



Techné:

Research in Philosophy and Technology

Special Issue:

**PHILOSOPHY OF TECHNOLOGY:
IN SEARCH OF DISCOURSE
SYNTHESIS**

a book by
Paul T. Durbin

Volume 10 Number 2 Winter 2006

**PHILOSOPHY OF TECHNOLOGY:
IN SEARCH OF DISCOURSE SYNTHESIS**

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An Introductory Essay: A Framework for Understanding Philosophical Controversies

When I wrote my *Dictionary of Concepts in the Philosophy of Science* (1988), for a Greenwood Press series edited by Raymond McInnis, I did my best to keep the tone evenhanded and encyclopedic. So when I volunteered—over a decade ago—to do a follow-up on philosophy of technology, I thought I could do the same. But my reason for volunteering in the first place was my long involvement with the Society for Philosophy and Technology as editor of most of its publications up to that time. Now that very reason seems to me to be an obstacle to keeping myself out of the controversies I talk about. I have an opinion on the work of every philosopher of technology I discuss here, and it now seems to me highly artificial to try to keep my opinions out of the story. So I won't. I will still try to be fair to the defenders of the viewpoints I talk about, but I won't hide my opinions, including my disagreements with particular philosophers where I have disagreements. In at least some of my accounts of controversies, I will join right in.

That is also why I have chosen an essay format for the book, rather than the encyclopedic style I felt constrained to use in the earlier book. This book looks at discourse within the community of philosophers who have taken technology and particular technologies as the focus of their analyses (or syntheses)—preeminently in the Society for Philosophy and Technology, and mostly in the United States, beginning around 1975. It is primarily to them that I address the book—though in the end I will argue that our disagreements have broader implications than we may have thought about, consciously, as we were engaging one another in our intramural disagreements within SPT.

My perspective throughout the book—in studied contrast to the proposal of Raymond McInnis (see his *Discourse Synthesis: Studies in Historical and Contemporary Social Epistemology*, 2001), that disciplines coalesce around what McInnis calls “discourse syntheses”—is to focus on the *disagreements* with other authors that show up in each philosopher's body of work.

To make this fly, I mention briefly McInnis's key idea, that knowledge communities—preeminently science communities but others as well—work toward a *consensus* on what constitutes genuine knowledge in (and the goals of) a given field. This includes not only key concepts but methods and values, respect for the community, and so on. And knowledge communities, according

to McInnis, have since the seventeenth century assumed that valid knowledge, especially scientific knowledge, is *cumulative*. There has also been a persistent claim, since Francis Bacon, that knowledge is power, and that power to control nature leads to social improvement. *How* knowledge becomes cumulative or progressive (at least internally, within the disciplines) is what synthesizing amounts to.

My Project

Many philosophers of technology within the SPT community have worried more about impacts outside academia than they have about cumulativeness (or not) within the academic community. By the end of the book I think the reader will see that at least for a significant part of philosophy of technology some philosophers at least *claim* to be able to help solve sociotechnical problems of our technological culture—although, as we will see, individual philosophers follow different paths toward this common goal. Some even think it can best be achieved through improvements in the status of the discipline within academia. This issue, of the social utility (or lack thereof) of philosophy, has been around almost since the beginning of philosophy in the Western tradition. In my view, it has been one core issue within the SPT community throughout its short 30-year history. There are, moreover, a number of other key issues that will show up in these pages again and again. It is my hope that this book will show that—in opposition to many critics of the philosophy of technology (and as we will see there are many)—the discipline (and I do not, at least not yet, call it an academic field) has much to offer that will be of interest not only to the broader community of philosophers but also to our culture.

Returning to the question of a consensus or not within the field, since Thomas Kuhn's *Structure of Scientific Revolutions* (1962), the supposed cumulativeness even of science has come under attack. Parallel with this development there arose another concern, about whether the scientific disciplines and their supposed offshoots in technological development were in fact making the world better. Critics, indeed, pointed to how they were making the world, including the environment, worse. All of this has culminated in so-called postmodernist or social-constructionist attacks on the hegemony of science in modern culture.

Obviously I am more sympathetic toward this viewpoint, or set of viewpoints, than I think McInnis is—though he did include in the 2001 volume a contribution by Steve Fuller, who is one of the leading social constructionists. What I offer in

this booklength essay may not be exactly constructionism, but it is definitely a pluralism. I wouldn't even dream of saying at this point what the consensus is among philosophers of technology—I leave the question open for the moment whether there is a consensus—within the field in general or within any particular group of philosophers of technology. But I must admit from the outset that among the earliest intellectuals calling themselves philosophers of technology there were many critics who were convinced that technology is, on balance, bad rather than good for our technological society. This is the grain of truth that lends weight to criticisms of the field as a whole. But I hope to show convincingly that it is by no means the whole story.

Some key texts with which to situate ourselves within what I have called a "philosophy of technology/philosophy and technology" discourse seem to me to be Randall Collins's *The Sociology of Philosophies: A Global Theory of Intellectual Change* (1998). There, as I do here, Collins focuses on controversies, covering an amazing range from the Greeks through various controversies within and among philosophical schools in both Western and non-Western societies up to the early twentieth century in the USA. Collins's focus is distinctly on *intellectual* change rather than on social change.

Nicholas Mullins's *Theories and Theory Groups in Contemporary American Sociology* (1973) is closer to McInnis; at the same time Mullins emphasizes that in the sociology of the middle part of the twentieth century there was not one dominant discourse synthesis but several. So his book is decidedly *pluralist*.

And of course we should not forget McInnis himself (2001). In his book, McInnis not only lays out his basic idea but introduces a series of other people's takes on the discourse synthesis idea in different fields—including a contribution I wrote on the place of encyclopedias in the history of discourse syntheses. However, McInnis is also pluralist, in the sense that he emphasizes *local* syntheses rather than any grand synthesis even in a single field such as philosophy or sociology—though, like Collins, his interests are primarily *intellectual*.

Against this background I place three books addressed to the issue of a community of philosophers "of" or "and" technology: Carl Mitcham's *Thinking through Technology* (1994) I view here as a premature attempt at synthesis. We will see that what he seeks is a metaphysical synthesis, which, if at all, could lead to social reform only in the long run.

My edited volume in the Philosophy and Technology (Kluwer) series, *Philosophy and Technology*, volume 7: *Broad and Narrow Interpretations of Philosophy of Technology* (1990), summarizes some of the problems of the would-be field in the middle period. And one of the chief problems I talk about is based on the claim of some philosophers in the field who wanted at all costs to *keep it from* becoming an academic subspecialty.

Finally in this connection, editors Higgs, Light, and Strong in *Technology and the Good Life?* (2000) make a strong case that there is a good candidate to become the beginning of a *new academic field*, specifically in the writings of Albert Borgmann and reactions to them. Their concern is obviously academic, but many things they say in defending the new venture suggest that they want it to spread its concerns to other areas of public interest, possibly including social reform, as the title might suggest.

Returning to my book, this book—which was supposed to focus on concepts in the philosophy of/and technology—in my mind it was always *conceptual issues* that I wanted to focus on, and in our field one key issue has had to do with arguments over whether or not, and to what extent, it ought to be academic.

I have also now come to depend heavily on sketches—sketches of *intellectual disagreements* rather than personal sketches—which is why I came to feel more confident, after a slow start, about completing the long-delayed project. Another reason for optimism is that I have limited my scope, both in terms of the time period and in terms of the persons and controversies discussed. The main method will be reviews, not just of one major book but of the body of work of *the central figures in the first 30 years* of the Society for Philosophy and Technology.

Since I claim that discourse synthesis has not—at least not as yet—been achieved among the philosophers studying technology or particular technologies, I need some other organizing principle. Why? Why does one need an organizing principle for a venture of this sort? Well, my initial orientation in philosophy was Aristotelian (though I now consider myself a pragmatist following in the footsteps of the major figures in American Pragmatism, especially John Dewey and G.H. Mead). In an Aristotelian approach, especially an Aristotelian encyclopedic approach, it is thought to be important to lay out a framework within which to view intellectual controversies in any field of philosophy, from metaphysics to the philosophy of art. This is partly for teaching purposes, to help

people who are new to a field to orient themselves when they are just beginning. But it also has an intellectual purpose: in order to understand where people are coming from (in that hackneyed phrase) when they attack one another, it is helpful to have a list of *places*, a road map so to speak, to identify various “wheres,” and sometimes even to predict where attacks are likely to come from or against whom they are likely to be addressed. The best-known spokesman and utilizer of this Aristotelian approach was Mortimer Adler, not only in *The Great Books of the Western World*, including volumes 2 and 3, *The Great Ideas of the Western World*, but also in the *Propaedia* included within *The Encyclopedia Britannica* in recent decades. Adler and a group of co-workers also produced a series of concept volumes, including for example *The Idea of Freedom*, in which they also arranged controversies against a background or framework.

My framework is in this Adlerian tradition, though less grandiose. I simply let philosophers who study technology identify their own positions within a broad framework, spelled out by the philosophers themselves as they engage in controversies with other philosophers. Details of this broad framework I save for a concluding essay at the end of my book. But I can say for now that defenders of one or another approach identify themselves by their opposition to (at least one of) the other approaches. (Collins also says philosophers identify themselves in terms of their opponents, though he apparently felt no need for a framework.)

Some early hints of my approach can be found in a Society for Philosophy and Technology publication (see Cuello and Durbin in *Technè 1:1* <http://spt.org/journal>). Cesar Cuello and I included a note on methodology. We said that making explicit the methodology used in discovering the underlying assumptions of parties to sustainability debates in environmental philosophy can move us toward links with the philosophy of technology. Knowing the risks, we nonetheless utilized the scheme of Walter Watson in *The Architectonics of Meaning: Foundations of the New Pluralism* (1985). We certainly did not endorse the exaggerated claim (on that book’s cover) that Watson has devised “the first truly useful taxonomy of all ideas,” but, stripped of such bloated claims, Watson’s book offers an interesting hermeneutic, and one should note his keyword is “pluralism.”

I am going to deal with these ideas at slightly greater length in the essay at the end of the book, but here I summarize Watson’s view, that every author or public speaker, in *any* discipline or field, betrays his or her philosophical assumptions by differentially utilizing the four necessary components of any piece of

literature:

author's *perspective* (which may be entirely personal or that of a tradition and may be hidden even from the author);

objects discussed;

the text itself, and especially the *methods* that link items to one another;
and

the goals or *principles* (ideals, values, etc.) that drive or motivate the text, which almost always reflect sets of background assumptions, such as the cultural values influencing both individual authors and intellectual traditions.

According to Watson, authors or speakers who stress objectivity above the other three components employ a *scientific* writing style (though that is not Watson's term for it). They tend also to use logical methods, invoke *reductionistic* aims, and try to avoid values as much as possible. Authors, on the other hand, who consciously stress values and see the objects of their discourse as this-worldly shadows of otherworldly realities—typically linking the two by a method explicitly referred to as *dialectical*—Watson links to Plato. These *idealist* philosophers (using the term in a loose sense) tend to emphasize comprehensiveness, and often disparage narrow technical scientific knowledge. Authors who stress method and discipline (in the school subject matter or *professional discipline* sense), and who emphasize the pigeonholing of objects within large *encyclopedic* schemes, Watson links to Aristotle.

The fourth perspective requires elaboration. A significant feature of Watson's scheme, (which represents a break with his mentors, especially Richard McKeon), is his recognition of this fourth basic group. Authors in the group emphasize their own subjective *perspective*, their own *creativity*, as an end in itself. In terms of method, they often tend to be anti-methodical, to utilize any means that will move the narrative (story, drama, etc.) along. Watson links this group to the Greek Sophist Protagoras (for whom humans are “the measure of all things”), and defends this as a philosophical perspective fully parallel with the other three.

Finally, it should be noted that Watson acknowledges that the four basic groups

do not exhaust the stylistic field; many authors combine modalities. For example, as Watson recognizes, almost all the great philosophers of the modern period, after Descartes, have tended to use hybrid styles. Even so, a hybrid style is recognizable—Watson thinks—as a joint use of two or more of the four basic styles. (For sample hybrid styles, see Watson’s index, beginning with Descartes.)

This is a hasty account—maybe even more idiosyncratic than Watson’s own—of an enormously complicated scheme. But it may be enough to suggest that a hermeneutic approach, roughly along Watsonian lines, can help discover philosophical presuppositions implicit in the language used in *philosophical debates*. However, where Watson’s aim seems to be Aristotelian, (to pigeonhole authors), Cuello and I called our aim (in Watson’s terms) *creative*. We wanted to *let the authors have their own say* about what it is they want to emphasize in the sustainability debate.

Cuello and I went on to attempt to figure out the mostly implicit philosophies of technology latent in recent controversies over the meaning of the slogan “sustainable development.” I am recommending the same approach here for all the controversies among philosophers of technology that I take up in this book.

Whatever the merits of this scheme, here is some concrete background for my analysis in this book:

- a. Collins, agreeing with Mead, says that people *define themselves* through interactions with others; here that means that philosophers define themselves by their disagreements with other philosophers. No one should ever put people—especially not philosophers—in boxes. If one insists, they can be viewed as doing that themselves, at least implicitly, when they take on particular opponents.
- b. In a controversy-based framework like Watson’s, there would be hundreds of philosophers in each quadrant, indeed hundreds of very independent thinkers with idiosyncratic opinions. If you count all the philosophers in all the universities and philosophical societies just in the USA, not to mention philosophers who work in non-university settings in education, government, and industry, as well as totally independent thinkers such as professional writers, then the total comes to more than 100,000. In round numbers, that *could* mean upwards of 25,000 very

independent thinkers in each quadrant, each ferociously resisting pigeonholing, and opposing other approaches. (Obviously in a small field such as philosophy of technology there are far fewer in each quadrant, but the point is to avoid pigeonholing even small numbers of cantankerous philosophers.)

- c. Just like anyone else in a dynamic real-world environment, philosophers change their views, especially as they take on new opponents. Any grid should be used in a fluid and dynamic way.

Even with all these qualifications, we must still be careful. If we are, it seems to me not only helpful but possibly even necessary to have some sort of framework for analysis, if only to preserve one's sanity or to get a useable book before the public.

Now for a preliminary outline of the book—based on a list of presidents of SPT and other philosophers associated with the group, including more or less regular attendees at society meetings—here is my outline by parts:

Part 1. Philosophers of Technology Move Away from Philosophy of Science.

This focuses on the first four presidents of SPT (Carl Mitcham, Alex Michalos, Kristin Shrader-Frechette, and Marx Wartofsky, along with early board member Edmund Byrne), and outsiders (though they too attended SPT meetings) such as Joseph Agassi and Joseph Margolis. Mario Bunge did not attend any meetings, but was a supporter from a distance.

Part 2. The Field Refuses to Jell.

This covers presidents Joe Pitt to myself, and includes many board members and meeting attendees, from Andrew Feenberg to Frederick Ferre; the exception is Steven Goldman, but even he has been a frequent contributor to SPT publications. Full list: Joe Pitt, Don Ihde, Langdon Winner, Andrew Feenberg, Jose Sanmartin, Larry Hickman, Goldman, Ferre, Donald Verene, Alois Huning representing international contacts, and myself.

Part 3. Attempts to Establish an Academic Discipline.

I start this with Higgs, Light, and Strong in the Borgmann festschrift volume,

because it claims to start a new discipline. I then include a chapter on our colleagues in the Netherlands, who also tend to think in disciplinary terms. I then loop back to Deborah Johnson, with her focus on ethics in engineering and computer science. This is followed by a chapter featuring the next SPT president, Andrew Light (of the new-discipline claim, above) and the important work of some philosophers of technology in environmental philosophy. Next I look at someone who has never been connected with SPT, Sheldon Krimsky, because of the importance today of controversies over biotechnologies of all kinds. Paul Thompson, who specializes in biotechnology in agriculture, comes next. Someone might argue that each of these sets of controversies amounts to (or could or should in the future amount to) one of a set of subspecialties in the philosophy of technology. Then I take up a less well-known topic that I feel is both important and neglected: what Larry Hickman and Andrew Light call “quotidian” technologies, especially films or the movies, but including as well other topics often missing in the “elevated” SPT discourse. Finally, I end with challenges to disciplines of all kinds, in “social constructionism” and/or postmodernism, where longtime SPT member Raphael Sassower has been the society’s most vociferous spokesperson, and where I will also include fellow-traveler Steve Cutcliffe, a historian of technology, who has ably summarized the Science, Technology, and Society part of this attack on academicism.

Note on quotation styles: in putting together this book: I have shamelessly used three kinds of sources, in addition to normal quoting. I believe that is almost essential in an account of this type.

As for “normal” quoting:

1. I violate a number of rules (e.g., in *The Chicago Manual of Style*) about the length of quotations that are permissible. In general, I will use quotation marks, rather than blocked quotes, for such material. Where I thought it necessary, I have sought permission from the publishers of the material.
2. The really difficult problem, however, comes with my use of material I have published elsewhere. For material I have published previously I follow the normal conventions in number 1, above—including seeking permission where necessary—except that I do not put the material in quotes. Even though not written expressly for this volume, the words are all my own.

3. For material quoted at length from SPT publications, whether or not I was the editor of a particular volume, I have received special permission from those who hold SPT copyrights.

