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Determining technology: myopia and dystopia[1]

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Throughout its brief history the philosophy of technology has been largely concerned with the debate over the nature of technology. Typically, technology has been viewed as being essentially another term for applied science, the practical application of scientific theory to the material world. In recent years philosophers and cultural critics have characterised technology in a far more problematic fashion, as an authoritarian power with the ability to bring about far-reaching cultural, political and ecological effects. Proponents of the former view are often termed instrumentalists and those of the latter technological determinists. The debate between them revolves around the question of the fact/value distinction, namely whether technology can be deemed to be value-neutral. I argue that employing a phenomenological approach to technology grants us a fresh perspective on the instrumentalism-determinism debate. It enables us to recast the instrumentalist/determinist debate as a debate between technological idealism and materialism, and to ground the instrumentalist and determinist positions in different experiential relations to technology. It also gives us a better grasp of the function of the different critiques of technology, with idealists concerned primarily with the misapplication of technology as a form of knowledge, and materialists with the existential implications of concrete technological relations.

Introduction

Technological determinism is the idea that technological development represents the (or a) key force that drives social change. This idea has a long pedigree in both popular imagination and political thought, and is a position that has been attributed to many of the figures considered to be canonical within the field of the philosophy of technology.[2] Whilst there are a variety of different perspectives within the philosophy of technology critical of technological determinism, the most prominent has been that of technological instrumentalism. Instrumentalists tend to take the view that technology is equivalent to technological artefacts, or products, that are themselves neutral with respect to human values. That is to say that value-considerations (political, ethical, etc.) are external to technology itself. In so far as they do apply to technological matters it is with exclusive regard to the application of technology. In this context such value-considerations would concern solely the desirability, appropriateness or effectiveness of the use of a particular technology by human agents. Technological determinists often take a more pessimistic view on technological matters, particularly regarding the consequences of technological development. Given their belief that technology determines (to some extent at least) the shape and course of

1 Earlier versions of this paper were presented at the annual Conference of the Philosophical Society of Southern Africa 2014 and at the Howard College Philosophy Seminar. I would like to thank all those who commented on the various versions of this paper, in particular Prof. David Spurrett and the referee for the SAJP.

2 Merrit Roe Smith identifies Lewis Mumford, Jacques Ellul and Langdon Winner as the three key technological determinist thinkers, although Herbert Marcuse, Martin Heidegger, Rene Dubos, Paul Goodman, Murray Bookchin, Kurt Vonnegut, David F. Noble and David Dickson also receive honourable mentions (Smith 1994: p. 28).

societal development, they tend to oppose the view that technology be considered as simply a neutral instrument of human volition.[3]

A recurrent problem with much of the debate over the nature of technology and the validity of the determinist position has been the tendency to divide the participants into neatly opposing camps, such that one is held to be *either* a pessimist *or* an optimist, pro-technology or anti-technology, voluntarist or determinist.[4] Such an approach has the merit of giving some order to the debate over technological determinism by drawing out common strands between diverse positions in order to locate them within the framework of a particular theoretical tendency. However, this is often at the cost of homogenising the individual theories of technology that are taken as constitutive of such a tendency. Knowing in advance that a philosopher is, for example, a technological determinist it is all too easy to assume that one already knows what the philosopher's views are before engaging with their work, and to find in their work only what one expected to find.

Whilst the classification of technological theories into instrumentalist and determinist camps does correctly identify many salient aspects of the debate, it has tended to obfuscate significant areas of commonality and difference amongst and between these positions. I will argue that employing Ihde's phenomenological approach to technology offers an alternative way of conceptualising the debate, both by doing away with the instrumentalism/determinism dualism and by reconsidering the issues that motivate, divide and unite the different philosophical analyses of technology.

I will start by giving a concise account of the key terms of the debate, namely technology, determinism, and technological determinism. Then, drawing upon Don Ihde's phenomenology of human-machine relations, I will argue that the debate over technological determinism is best understood as an argument between different forms of technological idealism and materialism, and that Ihde's account of the different modes of technological perception provides an alternative, phenomenologically grounded, account of the source of the traditional division between instrumentalist and determinist outlook. I will conclude by arguing that such an account provides a new way of approaching the debate, and conceptualising the standpoints involved, that captures more that is of importance than the traditional instrumentalism/determinism dichotomy. In particular, by viewing materialist technological critique as primarily concerned with the existential implications of concrete technological background relations, we gain a clearer understanding of the purpose of those views typically held to be 'determinist', namely to inform and empower.

