Brian Martin, *Technology for nonviolent struggle*
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Appendix

Theories of technology

This book is based on the idea that technologies can and should be developed and chosen because they are helpful for nonviolent struggle. This in turn is based on a number of assumptions about the nature of technology.

In chapter 2 on militarised technology, I argued that the military influences the development of technology in a number of ways, including through funding, applications, employment and suppression of challenges, plus via deep structures including the state, capitalism, bureaucracy and patriarchy. In later chapters, I outlined a variety of actual and potential technological developments that would be of special value for nonviolent struggle. In making these arguments I have assumed that:

- technology is shaped by a range of social factors;
- any given technological system is more useful for some purposes than others (e.g. military versus nonviolent struggle);
- it is possible to influence the process of technological development to serve desirable social goals.

It would be possible to attempt to justify these three assumptions through a set of abstract arguments. My approach, however, has been to build an argument—with plenty of examples—based on these assumptions and to implicitly justify the assumptions by demonstrating the insights available. In this appendix I continue this strategy by outlining some common approaches to studying technology and seeing whether they provide useful ways to tackle the topic of technology for nonviolent struggle. This will illuminate some of the shortcomings of certain approaches and help clarify my approach.[1]

Essentialist approaches

An "essentialist" approach to technology assumes that it has essential or inherent features. Common essentialist views are that technology is good, bad, neutral or inevitable.

Some people think that technology is inherently good. Military technology provides the best example that it isn't. Bullets and bombs kill. People who are killed by bullets and bombs would not see these artefacts as good—not good for them, anyway. It is difficult to argue that weapons of mass destruction are inherently good. In fact, it was the development of nuclear weapons that made many technologists realise that not everything they produced was of benefit to humanity.

When people think that technology is inherently good, they usually make an implicit assumption: the only choice is between present technology—all of it, including stereos, baby bottles and biological weapons—and no technology at all. If it is assumed instead that it is possible to make choices about technology, namely to have some artefacts but not others, then the idea that "technology is good" collapses. It should be obvious that the technology-is-good model is of no value in analysing problems with military technology or developing technology for nonviolent struggle.

A contrary view, held by a few, is that technology is inherently bad. This idea is similarly flawed. After all, some technologies help at least some people: wearing glasses helps some people to see better, even if the produc-

tion of the glasses causes pollution and unpleasant work conditions. It is only possible to argue that technology is inherently bad if there is no choice between technologies.

Many people are attracted to the idea that technology is inherently neutral, believing that it is either good or bad depending on the way it is used. This is the so-called use-abuse model: technology can be either used (for good purposes) or abused (for bad purposes). It is certainly true that many artefacts can be used for both good and bad purposes. For example, a computer word processor can be used to produce lists of dissidents who are to be arrested or killed, or it can be used to produce articles proclaiming the value of dissent. Computers often make tasks easier, but they also can lead to people losing their jobs. But does this mean that all artefacts are neutral?

An alternative perspective is that particular artefacts are easier to use for some purposes than others. For example, if you want to clean your hands, soap is more helpful than a newspaper or a candle. After all, artefacts are designed for particular purposes. Of course, they might be used for other purposes. A toothbrush is designed for cleaning teeth, but it can also be used to clean shoes or even for painting. But a toothbrush is not very helpful for sweeping the street or eating peas. This point should be obvious: any particular artefact is not equally useful for all purposes.

In this sense, artefacts are not neutral. A pair of dice might be said to be neutral if all possible rolls from 2 to 12 are possible. But the dice would be called biased if they gave 12 half the time. In this sort of sense, artefacts are biased. They potentially can be used for many different purposes, but they are much easier and more likely to be used for certain purposes.

This applies clearly to military technologies. A nuclear explosion can be used to heat a house or fry an egg, but this is neither the intended nor a convenient use of the technology. Thumbscrews are designed and used for torture. Their actual use as paperweights or parts of a sculpture, or their potential use for medical operations, hardly makes them neutral in any practical sense.

The idea that technologies are neutral is usually maintained by taking a broad perspective. For example, it can be claimed that computers are neutral because they can be used for beneficial or harmful purposes. But this only means that sometimes they can be used for beneficial purposes and sometimes for harmful ones. It doesn't mean that these applications are equally easy or likely. Nor does it mean that the benefits and harm are spread around equally.