Permissions and Acknowledgements

Because I have used so much material here that was not written specifically for this volume, I need to address acknowledgment and permissions issues. I can do so chapter by chapter. In Chapter 1, the only extensive quoting is from a review I did of Carl Mitcham's *Thinking through Technology: The Path between Engineering and Philosophy* (1994); the review appeared in a Canadian journal, *Philosophy in Review*, June 1997. I acknowledge that source but do not need permission for my own work. In Chapter 2, I had some difficulty getting permission from the publisher, Free Press, for the long Alex Michalos quote from my edited volume, *A Guide to the Culture of Science, Technology, and Medicine* (1980, 1984), so Michalos redid that material especially for this volume. I thank him and acknowledge Free Press as the original source. In Chapter 3, I used a translation of my own review essay, in Spanish, in *Isegoria*, October 1995, of three books by Kristen Shrader-Frechette. In Chapter 4, I use a long quote, on the persistence of Marxism after the collapse of the Soviet Union, from my book, *Social Responsibility in Science, Technology, and Medicine* (1992). In Chapter 5, I use a relatively short quote from Mario Bunge's *Treatise on Basic Philosophy*, volume 7 (Reidel, 1985). In Chapter 6, I use a long and complicated quote from Joseph Margolis that appeared originally in volume 5 of the *Philosophy and Technology* series, entitled *Technological Transformation: Contextual and Conceptual Implications* (Kluwer [now Springer], 1989) edited by Edmund Byrne and Joseph Pitt. I was the general editor for that volume, and Joseph Pitt has added his permission to use the material in his capacity as co-editor; I acknowledge Kluwer as the original publisher. In Chapter 7, I use a similar long and complicated quote from Joseph Agassi that appeared in volume 1 of *Research in Philosophy and Technology* (JAI Press [now Elsevier], 1978), which I edited; I acknowledge JAI Press as the original source. For Chapter 8, I used a long quotation, reviewing Edmund Byrne's *Work, Inc.* (1990), from my *Social Responsibility in Science, Technology, and Medicine*. In Chapter 9, the only quote needing acknowledgment is a short one, from Joseph Pitt's *Thinking about Technology: Foundations of the Philosophy of Technology* (Seven Bridges, 2000). In Chapter 10, I acknowledge Paragon House for permission to use several quotes from Don Ihde's *Philosophy of Technology: An Introduction*

(1993). In Chapter 11, I used material from my *Social Responsibility in Science, Technology, and Medicine* to review the work of Langdon Winner. In Chapter 12, I acknowledge permission from Sage Publications to use a long and complicated quote from a review in *Science, Technology, & Human Values* by Andrew Feenberg in a book by Sandra Harding. In Chapter 13, I have permission from Carl Mitcham, editor of the volume and author of the material quoted, to use a quote from the introduction to his *Philosophy and Technology in Spanish Speaking Countries* (Kluwer [Elsevier], 1993); I acknowledge Kluwer as the original publisher. In Chapter 14, a couple of longish quotes of material on Larry Hickman come from *Technè* (7:1, Spring 2003), a number that I edited. In Chapters 15, 16, and 17, there are no quotations long enough to require permission. In Chapter 18, I used material reviewing the work of Albert Borgmann from two of my publications, *Social Responsibility in Science, Technology, and Medicine*, and a contribution I made to *Technology and the Good Life?* edited by Higgs, Light, and Strong (University of Chicago, 2000). In Chapter 19, I use Pieter Tijmes's "Preface: Dutch Chandeliers of Philosophy of Technology," from *Technè* (3:1, Fall 1997), and a review I did of Hans Achterhuis's *American Philosophy of Technology* (2001), which appeared in *Metaphilosophy* (35:4, July 2004). In Chapter 20, I use a long quote from an article I wrote for the *Bulletin of Science, Technology, and Society*. In Chapter 21, there are no quotes requiring permission or acknowledgment. In Chapter 22, Praeger kindly gave permission for a long quote from Sheldon Krimsky's *Bioethics and Society* (1991). For the long quotations from Paul Thompson's *Agricultural Ethics* (Iowa State University Press, now Blackwell, 1998) in Chapter 23, I had to pay Blackwell. There are no quotes requiring permission in Chapter 24. Finally, for Chapter 25, I received permission from Rowman & Littlefield to use material from Stephen Cutcliffe's *Ideas, Machines, and Values: An Introduction to Science, Technology, and Society Studies* (2000).

Specific page references and acknowledgments are made in the text, not only for quotes requiring permission but also for quotes falling within the guidelines of the *Chicago Manual of Style* for scholarly quotation.

Part 1. Philosophers of Technology Move away from Philosophy of Science

Chapter 1

A Premature Attempt at Discourse Synthesis: Carl Mitcham in Thinking through Technology

I begin with a sketch of Carl Mitcham. He was educated at the University of Colorado (B.A., M.A.) and Fordham University (Ph.D.). Currently Professor of Liberal Arts and International Studies at the Colorado School of Mines, he has taught previously at Berea College (Kentucky), St. Catharine College (Kentucky), Brooklyn's Polytechnic University, and Pennsylvania State University. Throughout his career—according to one of his self reports—Mitcham has reflected on the nature and meaning of living in a “high-science, high-technology society,” in both general and particular terms. Although critical assessment of particular technoscientific practices and achievements is crucial, and where reflection must begin, particular assessments do not (he says) exhaust the challenge of technoscience.

Mitcham's publications are almost all relevant to this book. To set a pattern for my book, I will not list them here. They are included in the bibliography at the end, where citations are arranged by chapter.

Mitcham deserves more credit than anyone for enlisting an organized group of philosophers in the serious study of technology, previously relegated to sporadic discussions here and there. Mitcham and Robert Mackey produced a heroic initial effort aimed at achieving this in 1973, with the publication of the first version of their bibliography of the philosophy of technology in the history of technology journal, *Technology and Culture*. Mitcham also worked closely with me on the invitation list for the 1975 conference on philosophy and technology at the University of Delaware that led, shortly thereafter, to the formation of the Society for Philosophy and Technology. He was also the first elected president of SPT.

Mitcham is clearer than most early philosophers of technology in having spelled out his agreements and disagreement with others in one major book, *Thinking through Technology: The Path between Engineering and Philosophy* (1994).

I was asked to review that book for *Philosophy in Review* (June 1997). What follows is repeated here, almost verbatim, from that review.

I said there that because of my long association with Mitcham as collaborator and editor, but also as friend—I had refereed the original bibliography for *Technology and Culture* and championed its publication—I may not have been the most objective reviewer of one of his books. But I take that risk now as I did then. I do have, as longtime editor of the publications of the Society for Philosophy and Technology, a unique perspective on the philosophy and technology field, so I hope I can be sufficiently objective. (For that matter, I have become a friend as well as a colleague of many of the philosophers discussed here in this book.)

I decided to take the review task upon myself for two reasons. First, it had been alleged many times that the philosophy of technology had neither an adequate basic textbook nor an adequate history of the field. Mitcham's book—and I am not the only one to note this—could serve as either or both of these. Second, Mitcham's book seems to me to be important in its own right, in addition to reacting to the kinds of criticisms it was likely to experience. In fact, the book did receive criticisms immediately and undoubtedly will continue to do so.

So I begin this survey of concepts and controversies in the philosophy *of/and* technology in the last quarter of the twentieth century, not only with Mitcham but with this book.

Before turning to Mitcham's own philosophy, together with his controversial stances and the critics' replies, I take up the issue of Mitcham's book as a history or a textbook. How does *Thinking through Technology* fare by contrast with other histories of or primers in this new field? I should say right off that I think an academic discipline—and only some philosophers believe that the philosophy of technology is or ought to become such—does need some sort of basic textbook. I think, furthermore, that historically grounded textbooks are the best kind.

There were five principal English language competitors when Mitcham's book appeared on the scene: Friedrich Rapp's anthology, *Contributions to a Philosophy of Technology* (1974); Rapp's monograph, *Analytical Philosophy of Technology* (1981); Don Ihde's early effort, *Technics and Praxis: A Philosophy of Technology* (1979), along with his later, *Philosophy of Technology: An Introduction* (1993); and Frederick Ferre's *Philosophy of Technology* (1988). Two other books might be mentioned, Larry Hickman's anthology, *Technology as a Human Affair* (1990), and Mitcham's own anthology (co-edited with Robert

Mackey), *Philosophy and Technology: Readings in the Philosophical Problems of Technology* (1972; reprinted with enlarged bibliography in 1983). For comparative purposes here, as with my review in the *Canadian Journal*, I limit myself to the non-anthologies, by Rapp, Ihde (two books), and Ferré.

Among the five books, Mitcham's is far and away the most comprehensive, as well as the best grounded in the history of the field. Mitcham includes a long part one on historical traditions in philosophy of technology, where he summarizes both pro-technology ("engineering") and mostly anti-technology ("humanities") philosophies of technology, along with attempts to reconcile the two—especially efforts in Germany and the United States.

In this historical introduction to his book, Mitcham summarizes contributions by a long list of authors, from Karl Marx and Ernst Kapp in the nineteenth century, to Peter Engelmeier in the early twentieth century, Lewis Mumford, José Ortega y Gasset, Martin Heidegger, and Jacques Ellul in mid-century, and on to Rapp, Hickman, and Ihde, among others. In addition, he discusses the relations of the developing field to philosophy of science, history of technology, and such other disparate fields as theology and political philosophy.

Mitcham has been criticized for not including recent work—recent at that time—in what is generally called the social construction of technology. He would later correct this oversight with a volume he edited in *Research in Philosophy and Technology*, volume 15: *Social and Philosophical Constructions of Technology* (1995).

Though Ihde's *Philosophy of Technology* includes a long discussion of the history of human technological engagements with nature—and something of a history of the philosophy of technology—none of the comparator books comes close to matching the breadth and depth of Mitcham's historical introduction.

Nor can any of the other would-be textbooks match Mitcham's evenhanded discussions of competing viewpoints. Rapp's text is avowedly "analytical" (see Chapter 13 below, on international connections of SPT). Both of Ihde's books are rooted in phenomenology (though the later text does provide a somewhat broader focus). Ferré's—which is the only one that reads like an introductory textbook—ends with a defense of a Whitehead-inspired metaphysics, a holistic critique of narrow technological thinking, not totally at odds with Mitcham's. (For Ihde see Chapter 10; Ferré, Chapter 16.)

Each of these viewpoints can be seen as a source of criticisms of Mitcham's work. To the extent that Rapp's approach is different from engineering philosophy of technology—Mitcham's primary target—Rapp's complaint would be that Mitcham is not analytical enough or not analytical in the right way. But Mitcham views Rapp as falling within the engineering philosophy camp, where we would expect to find more objections to Mitcham. His reply to Rapp is that he is analytical, and includes analyses of technology in terms of ethics, epistemology, and, most important for him, metaphysics. The metaphysics, Mitcham says, is "part Aristotelian, part Heideggerian."

So Rapp might retort, as would most of those Mitcham lumps under the engineering philosophy heading, that metaphysics of almost any kind is the problem with his humanities philosophy of technology. This basic controversy for Mitcham needs to be explored in more detail, but I postpone that for now.

Phenomenology of Ihde's kind—phenomenological analyses of perception as colored by technological means—is, admittedly, something that Mitcham does not do.

Mitcham's reply is that he does do careful phenomenological analyses, in particular of everything that engineers do and think, under his four headings of technology as object, process, knowledge, and volition; it's just that he doesn't do it in Ihde's fashion. Mitcham actually gives Ihde a great deal of credit, though he puts his phenomenology down as pragmatist in effect, and says it (therefore?) doesn't completely escape the engineering philosophy camp.

Ferre's objection, though I don't know of anywhere that he actually says this, would be to Mitcham's kind of metaphysics. Ferre does critique Heidegger, so to some extent that would carry over to Mitcham; but he discusses Aristotelian substantialism only in the most general historical terms. Ferre's metaphysics, in his neo-Whiteheadian process metaphysics (see Chapter 16 below), is opposed to substantialism, so possibly to Mitcham's use of Aristotelian categories, but Ferre's strong religious overtones are something that, on principle, Mitcham ought not object to.

These were some ideas I came up with based on my original review. Mitcham's own version of his controversies with others—at least his side of those controversies—follows.

First, his main controversy throughout the book involves humanities philosophy of technology versus engineering philosophy of technology, including his repeated defense of the humanities approach as better (though itself subject to further controversies).

Next, he does deal, however briefly, with four attempts to mediate between those two major adversaries:

1. He treats German attempts associated with the Verein Deutscher Ingenieure as little more than engineering philosophy in disguise.
2. He treats pragmatism (referring to myself and Hickman as based on Dewey) as a second attempt—and argues that it fails to extricate itself from the engineering pole. That, for me, sets up a controversy, best represented in later chapters (14 and 18) in this book, between Hickman and Borgmann over whether or not non-instrumental values are needed for an adequate critique of technological culture as a whole.
3. Mitcham next treats Ihde's phenomenological philosophy of technology as so closely related to pragmatism that it falls under the same doesn't-escape-engineering stricture as pragmatism more generally. Chapter 10 will deal with this, supplying Ihde's reply.
4. Mitcham also treats Marxism, to the extent he does at any length, in this same context:
 - a. Mitcham says Marx himself ended up leaving a double legacy (see Chapter 4 below). His two candidates follow.
 - b. Political Marxism (especially of the Soviet variety) Mitcham treats especially in terms of the *Man, Science, Technology* (1973) collective book, where Mitcham accuses Soviet thinkers of lapsing into a pure technocracy, clearly subject to the engineering philosophy stricture.
 - c. Neo-Marxism, from Adorno and Horkheimer to Marcuse, to his competitor Habermas, then back to Marcuse-inspired Feenberg (see Chapter 12 below), which Mitcham seems to think is the

best mediation offered so far. Even Feenberg's mediation, however, Mitcham says is “unrealistic,” leaving the charge unelaborated. (I treat that charge in the Feenberg chapter.)

Mitcham also deals with a series of controversies under his detailed accounts of “objects, knowledge, activity, and volition.” Whether technological objects are to be viewed better under the light of an engineering or a humanistic approach I treat under the main controversy. Discussions of the applied science model (p. 199) I take up in Chapter 5. Mitcham's entire chapter on engineering activities (it is a gem) is filled with controversies over likenesses and differences of engineering in relation to crafts and related activities; over the interpretation of invention; or of design, all the way to issues over the use by consumers of engineering products. I would probably single out one in particular as exemplary—Mitcham's treatment of so-called engineering design—but again I save that for a later chapter (Chapter 15).

Mitcham's final detailed discussion, of “volition” in engineering (or a culture that depends crucially on the products of engineering), returns us to the main controversy, Heideggerian culture critique versus an engineering-based technological culture, though the chapter also includes discussions of issues such as technological determinism.

Mitcham's book ends with a defense of a particular viewpoint, in a way that introductions to other fields typically do not. But there is much evenhandedness about dozens, perhaps even hundreds, of different attempts to define a new field.

All of this detail ends up working against the book as a textbook, at least as an introductory text. Too many approaches and too many topics are touched on too concisely for the beginning student to be able to grasp them. At most, in my opinion, the book might serve as a sourcebook for an advanced seminar in philosophy of technology, where advanced undergraduates or graduate students could follow up on particular issues or look for thesis topics.

But I am more interested in the second of the issues I raised above and in my original review in the Canadian journal—the point of view of *Thinking through Technology*, its significance, and the controversial issues that it raises, either directly or indirectly. And the first thing to note is the subtitle, *The Path between Engineering and Philosophy*. Mitcham is at least implicitly suggesting that previous philosophers of technology had seemed to be ignorant of engineering

and related technical fields, an objection that Langdon Winner raised in a *Science* magazine review of the first volume of *Research in Philosophy and Technology*. Winner was giving voice to what would become a longstanding complaint (echoed more than once by Joseph Pitt, as we will see in Chapter 9) that too much of philosophy of technology amounts to critiques of Technology with a capital T. There were, the critics said, too few detailed examinations of actual efforts to control particular technologies at the concrete policy level. Early philosophers of technology had not seemed to take into account to any satisfactory degree what technical professionals actually do, the things they produce, and the values they hold, often claiming, for example, to be working “for the betterment of the human condition.”

Mitcham sets out deliberately to undercut this criticism, almost swamping the reader (at least the reader of his notes and references) in details of what engineers and technical professionals say about the objects they work on, their procedures and methodologies, the knowledge claims they make and defend, and even their values and motives.

This last heading—motives—is the least developed, and Mitcham says that is because neither engineers nor philosophers have written much about it. Mitcham’s chapter, “Types of Technology as Volition,” includes a long and detailed discussion of Heidegger’s eccentric though popular philosophy of technology, and Heidegger is one of the main philosophers whom defenders of technology have in mind when they claim that philosophical critics are ignorant of the real world of technology.

Unfortunately, despite the minute detail on engineering in Mitcham’s notes and references, his critics still accuse him of evaluating technology from an outsider’s perspective. This is partly because he does not do, or even depend upon, any of the detailed studies—historical or sociological—of the development of particular technologies or technological institutions that were available at the time he wrote the book. Mitcham basically concedes this point; that’s why, as I mentioned earlier, he would edit a volume on constructionism and technology. (See Chapter 25 below for my discussion of social constructionism within SPT.)

The crux of the issue here is that “the path between engineering and philosophy” is really a path from engineering to philosophy—in fact, to a humanistic philosophy whose avowed aim is to “take the measure of” not only technology in the abstract but of our modern technological culture as a whole. This is most

explicit in a section headed, “A Brief for the Primacy of Humanities Philosophy of Technology,” but the attitude is pervasive throughout the book.