Key terms

Before considering the ways in which a phenomenological approach can alter and deepen our understanding of what is at issue in the debate over technological determinism, it would be useful to clarify some of the key terms involved, in so far as this is possible.[5]

The term 'technology' is employed in at least four main senses, being understood as artifact, as system, as cognition and as metaphysics.[6] In the artefactual sense technology is understood as

3 It should be noted that there is hardly a uniformity of opinion within or between each camp. Technological determinists are sometimes pessimists or determinists about specific technologies, and instrumentalists about others. Politically, instrumentalists and determinists range from either end of the political spectrum, some viewing technology as the standard bearer of democracy and capitalism and others as a weapon of the revolution.

4 Samuel Florman, for instance, has no qualms about labelling technological determinists, such as Ellul and Mumford, as 'antitechnologists', a doctrine that he defines as holding 'technology to be *the root of all evil*' (Florman 1976: p. 45).

5 It is not my intention in this paper to attempt to offer a definitive account of the nature of technology, or adjudicate the validity of the technological determinist position. I wish merely to identify the senses in which the key terms of the debate are frequently employed, and ultimately to suggest an alternative way of considering the debate and the positions involved. Regarding terminology, given that the key concepts of the philosophy of technology have not yet been fixed, and that different thinkers employ different terminology that often emphasises different aspects of technology, there is little consensus to appeal to. And the sheer breadth of divergent opinion and argument on this subject prevents anything more than a cursory sketch of common usage here. Considerations of space require that I assert rather than argue much of what follows in this section.

6 It should be noted that while none of the four definitions of technology are necessarily mutually exclusive, they often function as a justification for a certain area of focus. To assert, for example, that the artefactual definition of technology is the philosophically significant one is to justify the restriction of one's analysis to that area. Given that instrumentalists tend to favour analysis at the artefactual level and determinists at the systemic, it is not hard to imagine the reasons for the disparity in their conclusions.

hardware, as technological devices and products, tools and utensils (Dusek 2006: p. 31).[7] This is the least problematic, and most common, definition of technology. The artefacts are typically self-contained and are manipulated by the user.

Technological systems are large-scale technological structures that involve technology and humans *as components*.[8] They frequently provide an essential background to the employment of other technologies by providing enabling conditions for the utilisation and maintenance of other technological artifacts. In addition, unlike technological artefacts, in the operation of technological systems it is far less clear who exactly is guiding the operation, as there is often no clear *telos* to a technological system's activity, no direct link between the will of the user and the resulting technological action.

When understood as cognition, technology is considered as a body of knowledge. If, as is commonly assumed, technology is essentially applied science, then technology understood as a form of knowledge would constitute (in part) the body of knowledge needed to conceive of, or plan, the construction of technology (understood as artefact or system). Technology as cognition also includes the sense in which technology represents a body of practical knowledge. Knowledge is required of how to actualise the conceptual, that is to say knowledge of the materials of construction themselves. In addition, the process of technological construction and production requires particular skills, precise measurements, standardised components, specific procedures and methods, etc., which Winner terms *technique* (Winner 1977: p. 12). Related to, yet distinct from this idea of technique, is the understanding of technology as a form of rationality. The rationale of technology may be described as:

(1) the systematic reordering of all phenomena relevant to the technological process
(2) the subordination of means to ends
(3) the pursuit of efficiency, i.e. the maximum output for the minimum input.[9]

Technology as metaphysics refers to metaphysical systems or outlooks that represent reality in a technological (or mechanistic) fashion.[10] This technological conception of reality is held to operate as a kind of 'enabling condition' for technological intervention in the world (and indeed, for any of the other definitions of technology just discussed). A weaker version of this conception of technology might simply hold that there is something intrinsic to technology that is not captured by the cataloguing of various technological artefacts, processes, systems, operators, etc. This implies that there remains something to 'technology' over and above its reduction to its component parts.[11]

