that the opportunity to choose among alternative directions for society is missed, hidden by the neutrality thesis.

This leads to an important conclusion about normative problems associated with technologies. In a society dominated by technological neutrality technologies will often pose irresolvable conflicts among the values embedded in and implemented through a technology and the values held by society more generally but not embedded in the technology. When we implement technologies, we assert their values as well, bringing about a particular society regardless of the values that we claim to hold. It is thus the former set of values, not the latter, that govern the social consequences of those technologies.

Value-critical Technology

The affinities between pragmatism and constructivism are strong. But Langdon Winner strongly criticizes the SCOT framework on several grounds related to its treatment of normative issues. He argues, in my view correctly, that SCOT is not generally concerned with the social consequences of technology and that it is generally ignorant of the larger moral and political questions that technology poses.[30] One must certainly recognize the limits of Winner's critique; his claims do little to fundamentally challenge the SCOT program. These criticisms are less theoretical failures than consequences of the fact that the SCOT program is a program trying to

[30] Langdon Winner, "Upon Opening the Black Box and Finding it Empty: Social Constructivism and the Philosophy of Technology," *Science, Technology, and Human Values* 18:3 (Summer 1993), 362-378. A similar critique is offered in Hans Radder, "Normative Reflexions on Constructivist Approaches to Science and Technology," *Social Studies of Science* 22:1 (February 1992), pp. 141-173, though Radder's approach focuses primarily on normative implications of constructivist methodology rather than of the constructive nature of technologies themselves.

empirically explain the development of a technology. But in a broader sense the point is compelling: SCOT cannot be critical of technology in the way that other philosophers of technology have been. Clearly the value-neutral reading of pragmatism avoids this, but at the price of an unrealistic view of technology itself. The pragmatic/constructivist philosophy of technology avoids both problems, and does so in a unique manner: by employing science to make science and technology value-critical.

Peirce understands science broadly, as a way of life that relates the individual and the community to the world in such a way that reliable knowledge becomes possible—essentially, he regards science as a technology in precisely the sense that Hickman describes. Peirce shows that science is a way of life in his seminal essay "The Fixation of Belief." Peirce first posits a theory of action rooted in a connection between belief and habit. Beliefs are those propositions on which we would act. The condition of belief is thus the establishment of a habit of mind that would determine our actions. Doubt about the validity of a proposition—meaning primarily the utility of the proposition for action—spurs inquiry. Such doubt must be actual; that is, the doubt must actually impair action, and not merely constitute a logical objection on the basis of which one would not act. Inquiry thus begins not with assumptions that are strictly proven but with assumptions that are themselves free of doubt. [31] Here Peirce suggests a relationship among belief, action, and inquiry. This relationship is not unique to science; Peirce shows that beliefs are a necessary element of action, and that inquiry is a necessary result of this. Thus a method of fixing beliefs becomes not simply a method of inquiry but a way of relating the world to the self that will shape one's actions; in short, one's method of inquiry is one's way of life.

[31] Peirce, *Essential Peirce*, vol. 1, pp. 109-123.

Peirce offers four methods of inquiry: tenacity, authority, *a priori* thought, and science. The first three suffer from the fact that they cannot respond to experiences that conflict with the beliefs that the methods generate without going outside of the methods. Experience will intrude on these beliefs and show them to be inadequate bases for action as they will not produce the desired results of the action. Thus the ways of life based on tenacity, authority, and *a priori* reason will ultimately fail to fix belief. Action ultimately becomes impossible, as there is no sound basis for action.