Mitcham’s reply to this critique is that, “Although critical assessment of particular technoscientific practices and achievements is crucial, and where reflection must begin, particular assessments do not exhaust the challenge of technoscience” (as we have seen him say, above, in his web autobiography). He spells his arguments out in what he calls a “brief” for the primacy of humanities philosophy of technology over engineering philosophy of technology (pp. 88–93). Mitcham proposes three arguments, with the second one subdivided into three:

1. An argument from “historical subservience”: when engineers and their collaborators first proposed an engineering philosophy of technology (for example, in connection with the professional association of engineers in Germany in the 1970s), what they did was turn to traditional humanities disciplines, especially ethics.
2. A complex argument from “inclusiveness”:
 - a. “Conceptually,” the humanities include historical perspectives that are broader than a Whiggish belief in technological progress, even when technological progress is equated with scientific progress and ultimately to social progress.
 - b. “Functionally,” speculative knowledge and wisdom, since Aristotle (and Plato, though Mitcham doesn’t say that), have been ranked higher than political virtue and honor, and clearly higher than the pursuit of pleasure (read the utilitarian “hedonistic calculus”).
 - c. “Anthropologically,” the humanities come closer to being coextensive with human activities broadly speaking—they reflect “more of human life.” You can only engineer so much, and even that much requires broader human social goals.
3. An argument from “spiritual continuity”: *questioning* has been the preeminent philosophical tool from Socrates to St. Augustine to Miguel Cervantes to Herman Melville; each “rejects or struggles against a

technical delimitation of perspective.”

Mitcham elaborates on this last point in his brief (p. 93): “Often this insistent, sometimes conservative return to questions of justice, virtue, and piety will be perceived as romanticism if not mere churlishness. On occasion the return will degenerate into ritual . . . But were the philosophy of technology to become identified solely with a philosophical extension of technological attitudes, it not only would close itself off to the rich otherness of reality, it would also abandon its claim to be philosophy.”

Clearly C.P. Snow in *The Two Cultures* (1959) and other advocates of applying scientific and technological knowledge to the solution of world problems—especially to the solution of problems of hunger and poverty in the developing world—would react to this indictment with alarm. Do the humanities have anything to offer toward the solution of such *human* problems? Isn't it *inhumane* to go on as we did in the past?

And there is more. In his book, Mitcham also has what seems to me a somewhat strange attitude toward the ethics and politics of technology. He says (p. 12) that he wants to emphasize “the vitality of theory” but what theory means in his view is primarily metaphysical and to a lesser extent epistemological theorizing about the objects, processes, and knowledge claims of technologists. There is little ethical theorizing. Mitcham has written or edited several books on engineering ethics, but he has written virtually nothing about the politics of technology. When Mitcham discusses Marxism and neo-Marxism, his main complaints are that Soviet-era philosophers of technology reduced politics to a kind of fetishism of technology, a kind of technocracy out of step with Marx's initial insights about a broader cultural context of technology and economics; he says most neo-Marxists have been politically “unrealistic.”

This rather cavalier attitude may have been Winner's real complaint about Mitcham and other early philosophers of technology (see Chapter 11, below), but in any case a serious *political objection* to Mitcham deserves discussion here. One does not have to subscribe to Marx's claim about religion as the “opiate of the masses” to claim that Mitcham's easy linking of his metaphysics with religion stands in need of political discussion, if not critical rejection.

Similarly, when it comes to American pragmatism (and Ihde's phenomenology which Mitcham says is closely akin to pragmatism), Mitcham seems to think that

he can deal with them effectively by simply stating that they do not manage to mediate between engineering and humanities philosophy of technology, that in fact they do not successfully escape from an engineering attitude toward our culture. His critiques of that attitude, he thinks, are also effective against the pragmatists, including Ihde as Mitcham interprets him. (Reactions from Ihde and from pragmatists can be found in Chapters 10 and 14 below.)

When it comes to the values and motivations of engineers and other technical workers (as well as modern consumers, the users of their products), Mitcham seems to be most comfortable with a Heidegger-like claim that they are “forgetful of being,” unwilling to grapple with goals or ends as opposed to instrumental means. And he concludes his book with an appeal to Heidegger, even though he says it is an appeal “not wholly consistent with Heidegger’s own analysis or intentions” (p. 297), where this may be a cryptic reference to his reliance, instead, on neo-Heideggerian Albert Borgmann (see Chapter 18).

At that point, Mitcham appeals to “the romantic way of being-with technology.” And he concludes with a lament: “The paradox of the romantic way of 'being-with' technology is that, despite an intellectual cogency and expressive power, it has yet to take hold as a truly viable way of life” (p. 299). And his very last word on the matter in the last sentence of the book is a question, about whether, perhaps, the “internal ambivalences” of a romantic critique of technological society “vitiates its power.” This does not seem to be an effective reply to objections about Mitcham’s neglect of politics (see above and Chapters 14 and 17).

To sum up, Carl Mitcham’s *Thinking through Technology* is an ambitious and detailed summary of some of the major contributions to the growing field of the philosophy of technology, as well as a refreshingly complete summary of what engineers and technical experts say about their work and its products. But it is also a brief for an attitude toward modern technology, and the culture within which it holds a central place, that wants to be “romantic/critical,” while also recognizing that objections may be forthcoming from his engineering opponents on that point.

Thinking through Technology, thus, though it did not lead to the development of a new field of philosophy of technology in academia, is a good place to begin my study here in this book of controversies among philosophers of technology.

Summary of full quadrant range of controversies

It seems to me that Mitcham, more than anything else, champions an *idealism* of the religious sort. He does try to meet academic philosophy standards, thus following, in some sense, *scientific/analytical* standards, which would, he thinks, put him in opposition to some philosophers of technology who do not. One's position in the grand scheme, however, is determined more by one's opponents than by anything else, and in those terms, "engineering philosophers of technology" are Mitcham's main antagonists. In this book, see Chapter 4, on Bunge. And this could be generalized to cover a whole range of his opponents in the *science* quadrant, e.g., Shrader-Frechette (Chapter 3) or Pitt (Chapter 9). Mitcham would also oppose and be opposed by Marxists (Chapters 4 and 12). In *Thinking through Technology*, while he acknowledges the roles of *pragmatism* and Don Ihde's *phenomenology* as significant contributions to the early history of the would-be field, he also criticizes these approaches as too limited, as not challenging the cultural dominance of a short-sighted engineering mentality—and, of course, pragmatists (e.g., Hickman, Chapter 14) and phenomenologists, pre-eminently Ihde (Chapter 10) among philosophers of technology challenge him on this point.

Chapter 2

Philosophy of Science and Social Responsibility: Alex Michalos

Alex Michalos's autobiographical accounts in two websites are surprisingly expansive for such a normally modest man. Currently Professor Emeritus at the University of Northern British Columbia and director of an institute for social research there, he is a fellow of the Royal Society of Canada—a long way from M.A., B.D. (bachelor of divinity), and Ph.D. degrees at the University of Chicago. Among many, many honorary or appointive positions, he has been president of the [Canadian Rural and Remote Health Association](#); vice president of Academy II (Humanities and Social Sciences) of the Royal Society of Canada; president of the International Society for Quality of Life Studies; and—important for our purposes here—he was the second person elected president of the Society for Philosophy and Technology. Michalos was also a Federal New Democratic Party candidate for Parliament in Guelph-Wellington, Ontario, twice and in Prince George Peace River once, and has held several offices in the party over the past two decades or so. Michalos has taught social sciences and philosophy since 1962, with 28 years at the University of Guelph prior to moving to UNBC.

He has published at least 18 books and 70 refereed articles. He founded and, though he is now retired, still edits four scholarly journals: *Social Indicators Research* (an interdisciplinary and international journal for quality-of-life measurement); *Journal of Business Ethics* (with Deborah Poff); *Teaching Business Ethics* (also with Deborah Poff); and *Journal of Happiness Studies* (with Ruut Veenhoven and Ed Diener). He has served on the editorial boards of the *Journal of Medicine and Philosophy*, *Research in Philosophy and Technology*, *Theory and Decision*, *International Journal of Value-Based Management*, *Optimum* (the journal of public sector management), and the *South Asian Journal of Psychology*.

Following my convention here, his books, especially those that I think are relevant to controversies in the philosophy *of/and* technology, are included in the bibliography at the end, under Chapter 2.

Michalos's five volume treatise, *North American Social Report: A Comparative Study of the Quality of Life in Canada and the USA from 1964 to 1974* (1980–82), received the 1984 Secretary of State's Award for Excellence in interdisciplinary studies in the area of Canadian Studies. His Science for Peace

volume on *Militarism and the Quality of Life* (1989) argued that some scientific research and development was counterproductive from the point of view of improving the quality of life. His four volume *Global Report on Student Well-Being* (1991–93) gives the results of a survey of over 18,000 university students in thirty-nine countries. It is the biggest international survey of students ever undertaken and involves the most extensive testing of a social scientific theory across national boundaries.

Michalos has also been a consultant to many federal, provincial, regional, and municipal government departments and agencies in Canada and other countries, and his writings have been translated into Japanese, Chinese, German, French, Spanish, Italian, and Polish.

Most of this is from Michalos's own websites. And it means that, for our purposes here, Michalos is a very special case. He has written little about philosophy of technology as such; much about philosophy of science, including a chapter in a book I edited, *A Guide to the Culture of Science, Technology, and Medicine* (1980, 1984), that touches on ethics and social responsibility in science; but mostly on measures of the quality of life in the contemporary world. His *Guide* chapter puts on display many opponents in philosophy of science, on which issues he is open-minded and fair, down-to-earth, almost the total opposite of most of his opponents. His early technical writings on the interpretation of the foundations of statistics were well received by experts; there his view is down-to-earth practical; he even calls himself a pragmatist, and often does so while citing Dewey.

To try to sum up Michalos's views in a sentence, he believes passionately in the power of public opinion polling and statistical analysis to provide the intelligence we need in modern society for good democratic governance. It is difficult to fit Michalos within a framework of discussions in the philosophy of/and technology. I won't even try, but I should give him his due as the second president of SPT—though with strong links to the Philosophy of Science Association in the early days, and as a genuine maverick since.

To give him his due I will focus on the part of his chapter in *A Guide to the Culture of Science, Technology, and Medicine* that touches on ethics and social responsibility in science. It admirably reveals his evenhanded and self-effacing approach.

“From a logical point of view, the central problem underlying . . . [many] discussions [in the Guide] is the conflict between cognitive and pragmatic (or social) utilities or values—i.e., the subject of this section.

“Anyone who has an ordered set of preferences that may be exhaustively measured on an interval scale is said to have a utility function. Interval scales are such that their basic units of measurement are of equal size, allowing one to say, for example, not only that one item is larger than another but exactly how much larger in terms of a standard unit of measurement. For some limited areas, provided that they do not contain more than half a dozen items, one may be expected to have such a utility function. However, given the wide variety of things that people value, it would be a rare person indeed who could neatly order her or his total set of preferences. Most people do not have, and probably do not miss, utility functions for all their preferences.

“Since preferences are, by anyone’s reckoning, closely related to values, it is often assumed that insofar as one has a utility function, one’s values are measured on an interval scale. Moreover, by combining utility and probability values, it is possible to increase substantially the variety of one’s inductive procedures. The method of combination is straightforward, involving a Maximization of Expected Utility (MEU) rule, which is itself easy to illustrate.

“Suppose, for example, you are considering buying one of two houses. Both houses are selling for \$100,000, but one is 10 miles from work and the other is 30 miles away. If all other things are roughly equal, you might think that because you will suffer three times as much in travel time at one house as at the other, the expected utility or value of buying the house closer to work is about three times greater than that of the house farther away. So, following the MEU rule, you buy the house closer to work.

“It has been suggested that the idea of utility considered here is too general to serve the specific interests of science. After all, the argument runs, the values that are of particular concern to scientists represent only a subset of all the values that people hold. Moral, political, aesthetic, religious, economic, and social values, for example, are supposed to be irrelevant to the scientific enterprise. Hence, if one is going to use the MEU rule to determine the acceptability of scientific hypotheses, one is going to have to put some constraints on one’s utility function. More precisely, one must distinguish epistemic from pragmatic utility, and employ only the former in science. Pragmatic utility may be identified with

the broader concept with which this discussion began. Epistemic utility requires a bit more explanation.

“The epistemic utility or value of a hypothesis is its utility or value from the point of view of the aims of pure or basic science. Without getting bogged down in a debate about the difference between pure and applied (or ‘mission-oriented’) science, one may safely assume that truth is near the top of the list of aims of pure science. Besides truth, defenders of this position claim, there are other epistemic values—e.g., the explanatory power of a hypothesis, its internal coherence (self-consistency), its external coherence or consistency with other hypotheses, its precision. So far as the expected utility of a scientific hypothesis is concerned, then, these are the only kinds of values that should be taken into account. . .

“Such considerations as how much it will cost to test the hypothesis, whether the right personnel are available to get the job done, how one’s reputation will be affected if the hypothesis succeeds or how much one’s reputation might be damaged if it fails, are all important for the assessment of the hypothesis’s pragmatic utility, but not for its epistemic utility.

“As one might expect, there is some dispute about the matter. Some people believe that pragmatic values must be considered in the determination of the acceptance of scientific hypotheses. According to these people, the decision to accept or reject a hypothesis is always based, for instance and among other things, on the seriousness of making a mistake. One must take into account the expected utility of accepting a hypothesis that may turn out to be false, and the utility must be as pragmatic as the actions one is likely to perform under the influence of a false belief. That is, because one’s scientific beliefs influence one’s actions beyond the realm of science, one’s assessment of the consequences of holding those beliefs must include an appraisal of the consequences beyond this realm. Hence, the evaluation of the expected utility of scientific hypotheses must be based on pragmatic as well as epistemic utility. . . .

Social Responsibility

“The preceding section has taken us slightly beyond the threshold of a discussion of the social responsibilities of scientists as scientists. . .

“As scientists, what, if any, special social responsibilities do scientists have?

Since no one has been able to provide precise necessary and sufficient conditions for distinguishing the scientific enterprise from everything else, one should not expect a logically tight answer to this question. Still, several worthwhile points may be made.

“In the first place, a wide variety of social responsibilities accrue to scientists as a direct consequence of what scientists do for a living or, perhaps more precisely, of the very nature of the scientific enterprise. Suppose, for example, we begin with the fairly uncontroversial idea that one of the most important aims of science is to discover well-warranted, descriptively true claims about the natural world. Publication of the claims, procedures used to warrant the claims, procedures used to assess, audit or certify the alleged warranting procedures and claims all require special responsibilities. A history of science is in large part a history of human reflections, discussions and debates about what are to count as good, acceptable or appropriate procedures. Someone must decide who is qualified to decide such things and what procedures are to be used to make such decisions. Thus, disciplinary, multidisciplinary and transdisciplinary organizations are created to provide the personnel, procedures and criteria to make such authoritative decisions. Official, or at least, authoritative outlets have to be created, indicating the approval of the right people, with the right credentials, using the right rules of procedure. All of this routine day-to-day work has to be undertaken by scientists as their social responsibility as scientists. Much of this work is not scientific but social, e.g., founding disciplinary organizations, journals, networks of likeminded researchers, rules of proper behaviour for chemists is not like bench chemistry. Just as the creation of a workable political/social/economic/moral infrastructure that allows people to interact productively in a community is different from the variety of individual activities undertaken within the community as residents perform their daily roles as bakers, cooks, teachers, etc., the creation of a scientific infrastructure is different from inventing hypotheses or theories, testing them, and so on. Broadly speaking, then, the first social responsibility of scientists is to construct a good infrastructure for the scientific enterprise to flourish responsibly.

“In the second place, it must be appreciated that scientists are not immune to the buck-passing syndrome. Most of them will almost certainly be inclined to narrow the range of activities for which they are prepared to accept responsibility and, at the same time, widen the range of activities for which they are prepared to accept authority. Notwithstanding the psychological theory of cognitive dissonance, most human beings seem to manage this particular pair of

incompatible inclinations.

“Although people in business seem to be the only group blessed with the analytic aphorism, ‘The business of business is business,’ others certainly try to have their way in the same fashion, namely, by fiat. In the case of science, the inclination is to come down very hard on the as scientist part of our question, thereby paving the way for the narrowest possible purview. Scientists, after all, are not moralists, politicians, social workers. So they need not have the concerns of moralists, politicians, and so on. So the answer to our question is a flat no; scientists as scientists have scientific responsibilities and that is that.

“Apart from all the issues mentioned under the first point above, the trouble with this argument is that it assumes that all concerns or problems can be uniquely sorted into mutually exclusive pigeonholes. On the contrary, most concerns or problems can be regarded as species of several genera. For example, unemployment is an economic, moral, political, and scientific, as well as a social, problem. The task of ‘correctly’ measuring the number of unemployed people in a country or region continues to haunt official and unofficial researchers around the world. In fact, about this problem there remains a considerable disparity of views from one country to the next. Officially unemployed people may be eligible for compensation. Unofficially unemployed people—e.g., housewives—will not usually be eligible. Hidden unemployed people are surely unemployed but not officially unemployed and not eligible for compensation. To be counted as a member of the hidden unemployed is to be counted as a person without hope at best and as a slacker at worst. In either case, because they are no longer trying to find work, they are not officially regarded as unemployed. Their official status thus depends on their desires and the activities in which they engage in the interest of satisfying those desires. Or rather, it depends on some interviewer’s perception of those desires and activities. Needless to say, the self-images of the hidden unemployed and unemployed housewives are affected by their employment classification. Indeed, it is unlikely that the self-image of anyone in a work-oriented society is unaffected by her or his employment status. Clearly, then, the question, ‘Who ought to be regarded as unemployed?’ is as much moral, political, economic, and social as it is scientific. Hence, anyone who sets out to measure unemployment scientifically must be aware of, and must make decisions concerning, the propriety and consequences of a number of alternatives. Anyone attempting to measure unemployment without regard for the presumably nonscientific facts of unemployment would be a poor scientist. A good scientist as a scientist would address the problem in all its richness. He or she may not be

able to manage the problem in that form and may have to introduce arbitrary restrictions in order to manage it at all. But that is not the same as refusing to grapple with its richness on the grounds of its unscientific character, whatever that may be.