The attempt to specify what is meant by 'determinism' with regard to the debate over technological determinism has, to date, proved somewhat problematic. A major factor in this confusion, it appears to me, stems from the simultaneous employment of two different senses of the term 'determinism'. On the one hand we have determinism as historically employed in philosophy and classical mechanics. Here determinism refers to a form of causal determinism, possibly of a Laplacean sort, and carries with it notions of both predictability and of determinism by external factors (as opposed to free will). Thus 'technological determinism' would be the view that 'in light of the past (and current) state of technological development and the laws of nature, there is only one future course of social change' (Bimber 1994: p. 83). Alternatively, we have determinism understood in more historical terms, in the sense of shaping, limiting, fixing, deciding. On this account technological determinism is the view that technology operates as a/the

7 It is what Langdon Winner refers to as *apparatus*, 'the physical devices of technical performance' (Winner 1977: p. 12).

8 Winner terms such human-technological social arrangements as *organisations* and the larger-scale systems as *networks* (Winner 1977: p. 12).

9 This is the process of 'rationalisation' that Max Weber spoke of. Similarly, when Jacques Ellul speaks of technology (*la technique*) as the maximisation of efficiency, it is again to this rationale of technology to which he is referring.

10 In much determinist writing of this ilk, the terms 'mechanical' and technological are relatively interchangeable.

11 Heidegger argued that technology is a 'challenging-forth', a demand of nature that it reveal its truths in a way amenable to human exploitation, as 'utility-potential' or 'standing-reserve' (Heidegger 1993: pp. 320–321; Mitcham 1994: p. 52). Science, for Heidegger, follows technology historically and acts so as to prepare the way for the modern state of technological intervention in the world. Günther Anders, on the other hand, focused on specific types of technology and argued that there were 'inherent maxims' of a morally objectionable nature 'incarnated' in technological forms which remain present regardless of the values of their would-be user (Anders 1961: p. 134). We might locate the later Heidegger in the strong camp, and Anders in the weak.

determining factor in the process of social determination. It makes no superhistorical claims about the autonomous or necessary course of technological/social development.

Some philosophers, most notably Bruce Bimber, have argued that the former, nomological, definition is the only way in which technological 'determinism' can be meaningfully construed.[12] It is, for Bimber, the only definition that meets the requisite standard of analytic clarity and precision. While this might well be true, the problem with this nomological definition of technological determinism is that it gives us a model of technological change that hardly anyone has ever advocated and which rules out of consideration a whole host of other theories of technological change that have been termed technologically determinist. In effect, he gives us an analytic tool that no one can use. It is, I would suggest, the less analytic, historical sense of determinism that is employed in the vast majority of philosophies considered to be representative of a technological determinist position.

Technology, facts and/or values

Having attempted to clarify what is meant by technology and technological determinism in the context of this debate, we can consider what the nub of the issue might be. What, in other words, is at stake in the instrumentalist/determinist dispute? The answer, I will suggest, concerns the fact/value distinction and, more specifically, technology's location on either side of the divide.[13]

The dichotomy between facts and values is interconnected with the dichotomy between nature and humanity. Things belonging to the natural world are held to be facts, and thereby value neutral. By treating technology as a natural object, it becomes a fact, and it too is held to be value-neutral. For some philosophers who adopt a technological determinist position, however, it is technology's distinct absence of value-neutrality that is often the issue of central importance that ultimately motivates their analysis. Rather than being outside the human sphere in the realm of fact, as many instrumentalists would have it, technology for these determinists is firmly embedded (or at least entangled) in the realm of values. The issue concerning the appropriate level of technological analysis, and the appropriate definition of the nature of technology, is thus complicated further by the fact that the boundary between the level of technology understood as an artefact and technology understood as a system is, on the face of it, the boundary between the realm of fact and the realm of values. The clear conceptual distinction between facts and values serves for some instrumentalists as a means of clarifying technological analysis. It provides demarcation criteria with which to separate the relevant (objective issues and data) from the irrelevant (the subjective and affective). For some technological determinists, on the other hand, the use of the fact/value distinction as demarcation criteria, rather than clarifying the debate, actually serves to obfuscate matters by excluding the most relevant issues from consideration.[14]

Heidegger, Ihde and the phenomenology of technology

Heidegger's philosophy, both early and late, offers a good point of entry into what Don Ihde and Hubert Dreyfus call the phenomenological approach to technological analysis.[15] Heidegger's