The method of science overcomes these problems. Peirce defines science by a fundamental set of hypotheses positing a reality that influences the senses in a systematic way that allows one to apprehend that reality through experience and reason:

> There are real things, whose characters are entirely independent of our opinions about them; those realities affect our senses according to regular laws, and, though our sensations are as different as our relations to the objects, yet, by taking advantage of the laws of perception, we can ascertain by reasoning how things really are, and any man if he have sufficient experience and reason enough about it, will be led to the one true conclusion.[32]

Science, for Peirce, is a process of making inferences from experience, and of continually comparing that experience with one's beliefs, updating those beliefs when necessary. The scientific way of life compels us to then evaluate our beliefs when the action does not have the results that we anticipated. In so doing, we compare the results predicted by the beliefs to the actual results of the actions. Inconsistencies between the two must produce doubt, which is resolved through inquiry that takes seriously experience through experimental reasoning.

The key place of the interpretant in Peirce's ontology provides a foundation for experimental science. For Peirce and Dewey, the essence of scientific inquiry is the experimental method: that one compare the predicted consequences of a belief with the actual consequences of

[32] Ibid., vol. 1, p. 120.

it in practice and revise one's beliefs accordingly. Using Peirce's ontology, we can see that the predicted and actual consequences are interpretants of the thing as we understand it and as we experience (in many possible ways, for example, by formal analysis or empirical observation) it, respectively. Experimental reasoning is made necessary by the possibility that interpretants of the thing as it exists in our beliefs about it might conflict with interpretants of the thing as we experience it, that is, by the possibility that belief and experience might produce different results and thus produce doubt. Its consequence is that when the conflicts between interpretants become apparent, the sign-object-interpretant relationship of our beliefs *must* be revised in order to have beliefs that are free of doubt, beliefs on which one can act.

That the revision in light of conflicting experience is an imperative makes the pragmatist perspective on technology value-critical. Science and technology *are* contextual as methods, not just as products, contrary to Dewey's apparent instrumentalism in *Philosophy and Civilization*. But the context of science and technology as methods is critical inquiry: they aim to resolve through experimental reasoning doubts created by the gap between beliefs, concepts, and tools on the one hand and experience on the other. The values with which technology is laden are procedural rather than substantive; they make the substantive values that are embedded in particular processes ends-in-view that operate as hypotheses in relation to actual conditions rather than permanent truth-claims abstracted from reality that hold the absolute power of a Thomas Dolby-esque "Science!"

It is this approach to technology that allows one to reconcile Dewey's apparently contradictory statements about technology. Hickman argues that Dewey believes

> New technologies and techniques are multi-valent, that is, that they offer all sorts of new possibilities and that it is the obligation of those who use them to choose the best of those possibilities and then rework them in order to render them more valuable.[33]

If one replaces the word "multi-valent" in this passage with "interpretively flexible" and shifts the locus of responsibility from use to development, one has not only a position very similar to the SCOT approach but the addition of an obligation on the part of those constructing the technology to do so responsibly and critically. Technology is neutral in a sense *because* of its interpretive flexibility—because it is swimming in a sea of indeterminacy—in that it does not inherently entail any one set of values until closure is reached.[34] But it will ultimately be value-laden as closure is reached and possible constellations of sign-object-interpretant relationships are foreclosed. Those who move the technology toward closure are responsible for the values that are ultimately embedded in a technology.

In this understanding of technological neutrality, Dewey's critical perspective on science and technology in *Philosophy and Civilization* becomes quite compelling. Dewey holds that the neutrality of science and technology leaves society "forced to consider the relation of human ideas and ideals to social consequences which are produced by science as an instrument."[35] Science and technology have social responsibilities he argues; they "must, in short, plan [their] social effects with the same care with which in the past we have planned [their] physical

[33] Hickman, *Philosophical Tools*, p. 59.

[34] I use the word "neutral" here for consistency with Dewey's language. In line with the discussion above it would be more proper to say that technology is pluralistic in that even given interpretive flexibility a technology will not permit all value possibilities equally. I believe that this position is more consistent with Dewey's larger ideas regarding technology as well, and that Dewey would see our disagreement as a purely semantic one.

