Chapter 5

Mario Bunge's Systematic Definition of Technology

Mario Bunge is my first non-president here, though he was a candidate for president in the very first election for the presidency of the Society for Philosophy and Technology. He had already had, in the late 1970s, a long and very productive career, including a reputation as one of the pioneer philosophers of technology in the world. He had contributed to the first major symposium on philosophy of technology, held in 1966 under the auspices of the Society for the History of Technology; the papers were published in the SHOT journal, *Technology and Culture.* He was already a good way into his multi-volume magnum opus, *Treatise on Basic Philosophy* (first volume published 1974), though volume 7, which includes his most complete treatment of the philosophy of technology, wouldn't appear until 1985.

Bunge is now professor emeritus at McGill University in Montreal.

Bunge's list of books is much too long to list here; the relevant works related to philosophy of technology (not always obviously) are listed in the bibliography at the end of the book.

In his own words in "The Scientific Philosophy of Mario Bunge" (1974): "The Treatise encompasses what the author takes to be the nucleus of contemporary philosophy, namely semantics (theories of meaning and truth), epistemology (theories of knowledge), metaphysics (general theories of the world), and ethics (theories of value and of right action). Social philosophy, political philosophy, legal philosophy, the philosophy of education, aesthetics, the philosophy of religion and other branches of philosophy have been excluded from the above quadrivium either because they have been absorbed by the sciences of man or because they may be regarded as applications of both fundamental philosophy and logic. Nor has logic been included in the Treatise although it is as much a part of philosophy as it is of mathematics. The reason for this exclusion is that logic has become a subject so technical that only mathematicians can hope to make original contributions to it. We have just borrowed whatever logic we use. The philosophy expounded in the Treatise is systematic and, to some extent, also exact and scientific. That is, the philosophical theories formulated in these volumes are (a) formulated in certain exact (mathematical) languages and (b) hoped to be consistent with contemporary science.

"Now a word of apology for attempting to build a system of basic philosophy. As we are supposed to live in the age of analysis, it may well be wondered whether there is any room left, except in the cemeteries of ideas, for philosophical syntheses. The author's opinion is that analysis, though necessary, is insufficient—except of course for destruction. The ultimate goal of theoretical research, be it in philosophy, science, or mathematics, is the construction of systems, i.e. theories. Moreover these theories should be articulated into systems rather than being disjoint, let alone mutually at odds.

"Once we have got a system we may proceed to taking it apart. First the tree, then the sawdust. And having attained the sawdust stage we should move on to the next, namely the building of further systems. And this for three reasons: because the world itself is systemic, because no idea can become fully clear unless it is embedded in some system or other, and because sawdust philosophy is rather boring." (From the general preface to the *Treatise on Basic Philosophy*, vol. I, 1974, pp. v–vi.)

Bunge's application to philosophy of technology can be seen in the following selection from volume 7, part II of *Treatise* (I have used the1990 edition, pp. 231–232): "Technology may be conceived of as the scientific study of the artificial or, equivalently, as R&D (research and development). If preferred, technology may be regarded as the field of knowledge concerned with designing artifacts and planning their realization, operation, adjustment, maintenance and monitoring in the light ofscientific knowledge. (Recall . . . that an artifact can be a thing, a tate or a process, and that it can be physical, chemical, biological, or social.) This definition may be spelled out as follows with the help of concepts elucidated in the previous section. . . .

"A family of technologies is a system ***T*** every component of which is representable by an eleven-tuple ***T***= <C, S, D, G, F, B, P, K, A, M, V> (p. 231).

"Here:

C = a professional *Community* within

S = a larger *Society*

D = *Domain* of objects, natural, artificial, social

> G = *General outlook* or philosophy: epistemologically realist but also pragmatic
>
> F = Formal background of logic and mathematics
>
> *B = specific Background of data, hypotheses, methods, and designs of* related fields
>
> P = *Problems,* all related to D or some other item in the set
>
> K = *Knowledge*: data, hypotheses, and designs of the field
>
> A = *Aims*, especially inventing new artifacts or new uses for old (including social) artifacts
>
> M = *Methods,* both scientific and technological
>
> V = *Values,* especially the value of using science and technologyfor the benefit of society and (1) there is always at least one other partially overlapping family of technologies; and (2) the sets change over time as a result of their own R&D activities."