12 Bimber's definition of determinism has a very stringent, almost Laplacean character: if determinism is true, then given the state of the universe since its origin, and the laws of nature, then there is only one logically possible world as the outcome. Technological development is driven by the unfolding of the laws of nature, and necessitates all meaningful change in the social order (Bimber 1994: p. 84). The laws of nature operate independently of human will, and thus the resulting path of technological development can be said to be autonomous. Given that the path of technological development is necessitated by the laws of nature, it can only follow one trajectory, and is thus properly deterministic. So technological determinism boils down to two claims:
(1) that history is determined by laws rather than human will, and
(2) that technology plays a necessary part in determining human history.

13 I follow Tiles and Oberdiek in identifying the question of the fact/value distinction as the motivating factor in the instrumentalism/determinism debate (although they characterise it as a technological pessimism/optimism debate) (Tiles and Oberdiek 1995: pp. 28–31). I do, however, dispute their conclusion that both parties place technology in the realm of fact as opposed to value.

14 It should be noted, though, that this opposition to the application of the fact/value distinction (with technology on the side of fact) is by no means universal among technological determinists. Indeed, many of the determinists agree with their instrumentalist opponents that
(1) technology is value-neutral
(2) technology is located in the realm of fact
(3) value issues regarding technology are restricted to their subsequent application by human agents.

15 In this section I will largely be using the phenomenology of man-machine relations that Ihde set forth in his *Technics and Praxis* (1979). It

famous discussion of the hammer in *Being and Time* offers a highly suggestive account of three different ways of being with technology.

On a Heideggerian account, the starting point for any investigation into the nature of technology (and science) must always be the fact that humanity is always to be found concretely embedded in the world. Human action in the material world is prior to theoretical reflection upon it. Praxis precedes concept, and technology precedes science, in an inversion of the idealist version of the mind/body relationship.

Starting from Heidegger's assertion of the ontological priority of technology over science, Ihde views technology as a mode of praxis, a way of being-in-the-world, and considers the ways in which technology mediates and forms our perceptions of and actions in the world around us. He terms this '*a phenomenology of human-machine relations*' (Ihde 1979: p. 3).

The first sort of human–machine relations that Ihde considers are *embodiment* relations, where the machine operates as an extension of the person using it. The classic example of such a relation is Merleau-Ponty's example of a blind man's cane. Ihde mentions the act of writing on a chalkboard with a piece of chalk. In either case the artefact extends their perceptual field (in the case of the cane and the chalk to their far point) to where they meet the 'world'.[16] In doing so the artefact becomes (partially) transparent to the user in that the user does not experience the artefact itself, but rather experiences through the artefact. The artefact is not experienced as an object or something (fully) external to the operator, but rather as 'a symbiotic extension of [one's] own embodiedness' (Ihde 1979: p. 8). To return to the Heideggerian example of the hammer, the better the hammer works, that is, the better it operates as an extension of myself, the more it withdraws into transparency (Heidegger 1962: p. 98). However, as Ihde points out, it is important to note that this sensory extension is also a transformation. The experience of the world via the artefact will not be exactly the same as one achieved without instrumental mediation. There might well be a reduction in the breadth of experience when compared to unmediated contact, or an amplification, or quite possibly both.[17]

In the second type of human–machine relations, which Ihde terms *hermeneutic*, the machine ceases to operate as transparent carrier of embodiment relations. Rather than experiencing through the machine, humanity experiences the machine itself. Returning to Heidegger's example of the hammer, we experience the hammer as a hammer (rather than experience *through* the hammer with the hammer acting as an extension of our self-experience) at the moment that the hammer ceases to function as a hammer. That is to say, when it breaks. Then its instrumental transparency is removed and it appears to us as a thing-in-itself, as an object. Now whilst Heidegger's account of the broken hammer is valuable in alerting us to this other way of experiencing human–machine relations, there is a danger that the particular example that he offers, i.e. a broken hammer, would lead us to conclude that this second mode of being-with-technology is one of deficiency. The hammer no longer obeys our intentions, and becomes an obstacle to our will (Heidegger 1962: pp. 103–104). However, as Ihde points out, there are numerous contexts in which we encounter machines *in their machineness* and in which the machines still function. Ihde offers as an example an engineer whose primary role is to monitor the operations of a university's heating and cooling systems, monitoring, 'reading' and adjusting dials as needed (Ihde 1979: p. 11). The engineer's intentions and experiences do not travel through the machine to the terminus point, as with embodiment relations. Rather the machine itself is the focal point of the engineer's experience. Instead of transparency 'there is a partial opacity between the machine and the World and thus the machine is something like a text' (Ihde 1979: p. 12). Hence Ihde's classification of such human–machine relations as hermeneutic.