To pierce the illusion of neutrality it is only necessary to take a closer look, for example at the computer built into the nose cone of a cruise missile, enabling the missile to use altitude readings to assess where it is and to adjust its course as necessary. The computer is designed to help the missile reach its target and destroy it. This computer is not neutral. The idea of neutrality may be attractive to people because it removes the necessity to think carefully about the values built into the design, choice and use of technology.

The idea that technology is neutral provides no leverage for analysing technology for nonviolent struggle. After all, if technology is neutral, that presumably means that any technology can be used for nonviolent struggle and there is no obvious means for choosing between technologies.

Sometimes it seems like technologies have a will of their own. The telephone and the automobile have spread throughout society and no one seems able to stop their use. What is called "technological determinism" can be interpreted in various ways. It can mean that once a new technology is developed—such as guns or nuclear weapons—it has an inherent momentum leading to its widespread use. It can mean that there is general pattern of technological development that is inevitable, such as the use of steel, electricity or computers.

Simple interpretations of technological determinism don't stand up to scrutiny.[2] There are plenty of technologies that have been

developed but have never become dominant, such as housing with passive solar design, supersonic transport aircraft, microfiche publishing and cryonic suspension. How can it be said that technology determines its own development when so many technologies are failures? One answer is that some technologies are "better" and hence more successful. But this provides a circular argument, at least when the way to determine whether a technology is better than another is to see whether it is more successful. Technological determinism provides a convenient excuse for ignoring the human choices, especially the exercise of power, in development of technology.

Technological determinism provides no help in analysing technology for nonviolent struggle. It assumes that military technologies are dominant due to their own inherent properties; nonviolent alternatives have not been successful and hence may be ignored. My entire analysis is based on a rejection of technological determinism and an endorsement of the view that social choice is the basis for technological development and that that choice should become more participatory.

However, by adopting the topic of technology for nonviolent struggle, it is hard to avoid sounding like a technological determinist at times. Because the focus is on technology, it is possible to create the impression that by adopting a suitable technology, the cause of nonviolent struggle is automatically advanced. My view is that development and use of technology is always a social process and, as such, is one of a number of social locations for promoting or waging nonviolent struggle.

Social shaping of technology

Rather than assume that technology has intrinsic properties—being good, bad, neutral or inevitable—another approach is to assume that technology is a product of society and reflects or embodies its origins in various ways. This general approach can be called "social shaping of technology." It proceeds by examining social influences on the nature of technology.

An extreme version of this approach is to claim that large-scale social structures almost entirely determine technology, for example that capitalist society leads to technology that serves capitalists.[3] This can be called "determined technology" or "social determinism" and is the converse of technological determinism. This approach provides an antidote to technological determinism but isn't particularly helpful when it comes to developing alternative technologies. If the structure of society determines technologies, then advocating alternatives to current technologies seems futile since it doesn't change the process of social determination. In other words, this approach assumes that the only way to change technologies is to change the fundamentals of social structure. My analysis assumes the contrary, that technology is one potential avenue for intervening to change society as well as technology itself.

A more moderate approach involves examining the interaction of social and technical factors on the development and choice of technology. For example, there have been studies of compression versus absorption refrigerators, numerically controlled machine tools, light bulbs and electricity systems.[4] This approach has been used in a number of studies of military technology, some of which were mentioned in chapter 2. It is valuable for analysis of actual technologies and also for opening up the possibility that other technologies might have been developed if different forces had been influential.

One of the most cited examples of social shaping of technology is the low bridges, designed by Robert Moses for New York, which allegedly prevented the twelve-foot high buses from passing underneath and hence prevented those relying on public transport, especially blacks and poor people, from easily visiting beaches.[5] This example has been frequently used to show how social values, in this case racism, can be built into artefacts, in this case bridges. Its pedagogical value seems to arise

from it being neither too complex nor too simple, and having an obvious bad guy. Military technology provides plenty of examples that are almost too simple. Weapons are designed to kill and destroy. Detailed examples can be produced by the dozen. Brightly coloured landmines are designed to attract the attention of children. Tumbling bullets are designed to cause horrific exit injuries. One can speculate why scholars haven't raised these sorts of examples more often. Perhaps the social shaping is too obvious.

Although the social shaping approach is quite valuable, it has some limitations as actually applied. Most social shaping analyses look at rejected alternatives that are fairly similar to their successful rivals, such as the AR-15 rifle that was rejected in favour of the M-16. Postulating comprehensive wide-ranging alternatives is unusual, possibly because it requires too much of a jump from the historical record. Certainly there have been no discussions of technology for nonviolent struggle, nor even much study of the field of appropriate technology, which would seem a natural area for analysis.