“It must also be remembered that because the results of scientific investigation may be used intentionally to influence or control human action, investigators should at least be required to share some of the responsibility for aberrant uses. Although one may balk at the suggestion that Pavlov should be condemned for all the immoral uses to which operant conditioning has been put, one should not be oblivious to the unseemly side of the social impact of his discovery. Undesirable consequences unleashed by scientific discoveries may be as real as desirable consequences.

“Again, if allegedly scientific claims are used to legitimize socioeconomic policies, then the scientists making those claims in behalf of those policies should be held partly responsible for the consequences of the policies if they are put into effect. For example, those who recommend separate tracks in schools for minorities and majorities or bright and dull students on the basis of their research should be held responsible for the costs as well as the benefits that follow the development of programs consistent with those policies. Whenever social programs are initiated on the strength of the recommendations of scientists, whose recommendations would not be heeded at all if they were not made as scientific, the scientists must share the responsibility for the consequences of the programs. If scientists are not held accountable for the consequences of their scientific pronouncements then they will be encouraged to be irresponsible, and they will enjoy an unwarranted social privilege that most people cannot and should not enjoy. These two arguments are used in the document, *Scientific Freedom and Responsibility* (1975), produced by the A.A.A.S. Committee on *Scientific Freedom and Responsibility*. . . .

“It is also the case that because scientists draw from the same limited resource pool from which the rest of the human race draws, they have an obligation to try to make their demands reasonable from the point of view of the public interest. The assumption behind this argument is that there is no invisible hand operating to allocate the world’s resources equitably or even efficiently. Moreover, it is demonstrably certain that if everyone attends only to what he or she perceives as his or her own interests, a socially self-destructive result may occur. That is the clear message of so-called ‘prisoner’s dilemma’ studies. It is also the message of

two children in a playpen who finally tear the toys apart rather than share them. . . .

“Finally, there is an argument from self-interest that is worth mentioning. Scientists as scientists must look beyond their own interests in order to preserve those interests. They must try to assess the total demands on the resource pool that they are tapping in order to avoid what one author has called ‘the tragedy of the commons.’ Here, as on our roadways, one must drive defensively. To assume that the ‘other guy,’ an elected representative, civil servant, or kind-hearted citizen, is going to be wise enough or morally good enough to balance all interests equitably and efficiently is to reject the lessons of history. The public good is the business of everybody—scientist and nonscientist alike.”

Some readers might think that all of the assertions in this long quote are far removed from philosophical concerns about technology. But if we assume—along with the American Association for the Advancement of Science that Michalos quote—that “scientists” include all technically trained workers, including, for example, engineers and economists, then we can conclude that Michalos’s assertions can fall under the heading of philosophy and technology. Presumably the members of SPT who voted for Michalos read him that way.

Thus in terms of *controversies*, Michalos's opponents come primarily from within a *science* quadrant, though he thinks there is no sharp divide between scientists and technologists, and he wants all of them to be socially responsible. He also sometimes says he is a *pragmatist* (though Hickman, see Chapter 14 below, would challenge his reading of Dewey). His principal explicit opponents are narrow positivist philosophers of science; that is, defenders of the narrowest possible claims for exclusive epistemic values. In his political career, Michalos has been a *socialist* New Democrat, which places him squarely in opposition to Canadian conservatives (typically *idealists* in Watson's terms) and liberal *meritocrats*. Michalos’s socialism is also opposed to Marxism, though he does not make a big deal of this. In short, we must guess where Michalos would stand on a number of philosophy of technology issues, because he has not entered explicitly into controversies with other philosophers—either “of” or “and” technology.

Chapter 3

Philosophy of Technology as Risk Assessment of Technological Ventures: Kristin Shrader-Frechette

Kristin Shrader-Frechette (according to her web autobiography) studied physics at Xavier University and then graduated, *summa cum laude*, in 1967, with an undergraduate major in mathematics from Edgecliff College. In 1972, she received her Ph.D. in philosophy from the University of Notre Dame—where she now teaches. Shrader-Frechette did postdoctoral work for two, one, and two years, respectively, in biology (community ecology), economics, and hydrogeology. She has held Woodrow Wilson Foundation, National Science Foundation, and Carnegie Foundation fellowships in philosophy of science and has held offices or served on committees in the American Philosophical Association, the Philosophy of Science Association, the Society for Philosophy and Technology, the Risk Assessment and Policy Association, the International Society for Environmental Ethics, and the US National Academy of Sciences. She has been a member of many boards and committees of the National Research Council/National Academy of Sciences, including its Board on Environmental Studies and Toxicology, its Committee on Risk Characterization, and its Committee on Zinc-Cadmium-Sulfide Dispersions. Associate Editor of *BioScience* until 2002, and editor-in-chief of the Oxford University Press monograph series on Environmental Ethics and Science Policy, Shrader-Frechette also serves on the editorial boards of 17 professional journals. Past President of the Society for Philosophy and Technology; the Risk Assessment and Policy Association; and of the International Society for Environmental Ethics, Shrader-Frechette was the first woman president of all three of these international organizations. She has also served as principal investigator for grants from the National Science Foundation, the National Endowment for the Humanities, the Council on Philosophical Studies, and the US Department of Energy.

Most of Shrader-Frechette's work is either on scientific method, on ethical theory, or on ethical issues related to technological risk and their environmental consequences. Since 1984, her work has focused on methodological and ethical problems associated with nuclear technology or with ecological measures of technological risks.

Shrader-Frechette has published more than 300 articles and more than a dozen

books or monographs, and many of these publications have been translated into half a dozen languages. Moreover, Shrader-Frechette has appeared—often as featured speaker—in all the countries where those languages are spoken. Since almost all of her books are relevant to this book, they will be found in the bibliography at the end.

Much of this sketch comes from Shrader-Frechette's own website. What I would add is this, that nearly everyone would agree with the claim that Shrader-Frechette's large body of works are important philosophical analyses of particular technologies and particular approaches to assessments of technology and the status of the environment. She strongly opposes philosophers of technology who cannot deal with technical experts on their own terms, and she has also made important contributions in the philosophy of science, for example to the analysis of the foundations of probability and statistics. There she seems ready to endorse a kind of learn-from-experience Bayesian approach—though on topics such as technology and environmental assessments she is quick to point out places where the assessors are not learning from experience but treating their prejudices as though they were exempt from criticism. To sum up her views in a nutshell, she is an avowed Rawlsian egalitarian social contract ethicist who uses this yardstick in all her particular assessments related to technological controversies. She is also an avowed feminist. I think she would also accept the currently unpopular liberal label, along with her intellectual hero, John Rawls.

In her approach to philosophy, Shrader-Frechette always insists on being precise, on getting things right. I will try to do the same here, and one way is to stick close to her own texts. They usually spell out her opponents' views in short arguments, philosophy-of-science style, before refuting them with equally short and precise arguments.

It would be impossible here to do full justice to everything Shrader-Frechette has written, so I am going to repeat what I did once before and focus on a representative series of three books. The survey appeared originally in Spanish (see *Isegoria*, October 1995), but the version I repeat here is in English, and can be found in my "Activist Philosophy of Technology: Essays 1989–1999" (www.udel.edu/Philosophy/pdurbin.html). I started with the latest of the three, *Burying Uncertainty: Risk and the Case against Geological Disposal of Nuclear Waste* (1993), then worked back to her earliest (and probably still the best known) book, *Nuclear Power and Public Policy* (1980). Here is that material, almost unchanged.

Almost from the beginning of her philosophical career, as noted above, Shrader-Frechette has been involved with a variety of technology assessment and environmental impact assessment commissions, first at the state level and then at higher and higher levels up to the Federal level in Washington, D.C. Indeed, I think it is a fair guess to say that no North American philosopher has been involved in more such committees. In some ways this is paradoxical, because, since the appearance of *Nuclear Power*, Shrader-Frechette has often been accused of being not only anti-nuclear but anti-technology in general—a charge she has repeatedly felt that she has to combat. But several characteristics—the fairness of her arguments, the expertise that she brings to discussions, and the fact that she always tries to make a positive contribution—keep getting her invited back again and again.

Burying Uncertainty is in many ways the most detailed of her books, and it is a good example of all of the best qualities of her work. The first four-fifths of the book constitute her critique of the major plan to bury nuclear wastes deep in Yucca Mountain in Nevada. The critique includes many by-now-familiar features of her arguments: the risk assessments used to justify the plan are faulty because they hide certain value judgments; the subjective risk assessments used are in fact mistaken in many cases; faulty inferences are drawn from these faulty assessments; there are fatal but unavoidable uncertainties in predictions of the geological suitability of the site; and the entire venture violates an American sense of fair play and equity, especially with regard to the people of the state of Nevada. These are her conclusions. The arguments in support of them are meticulous, even-handed, and unemotional in every case.

This does not mean, of course, that they have been or will be viewed as such by Federal officials, including scientists, especially bureaucrats in the Department of Energy with vested interests in pushing the official project to completion; she has even been heckled when presenting her arguments in their presence.

A second notable point is that Shrader-Frechette knows what she is talking about; indeed, her knowledge of both geology and the risk assessment process is remarkable in a philosopher in these days of academic specialization—though her critics, naturally, maintain that some of her geological claims are irrelevant and that her accounts of particular risk assessments are biased against official government experts.

One bias Shrader-Frechette does not attempt to hide is in favor of equity; she has even given one of her more general studies a subtitle that underscores this bias: *Risk and Rationality: Philosophical Foundations for Populist Reforms* (1991). This might make her sympathetic toward some aspects of John Dewey's progressivism, but the social philosopher she invokes most often is Rawls and his contractarian, neo-Kantian theory of justice as fairness.

What typifies Shrader-Frechette's approach more than anything, and what clearly makes her a welcome addition to any discussion (including the discussion, here, of how to deal fairly with the urgent problem of finding a place to put highly toxic nuclear wastes), is her insistence on being more than just a critic. She feels that it is necessary to make a positive contribution to the discussion; as she says, one purpose of the book is "to provide another alternative to the two current options of either permanently disposing of the waste or rendering it harmless" (p. 2). The positive contribution makes up the last part of the book.

Admittedly providing only a sketch (one-fifth of the book versus the four-fifths devoted to critiquing current policy as epistemologically faulty and ethically unfair), what Shrader-Frechette argues for, in place of permanent disposal, is placing "high-level radwastes in negotiated, monitored, retrievable, storage facilities" (negotiated with the host community or communities), for at least a hundred years.

It is too early to tell whether Shrader-Frechette's book will have any impact, either on Department of Energy scientists and officials, or on public officials more generally—or even on the educated public (except perhaps in Nevada). The debate is still ongoing. But one thing is clear even now: if a philosopher were to choose to follow Dewey's advice, to get involved actively in trying to solve some urgent technosocial problem like the disposal of nuclear wastes, he or she would have to search far and wide for a better model than Shrader-Frechette as she makes her case in this book. (For a contrast with a more specific pragmatism, see Chapter 14 below on Hickman.)

Taking a step back in time, Shrader-Frechette's *Nuclear Power and Public Policy: The Social and Ethical Problems of Fission Technology* (1980, with a second edition in 1983) was her first venture into the epistemological/methodological fallacies of nuclear policy, along with its ethical inequities. It is clearly more strident than *Burying Uncertainty*. There is already all the care—to get the facts right, to deal with risk assessors on their own terms

(even when pointing out their errors), and to argue carefully and meticulously—that one finds later. Also, as later, the ultimate aim is to make an equity-based ethical claim; but here it is reduced to little more than a dozen pages. And, though Shrader-Frechette, when she wrote this book, already had an exemplary record of working with assessment teams, this early venture does not show the same degree of care as the later one when it comes to understanding and appreciating the motives and feelings of her opponents.

Shrader-Frechette's *Science Policy, Ethics, and Economic Methodology* (1985), falls midway between *Nuclear Power* and *Burying Uncertainty*. There, Shrader-Frechette broadens the scope of her critique, taking on the fallacies and hidden assumptions of a whole host of technology and environmental-impact assessments. *Science Policy* is an extended critique of risk/cost/benefit analysis, the most widely used methodology in these various assessments. In this book, Shrader-Frechette points out general and specific problems, and she makes an extended case for what she calls regional equity—avoiding, where possible, imposing risks or costs on people in particular geographical regions.

In this middle one of these three books, Shrader-Frechette clearly moves toward providing positive alternatives to the methodologies she has criticized. She offers two: an ethically-weighted version of risk/cost/benefit analysis, and a technology tribunal—a public procedure for weighting equitably the competing values that different scientists bring to their risk/benefit analyses. Shrader-Frechette is here, then, clearly moving toward the positively collaborative attitude so much in evidence in *Burying Uncertainty*—though perhaps the generality of the argument, focusing on a variety of assessments, probably dooms the book to have less of an impact than the later book. *Nuclear Power* may have had more of an impact, though it also gave more ammunition to opponents accusing her of being anti-technology.

Shrader-Frechette's *opponents*, as they show up in these summaries, include not only public officials she accuses of bias but also early philosophers of technology, whom she accuses of not doing their homework before offering their critiques of technology—especially if they are critiquing something like Technology with a capital T. Defenders of current policy on nuclear power, including the disposal of nuclear wastes, do not agree that they are biased. And, while early generalist critics of technology within the Society for Philosophy and Technology welcomed Shrader-Frechette within their circles, most did not follow her example with detailed technical studies. We have already seen Carl

Mitcham, in Chapter 1, say that concrete studies are a good beginning, but what is more important is a broad critique of technological culture as a whole. One bias that Shrader-Frechette does not attempt to hide, as noted, is in favor of equity; she has even given one of her more general studies a subtitle that underscores this bias: *Risk and Rationality: Philosophical Foundations for Populist Reforms* (1991). This might make her sympathetic toward some aspects of John Dewey's progressivism, but the social philosopher she invokes most often is Rawls and his contractarian, neo-Kantian theory.

So, full range of *controversies*? Clearly Shrader-Frechette's controversial stands make her a hybrid, disagreeing with many within the *science* quadrant. For example, Joseph Pitt (see Chapter 9 below) also falls within the *science* camp, but Shrader-Frechette has accused him of not being fair to Langdon Winner (Chapter 11 below), the non-Marxist but *radical* critic of undemocratic technological ventures. Shrader-Frechette herself tends to interpret Rawls as *meritocratic*, which would still keep her within the *science* quadrant. On the other hand, her egalitarian value slant is often perceived (e.g., by her nuclear bureaucrat opponents) as *idealist* (even anti-science). But opponents also include *idealist* philosophers of technology who do not think they need to do the kind of scientific work that she does, or (like Mitcham) who insist that what our technological culture needs is radical critics. Shrader-Frechette is less clear about her opposition to standard Marxists, but it seems clear that she opposes them—as they oppose liberalism. Her attitude toward *pragmatists* like Hickman (Chapter 14) is not clearly spelled out—though some pragmatists and other progressives (e.g., recent writings of Martha Nussbaum) criticize Rawls's version of egalitarianism in ways Shrader-Frechette might have questions about.

Chapter 4

A Marxist Critique of Capitalist Technology: Marx Wartofsky

The Society for Philosophy and Technology grew out of a conference that I hosted at the University of Delaware in 1975. The original idea came from Carl Mitcham. But it was a set of fortuitous circumstances that made the conference possible. I had come to Delaware in part because of an earlier, aborted effort to establish a center there for philosophy of science, memorialized in a set of conference proceedings called the Delaware Seminar—an effort that had not received a warm welcome from scientists associated with the DuPont Company. Even so, a university that existed within the milieu of, and was well supported by that company with its slogan, “Better Things for Better Living through Chemistry,” seemed a natural locus for such an effort. And the local scientific and engineering community did support the idea of the 1975 conference. Also, at the University of Delaware there was a robust history of science and technology community of scholars, including a strong link with the DuPont-related Hagley Fellows program of the Eleutherian Mills Hagley Library. Eugene Ferguson, an eminent historian of technology with an engineering background who was a member of the Delaware history department, had been instrumental in getting Mitcham’s bibliography of the philosophy of technology published in *Technology and Culture* in 1973. The editor of that journal, Melvin Kranzberg—who had, earlier, in 1966, published in its pages one of the first major symposia on philosophy of technology—was easily enlisted to help provide names of philosophers to invite to the conference. But probably what was most significant was that the time was right. The North American academic community was just emerging from, and still influenced by, a social movement—the so-called New Left—that was critical not only of the Vietnam War but also of the technologies utilized there, and by extension a whole range of technologies that were widely perceived to be damaging especially to the natural environment.