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should be noted that whilst Ihde cites both Husserl and Heidegger as sources for his technological outlook, and in his later work shows the increasing influence of Merleau-Ponty, his *Technics and Praxis* is itself Heideggerian in character. Given that I will be drawing solely upon this early work for the purposes of this paper, I will be giving his work a rather Heideggerian interpretation. However, my argument in no way commits the reader to such an interpretation of Ihde's work, either in general or with specific regard to this book. Ihde, in sections of *Technics and Praxis*, does outline a Husserlian account of his man–machine relations, and one could perhaps attempt to recast the entire work along Husserlian lines if one felt so inclined (Ihde 1979: pp. 5–6).

16 Ihde refers to this as the terminus of 'intentional extension' (Ihde 1979: p. 7).

17 If one imagines that science, on this account, is a conceptual derivation from technologically embodied practice, it gives a whole new slant to Abrams observation in *The Psychology of Science* that 'when all you've got is a hammer, everything looks like a nail'.

The third type of relations Ihde terms *background*. Here Ihde refers to the 'technological texture' of our modern environment, or the 'technosphere' as he terms it (Ihde 1979: p. 14). He is identifying the manner in which human existence is thoroughly permeated by technology, but with which we stand in relations that are neither embodied nor hermeneutic. Technology is a constant, enveloping presence with which one has but perfunctory intentional contact (such as turning on the kettle or flushing the toilet). It is set in motion and left to its own devices. The majority of relations here are *between* machines and they create a technological web within which we dwell. In this sense technology has become existential, a way of being-in-the world.

Instrumentalism, determinism and phenomenology

If we now connect Ihde's three types of human–machine relations to our earlier exploration of the concepts and commitments involved in the instrumentalist and technological determinist positions, we can recognise that instrumentalism and determinism as philosophical outlooks on technology are related to the mode of being-with-technology that is preferred or emphasised.

The instrumentalist (or technological idealist) outlook, with its emphasis on technology as a tool, that is to say pure means, a neutral carrier of human intention, has close affinities with the embodiment type of human–machine relations. Here we find the type of technological experience that best expresses the 'transparency' of intentional extension that the instrumentalists describe, and indeed require to maintain the factual 'purity' of technology as applied science. Once again, if one's primary mode of technological experience was that of embodiment relations, one can easily see why the idea of technological determinism, or autonomous technology, would appear patently absurd.

It should be noted, however, that an embodiment relation is not simply neutral technological mediation between the will of the user and the resulting action. Embodiment relations are transformative. However transparent they may appear, they are only ever partially so. The transformation of sensory experience displays what Ihde calls an invariant feature, the 'amplification-reduction structure' (Ihde 1979: p. 21). Embodiment relations reduce as they amplify and thus, contrary to instrumentalist belief, cannot be considered neutral.

The technological determinist (or technological materialist) outlook, with its emphasis on technology as a system, has close affinities with the hermeneutic type of human–machine relations. The instrumental transparency of embodiment relations is replaced with the opacity of technological systems, and the machine appears as an object, a thing between us and the world, a 'quasi-other' (Ihde 1979: p. 41). The appreciation of technology as something that can be considered as a thing-in-itself, a focal point of experience, brings to mind questions concerning the degree of hermeneutic 'reading' involved in technology use, that is, the extent to which our experience of the world is mediated and transformed by technology, or the extent to which our experience of technology is (effectively) the world. From the perspective of hermeneutic human–machine relations it makes far more sense to inquire into the characteristics of technology, the ways and degrees by which we are constrained in our use and interpretation of technology.