As defended by Bunge, this *systems* definition presupposes an approach that identifies systematization with an exact—and preferably mathematical—formulation in the manner of theorizing within pure science. Furthermore, Bunge thinks that the ideal limit of this general approach is a set of mathematical systems (though General Systems theory—see von Bertalanffy, 1973—is controversial, especially in the singular, he nonetheless adopts it). General systems theory, Bunge admits, cannot alone solve any particular problem, but he thinks that using it can help *pose* problems—identifying their components, couplings among these components, and relations to an environment—in ways that make solutions more likely. Bunge refers to examples, including the general theory of machines, automata theories (deterministic and indeterministic), linear systems theory, cybernetics, statistical information theory, catastrophe theory (his addition to the list), general Lagrangian equations, and (here Bunge say he has strong reservations) decision theory. Moreover, Bunge insists that systematizations, wherever possible, ought always to be consistent with the findings of contemporary science. (See also Padilla, 1993.)

Using this approach, Bunge claims to be able to address, in a comprehensive fashion, problems in the ontology, epistemology, action theory, and axiology (both valuation and codes of ethics) of technology (Bunge, 1979). But even this does not exhaust the comprehensiveness claims that Bunge makes. He also includes a "systematist" social theory, "systemic emergent materialism" (which repudiates while at the same time also embodying aspects of two opposed theories, atomistic individualism and ontological holism), along with a commitment to both "social technology" (Bunge's phrase for a broader function which includes what others call social engineering) and a flexible, democratic control of social technologies.

To a certain extent, Bunge is saying no more here than that philosophers should be as clear as possible about "exactly" what they mean (he advocates "exact philosophy") when they talk about technology (or anything else). But his insistence on exact mathematical formulation coupled with support from the data of science can be thought to carry the search for clarity and precision too far. In any case, there can be no doubt that broadscale critics of technological culture, like Jacques Ellul (1964), would object to Bunge's entire approach as not a critique but an uncritical, wholesale endorsement of science-based technology with all its rationalist presuppositions.

Bunge's reply to this objection is to concede, but also to turn the objection against such critics. He says that they cannot even pose a clear problem for solution with such sweeping characterizations of Technology (Ellul's Technique); you have to be *clear* about *particular* technological communities, including their goals and values as well as their knowledge limitations, before you can even think about controlling them democratically for the benefit of society. (We will see Joseph Pitt echo Bunge on this point in Chapter 9, below.)

Moreover, even a friendly critic like Friedrich Rapp (1991) can say that Bunge's version of an assessment of technology goes too far. Though the goal of precise characterization may be good, it leaves issues about which values to choose up in the air and thus fails to solve the very problems it is aimed at helping to solve.

Again Bunge has a reply. Issues about value choices *must* be left up in the air; even if we choose to oppose particular choices, we need to know what they are before opposing them.

Rapp's rebuttal challenges Bunge to be precise about what his choices would be in particular cases. To which Bunge replies that he has: he is all for *democratic* values. More particularly, he is opposed to capitalists and small-minded conservatives, especially religious conservatives, who want to *undermine* those values in the name of pseudo-technologies that have no more scientific validity than psychoanalysis or pseudo nostrums for the "reform" of education.

Other philosophers have other objections. I would enlist Aristotelian Martha Nussbaum (1986) to offer an objection to what she sees as technicism (not specifically to Bunge), which she identifies with a Platonic approach to ethics. The wise or prudent person never trusts technical exercises in preparing to face life's uncertain outcomes. A measure of belief in fate or luck is always wiser and more prudent. This kind of objection, Nussbaum quickly found out, can be turned into a conservative objection to any and all social engineering. According to conservative critics, social engineering, whether science-based or not, makes the problems it addresses worse rather than better. The way to face life's problems is with faith—in God or in the traditional ways of handling the fickleness of fate. (See Kirk, 1953; this is the view of Ellul, 1954 [1964], according to Lovekin, 1991.)