Marx Wartofsky, the fourth SPT president but only one focus of this chapter, was not involved with the 1975 conference. Nevertheless, he and his colleague at Boston University, Robert S. Cohen—who together ran the Boston Colloquium for the Philosophy of Science with its Boston Studies series of publications—supported the venture from a distance. (The first proceedings volume of SPT based on an international conference was jointly published in the Boston Studies series and in the new Philosophy and Technology series.) And one of their colleagues at Boston, Joseph Agassi (who had contributed to the *Technology and*

Culture symposium in 1966), was a presenter at the Delaware conference. (See Chapter 7 below on Agassi.) So it was natural to invite Wartofsky and Cohen to get involved in SPT—even though, as was the case with Michalos, Wartofsky was another interloper from philosophy of science. Wartofsky's Marxist leanings, however, made his work more relevant to philosophy of technology—and popular critiques of technology—than the typical philosopher of science of that era.

Wartofsky's best known publication at the time was his *Conceptual Foundations of Scientific Thought: An Introduction to the Philosophy of Science* (1968). And he did not go on to publish a great deal in philosophy of technology other than his presidential address to SPT in 1989, "Technology, Power, and Truth" (included in Winner, ed., *Democracy in a Technological Society*, 1992), and two or three other articles. So this chapter focuses less on Wartofsky's own work in particular than on a *general line* of Marxist and neo-Marxist thought that strongly influenced many leaders of the New Left.

Here is a key text from Wartofsky's 1989 SPT presidential address: "[I] characterize some of the objective conditions of the fourth revolution [in the history of technology], . . . namely, those conditions which politicize technology as a central question of national policy, the national economy, international competition, rivalry, or war, and governmental or global regulation of massive hazards for species life. All this is new [though . . .] this does not mean that aspects of such problems did not already show themselves much earlier . . .

"The fourth revolution, by contrast to the first three, introduces a terrifying option; it makes technological or maker's truth hostage to political power, in a decision-procedure that tests policy against the lives of millions, against the planet's future . . .

"However loose the fit between intentions and outcomes in policy matters, good faith requires some reading of the relevant facts, in their best determination, upon which the policy decision is crucially based. The willful distortion or suppression of facts, or even of reasonable conjectures and arguments about the facts, in the interests of some favored policy goal, or of some exercise of power, is the most dangerous corruption that the politicization of technology makes possible in the context of the fourth revolution" (pp. 27 and 33).

I will return to this text, but in my book, *Social Responsibility in Science*,

Technology, and Medicine (1992), I include a section on why Marxism seems to offer a solution for the social problems associated with modern technology. I borrow from that here almost *verbatim*. I did not there and do not here want to glibly dismiss Marxist responses to the problems of technology.

I take the Marxist response seriously in spite of the end of the Cold War. Here is why. I had proposed early in that book a list of ten types of social problems that beset contemporary high-technology society. The problems range from the nuclear arms race to commercialization of traditional high culture, from ecological catastrophes and genetic engineering to boredom in high-technology jobs and alienation in family life in today's sprawling urban centers. But at the center of my list is growing technoeconomic injustices, and especially the increasing disparity between the haves and the have-nots—whether these are national, between socioeconomic classes in high-technology economies, or international, between developed and supposedly developing nations.

It is this problem that Marx, and Marxists ever since, have focused on. I would in fact go so far as to say that any interpretation of Marx that does not focus primarily on the class struggle between, on one hand, those who control the means of production appropriate to a given stage in the dialectic of history, and, on the other, the exploited workers who actually produce economic wealth is not within the mainstream of Marxist theory as I understand it. I would go further and say, anticipating objections to my interpretation, that any authentic Marxist ought to say that none of the other problems of technological society I list will be solved until the class struggle is resolved worldwide.

Why is this? There would seem to be an obvious link between the economic issue—especially if interpreted in class-struggle terms—and all the other issues: the nuclear economy obviously; industrial and consumption-driven wastes; the temptation of the haves to use high-tech surveillance methods, and perhaps eventually genetic intervention, to keep the exploited have-nots in line or to mold them for particular sorts of work; bribes for workers to induce them to accept hazardous or mind-numbing jobs; worker alienation carrying over into family life, or even leading to its breakdown; schools turned into corporate training grounds without attention to their traditional role of educating responsible citizens; politics turned into media manipulation, frustrating true democracy; the arts no longer critical of society but corporation-dominated. This all-too-familiar litany of contemporary social problems almost always sounds, to defenders of the corporations and of high-tech society, as though it must come from left-wing

enemies of capitalist society—“fellow-travelers” at worst, or dupes of the Communist line at best.

Several common interpretations of what is going on here need to be dispatched quickly. Students, when they come in contact with Marxist views on the impact of economic power on social problems, often think of it in terms of the exercise of raw economic power. Wealthy individuals, high-level corporate managers, politicians in league with the wealthy and managerial classes, can simply do as they will. If it means profit for them, they can start wars or keep cold wars going indefinitely. (Perhaps they would now say almost indefinitely.) Similarly, critics often take Marxists to be saying that leaders of the capitalist exploiting class act in conscious concert to control education or the media. And, finally, cynics interpret capitalist exploiters as pure and simple greedy men who will do anything, no matter the effects on workers or on the environment, if it means more short-term profits for themselves. (Short-term profits, of course, turn into long-term capital investments, and the cycle goes on.)

None of these interpretations is necessarily or entirely false. No doubt leading capitalists do exercise raw economic power, do sometimes act in collusion in ways that seem to amount to conspiracy (or monopolistic practices), and can be as greedy as anyone else in society. But none of this is the point of the Marxist claim that class divisions pitting capitalists against workers are the root of all social ills in our technological society—or in any previous version of capitalist society. According to Marxist theory (as I am interpreting it here), it is not the individual motives of capitalists, singly or acting in concert, that explain why class-division disparities between capitalists and workers lead inevitably (according to this view) to toxic wastes, hazardous workplaces, and boring high-technology jobs. What makes these social problems insoluble until exploitation ends, according to Marxism so interpreted, is that capitalism is a wholesale ideological superstructure erected on the base or substructure of capitalist-era modes of production. Our entire way of life, all our social relations, not only at work but in the home and everywhere else, are intelligible only in terms of the ideology of capitalism (or, in the present view, techno-capitalism).

A slightly dated example: Eugene Genovese, a neo-Marxist historian, provides a telling picture of how all of this is supposed to have been in evidence at one time, in his interpretation of life in the slaveholding society of the Old South in the United States, including its accompanying (and legitimating) worldview. The ideology afflicted not only the slaveowners themselves, but their wives, their

mores, the law of the land—and even the self-images of non-slaveowning whites, of overseers, as well as of the slaves themselves (however much the slaves later came to see their interests as at odds with the slave economy). In one among many passages (the book must be read in its entirety to get the total picture of a worldview as a seamless—though class-divisive—web), Genovese says: “This ideology . . . developed in tandem with that self-serving designation of the slaves as a duty and a burden which formed the core of the slaveholders’ self-mage. Step by step, they reinforced each other as parts of an unfolding proslavery argument that helped mold a special psychology for master as well as for slave. The slaveholders’ ideology constituted an authentic world-view in the sense that it developed in accordance with the reality of social relations.”

The kind of men and women the slaveholders became, their vision of the slave, and their ultimate traumatic confrontation with the reality of their slaves’ consciousness cannot be grasped unless this ideology is treated as an authentic, if disagreeable, manifestation of an increasingly coherent world outlook.

Genovese’s marvelously comprehensive account of an earlier capitalist society, where class divisions are obvious, goes into all aspects of the problem—religious legitimations as part of the ideology, and so on. But if his depiction of how economic relations spread out in every direction to become a wholesale ideology seems esoteric and far removed from techno-capitalist ideology, it nonetheless highlights, in a historian’s fashion, the substructure/superstructure dialectic.

The same thing is done from a social-scientific perspective by Peter Berger and Thomas Luckmann. Their focus is on ideological consciousness and how it comes to have the authoritative character it does throughout a culture: “Only at this point does it become possible to speak of a social world at all, in the sense of a comprehensive and given reality confronting the individual in a manner analogous to the reality of the natural world. Only in this way, as an objective world, can the social formations be transmitted to a new generation. In the early phases of socialization the child is quite incapable of distinguishing between the objectivity of natural phenomena and the objectivity of social formations. . . . All institutions [including the most basic institution of all, language] appear in the same way, as given, unalterable and self-evident.”

It should not be thought that such “objectivity” of social institutions, of ideology, ends when the child grows up. Berger and Luckmann admit that one of the most difficult cases for their dialectical theory of social consciousness is that of the

alienated intellectual—and especially of the revolutionary intellectual. But far from disproving the wide-ranging impact of reigning ideologies, the case of the revolutionary intellectual actually confirms the theory: it is extraordinarily difficult for anyone to break out of an ideology, and, in Berger and Luckmann's view, when one does so, he or she will immediately try to rally a group together and produce a counter-ideology.

Such praxis-oriented revolutionary theorizing has been applied directly to technological society and its problems. The best-known instance is the theories of Herbert Marcuse, especially in *One-Dimensional Man* (1964). For my part, however, I prefer the elaborations of Marcuse's views, in a historical mode, by David Noble (1977, 1984). Where Marcuse claims that any opposition to the reigning ideology—for example, in cases of union opposition to hazards in high-technology industrial workplace—ends up being interpreted as counterproductive, even irrational (according to the “logical” demands of technological “progress”), Noble spells out in relentless detail, and wherever possible in the words of corporate managers, the total way in which the ideology of science and technology in the (alleged) service of society came to permeate every aspect of society in twentieth-century America. To speak of solving particular social problems in our science-based economy without changing the overarching ideology, according to Noble (and those who think like him), is, paradoxically, to reinforce rather than undermine the foundations on which the problems rest.

Once again Peter Berger (this time with Brigitte Berger and Hansfried Kellner) can be cited to provide a social-scientific confirmation of this dialectical view. Berger and his colleagues call their method phenomenological, but they intend for their comprehensive account—of how technological production and bureaucracy permeate every aspect of ordinary consciousness in thoroughly “modernized” societies—to be taken to be scientific. They believe that it is impossible to conceive of a modern society without technology and bureaucracy (that is the phenomenological part of their account), but they are equally convinced that empirical studies will confirm the implications of their account. And to deal in any radical way with major social problems such as the boring character of work in highly automated production facilities without changing the overall technoeconomic system would, on their account, seem extremely unlikely. (In fact they think it is unlikely in any case.)

What all of this boils down to is a powerful Marxist objection to reform politics

(sometimes disparaged as “mere procedural justice”): it cannot get at the roots of techno-social problems without challenging the techno-economic system. And that system has built-in disparities between exploiting managers and exploited workers, and between high-technology nations and the so-called “developing nations” so often exploited for the raw materials and exotic minerals needed for high-technology production.

What should one conclude from this? If anything is going to be done to deal with technosocial problems, they cannot be dealt with one at a time. They are all interconnected, and the fundamental problem is economic. Only a political revolution that eliminates the power of capitalists and quasi-capitalist bureaucrats over the masses of workers offers any real hope of success.

In Chapter 12, we will see how Andrew Feenberg thinks some managers can be won over to more enlightened views.

The most obvious objection that can be raised against the kind of Marxist thinking presented in this brief account is that it is far too totalistic. (See Bunge in Chapter 5, or Pitt in Chapter 9.) Part of a reply can already be seen in the Wartofsky quotation earlier. The stakes in our technological society are truly worldwide.

But Wartofsky’s emphasis on the *willful* distortion of the facts the public needs to know, in making good democratic decisions where a decision “tests policy against the lives of millions,” or “against the planet’s future,” suggests another question to me. It follows, I think, his own Marxist lead. Suppose that distortions are not willful but ideologically blindered; and suppose that the ideological blinders affect not only leaders but the entire populace. Is not that situation even more terrifying than the one Wartofsky talks about explicitly?

This might lead us to continue to think that the *only* way out is to heed the radical critique and act accordingly, to join in the worldwide workers’ revolution. Unless the late-capitalist ideological blinders, of leaders and the masses, are removed, there is no way of avoiding technological catastrophes affecting millions of people—or even techno-blunders that might destroy life on earth.

The problem with this kind of revolutionary rhetoric today is the end of the Cold War and the demise of Communism in Eastern Europe. Almost no one today thinks that Marxism, or at least the version put in power in Russia and its

satellites under Stalin after World War II, is the solution for *any* kind of problem.

There have been at least two kinds of replies on the part of radicals to this situation. The first, in Russia and the former Iron Curtain countries and among some intellectuals in the West, is a dogged insistence that Marxism still has the answers—and that the first answer is still to unmask ideology, to show up technocapitalist imperialism for what it is wherever it is, even among supposedly populist leaders in what is left of the old East Bloc.

A second kind of response has been made by Andrew Feenberg, among others. (I will consider Feenberg's version of neo-Marxism in Chapter 12.) Feenberg takes Marcuse as his starting point. To put the matter briefly here (saving Feenberg's full account for later), a new order can become a reality if workers are educated to recognize the clear benefits of a new socialized system, and if their consequent demands are met with a sufficiently sympathetic response on the part of at least some technical managers now imbued with a "culture of responsibility."

It seems, however, that this fails to show how ideological blinders are going to be removed.

What I have elsewhere proposed as the role for radical socialist theorizing today is that it be merged with a Deweyan progressive politicking. According to Dewey, philosophers should know, the solution of urgent social problems—including technosocial problems and even including the problem of technological manipulation of public opinion (see Hickman in Chapter 14)—is to be sought by way of collaboration among all sorts of activists, from workers and union leaders, to corporate and civic and educational leaders, to intellectuals. Dewey had an ambivalent attitude toward Marxism and toward Communism in Russia; he recognized the need to unmask the ideological obfuscations of corporate leaders and their cronies in government but he was extremely leery of violations of civil liberties in the name of democracy. Though I am not aware that Dewey ever said this explicitly, the thrust of his thinking on the matter ought to lead us to conclude that the unmasking efforts of Marxist and other radical intellectuals can be a tremendous boon to progressive social activism. It is not necessary that everyone involved be radicalized; it is enough that the radicals among progressive social activists help the rest to see through ideological obfuscations. Of course, unreconstructed Marxists are going to retort that this is naïve liberal posturing.

Controversies? Wartofsky always remained an unreconstructed *Marxist*, in the scientific materialist sense, though he had many differences with other Marxists. In general, that would place him in opposition to almost any kind of liberalism, but in fact he was notably *pragmatic* in terms of short-term means. (In the Bordeaux address quoted above, for example, he didn't take on Jacques Ellul directly on the latter's home turf; he preferred instead to acknowledge the young Ellul's Marxist roots—while decrying his later departure from them.) Wartofsky, like all Marxists, was a lifelong opponent of *idealism* in all but some neo-Hegelian forms. On one occasion, at an SPT session at an American Philosophical Association meeting, Wartofsky explicitly took on the well-known neo-Kantian critic of technology, Hans Jonas, accusing Jonas of being unduly pessimistic, even in the face of the global challenges both of them worried about. In his well-received philosophy of science book, Wartofsky clearly opposed positivist philosophies of science—which put him in opposition to many of his friends in the *science* quadrant. However, in general, Wartofsky wrote so little explicitly on philosophy of technology that it might be better here to talk about ways in which a great many neo-Marxists continue to address technology in controversial ways. I have chosen to delay that until Chapter 12.

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 the 1990 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 of scientific knowledge. (Recall . . . that an artifact can be a thing, a state 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 $T = \langle C, S, D, G, F, B, P, K, A, M, V \rangle$ (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 technology for 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 says 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).

Chapter 6

Joseph Margolis on Technological Society

Laura H. Carnell Professor of Philosophy at Temple University in Philadelphia, Joseph Margolis's main interests (according to his website) are in the philosophy of the human sciences, the theory of knowledge and interpretation, aesthetics, philosophy of mind, American philosophy, and pragmatism. Academic positions have included Columbia University and Long Island University, at the beginning of his career, through a professorship (including chairmanship of the department) at the University of Western Ontario to his present position as professor of philosophy at Temple University, with honorary and visiting professorships all over the world, from the University of Toronto to the University of South Africa.

Honors, fellowships, awards, grants and other responsibilities (according to his website) have included everything from an honorary lifetime membership in the International Association of Aesthetics to the co-directorship of the Greater Philadelphia Philosophy Consortium, and from a doctorate *honoris causa* from the University of Helsinki to Fulbright fellowships in Sweden and Scandinavia, and grants from the Pew Charitable Trusts to being distinguished professor in the College of Liberal Arts at his home institution, Temple University (among many, many others).

Editorial boards have included dozens of journals, from the electronic journal of the Canadian Society of Aesthetics to the *Journal of Value Inquiry*, from the *International Journal of Applied Philosophy* to *Research in Philosophy and Technology*, as well as numerous book series.

On Margolis's overall philosophy, see Michael Krausz and Richard Shusterman, eds. *Interpretation, Relativism, and the Metaphysics of Culture: Themes in the Philosophy of Joseph Margolis*. New York. NY: Humanities Books, 1999.

Margolis's own writings are so numerous that even a partial listing is overwhelming. The books I find relevant to this chapter are listed in the bibliography at the end.

I am going to do something different, and perhaps risky, in this chapter. Until recently, Margolis had been involved with SPT during most of its existence. He contributed important articles to several of our early publications, and practically

every year I would importune him to turn those articles into a full-scale book—even a short book—on philosophy of technology as he understood it. He never did so. So I am here going to try to reconstruct what he might have said, *using his own SPT publications*—in conjunction with a recent book of his on pragmatism.