More fundamentally, the social shaping approach deals with the social influences on technology and says little about the actual technologies that exist or might exist. For example, it is all very well to analyse the social forces shaping military and civilian communication systems, but what guidance does this give for assessing which such systems would be useful for nonviolent struggle? The social shaping approach is restricted by its focus on influences *on* technology, which leaves out the effects *of* technology. The next stage in the development of this theory is to look at the ways that society and technology co-shape each other.

Various more focussed theoretical frameworks, such as labour process theory,[6] can be applied to technology within the general ambit of the social shaping approaches. A different angle on technology is provided by "actor-network theory," which is based on getting rid of the dichotomy between humans and artefacts.[7] In this approach, anything potentially is an "actor": a scientist, a scallop, a mechanical door-closer, a bullet. The task of the social theorist is to "follow the actors," namely to watch what they do without making assumptions about them in advance, and to observe their networks, namely to see how they create, destroy and rearrange relationships between themselves. One advantage of the actor-network approach is that it gets away from the essentialist assumption that social structures such as the state are ordained categories for understanding social reality.

There have been a number of criticisms of actor-network theory.[8] It tends to overlook groups such as women and the unemployed who are not prominent in networks associated with technological innovation. Actor-network theorists often seem to smuggle in concepts of social structure that they supposedly have jettisoned.

More importantly, social constructivists seem to restrict their efforts to explaining existing technology, not taking any stance on whether it is good or bad for humans nor saying how to go about changing it.[9] Since actor-network theory builds on actors—including artefacts—that exist, there is no theoretical warrant for examining technology that might be designed in a social system putting a priority on nonviolent struggle, especially since social structural analysis, including the concept of the military, is avoided.

Biased technology

A useful framework for analysing technology for nonviolent struggle is to think of artefacts as non-neutral, biased, political or selectively useful.[10] In other words, they are easier to use for some purposes than others. A key aim of a social analysis of technology then is to find out which purposes a technology can be most easily used for, and why.

Most technologies developed by the military are biased, or selectively useful, for killing and

destruction. This obviously is because the aim of most military science and technology has been to develop more lethal and destructive weapons.[11]

It is quite possible to kill or incapacitate someone without technology. For example, a suitable blow from the hand at the back of the neck can do this. Mass killing can occur without technology, but it is much easier—and more tempting—if technology designed for killing is available. Spears, axes, bows and arrows, rifles and explosives make killing easier. Admittedly, they can be used for killing animals and other less lethal purposes, but in many cases they have been specially designed for battles.

The idea of biased technology obviously is incompatible with the idea of technology as good, bad or neutral. On the other hand, the idea of biased technology is quite compatible with the social shaping perspective. One would expect that when the military influences the development of an artefact—such as designing a radar system or grenade—it is likely to be selectively useful to the military. But there are no automatic connections. It is necessary to examine actual technologies, not just the social shaping process, to determine which groups can most easily use them. The Internet had military origins but has turned out to be highly useful for communication between antiwar activists.

Another way to describe this approach is to say that technologies embody social values or social interests. The idea of embodiment suggests that technologies take on the values of the interest groups crucial to their development and in turn are likely to be selectively useful to these same interest groups. For example, nuclear technology was developed by scientists and engineers working in the service of governments and militaries. Some of the key characteristics of nuclear weapons and nuclear power are high potential danger and large scale, both generating a need for high security and centralised control. These features make nuclear technology selectively useful to the military and the state.

The idea of biased technology is quite common among those who examine technological alternatives, such as appropriate technology. But it has never been the centre of popular or scholarly perceptions. The most common popular perceptions of technology seem to be that it is neutral, good or bad. The social study of technology has focussed on social shaping approaches; in the past couple of decades, social analysis of the impacts *of* technology has not been nearly as common as analysis of social influences *on* technology. There is not even a good name for the view of technology as biased. To talk of biased technology certainly counters the idea of neutral technology, but it suggests that there is something wrong with it: in a general sense, being biased is not seen as a good thing, even if it is biased in favour of harmony or biased against torture. Also, to talk of biased technology suggests that bias could be removed, which is not possible—the question is which way technology is biased, and in whose interests. The meanings of alternative terms such as embodiment or selective usefulness are not immediately obvious.