A danger inherent in according primacy to hermeneutic technological relations is that it becomes easy to anthropomorphise technology, to forget that the 'other' that technology now becomes is a 'quasi-other'. And it is equally easy to move from this point to the imputation of intentionality to technology. From a phenomenological perspective instrumentalism (about embodiment relations) and determinism (about hermeneutic relations) tend to fall into the errors of understatement and overstatement. The former insists on the hammer's invisibility, the latter curses its willful intransigence. The one looks through the window and insists that there is no glass, the other sees their reflection and insists that there is something inside the glass.

It might seem odd to separate the *background* mode of human–machine relations from the hermeneutic with regard to its affinity with technological determinist positions (of the materialist variety). The awareness of the quasi-otherness of technology and its wider implications would seem to apply to both technological devices and large-scale technological systems. Yet what is significant about technological background relations is the way in which they don't appear as the 'other', or indeed disappear, at all. The distinguishing feature of background relations is the absence of experiential engagement that we have with them, and their ubiquity. This mode of

being-with-technology brings to our attention the extent to which technology literally encompasses us. The technosphere or technological environment has a substantial, material existence, rather than a mere metaphorical or conceptual one. And the aspect of technology that concerns many determinists is the manner in which technological development materially alters the technosphere that surrounds us and thereby alters (not necessarily for the worse) our existential conditions and options. Their point here is that technology is not just something you use or 'read', but something you live.

Technological idealism and materialism

Elsewhere in *Technics and Praxis* Ihde outlines an alternative way of conceptualising the debate over the nature of technology. Ihde suggests that a defining feature of the various positions is their perspective on the relative priority of science and technology,[18] and thereby the relative priority of theory and praxis. He identifies four main positions: parallelism, interactionism, materialism and identity theory. It is interactionism and materialism that are of most significance to this discussion.[19] Materialism holds that science is emergent from and/or dependent on technology. The interactionist, or idealist, position holds that science and technology are separate and distinct, and that technology is the result or application of science. Science is thus primary and 'dominant', and technology 'secondary and resultant' (Ihde 1979: p. xxi).[20] It is this perspective that underpins the instrumentalist outlook and, I will argue, many of the technological determinist positions too. It affirms the priority of mind over body, that is to say, theory over practice, and thereby science over technology. Science is held to deal with facts rather than values. Technology, as applied science, is effectively applied fact and is thus likewise placed outside the sphere of values. Any ethically or socially problematic issues arising from the operations of technology are placed firmly on the value-side of the fact/value dichotomy. To be a technological idealist, in effect, requires affirmation of the fact/value distinction as a necessary condition.

Function

This last point brings us to the question of function. What purpose is it that the different accounts of technology that we have considered above are intended to serve? What is at stake regarding the outcome of the debate over technological determinism? And what is gained by considering the various positions in terms of idealism and materialism instead of instrumentalism and determinism? Beginning with the last question, I would argue that the chief merit of employing the idealist/materialist distinction (science/technology, theory/praxis) is that it indicates that the instrumentalist/determinist dichotomy has carved the debate at the wrong point. When Tiles and Oberdiek argue (incorrectly) that in general both pessimists and optimists[21] affirm the fact/value distinction, they draw attention to the fact that there appear to be instrumentalists on both sides of the instrumentalist/determinist divide. In other words, there are philosophers who have typically been considered to be determinists, in that they argue that technology has the power to shape societal development, who also maintain the fact/value distinction with regard to technology, the primacy of science, and the instrumental nature of physical technology. The apparent contradiction can be resolved if one considers both instrumentalists and determinists of the above type to be technological idealists. Both share the same conceptual outlook, and their apparent difference stems from a difference in function. We can thus distinguish between descriptive idealism and normative idealism.

Traditional 'instrumentalism' is best considered as descriptive technological idealism. It is descriptive in that it does not explicitly seek to criticise and/or alter the nature of technological practice, but to describe it. Its primary concern is with the epistemological status of technology.

18 Ihde argues that the mind/body distinction of the Ancient Greeks is analogous to the distinction between science and technology in that the key conceptual positions in the mind–body debate parallel the key conceptual positions on the relations between science and technology. One need not agree with this point in order to appreciate the utility and accuracy of his recategorisation of the key positions.

19 Parallelism, on Ihde's account, would be the view that science and technology are separate and distinct but parallel each other, and Identity Theory, that the science/technology distinction is erroneous, and that science and technology are identical.