Before beginning that risky project, I note that in a textbook, *Philosophy of Psychology* (1984), Margolis explicitly claims he is a “non-reductive materialist”—like Marx in some respects but anti-Marxist in others. In his recent pragmatism book, Margolis is more Peircean than Deweyan, and he sees pragmatism in analytic philosophy terms, as the yet-to-be-fulfilled promissory note on a defensible future analytical philosophy/epistemology. Indeed, Margolis attacks Dewey for his activism. Most of this has much more to do with general analytical philosophy than it does with philosophy of technology. I think the early essays, placing himself in the middle between Bunge and Ellul, and between Marx and Heidegger, while fitting in with other philosophical work on technology, can—somewhat arbitrarily—be linked with Margolis's recent book to create *my* interpretation of a Margolis philosophy of technology. The effort will, unfortunately, entail some rather long quotations because of Margolis's style, which is even more dense than is customary in analytical philosophy. However, Margolis's (implicit) philosophy of technology is worth the effort.

I begin with Margolis's most recent statement of his general philosophy in his *Reinventing Pragmatism* (2002); what follows is my summary, taken from an article on pragmatism that I prepared for the *Encyclopedia of Science, Technology, and Ethics* (2005). The published article (volume 3, p. 1468) has been modified by the editors to make it fit within the encyclopedia's style, so I don't feel the need here to treat what follows as a quotation. (See Note on Quotation Styles, at the end of the introduction.)

The Recent Revival of Pragmatism

Margolis contrasts early American pragmatism with the revival of pragmatism in American analytic philosophy after about 1980. In the revived version, the focus is not on Mead and Dewey's “meliorizing” progressivism, with its suspicion of large science-based corporations, but on quarrels over different versions of epistemology. With the exception of Richard Rorty, who wants his pragmatism (he says it is more literary than philosophical) to join in leftist causes (Rorty, 1998), none of the “revived pragmatists” have much interest in ethics, less in

technology, and an interest in science that is reducible to a scientific model of human knowing—or opposition to such.

Margolis's is the best summary of these disputes that I know of, though his writing style is as always dense and convoluted. The primary debate Margolis talks about pits what he thinks is an acceptable pragmatism against "naturalizers." In fact, he talks about several debates between Rorty (claiming to speak for Donald Davidson as well as himself) and Hilary Putnam. The conflict has to do with how to safeguard a "true" pragmatism from relapsing into a Cartesian quest for a guaranteed foundation of knowledge, primarily scientific knowledge.

To summarize the account, at some cost in terms of glossing over the nuances, Margolis (p. 15) says: "In any event, Putnam's [1994] newly minted denial of his earlier denial [1980] of the subject-object disjunction . . . risks his joining forces with the Cartesian realists he opposes."

Margolis gives the reader some help in understanding the controversy: "On any serious reading, you can hardly deny that the essential philosophical questions that arise from the first appearance of Descartes's principal tracts persist to the very end of the twentieth century. We are evidently still trapped by the two unavoidable paradoxes Descartes has bequeathed us: *one*, that of . . . pretend[ing] to reclaim an objective and neutral grasp of the way the world is apart from our inquiries; *the other*, that of the conditions for resolving the first puzzle, *if* we are confined to inner thoughts and perceptions" (Margolis, 2003, p. 13).

Putnam, in Margolis's view, makes too much of a concession to "naturalizers." (Margolis lists W.V. Quine, 1969, and Donald Davidson, 1986.) Naturalizing, Margolis thinks, is incompatible with the earlier generation of pragmatists' repudiation of any and all versions of Cartesianism.

Margolis's critique of Rorty as the other pole in his "primary debate in recent pragmatism" is easier to state in simple terms. Rorty's "postmodernism" is incompatible with any pragmatism legitimately related to earlier pragmatism, with its trust in science and expertise generally.

In the end, Margolis outlines his own version of pragmatism. He sees it as following from the failures of the two parties: "Putnam went much too far in rejecting his internal realism when he rejected his [earlier] representationalism;

and Davidson and Rorty go too far in construing the mind-dependent constitution of the independent world” (p. 22).

According to Margolis, there can today be “no viable realism that is not also a *constructivism*. Constructivism means at the very least that questions of knowledge, objectivity, truth, confirmation, and legitimation are constructed in accord with our interpretive conceptual schemes . . . ; that, though we do not construct the actual world, what we posit (constructively) *as* the independent world *is* epistemically dependent on our mediating conceptual schemes.”

This is Margolis's take on his place within general philosophical pragmatism today. I next turn to his various contributions to SPT publications, where Margolis showed in some detail how all of the above implies a *technological* construal of the knower and the world known. The first selection comes from volume 5 of the Philosophy and Technology (Kluwer) series, entitled *Technological Transformation: Contextual and Conceptual Implications* (1989) edited by Edmund Byrne and Joseph Pitt. (See pp. 1–4, 8–9, 13.)

The Technological Self

“There is a double puzzle that Thomas Kuhn collects in certain well-known remarks in his *The Structure of Scientific Revolutions* that compellingly links the theory of science and the theory of human inquiry—in effect, the theory of cognizing agents, of selves, of persons. One may doubt that Kuhn has formed an entirely coherent picture of the sciences, but there can be no question that he has completely neglected the analysis of what a human being must be like in order to live and work in the world he posits. Kuhn's linking these two issues remains instructive, nevertheless. For he grasps its paradoxical features in a way that does not really depend on the validity of his own account of the historicized sciences; and what he does say about the sciences is quite compatible with (indeed, it memorably instantiates) a number of very large doctrines that the entire sweep of Western philosophy may fairly now be said to be converging upon. These include at least: (a) the rejection of all forms of cognitive transparency and privilege; (b) the indissoluble unity of realist and idealist elements in any plausible theory of the sciences; (c) the conceptual symbiosis of cognizing self and cognized world; and (d) the matched historicity of self, science, and world. Doctrines (a)–(d) dissolve any hierarchical advantage that might otherwise be assigned so-called naturalistic and phenomenological theories *vis-à-vis* one another and fix at the same time the sense in which theories of

either sort could incorporate so-called deconstructive or post-structuralist exposes of their own pretensions regarding any form of cognitive transparency. By a term of art—a fair term—contemporary views incorporating (a)–(d) may be dubbed *pragmatist*.

“Kuhn’s remarks are these: first of all, that ‘Lavoisier . . . saw oxygen where Priestley had seen dephlogisticated air and where others had seen nothing at all. . . . Lavoisier saw nature differently . . . Lavoisier worked in a different world’; secondly, speaking of that phase of post-fourteenth-century physics (affecting Galileo’s work) in which Buridan and Oresme’s impetus theory replaces Aristotle’s, that ‘I [that is, Kuhn] am . . . acutely aware of the difficulties created by saying that when Aristotle and Galileo looked at swinging stones, the first saw constrained fall, the second a pendulum. Kuhn, of course, favors the thesis that these paired scientists ‘pursued their research in different worlds.’

“Until [for example] that scholastic paradigm was invented [Kuhn says], there were no pendulums, but only swinging stones, for the scientist to see. Pendulums were brought into existence by something very like a paradigm-induced gestalt switch.

“We are not interested here in the bafflements of Kuhn’s own conception of the sciences except as they may help us to understand what is required of a theory of the cognitively apt selves that pursue particular inquiries under the conditions Kuhn advances or, more generally, under constraints (a)–(d) that Kuhn’s own views instantiate. Kuhn gladly abandons all talk of ‘the given of experience,’ ‘immediate experience,’ ‘a pure observation-language,’ ‘mere neutral and objective reports on the given.’ But he effectively reneges on this proviso—however unwittingly—in his explanation of the viability of the contingently different worlds of different societies: ‘An appropriately programmed perceptual mechanism,’ Kuhn explains, ‘has survival value. To say that the members of different groups may have different perceptions *when confronted with the same stimuli* is not to imply that they may have just any perceptions at all.’ The remark is fair enough. But on what grounds (accessible to Kuhn) can we speak of the operations of ‘the same stimuli’ across different paradigms, differently ‘programmed perceptual mechanisms’? ‘Two groups,’ Kuhn maintains, the members of which have systematically different sensations on receipt of the same stimuli, do *in some sense* live in different worlds. We posit the existence of stimuli to explain our perceptions of the world, and we posit their immutability to avoid both individual and social solipsism. About neither posit have I the

slightest reservation. But our world is populated in the first instance not by stimuli but by the objects of our sensations, and these need not be the same, individual-to-individual or group-to-group. To the extent, of course, that individuals belong to the same group and thus share education, language, experience, and culture, we have good reason to suppose that their sensations are the same. . . . They must see things, process stimuli, in much the same ways. But where the differentiation and specialization of groups begins, we have no similar evidence for the immutability of sensations.

“These are very curious remarks: first, because ‘invariance’ or ‘immutability’ of ‘stimuli’ (neurophysiological connections, even physical laws) are merely *posited* to forestall solipsism (skepticism, radical incommensurability, intellectual nihilism, anarchy, relativism); second, because such invariances are themselves validly relativized to the shared ‘form of life’ of a given society *and only there*; and third, because, apparently both intra- and inter-societally, the division of labor and historical variation *threaten our confirming any genuine, context-free invariances*.

“Kuhn is not content with this kind of tenuousness. ‘We try,’ he says, to interpret sensations already at hand, to analyze what is for us the given. However we do that, the processes involved must ultimately be neural, and they are therefore governed by the same *physico-chemical* laws that govern perception on the one hand and the beating of our hearts on the other. But the fact that the system obeys the same laws [in all perceptual cases, presumably in all societies] provides no reason to suppose that our neural apparatus is programmed to operate the same way in interpretation as in perception or in either as in the beating of our hearts.

“It is in this same context that Kuhn concludes that, ‘An appropriately programmed perceptual mechanism has survival value.’ This means that those who live in ‘different worlds’ also live in ‘one world,’ that the provisional invariances internal to the different worlds of socially shared practices are also good guesses of some sort regarding the actual invariances that hold across such different worlds, that the ‘incommensurable viewpoints’ of these separate worlds are also collected within the range of commensurability (or, at least within the range of intelligibility) of the one overarching world. Incommensurability is not—or at least should not be—construed as equivalent to incommunicability or unintelligibility or untranslatability; on the contrary, moderate incommensurabilities, as much of conceptual categories as of metrical

instruments, must, on pain of incoherence, be intelligible, even comparable, to the same inquirer or inquirers. And yet, of course, *to be able to affirm invariances across moderate incommensurabilities signifies cognitive sources that cannot be confined within the bounds of such incommensurabilities*. Kuhn never explains that ability.

“There is no question that Kuhn has put his finger on the essential puzzle of a historicized conception of science still bent on formulating the lawlike invariances of the entire order of physical nature. But it is equally clear that Kuhn’s solution is threatened with an ineliminable measure of incoherence. For our present purpose, it is more important to emphasize what may be called the ‘constructive’ or ‘constitutive’ theme in Kuhn’s theories, the notion that the world we live in—we ordinary percipients as well as Aristotle and Galileo as more disciplined scientists—is in some way *constituted* by the socially shared paradigms or practices that form or preform (tacitly rather than by explicit conjecture) the way we perceive and think. Kuhn sees the matter more in terms of the general nature and psychology of human investigators than in terms of the merely formal features of potential truth-claims advanced within the relevant space; and yet, he nowhere directly considers *what* a human person must be like, constituted and reconstituted *by* such cultural forces in the same instant in which the ‘world’ is constituted and reconstituted *by* our changing inquiries and interventions. In this sense, Kuhn offers the barest glimpse of the interesting notion (which his own theory requires and which is required by any generic theory that subscribes to (a)–(d)): that *the human self is itself technologically and praxically constituted*. The potentially radical implications of this notion normally escape our notice, in spite of the fact that constraints (a)–(d)—perhaps, now, only marginally clarified by Kuhn’s own favored theories—must surely be among the most salient conceded in our own age. The point may be taken as embedded at least in Kuhn’s challenging distinction between a swinging stone and a pendulum.

“We are marking off a strategy of argument, possibly a map of an argument, not an actual argument. The approach enjoys a considerable economy. For, there are a surprising number of quite powerful consequences that follow from admitting (a)–(d) together with the cognate finding that if ‘worlds’ are constituted by the inquiries and practices of human selves, then selves are correspondingly constituted by processes internal to the formed worlds in which they contingently mature. . . .

“Merely to concede the point of what may now be called (e), the thesis of the technological or technologized self, leads directly to a number of important findings—in a remarkably painless way. It affords a very simple conceptual lever by which to topple a large number of fashionable theories. . . .

II.

“What we have sketched thus far are the lines of an argument by which, admitting the constructive nature of the world along the moderate (if somewhat muddled) lines of Kuhn’s historicizing, we find ourselves obliged to admit the constructive nature of cognizing selves. Mark that (the constructive thesis) as thesis (1) of what we have termed the doctrine of the technological or technologized self. It exercises an immense economy in disqualifying at a stroke all forms of logocentrism—all essentialisms, all universalisms, all natural necessities of cognition, all totalizing, all closed systems, all apodicticity. But it is itself fragile and incomplete as an account of what the technologized self entails. It does not sufficiently identify what, minimally, the achievement of human communication requires. . . .

“A better clue lies elsewhere—in the biologized philosophical anthropologies of the European tradition. Marjorie Grene, for instance, captures what we shall mark here as theme (2) of the technologized self: to be a person is to be a history. In what respects? In two respects, opposed but related. On the one hand, being a person is an achievement of a living individual belonging to a natural kind whose genetic endowment and possible behaviors provide the necessary conditions for that achievement. On the other hand, a human being becomes the person he is within, and as one expression of, a complex network of artifacts—language, ritual, social institutions, styles of art and architecture, cosmologies and myths—that constitute a culture. A culture, of course, is itself a sedimentation of the actions of past persons; but it is, nevertheless, preexistent with respect to the development of any particular person.

“. . . Technology, then, is the biological aptitude of the human species for constituting, by alternative forms of equilibration, a world suited to a society of emergent selves or a society of such surviving selves adjusted, diachronically, to such a world. We understand one another for the same reason we survive as a species. Technology is the flowering of our biological endowment and is incarnate in it

Conclusion

“One cannot refuse the bare option of the reduction or elimination of the cultural dimension of the real. But its intended prize has yet to be earned. The doctrine of the technological self is incompatible with the victory of that project; and, in fact, the separate vindication of its own characteristic claims—the constructed nature of reality and self, the incarnation of cognition, the praxical nature of theory—counts against a bifurcation of the real and the rhetorical, in virtue of which one might be otherwise tempted to endorse their ultimate rejection. Failing that, we are invited to make a fresh analysis of what is clearly salient in human history—of what, in the opposing view, tends to be neglected anyway. Nevertheless, in achieving just this small advantage, we have not yet explained what the sense is in which the technologized self or its world *are* constructed and yet are not *merely* constructed.”

This long and complicated quote—which whittles down Margolis's account in a way to which he would surely object on the ground that it has ignored his nuances—can be supplemented by way of two other SPT publications, in which Margolis situates himself in the middle between extreme opponents on both sides of him (as he sees things). The first is found in *Research in Philosophy & Technology*, vol. 7 (pp. 146, 156):

Three Conceptions Of Technology: Satanic, Titanic, Human

“. . . Theories of technology . . . are strongly tempted—when they are drawn to moral appraisal—to construe the present age in an apocalyptic light or in such a way as to confirm the promising advance of the powers of human reason over the alien and troublesome forces of brute nature.

“. . . On Bunge's view, 'technology is applied science'; and the rules of conduct he is prepared to favor are those only (opposed to merely 'conventional,' 'groundless' rules, like those of etiquette) that are 'based on a set of law formulas [scientific laws] capable of accounting for [their] effectiveness.' Once, however, science is historicized, and science and technology praxicalized, there is no longer room for the elementary confidence Bunge exudes. The truth is that *there can be no discovery of the right objectives to which our technology and social reforms ought to be consecrated*. But there is a tradition of reflecting on the ends of man—diachronically changing, plural, self-conflicting, and yet conserving; and it can only be in a dialectical enlargement and revision of that tradition

within the particular processes of human history (changing, plural, self-conflicting, and conserving still) that the ‘human’—not the satanic or titanic—alternative of the emancipatory possibilities of technology can be found at all.

“The point is that we must look for reasonable directives and constraints in the right place and give up those yearnings that are impossible to satisfy. Technology is nested in historicist and praxical processes. In recognizing that, we understand as well the rearguard disappointment that Ellul’s and Bunge’s opposed essentialisms are hopelessly designed to dissolve. It is also to understand, with considerable trepidation, the dangerous options of a genuinely human freedom.”

The final quotation is from volume 1, *Philosophy and Technology* (eds. P. Durbin and F. Rapp) of the Philosophy and Technology (Kluwer) series (pp. 291, 296, 305–306):

Pragmatism, Transcendental Arguments, And The Technological

“. . . To assimilate Heidegger’s contribution and to reject it at a stroke, we may say, by way of epithets that are somewhat cryptic but perhaps not disagreeably so, that Heidegger pretends to have made a *transcendent* discovery about technology (indeed, about the whole of Western philosophy), whereas the best (and entirely adequate) effort that men can hope to make in answering the Overwhelming Question is to offer a *transcendental* proposal about the nature of technology and reality. . . .

“. . . It is impossible to ignore, here, Marx’s insistence on construing philosophy and science—all theoretical knowledge—as forms of *praxis*; they are, Marx affirms, conceptually and really dependent on the historical conditions of actual production. In this sense, whether or not we agree with Marx’s diagnosis of capitalism (or, indeed, of the whole of human history), we cannot fail to see the important sense in which Marx anticipates and (in effect) resists Heidegger’s philosophical injunction. . . .