Bunge's reply would be that he is not proposing a technicism, and certainly not of the Platonic sort. But you do need technical exercises in order to be clear about what is at stake in particular controversies. As for opposing social engineering, what better examples do we find in history than religious conservatives' indoctrination-of-the-young education schemes?

At the opposite end of the political spectrum, Marxists (see, for example, Marcuse, 1964) and other radical critics (see Winner, 1977 and 1986) tend to see Bunge's formulation as no more than a careful delineation of the *status quo*, leaving all the power in the hands of those who now wield it, namely the managerial classes. (On the issue of whether some managers can be won over to help achieve worker control of the means of production, see Feenberg, 1991.)

It would be easy for Bunge to reply that his background was as Marxist as theirs (I'm not aware that he ever actually said this), *but* such undemocratic control is a good reason to be clear about these issues. If you don't know what the *status quo* values are, including how they impact *particular* technical communities, how are you going to challenge the managerial classes and their control of workers—including such technical workers as engineers?

Even those who share Bunge's confidence that particular technologies can be controlled democratically would place more emphasis than Bunge does on the activist politicking that is going to be needed if participatory values are to win out over managerial values in the democratic control of technology (see Chapter 12 on Feenberg, and Durbin, 1992, as well as Chapter 14 on Hickman).

But Bunge even has a reply to this: he's not necessarily opposed to activism, but that's not philosophy, certainly not his brand of "exact" philosophy.

Finally, there are those who say that Bunge's presupposition of a clear distinction between facts and values is misguided from the outset. Even Bunge's ideal of basic science sought purely for its own sake, as actualized in real-life scientific communities, is constrained by needs of technological survival (see Margolis, 1984 and 1986, and Chapter 6 below). It is also socially constructed along the ideological lines of powerful groups in society (see, for example, Latour and Woolgar, 1979, and Pickering, 1992, as well as Chapter 25 below).

Bunge doesn't say it in reply to social constructionists (he despises them), but he views the distinction of facts from values—along with a whole set of other clear and exact distinctions—not as society dictating to applied scientists and engineers what is true or false, right or wrong, but as something necessary to a systematic account. To deny clear distinctions is to revert to the fuzzy philosophy that exact philosophy is supposed to challenge.

But, these final objectors retort, to try to be absolutely clear about all the constituents of our technological world, along the lines of Bunge's exact philosophy, does not, in the end, solve the crucial philosophical problems he claims to have a solution for.

In Bunge's defense, we should recall that he doesn't talk about solutions but about clearly *posing* problems so that conclusions will come more easily. Nevertheless, he must defend the values he wants to see embodied in technological systems, and he must overcome strong philosophical objections (see Margolis in Chapter 6) to the clear fact-value distinction his approach presupposes. In my opinion, this may be Bunge's weakest point: he simply assumes we can be clear about what is fact and what is value, and that the two don't intertwine in ways that undercut the distinction.

So to sum up the controversies: as a staunch defender of *science*—though Bunge had *Marxist* roots and never lost his social meliorism orientation—he is clearly *expertist.* His opponents are "unclear" thinkers of any stripe—his most vociferous condemnations, for example, fall on psychoanalysts, among the social engineers he would otherwise welcome. Bunge's clear fact/value distinction is opposed by Margolis (Chapter 6), among others. Bunge doesn't actually say much about Heidegger, but he clearly opposes Heidegger's Nazi connections, along with *idealism* of any kind, as well as doctrinaire Marxism. A number of European philosophers of technology—for example, Miguel Angel Quintanilla (1996; see also Agazzi and Lenk, 1997, along with Chapter 13 on European philosophy of technology)—follow Bunge's lead. But they are also countered by resolute opponents of positivism among recent philosophers of science (best represented here in Chapter 11 on Ihde)—as well as by social constructivists (see Chapter 25).