[35] Dewey, *Philosophy of Dewey*, p. 390.

operation and consequences."[36] To leave the choice of these consequences to private interests is to abdicate the responsibility that technology has to society. It may appear problematic that Dewey sees that responsibility as control until one notes that for Dewey control means most fundamentally the ability to act in a *self*-controlled manner, that is, to act with knowledge and understanding that allows one to bring about in practice the consequences that one expects from one's beliefs.[37] If the closure of technology will result in values being built into society then it is indeed irresponsible not to inquire into whether those values should be built into society.

The pragmatic structure of scientific and technological inquiry described here can be critical because the process of inquiry applies to these values as well as to the physical engineering of technologies. Embedded values are seen not as universal claims but as ends-in-view that are therefore subject to evaluation and revision as well. As Dewey puts it:

> Only recognition in both theory and practice that the ends to be attained (ends-in-view) are of the nature of hypotheses and that hypotheses have to be formed and tested in strict correlativity with existential conditions as means, can alter certain habits of dealing with social issues.[38]

At the very least, the pragmatic philosophy of technology demands a kind of Weberian inquiry into technological values: we identify the values that are present, clarify the values by making them more logically coherent, draw out the implications of these values, and predict the consequences that one might expect from implementing technologies with particular values embedded in them.[39] We might go as far as invoking Peirce's later ethics, in which he defines

[36] Ibid., p. 392.

[37] Ibid., p. 395, see also p. 189n.

[38] Ibid., p. 407.

[39] Max Weber, *The Methodology of the Social Sciences* (New York: The Free Press, 1949), pp. 20-21, 52-55.

ethics as the "study of what ends we are deliberately prepared to adopt."[40] The evaluation of norms under pragmatic inquiry compels us to change our technologies if we are not prepared to deliberately adopt the ends that are embedded in technology because it reveals that we hold doubts about the rightness of those ends.

It might be possible to go a step further than this. Cheryl Misak holds that pragmatic inquiry is necessarily responsive to moral as well as observational experience. She argues that assertion of a proposition entails that one believes that it is true, that one is committed to defending it, and that one is committed to abandon it in the face of compelling evidence and argument against it because one seeks truth in making a claim. This makes one sensitive to experience, which Misak rightly shows means more that just observational experience; a proof can be seen as an analytical experience. Misak shows that moral inquiry is subject to certain kinds of experience under conditions similar to those of the natural sciences. One's moral judgments, for example, are shaped by background beliefs which vary much more than those of scientists but operate in the same fashion. Thus she concludes that one's moral claims are sensitive to one's experience—and that of others—in precisely the same way that other kinds of inquiry require. So long as one maintains that one's moral belief is true, one is committed to respond to empirical and analytical experience just as with one's empirical beliefs.[41] Pragmatic technology should thus be able to criticize the beliefs that are inherent in technology much as it could criticize empirical beliefs, at least within a broad framework of moral pluralism.

Two Objections

[40] Peirce, *Essential Peirce*, v. 2, p. 200.

[41] Cheryl Misak, *Truth, Politics, Morality: Pragmatism and Deliberation* (London: Routledge, 1999).

Two challenges emerge in the pragmatic philosophy of technology developed here. One might see pragmatism as unable to respond to the deep moral questions involved in many areas of technology because of its perceived crude consequentialism or relativism. Such a criticism would claim that pragmatism's moral theory could be reduced to doing what has good consequences. But without a standard of good, it would prove quite difficult to determine what would be good. Pragmatism would thus be of little use in understanding moral claims. One might even go further to assert that the standard of good is in fact culturally based and has no objective value whatsoever. Pragmatism would thus be a form of moral relativism, and could not by definition be critical of the values embedded in pragmatism.