20 Ihde argues that, 'if there is a 'paradigm' within the dominant tradition regarding a science–technology relation, it is one which simply takes for granted the primacy of science' (Ihde 1979: p. xxii).

21 Determinists and instrumentalists, on my reading.

As such it tends to examine the structure and validity of technology as a form of knowledge and the way in which it relates to other forms of knowledge, namely science. It aims at a rational reconstruction of the logic and method of technological knowledge, and its relation to the logic and method of scientific knowledge; that is, scientific theory and methodology. By defining technology in such purely cognitive terms, technology is kept on the 'fact' side of the fact/value dichotomy. It is held to be value-neutral, with issues of values only entering with the decision to apply technology. Such an instrumentalist view is often accompanied (though by no means necessarily so) with a utopian, or at least strongly optimistic, view of the benefits that technological development and increased technological application could bring to humanity.

Normative idealism, or technological determinism of an idealist character, agrees with the better part of the instrumentalist position. It too holds technology to be essentially cognitive, a form of knowledge, and to be value-neutral. Its normative dimension stems from the fact that it believes that the method/logic/rationale/technique, etc. of technology is being incorrectly applied outside its proper sphere. The aim of the normative idealist critique is to identify the areas where technological forms of knowledge are being misapplied and make the case for the restriction of such forms to the technological domain, and the restoration of appropriate values to the relevant areas.[22]

In contrast to these idealist positions, we can also identify forms of technological materialism, that is to say technological determinism of a materialist character.[23] Langdon Winner's technological politics provide a good example of just such a position. Winner states that, 'the interesting puzzle in our times is that we so willingly sleepwalk through the process of reconstituting the conditions of human existence' (Winner 1988: p. 10). Winner argues that certain types of technological structure are more compatible with certain moral and political systems. By allowing new technologies to establish themselves, merge with pre-existing techno-structures and interact with the social structure, we progressively limit the types of society we can bring about. Thus by not attending to the development of the technical base of society, we unwittingly reduce the variety of political systems that are compatible with it (Winner 1977: p. 325). It is due to our continuing, and Winner suggests culpable, ignorance of this state of affairs that he suggests that his theory of technology be best considered technological somnambulism (Winner 1977: p. 324).

The reason then for this 'technological drift' stems, according to Winner, from lack of oversight of the trajectory of technological development. Why might this be the case? It is felt that the scale and speed of technological development, and its ever-increasing intricacy, render us incapable of foreseeing the outcome. The sheer complexity of our technological systems means that we cannot predict the outcome of any choice of action. And it is not just the intricacy of new technologies that render accurate prediction impossible, it is the novel and unexpected ways in which newly introduced technologies interact with pre-existing technologies that results in a level of complexity such that we cannot predict the outcome of any choice of action.

A further reason concerns the fact/value distinction. Questions concerning the direction and nature of technological development are widely considered as not value issues, but technical ones. It is this last reason, I would argue, that is central to the technological materialist case. Regarding the significance of the first two issues, the second of which is really but an aspect of the first, it may well be true that the complexity and interaction of technological systems render it difficult, or at times impossible, to predict the outcome of a technological decision. It may even be true that the interaction of technological systems can produce entirely unexpected outcomes. However, this is hardly a novel development in the history of the human condition. More importantly, as Winner points out, the fact that we can't always predict the outcomes of technological development doesn't mean that we can't most of the time.

22 On this account Ellul would be considered a normative idealist, in that technology is understood at a cognitive level as rationale or method, and the danger it poses stems from the misapplication of this rationality outside the realm of fact. Smith's other two key determinists, Mumford and Winner, would both be deemed to be technological materialists.

23 I would wish to include the form of technological determinism that Bimber called 'unintended consequences' determinism in this category, although I would not want it to count as a definition for this category as a whole. The 'unintended consequences' formulation does capture a key part of what I have termed technological materialism, but tends to neglect the materialist side of things.