Whatever its name, though, this perspective is quite useful for analysing technology for nonviolent struggle. This appendix began with the assumption that it is worthwhile to analyse technologies, including yet-to-be-developed technologies, according to their value to a system for nonviolent struggle. Working backwards, it is possible to judge theories of technology to see how well they serve this purpose. Ideas that technology or technologies are inherently good, bad, neutral or inevitable are not helpful at all. Ideas of social shaping have more potential, but are not well adapted to looking at alternatives to what exists. Most useful is the idea that technologies embody social values and are selectively useful for certain purposes. It should not be surprising that this has been the framework implicitly used throughout this book!

Notes

1. I thank Sharon Beder for helpful discussions about theories of technology and Stewart Russell for helpful discussions and a thorough reading of this chapter. For overviews and critiques of approaches in studies of science and technology, see David J. Hess, *Science Studies: An Advanced Introduction* (New York: New York University Press, 1997); Sheila Jasanoff, Gerald E. Markle, James C. Petersen and Trevor Pinch (eds.), *Handbook of Science and Technology Studies* (Thousand Oaks, CA: Sage, 1995); Sal Restivo, *Science, Society, and Values: Toward a Sociology of Objectivity* (Bethlehem, PA: Lihigh University Press, 1994).

2. For a critique of technological determinism, see Langdon Winner, *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought* (Cambridge, MA: MIT Press, 1977). For differing views by historians, see Merritt Roe Smith and Leo Marx (eds.), *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge, MA: MIT Press, 1994).

3. One of the few works that comes close to this view is David Dickson, *Alternative Technology and the Politics of Technical Change* (London: Fontana, 1974).

4. Donald MacKenzie and Judy Wajcman (eds.), *The Social Shaping of Technology: How the Refrigerator Got its Hum* (Milton Keynes: Open University Press, 1985).

5. Langdon Winner, "Do artifacts have politics?," *Daedalus*, Vol. 109, No. 1, Winter 1980, pp. 121-136. For a critical perspective, see Bernward Joerges, "Do politics have artefacts?," *Social Studies of Science*, Vol. 29, No. 3, June 1999, pp. 411-431.

6. The classic work, much criticised but immensely influential, is Harry Braverman, *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century* (New York: Monthly Review Press, 1974).

7. 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, Mass.: MIT Press, 1987); Michel Callon, John Law, and Arie Rip, *Mapping the dynamics of science and technology: Sociology of science in the real world* (London: Macmillan, 1988); Brian Elliott (ed.), *Technology and Social Process* (Edinburgh: Edinburgh University Press, 1988); Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society* (Milton Keynes: Open University Press, 1987); Bruno Latour, *The Pasteurization of France* (Cambridge, Mass.: Harvard University Press, 1988); John Law (ed.), *Power, action and belief: A new sociology of knowledge?* (London: Routledge and Kegan Paul, 1986).

8. Olga Amsterdamska, "Surely you are joking, Monsieur Latour?" *Science, Technology, & Human Values* Vol. 15, 1990, pp. 495-504; Pam Scott, "Levers and counterweights: A laboratory that failed to raise the world." *Social Studies of Science*, Vol. 21, 1991, pp. 7-35.

9. Langdon Winner, "Upon opening the black box and finding it empty: social constructivism and the philosophy of technology," *Science, Technology, and Human Values*, Vol. 18, No. 3, Summer 1993, pp. 362-378. See also Stewart Russell, "The social construction of artefacts: a response to Pinch and Bijker," *Social Studies of Science*, Vol. 16, 1986, pp. 331-346, a critique of another constructivist approach called "social construction of technology."

10. There are no central references on this approach. Some representative works are David Elliott and Ruth Elliott, *The Control of Technology* (London: Wykeham, 1976); Ivan Illich, *Tools for Conviviality* (London: Calder and Boyars, 1973); Richard E. Sclove, *Democracy and Technology* (New York: Guilford Press, 1995); Langdon Winner, *The Whale and the Reactor: A Search for Limits in an Age of High Technology* (Chicago: University of Chicago Press, 1986).

11. Harvey M. Sapolsky, "Science, technology and military policy," in Ina Spiegel-Rösing and Derek de Solla Price (eds.), *Science, Technology and Society: A Cross-disciplinary Perspective* (London: Sage, 1977), pp. 443-471 makes this point nicely, commenting that, in the shadow of weapons development, there is some work "in repairing battle wounds, in making rations more tasty, and in preventing machinery from rusting" (p. 459).