The consequentialist and relativist criticisms conflate philosophical pragmatism with the conventional meaning of pragmatism. Philosophical pragmatism does not claim that morality is rooted in doing what "works"; its claim is that the consequences of a claim determine that claim's meaning. A claim that "works" in the pragmatist sense is merely one for which the observed consequences match those of the claim itself. Pragmatism is a philosophy rooted in action, and not a crude consequentialism. It calls on the individual to make their beliefs and actions consistent with their consequences. Dewey emphasizes judgment and uncertainty in making decisions; the lack of an objective universal standard is a condition of life and thus requires scientific inquiry in the pragmatist sense—a way of fixing individual beliefs in a manner consistent with their consequences—in order to make decisions.[42] Pragmatism, while not a moral theory itself, seeks the "concrete security of values" by "perfecting *methods* of action."[43]

[42] Dewey, *Philosophy of Dewey*, pp. 355-388 *passim*.

[43] Ibid., p. , 379, emphasis in original.

This method is essentially the method of experimentation. Hypotheses—both means and ends—may be provisionally accepted but cannot be viewed as universally and eternally proven, only as the best explanation for the observed phenomena, and must be open to change as new observations warrant. The relation of beliefs about what *is* to beliefs about what *should be* is a problem for inquiry itself and not something to be posited *a priori*:

> That man has two modes, two dimensions, of belief, cannot be doubted. He has beliefs about actual existences and the course of events, and he has beliefs about ends to be striven for, policies to be adopted, goods to be attained and evils to be averted. *The most urgent of all practical problems concerns the connection the subject-matter* [*sic*] *of these two kinds of beliefs sustain to each other*. How shall our most authentic and dependable cognitive beliefs be used to regulate our practical beliefs? How shall the latter serve to organize and integrate our intellectual beliefs?[44]

As a practical problem, the question of normative claims is itself a matter for scientific inquiry in the pragmatist sense that seeks to fix beliefs in a manner consistent the experience of the world. While contemporary pragmatists such Rorty might make claims of moral relativism, the claims of consequentialism and relativism do not hold for the early pragmatists on whom this argument is based.

A far more serious problem emerges in the politics of control in a pragmatic practice of technology. One might question the pragmatist emphasis on control as potentially leading to the kind of totalitarian societies envisioned by Marcuse and Huxley. A less extreme form of this challenge links Dewey's ideas to those of the American Progressive movement of the late nineteenth and early twentieth centuries in calling for rule by scientific experts rather than a democratic public, a program that has had serious practical shortcomings as well.

Is this vision of a scientific critique of technology different than the progressive vision of rule by experts? I believe so. The progressive vision relied in large part on panels of scientific

[44] Ibid., p. 367, emphasis added.

experts. This scientific management in the public interest would overcome the power of entrenched interests and thus promote democracy, paradoxically, by the rule of unelected experts. This seems superficially quite Deweyan. Science is used to create sound public policies. The policies are problem-oriented. And they aim ultimately at public control. Thus the two problems that arise must be taken seriously in applying the pragmatic model of inquiry to technology.

The first problem is the problem of democracy. One might see this problem in several ways. One would be to take an institutionalist perspective. This would be to suggest that in the absence of institutional checks on the power of these experts, the temptations of power are likely to lead them to become tyrants in the name of science. Like Madison's dissatisfaction with paper declarations of rights, Dewey's injunctions against the quest for certainty are quite likely to go unheeded by these panels of experts. Without a way to check their power the experts that rule in the public interest become an unaccountable dictatorship. This objection is more theoretical than practical, however. In practice this kind of expertise was never unchecked, and bureaucratic capture of the experts by those that they are supposed to regulate has proven a far more common threat.