“. . . The technological, therefore, performs a double role. On the one hand, in accord with Heidegger’s and Marx’s view, it signifies how reality is “disclosed” to humans—primarily because it is through social production and attention to the conditions of survival (both precognitively and through explicit inquiry) that our sense of being in touch with reality is vindicated at all; but contrary to the thrust

of Heidegger's late qualification, the correction of all theories of cognition and reality thus informed is itself inevitably historicized and subject to the ideological limits of any successor stage of *praxis*. There is no escape from the historical condition, but the recognition of that fact itself is the profoundly simple result of transcendental reflection *within* the very condition of history—which obviates, therefore, the inescapability of Heidegger's various (transcendental) pessimisms and the need for his extravagant (transcendent) optimism. On the other hand, the technological signifies how the study of the whole of reality—of physical nature, of life, of the social and cultural activities and relations of human existence—is unified in terms of our own investigative interests. Hence, at the very least, not only can the theory of the physical sciences not afford to ignore the systematic role of the actual historical work of particular human investigators (for instance, against the model of the unity of science program); but also, we can neither preclude the scientific study of man nor insure that the human sciences must conform to any canon judged adequate for either the physical or life sciences. The primacy of the technological, therefore, facilitates a fresh grasp of the methodological and explanatory peculiarities that the human studies may require—for example, regarding the analysis of causality in the human sphere, the relation of causality and nomologicality, and the bearing of considerations of rationality, understanding, interpretation on the explanation of human behavior.

“Seen both in its transcendental role (as insuring inquiry a measure of objectivity relativized to the conditions of *praxis* and dialectical review) and in its role *vis-a-vis* the human sciences (as modelling the methodological distinction of such sciences) the technological may fairly be interpreted as helping to preserve whatever distinction bears on human freedom and dignity, the thrust and direction of human inquiry, the balance between realist and idealist components of cognition, the tolerance of plural, even incompatible, theories compatible with a common *praxis*, the provision of grounds for disclosing ideological distortion without appeal to foundationalism, the admissibility of a moderate relativism consistent with objectivity, and such similar doctrines as the recent currents of pragmatism have been advancing. But that is probably as much as one can ask of any relevant theory—and more than most can afford.”

In terms of *controversies*, in these last two selections, Margolis situates his version of *technological pragmatism* in the middle between Bunge (*science* quadrant) and Ellul (*idealism*), as well as between Heidegger (*idealism* again) and Marxist *socialism*. We might ignore his similar approach, above—situating himself between Rorty and such “naturalizers” as Quine in recent attempts to turn

analytical philosophy or epistemology into pragmatisms (plural)—or, alternatively, we could try to draw the analysts into the game. (But that would need to be done in a book with different purposes than the present one.) So in whatever fashion, we can clearly identify Margolis's positioning of himself within quadrants, though my reference at the beginning to Margolis's calling himself a “non-reductive materialist” would seem to keep him within the same general quadrant as Marxism while still being opposed to all versions of it. Finally, if we add in his disparaging of Deweyan pragmatism as “epistemologically naïve” (while defenders like Hickman would say Margolis's resultant pragmatism is not pragmatic at all), Margolis would be opposing the *whole range* of quadrant positions.

Chapter 7

Joseph Agassi, Philosophy of Technology, and Mass Movements

An Israeli, Joseph Agassi was born in Jerusalem in 1927; studied 1940–1944 at the Jewish Theological School in Cincinnati, then 1946–1951 at the Hebrew University, Jerusalem, with a physics major, but with additional concentrations in mathematics and philosophy. He married Judith Buber in 1949.

Current and past positions: 1997 Emeritus Professor, Tel Aviv University, Tel Aviv and York University, Toronto. 1971–1996 Professor of Philosophy, Tel Aviv University, Tel Aviv. 1982–1997 Professor of Philosophy, York University, Toronto. 1965–1983 Professor of Philosophy, Boston University. 1963–1965 Associate Professor of Philosophy, University of Illinois. 1960–1963 Lecturer and then Reader and Head of Department of Philosophy, University of Hong Kong. 1957–1960 Lecturer in Philosophy, logic and scientific method, London School of Economics. 1956–1957 Research Associate, Center for Advanced Studies in the Behavioral Sciences, Stanford.

Additional previous positions (among many others): 2000–2001 Shann Lecturer, St. John College, Hong Kong University. 1998 Summer, Resource Person, Central European University Summer School, Budapest. 1998 Summer, Visiting Professor of Philosophy, Karl-Franzens-Universität, Graz. 1996 Fall, Distinguished Visitor, Faculty of Education, University of Calgary.

There are two volumes of essays in honor of Agassi, both edited by I.C. Jarvie and Nathaniel Laor in the Boston Studies in the Philosophy of Science series, vols. 161–162:

1995. *Critical Rationalism, Metaphysics and Science*. Dordrecht, Netherlands: Kluwer.

1995. *Critical Rationalism, the Social Sciences and the Humanities*. Dordrecht, Netherlands: Kluwer.

Agassi's books in English (there are many others in Hebrew and Italian) that are relevant (in my opinion) to this chapter are included in the bibliography at the end.

Agassi was already well known in philosophy of science circles—mostly as a faithful follower in the footsteps of Karl Popper—when the Society for Philosophy and Technology was founded. But he was also recognized for having wandered onto the turf of philosophy of technology very early. Never losing his Popperian roots, Agassi picked up on one of Popper's maxims about engineers (whom Popper despised), about how they are “looking for a needle in a haystack.” Agassi parlayed this into a distinction between philosophy of science and philosophy of technology that Popper probably never intended. But all of this belongs among philosophy of science controversies. Once Agassi entered the not-yet-existent field of philosophy of technology (in 1966), he never left; he was one of the most regular attendees in the early days of SPT meetings. There, however, all his energies were focused on how engineers and philosophers of technology, alongside philosophers of science, should be actively involved in campaigns for social responsibility among technical workers. This makes a contrast with Alex Michalos (Chapter 2) interesting.

Michalos never talks much about engineers, and his concerns about social responsibility among philosophers of science barely mention them. This is also true for Agassi. The chief difference is that, in all his presentations at SPT meetings, Agassi explicitly addresses fellow philosophers of technology, urging them to join in the sorts of mass movements for social change that Agassi identifies with Bertrand Russell's Ban the Bomb movement at the beginning of the nuclear age. As we have seen, Michalos chose rather to address more or less the same constituencies, but by way of work with a non-Marxist socialist party in Canada.

Agassi more or less ignores his obvious opponents, those who think that talk of social responsibility is needless—philosophers who say that scientists and technologists when they do their jobs well are already working for the common good. (Agassi does call this an ostrich posture.) We saw Joseph Margolis, in the previous chapter, join Agassi in a forceful attack on this view as defended by Mario Bunge (Chapter 5); as we saw, Margolis says Bunge's view—treating scientists and other technical workers as having social responsibility as an add-on, *when their very professional work is already shot through with values*—is nothing more than hidden positivism.

Agassi's goals, like those of Margolis when he defines what a technological society is, are involved with avoiding the catastrophic; but Agassi is explicit in framing these goals in terms of technological disasters such as nuclear war and

wholesale pollution of the planet. What is different with respect to Michalos is that Agassi comes close to sermonizing when he urges his new friends among philosophers of technology to join in mass movements to save the world. (Agassi is explicit in saying that earlier philosophers of technology had nothing to offer in this regard.)

In this chapter I am going to follow my pattern in the previous one; though Agassi wrote a book on technology, *Technology: Philosophical and Social Aspects* (1985), it does not reflect the directions he pursued in his SPT publications. So here again I try to reconstruct his view. What follow are more or less brief (at least truncated) selections from several of Agassi's contributions to SPT publications. The first quotation comes from the very first SPT publication, *Research in Philosophy & Technology*, vol. 1 (pp. 53–64, with omissions signaled by ellipses):

Technology, Mass Movements, And Rapid Social Change: A Program For The Future Of Philosophy Of Technology

“The problems the philosophy of technology encompasses are very broad, starting from the question: are we better off with technology or without, and with what tool is this decidable? This is an example of a hardly practical question. Consider, however, questions such as. What criteria are used by government agencies to allow the implementation of innovations? How do different agencies and different countries compare? Such questions are of great philosophical-methodological interest, as well as of a great practical value. Is it true, as pilots believe, that runways are improved only after disasters? If so, why? Can this be improved? Questions of this sort are hinged on methodology, on the philosophy and methodology of the social sciences, and on (democratic) social philosophy. It is no surprise that this area is backward, especially in view of the classical opinion that technology is purely physical technology and thus hardly problematic.

“The classical philosophy of technology made no provision for the adaptation of society to technology, no provision for social reforms necessitated by technology. Though social changes of this sort were made, they lagged behind. Now, due to population explosion and pollution many ecologists predict certain inevitable calamities, perhaps an irreversible change in the balance of nature that might make mankind extinct. The question I wish to pose here is *a priori* practically hopeless. It is. What changes ought we introduce, and how can we introduce

them rapidly so as to avert too much of a calamity? To narrow down the question so as to make even a preliminary discussion of it at all conceivable, I wish to put this question for my present discussion: can we learn something from the recent mass movements about rapid social change? Can we make the mass movements more effective, more democratic, more instructive? More pointedly, can we focus the mass movements on the solution of what I call the ‘technological apocalypse’?

“I shall, then, divide my time now among the three following topics:

1. What the mass movements were meant to be;
2. The politics of mass movements; and
3. The technological apocalypse.

1. What The Mass Movements Were Meant To Be

“I wish to begin by quoting from the third and last volume of the autobiography of Bertrand Russell, who, in a certain sense, was the father of the modern mass movements, or at least a major factor in their evolution. Of course, Russell did not plan things in any manner that resembled the outcome. What he had was an immense sense of urgency, a sense of now-or-never about the choice between abolishing nuclear war and abolishing mankind. What Russell felt was that the choice was in the hands of the fates, whereas it should be made rationally by all concerned. We are prone to forget this because his Ban the Bomb movement ended in a failure of sorts, and because somehow, perhaps miraculously, perhaps not, a precarious balance is kept and we pretend to have learned to live with the bomb. I do not think we can get the proper sense of the events of barely two decades ago, unless we try to empathize with Russell’s sense of emergency and his desperate effort to step up his activities. . . .

“What then happened has not yet been sufficiently chronicled, but is still fresh in memory. The movement crossed the ocean and spread in the United States in diverse directions: student liberation, black liberation, sex liberation, women’s liberation, gay liberation. But all these movements were, for most of the time, put in the shade by the mass protest against the American involvement in Vietnam—indeed ever since the day Martin Luther King, Jr., declared he could not go on in good conscience leading the black liberation movement without joining the anti-Vietnam War movement as well and until the end of the war. The movements, especially the student movement and the anti-Vietnam War

movement spread all over the world. Their techniques included, as had the black liberation movement before, both civil disobedience and violence. What the students introduced first were the teach-ins. These were immensely popular and successful, I think, but some viewed them with suspicion as possible means of slowing down the movements and thus dampening their impetus and robbing them of their mass character. I shall return to this soon. . . .

“Soon after the Vietnam War was over, much of the impetus dissipated. Some of it went into a new mass movement—the ecology movement. . . .

2. *The Politics Of Mass Movements*

“. . . It is a historical fact that the leaders of the mass movements, from Bertrand Russell to Noam Chomsky and Howard Zinn, declared their cases to be clear and unarguable. Of all of them only Martin Luther King was right. . . .

“The movement that has the greatest promise for technological problems and that should undertake the greatest and most important and urgent roles is the ecological movement. That movement developed rapidly—as rapidly as other movements—partly because a vacuum was there to be filled in the space of mass movements (the vacuum is still there) partly because of the new and intolerable level of pollution (the situation is rapidly deteriorating). The movement was defeated—as a mass movement, I mean—by its inadequacy. . . .

“Here I come to a philosophical aspect of the matter. The problem of induction as a problem of empirical justification of action, social or private, is insoluble. We never know whether we are too slow or too fast in implementing an innovation. Different societies have standards regulating all this, and the standards are regularly tested and altered. But some innovations are not subject to standards, some standards vary greatly depending on the urgency of the situations. Military establishments take greater risks in testing and implementing innovations since they fear the greater risk of unpreparedness; market mechanisms push corporations to similar considerations. Pilots say runways only improve after blood is spilled on them; because, I presume, runways conform to standards but standards are inadequate and improve too slowly.

“That population control and pollution controls are matters of emergency is commonly admitted. That standards to deal with them are either grossly inadequate or nonexistent is likewise admitted. The mass movement can come in

here, and of course it will make mistakes like any other movement, and more. This should be no discouragement if it is *a priori* admitted beforehand, especially since the mass movement, being so spontaneous and almost entirely amorphous, can be more flexible than any organized body.

3. *The Technological Apocalypse*

“The wedding of mass movement new style and apocalypse new style into the ecological movement was as obviously propitious as ill-fated. As the first phase is complete we may try to consider or plan the next one.

“Apocalypse, meaning revelation, has traditionally meant a prophecy of doom, especially war, famine, and pestilence, perhaps also the end of the civilized world or of humanity or of earth as a whole. The ecological apocalypse is not new, and its modern prophet was Aldous Huxley, who wrote about it extensively in his *Point Counter Point*, in his *Ape and Essence*, and elsewhere; and also Julian Huxley, one of the most ardent campaigners against population explosion. But the discussion on whether technological progress as a whole is really progress is old. That is to say, admitting that every innovation is implemented because someone finds it worthwhile; and assuming the questionable thesis that my progress is not your regress; even then we can ask, is it on the whole worthwhile to introduce technology or not?

“We do not have the intellectual tools to ask such a question, since we study questions within intellectual frameworks, and frameworks take for granted answers even to some global questions. Indeed, intellectual frameworks constitute sets of answers to some given questions such that they generate some research programs, as I have explained elsewhere.

“Also, the question is of no practical importance. We simply cannot stop the march of technological progress. We can, at most, impede it.

“Moreover, as we cannot stop the march of technological progress globally; it is mere folly, an ostrich policy, to try to impede it or ignore it locally. One who eats natural foods but breathes polluted air and drinks polluted water is but a fool. And soon all air on earth may be polluted.

“This, however, is not to say it is never wise to impede progress. Quite possibly the success of the American ecological movement to impede the implementation

of supersonic civil aviation will lead to the evolution of better techniques that will not risk the environment more than subsonic flights do. No doubt, the rapid implementation of Western technology in underdeveloped countries with little or no planning causes severe cultural lags there, creates new tensions there, and so on. But I cannot enter all this now. Rather, let me say some general things about the growth of technology and its social implications. . . .

“. . . [W]hat is characteristic of today’s ecological crisis is, first of all, that on the national scene of every advanced country where it is a problem, it sharpens the conflict between production and preservation: while production is run by a well-organized capitalist market, preservation has no spokesmen of any force; and second, the crisis has become international or global, with no spokesmen for global interests to speak of. . . .

“When we come to the global level we are stymied. The founders of the ecology movement felt this very keenly. Some ecologists said explicitly that it is a scandal that Western governments allowed themselves to offer Ceylon large-scale means of over-coming epidemics, especially malaria as it happens, without coupling the offer with some means of population control. I find such comments both unintelligent and immoral. But I mention this to illustrate the low level of present ability to cope with the problem of population control on the global level.

“Some ecologists said zero population growth begins at home, on the family and the national level. But suppose the West keeps its level constant, or suppose Protestants keep their level constant, while the others grow. This will cause a rapid demographic trend that not all will welcome. For my part, I suppose there is much consolation in those enlightened people who would rather teach than breed. But I cannot simply see here a solution to the global problem—at least not without an extensive debate leading to a radical change in attitude, i.e., at least not without a mass movement. But sooner or later the agenda will be: how can one country influence progress in another and how can global planning develop soon and effectively to avert the coming apocalypse?

“Obviously, the laissez-faire theory allowed first nineteenth-century imperialism and later the tendency of governments of advanced countries to help governments of backward countries consolidate, no matter how backward these were, so as to be able to trade with them, to invest there, etc. The paradigm is the oil-producing countries, and it is really of no import at all whether the official organization in charge of the process is a Western company, a joint Western and

local concern or a local concern. The local elite is backward and prevents progress at home; it sells oil for some luxury items and for arms and for almost no goods and services to distribute to the large masses which are still mostly illiterate.

“The ameliorating move of the West, the programs of foreign aid, failed since they were purely economic: they took no notice of local impediments to economic progress and so failed even economically; moreover, they were based on the hope that in the long run economic progress will bring all sorts of progress. Perhaps; but the long run is too long. I shall leave this topic referring the interested and concerned to D. V. Segre’s excellent *The High Road and the Low*, London, 1974.

“One still better move was the Peace Corps and Care and their like. They failed; the unenlightened leaderships of backward countries found ample reasons, good, bad and indifferent, to put an end to such programs. But there are countries that might still welcome the Peace Corps, perhaps if and when jointly organized; there are countries that can be made to accept the Peace Corps; and there is the Bourguiba plan of shipping masses of students from backward countries to be trained in highly skilled jobs in the advanced countries. These things need more thinking out and strong pressures on governments—and since time is short, teach-ins and mass movements may be called for.

“There is, however, no substitute for proper world coordination of world population growth, of world economic planning, and of worldwide arms control. The failure of the United Nations organization, even in the attempt to control nuclear proliferation, is a fact. . . .