The significance of the fact/value distinction with regard to technology, is that it prevents technology being considered as a social/political issue. Viewing technology as a purely technical matter erodes our ability to judge it. As non-technicians we do not feel qualified or entitled to express an opinion, believing that such issues are the exclusive preserve of the 'experts'. Limiting discussion of values to the 'use or misuse' of technology recapitulates the instrumentalist belief that all value-issues arising from technology are external to technology itself. For technological materialists such as Winner, this obscures three key facts. Firstly, the pointlessness of instrumental concepts such as use and user when referring to technological systems rather than tools. Secondly, the extent to which the structure of technological systems is chosen, as opposed to necessitated by the purely physical requirements of their operation. And thirdly, the fact that the instantiation of technological systems requires the *material* restructuring of society. It is this third point that brings out the 'materialist' aspect of the technological materialist position. In opposition to normative idealism, the repercussions of technological development are not primarily conceptual. The adaptation of humanity to the operational requirements of the technological systems of which they are part brings about significant alternations in behaviour. Certain forms of behaviour are called for in order to facilitate or maintain the functioning of a system, other forms are prohibited for the same reason. The built environment is transformed in line with these technological imperatives.[24] Decisions regarding technological systems bring about transformations that concern all aspects of the social sphere; social relations, political systems, moral norms, cultural forms. As Winner points out, technology is not problematic in that it requires legislation, but in that in a very real sense, it is legislation. And in that technology now legislates the conditions of the human existence in the polis, technology is a political phenomenon (Winner 1977: pp. 323–324).

> New technologies are institutional structures within an evolving constitution that gives shape to a new polity, the technopolis in which we increasingly live... Shielded by the knowledge that technology is neutral and tool-like, a whole new order is built – piecemeal, step by step, with the parts and the pieces linked together in novel ways – without the slightest public awareness or opportunity to dispute the character of the changes underway (Winner 1977: p. 324).

The myth of the machine

Whether or not one subscribes to Winner's version of consequentialist technological materialism, or prefers its formulation by another philosopher of technology, what is brought to light by this brief account of his position are the two key themes of materialist technological determinism; namely the assault on the myth of the machine (to borrow Mumford's term) and fear of the loss of agency in modern technological society.

The myth of the machine is perhaps best understood as a cluster of related concepts about the nature of technology, underpinned by the foundational assumption of the value-neutrality of technology. The materialist concern is that this assumption of value-neutrality acts as a smokescreen that hinders our awareness, and thus the exercise, of our own agency, whilst also masks the issue of who effectively wields power over technology. Behind the public perception of technology's neutrality, or autonomous character, or beneficial consequences, lurks the question of who (if anyone) is running the machine. If, as the materialists maintain, the instantiation of technological systems is both chosen with regard to its form and manner, and involves the restructuring of society, then technology is political from top to bottom. And being so, the nature of such decisions and the transformations resulting from their fulfilment are matters for public debate and political engagement. And likewise those who do have technological agency must be identified and held to account.

It might be objected at this point that, once we cash out all the criticisms levelled by technological materialists, all it really amounts to is the claim that technology is inside (rather than

24 Granted one might argue that that behavioural modification follows from the conceptual reorientation to technological values that the normative technological idealists describe. However, the priority is reversed with the consequentialist materialist position, where alterations in praxis, in the material conditions of human existence, would be seen as giving rise to alterations in conceptual orientation.

outside) the social sphere and rather than being value-neutral, many aspects of modern technology involve political, ethical, etc. matters. Technology then appears less as a thing to be considered in its own right and more as a form or stage in the development of human society. If this is the case, one might ask, then aren't all the issues raised by philosophers of technology just reworkings of all the standard issues that confront society in general; the politics of *x,* the ethics of *x*, the limits of human foreknowledge of the outcomes of their actions, and so on? Doesn't 'technology' as a philosophical issue vanish given that the topics with which the philosophy of technology concerns itself can be parceled out among more traditional fields of analysis?

Perhaps, but if so, maybe the significance and importance of the philosophy of technology, and the technological determinist outlook, is the attempt to awaken us to the hidden societal, value-laden nature of technology, to point out that technological transformations entail not just the conceptual but the material restructuring of society, and to demonstrate that what governments or technology corporations view and treat as a 'private' technical matter is in actuality very much a public matter. The determinists' critique is intended to inform and empower. By exploding the myth of the machine they did not expect authoritarian or restrictive technological systems to vanish into thin air. They did, however, hope to restore the awareness of our own agency and our responsibility to judge and determine technological development. And by pointing out that the negative social effects of technological advance are due not to technology's autonomy/inner logic/misuse, but to the fact it has been badly made, they give technology a human face. They reveal Oz behind the technological curtain.

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