Ultimately there is a danger that Dewey's emphasis on social control and expertise makes possible the development of totalitarian societies. Dewey's explicit suggestion that social control should be the goal of social science would appear to be precisely the claim of science that Marcuse and Aldus Huxley fear. By using science to control technology in particular and society more generally, Dewey makes possible the use of science to impose values, to coerce behavior, and to mass produce both the physical and organizational instruments of domination. These

problems have led most pragmatists to reject to some extent Dewey's vision of a scientific politics, focusing instead on his vision of democratic politics separate from science.[45]

The totalitarian criticism, too, misunderstands the pragmatist claim. Dewey's claim is not that technology should be controlled by the state or by the scientific community. The claim is that science as a method of inquiry makes it possible for society to control technology by understanding it more fully. In the pragmatist understanding of control, one controls one's self by making the beliefs that underlie one's habits and actions conform to experience. This is what Dewey calls for: the critically informed choice of social practices. The contrast is not between control and freedom, but between socially self-controlled practices and haphazard practices rooted in prescientific habits.

The use of science to make the public choices that pragmatism sees at the heart of technologies recalls the philosopher king and Plato's objections to democracy. How, then, can Dewey reconcile the undemocratic rule of experts with his democratic pretentions? The answer is actually quite simple: he doesn't need to. Holding that Dewey's advocacy of science is an advocacy of rule by experts is a misinterpretation that contradicts Dewey's own statements on the matter. Dewey recognizes these problems in the final chapter of *The Public and its Problems*. Dewey holds that expertise is not a claim to governance. He explicitly rejects the vision of scientist as philosopher-king. The experts are technical specialists, not omniscient rulers. They have specialized knowledge that is of use, but precisely that specialization leads to their inability to govern. "In the degree in which they become a specialized class," Dewey writes, "they are shut off from knowledge of the needs which they are supposed to serve."[46] The public's

[45] See, for example, John Patrick Diggins, *The Promise of Pragmatism: Modernism and the Crisis of Knowledge and Authority* (Chicago: University of Chicago Press, 1994).

[46] John Dewey, *The Public and its Problems* (Athens, Ohio: Swallow Press, 1954), p. 206.

knowledge is as important as the scientific experts, because the public sees technology in practice.

> The man who knows the shoe knows best that it pinches, and where it pinches, even if the expert shoemaker is the best judge of how the trouble is to be remedied. Popular government has at least created public spirit even if its success in informing that spirit has not been great.[47]

Thus, even if expertise was to actually rule, the participation of the public is still necessary. The masses "have the chance to inform the experts as to their needs,"[48] and this makes the experts more than simple oligarchs. Thus the knowledge necessary to design or build a technology is not necessary to use the technology, but the experience of the users and those who feel the consequences of technology is just as relevant as that of the experts to the inquiry into technology.

Conclusion

The superficial reading of pragmatism is wrong not as a theory of technology but as a reading of pragmatism. Pragmatism does not see technology as value-neutral. Given Peirce's ontology, nothing can be value-neutral because reality consists of constructed relationships among signs, objects, and interpretants, and these relationships incorporate values into reality. Technology is unavoidably value-laden, and there exists a strong obligation to choose these values responsibly, a responsibility that can be discharged most effectively by practicing critical inquiry, the scientific way of life.

Pragmatic science is thus critical in precisely the sense in which Iris Marion Young sees critical theory:

[47] Ibid., p. 207.

[48] Ibid., p. 208.

> Critical theory is a mode of discourse which projects normative possibilities unrealized but felt in a particular given social reality. Each social reality presents its own unrealized possibilities, experienced as lacks and desires. Norms and ideals arise from the yearning that is an expression of freedom: it does not have to be this way, it could be otherwise.[49]

Technologies offer the possibility of many possible ends-in-view, and a critical view of technology facilitates rather than restricts making effective, critically reasoned choices in these questions. Yet pragmatism offers more than just what a traditional Frankfurt-school analysis, steeped in the monism of Marxist social theory, might offer. Marcuse is one possibility, but so is Heidegger, so is Foucault, so is Ellul, so is Winner. And choosing critically among the many possibilities that technology offers rather than accepting the often unintended choices forced on society through technology is the fundamental challenge that pragmatism poses.

[49] Iris Marion Young, Justice and the Politics of Difference (Princeton, New Jersey: Princeton University Press, 1990), p. 6.