“But I must leave it here: I have already entered deeper into politics than some might deem in good taste when in a symposium on the philosophy of technology. So let me just say, no program for a philosophy of technology can be viable unless it is highly political in orientation: the result of two centuries of effort in the direction of physical technology without attention to social and political technology have caused a lag, and the lag must be filled as rapidly as possible, since time is short and the catastrophe may be around the corner. All I can pose today is the questions on tomorrow’s agenda for philosophy of technology. A major one is, I say, Can there be democratic mass movement for world planning and peace?”

Next comes Agassi's attempt to provide a framework in *Research in Philosophy & Technology*, vol. 6 (pp. 55–56):

Technology As Both Art And Science

Preface And Summary

“The word technique comes from the Greek word, *techné*, whose Latin cognate is *ars*. As often as we hear of surgery or of acoustic engineering or of any sort of a technique that it is an art, we also hear that it is a *scientific* art or technique. In fact it is both art and science, in the sense that some techniques are scientifically attested, some not, as well as in the sense that every item of our contemplation has both unique aspects, not given to science, as well as repeatable ones, subject to scientific investigation.

“This leaves open the question. Is technology as cumulative as science? In a sense science is indeed cumulative—though not in the traditional sense which most modern philosophers of science have assumed. In the sense in which science is cumulative, technology is not. Even so, a scientific theory of given techniques may succeed in rendering that technology cumulative.

“Applying all this to scientific method, one may wish to make methodology scientific and thus unite science and technology. Such ventures are not without promise, and at times they may produce exciting results; yet the project will be regularly threatened by unforeseen discoveries and by unforeseen inventions which will invite renewed efforts at integration. As uniqueness is inexhaustible, unifications by repeatable means may forever be met by diversification due to uniqueness. Science and art thus are competitors and partners in one and the same process.”

Finally, Agassi's applications in *Research in Philosophy & Technology*, vol. 7 (p. 194):

Political Philosophy And Its Implications For Technology

“What has political philosophy to say to those concerned with the use of spreading technological advances for the relief of urgent global problems? What is the proper philosophy for technology transfer? . . .”

And in the Philosophy and Technology (Kluwer) series, vol. 5 (p. 277):

Technology Transfer To Poor Nations

“The present essay belongs to the realm of global politics. It takes it for granted that the cleavage between poor nations and rich nations is not merely the problem of the poor nations but of the whole human race since it threatens the very survival of mankind, and in many ways and at the very least, it affects adversely the quality of life everywhere on earth. We are generally sufficiently aware of this fact so as to conclude that foreign aid is not the preference of the interest of the poor nation over the interest of the rich nation, but rather an act well within the national interest of the donor as well. This was epitomized by John F. Kennedy’s edict: we can afford to offer foreign aid and we cannot afford not to. Also, Kennedy was aware of the difficulty of granting foreign aid to the poor nations on a permanent basis, like a rich philanthropist’s regular aid to the poor as practiced well within all traditional societies; hence, foreign aid must aim at helping poor nations achieve self-sufficiency, i.e., learn to reach high levels of production so as to be free of the need for aid. This, of course, means the transfer of technology.”

In terms of *controversies* here, Agassi is not explicit about all his opponents. But the thrust is clear. He is *activist* where he thinks (all?) other philosophers of technology are not. In one case, where Michalos is active within a socialist party, Agassi seems suspicious of party politics as less likely to succeed than mass movements. Next, Agassi more or less dismisses out of hand the then-traditional *idealist* philosophers of technology, such as Heidegger, as ostriches. And he says the same about narrow positivist philosophers of science—the *science* quadrant. This puts Agassi in opposition to more or less everyone in all parts of the philosophy of technology sphere—where (following Popper's lead in challenging everyone) he thinks he ought to be.

Chapter 8

Edmund Byrne on Work

Edmund Byrne taught for many years and was a chairperson at Indiana-Purdue University in Indianapolis. He is currently emeritus professor there, where he continues to publish. See items listed in the bibliography at the end.

Longtime treasurer of SPT and one of the most regular attendees at our conferences, Byrne always made interesting contributions. But in my opinion his book on work reflects his general outlook and philosophical style better than anything else he has written. I have, before, reviewed the book, *Work, Inc.*, both for *Research in Philosophy and Technology* and, in modified form, as a chapter in my *Social Responsibility in Science, Technology, and Medicine*. *Work* goes to great lengths to spell out his agreements and disagreements with opponents, so it is perfect for my approach in this book. I thus feel confident about redoing my earlier review(s) for this chapter, with only the modification of underscoring his disagreements with key opponents. (See Note on Quotation Styles in the introduction.)

In simplest terms (I wrote in *Social Responsibility*), *Work, Inc.* is an appeal to philosophers who believe in social contract theory—and there are a great many of them—to revise their thinking in fundamental ways. The most important way, according to Byrne, is for these ethical theorists to take corporations—especially transnational corporations—more seriously in their speculations on the “just state” than they have up till now. The reason for this is simple (Byrne says): transnational corporations today exercise de facto sovereignty—a sovereignty that always influences, sometimes equals, and often overpowers the sovereignty of nation states.

(The first objection to his book, then, would come from philosophers of technology who depend on Rawls, such as Kristin Shrader-Frechette—see Chapter 3, above. But the fact of the matter is that few other philosophers of technology have taken the power of corporations as seriously as Byrne does.)

Easy as it is to state Byrne’s thesis, his is by no means a simple book. Its style is cryptic, dense, and allusive. And the argument is so subtle and nuanced that it is not inappropriate to say that the book contains just one long, convoluted argument that extends from cover to cover.

The premises of Byrne's argument are laid out in an introduction. He begins with a paraphrase of a widespread complaint made by people in the labor movement: "We had a social contract, and now we don't. The social contract has been broken. Government, business, and labor—each had its role and each understood its responsibilities to the others. All three together, cooperating for the betterment of all. That's how it was, but no more."

Byrne follows this immediately with an acknowledgement that this social contract existed for only a short time (especially in the United States)—roughly from the 1930s until the 1970s. And even then, Byrne says, the contract was from the beginning fatally flawed by a basic assumption accepted by all three parties: namely, that the parameters of the contract were national—and this in two senses. There was never any real commitment of the corporations to the local communities in which they operated and from which their workers derived such strength and meaning as they had; and the corporations were becoming increasingly transnational ("multinational" according to more popular usage).

Byrne's conclusions are conveniently set forth in a separate chapter that brings the book to a close. Q.E.D. There are three conclusions, which Byrne labels "factual," "hortatory," and "theoretical." The factual conclusion is the one stated earlier in a paraphrased complaint of union leaders, now bolstered by all the interpretations of facts argued for throughout the book.

The hortatory conclusion (Byrne says) is this: workers will be able to counterbalance the concentrated power of corporations only to the extent that they and the communities in which they live come to see their interests as intertwined and learn to defend these interests cooperatively.

The theoretical conclusion is this: social and political philosophy will remain irrelevant to a major social and political issue so long as its practitioners do not deal with the fact that corporations are becoming the world's most powerful de facto bearers of sovereignty.

Byrne had spelled out who these irrelevant social and political theoreticians are in his introduction, but his primary target is John Rawls. Byrne views Rawls as a liberal defending the claim that the public sector has a responsibility to take care of people's (including workers' and their families') basic needs, and he sees Rawls's opponents (e.g., Robert Nozick) as libertarians with their emphasis on

the efficacy of individual initiative.

(So Byrne places himself to the political left of Rawls, while joining the latter in opposing Nozick's libertarianism. Objections could clearly come from defenders of both, but once again they tend to operate at the abstract level rather than descend to the concrete real-world level where Byrne situates his book.)

Throughout the book Byrne uses as his means of arriving at his conclusions the method of demythologizing. What he claims to be doing is slaying "dragons that guard the gates of the status quo": namely, legal assumptions about corporate personhood and eminent domain, or about private property and the commodification of goods; management ideas about employees as autonomous individuals rather than citizens with roots in local communities, plus the management ideology of "profits without payrolls" by way of robots and automation; and ideologies of progress and competition.

I look here, as I have done before, at three examples of Byrne's demythologizing. The first is concerned with the obligation or right to work, the second with claims about "meaningful work," and the third with obligations of justice in plant relocations.

In Part I, "Worker and Community," Byrne deals with three issues: the obligation to work, the work ethic, and responsibility for people who are unemployed. Under the first heading, after reviewing the opinions of philosophers ancient and contemporary on the issue of forced labor, Byrne concludes that "freedom has come to be more highly valued than work . . . [so that] a well-informed representative of workers [Byrne's point of view throughout] would want to proceed with caution before endorsing a social contract in which work is made obligatory" (p. 45).

On the work ethic, Byrne defends a somewhat controversial view about a possible "contractarian basis for [an] obligation [to work] in a just society." He does so by defending four theses, namely that: (1) not all human beings would recognize or agree to an obligation to work (largely an examination of Johan Huizinga's reading of history in *Homo Ludens: A Study of the Play Element in Culture*); (2) not all rational human beings would recognize or agree to an obligation to work (people throughout history whom one would not want to accuse of an adolescent predilection for play over work—for example, clerical academics—are cited as evidence); (3) not all rational, responsible persons would

recognize or agree to an obligation to work (here Byrne cites management rules: an ultimate rule, that whenever possible people are to be replaced by machines, and an interim rule that says to use the work ethic to get as much work as possible out of workers in the meantime); and (4) not all rational, responsible, knowledgeable persons would recognize or agree to an obligation to work. In defending this fourth thesis, Byrne arrives at his all-too-obvious conclusion: that few people value work for its own sake; or, stated more directly, that most people value work only as a means to some other end.

On responsibility for the unemployed, Byrne acknowledges that “a society’s welfare benefits may be influenced by presumptions about work obligations,” but “nonetheless one’s involvement in the work force does not guarantee eligibility for benefits” (p. 99). About this state of affairs Byrne’s indignation shows through: “We are all losers if we continue to acquiesce in a public policy that for all practical purposes abandons displaced workers like tools no longer needed. We do not cut off benefits to veterans of yesterday’s wars just because they served with now obsolete means of destruction. Still less should workers be forgotten simply because they served with now obsolete means of production” (p. 109).

Byrne describes “meaningful work” as a “seductive” notion. As a general proposition, he says that, “The more people expect their work to be meaningful, the more they seem to challenge employers’ claims to control over the work relationship” (p. 115). And Byrne raises four objections to the expectation of meaningful work: (1) job satisfaction is not a sufficient reason for keeping a job, and the absence of job satisfaction is rarely a sufficient reason for leaving one. (2) Meaninglessness is not peculiar to disappearing low-skill jobs, and meaningfulness is often missing in new high-skill jobs. (3) In any case, whether a job is viewed as meaningless or not, it is always subject to termination. And (4) no matter how well-intentioned the “meaningful work” movement is, it is peculiarly vulnerable to manipulation by management: “Under such labels as job enrichment, quality of work life, and cooperation, employers are (Byrne says) luring even unionized employees out of de-skilled niches inherited from the past into purportedly more complex and challenging assignments. Workers in their turn are expected to respond to this recognition of their potential with deepest gratitude. But gratitude is not the most common response. As these experiments in meaningful work are carried out in the workplace (rather than in scholars’ thoughts) they frequently involve more stress and less compensation” (p. 120).

This may seem to be a pessimistic conclusion, considering the inherent appeal (management's objection to Byrne) of the meaningful work ideal, and Byrne (in an implicit reply) ends his discussion on an appropriately ambivalent note: "Employers are to be encouraged to provide opportunities for the exercise of creative potential. But people must remain free to decide for themselves how they personally want to go about exercising their own creativity" (p. 135).

Byrne slays his most important dragons and comes to his most important conclusions in part III, "Corporation and Community." But earlier in the book he had already done some heavy demythologizing: "Plant closings are commonly defended as a matter of business necessity. Many labor-intensive plants have been closed in recent years . . . especially in . . . the so-called rust belt. Why is this the case? Some blame rising labor costs. . . . Others, including [union] experts . . . prefer to blame 'the importance of technological innovation as a means of [meeting] competition.' The pressure of competition may generate a desire to innovate. But it may also inspire a company to find an environment in which 'cheap labor' is available . . . [or it] may be an opportunity to 'get out from under' a union" (p. 17). (This pits Byrne against both management and unions.)

Under the heading of plant closings, one dragon Byrne attempts to slay is new laws and legal interpretations that try to restrain the property rights of corporations. But, he says, the corporations display a remarkable immunity to these efforts: "Exemplifying this immunity is the fact that corporate restructuring often undercuts the [National Labor Relations Board's] distinction between partial and total closings, thereby exempting the 'restructuring' employer from notifying and negotiating with its 'lame duck' employees" (p. 212). And he goes on to cite the example of U.S. Steel, transformed into a division of USX, shutting down its mills in Youngstown, Ohio, in 1979.

Later Byrne says: "Judith Lichtenberg is certainly correct in saying that 'the company's ownership of the factory cannot settle the issue of its responsibility in plant closings.' But, as we have seen ownership is not necessarily coextensive with control, and either may change about as quickly as the price of a stock on the trading board. So a narrowly focused insistence on advance notice and transitional benefits already concedes the characterization of a corporation as a commodity and leaves communities in the position of beggars who as has oft been noted, cannot be choosers" (p. 218).

After which Byrne launches into his last and most powerful argument: "It is

essential that communities . . . be in a position to be choosers. A community being, by my definition, a geographically localized complex of legitimate interests (abstractly) and (concretely) human beings who assign these interests moral priority, the task before us is to tie the community thus understood to a plant or facility which a corporation owns or controls.”

Byrne can accuse Lichtenberg of a narrow focus on legalistic definitions, but we should be clear what his own focus is: namely, on a broad political restructuring that would give back to communities the power (did they ever really have it?) to negotiate a social contract on an equal footing with multinational corporations. Here we should recall Byrne’s overall hortatory conclusion at the end of the book: that workers need to mobilize their power, in local communities, to defend their interests cooperatively.

Byrne should recognize that this will be seen, at least by managers (and members of what can justly be called the managerial classes), as a call to class struggle, of workers and their communities, not only against the owners of corporations but against the whole social, political, and legal system that supports them—and ultimately against the ruling ideology of capitalist society. That is, critics (the main objection against his book) will accuse him of being a Communist—and it thus may seem odd that he rarely mentions Marxism in the book, whether to defend or oppose it.

In short, it seems clear to me that Byrne’s hortatory conclusion demands far more—in the way of political savvy, political activism, even political power—than his final theoretical conclusion. All that that requires is for political philosophers to be more realistic. But then, if political philosophers got more realistic, maybe they would see the need to go beyond theory to calls for restructuring political power relationships. They would become more pragmatic. (See Hickman in Chapter 14.)

So, in terms of *controversies*, Byrne’s book is fairly academic—though, he thinks, with a practical thrust. He situates himself to the left of Rawls in the latter’s opposition to both utilitarianism and the libertarianism of Nozick. Byrne accuses Lichtenberg of a narrow focus on legalistic definitions, and it should be clear that this means he wants more than words; he wants action against the *management* policies he outlines—so often based on supposedly scientific economic theories. This ought to move him toward activism of some sort. However, he gives only fleeting recognition to the two main philosophies

espousing that in our philosophy of technology spectrum (or sphere)—pragmatism and Marxism. His few references to Dewey (mostly positive) would suggest that Byrne is more of a leftist liberal (Progressive or Social Democrat?) than a Marxist.

Part 2. The Field Refuses to Jell

Chapter 9

An Early Attempt to Turn Philosophy and Technology into Philosophy of Technology: Joseph Pitt

According to his own web account, Joseph Pitt has research interests in history and philosophy of science and technology, with an emphasis on the impact of technologies on scientific change. He was founding editor of the journal, *Perspectives on Science: Philosophical, Historical, Social*, published by MIT Press. His historical interests include Galileo, Hume, and American pragmatism. He is author of several books and numerous articles in the history and philosophy of science and technology. Recent books, for example, include: *The Production and Diffusion of Public Choice: Reflections on the VPI Center*, co-edited with Dhavad Saleh-Isfahani and Douglas Eckel (2003), and *Thinking about Technology* (2000). I will focus on the latter, as well as a set of critiques of that book that I edited for the SPT electronic journal, *Techné*.

After four presidents of SPT—Mitcham, Michalos, Shrader-Frechette, and Wartofsky—to which I have added Bunge, Margolis, Agassi, and Byrne; and after four international meetings: Bad Homburg in (then West) Germany, New York City, Twente in the Netherlands, and Blacksburg, Virginia (Pitt was host there), and proceedings volumes for each of these—after all of that, Pitt was still not satisfied. In what we have seen so far, the early years had covered most of anybody's philosophical spectrum: metaphysics (Mitcham), the social responsibilities of technically trained experts (Michalos), ethical and philosophy of science analyses of particular expert projects (Shrader-Frechette), Marxism (Wartofsky), a systems/exact philosophy analysis of technology (Bunge), a philosophy of technology closely linked to major figures in analytical philosophy (Margolis), social-movement activism (Agassi), and a workers' perspective for technological society (Byrne). The non-proceedings volumes of *Research in Philosophy and Technology* added still more perspectives. But Pitt wanted philosophy of technology to be more like philosophy of science. He wanted, not a great variety of perspectives, but a professional discipline in the academic sense.

So, in *Thinking about Technology*, he set out to produce a textbook for the new field. Here is a summary of the book, drawn from my introduction to the *Techné* author-meets-critics number: "Pitt says his approach can be summarized briefly. He proposes a 'Commonsense Principle of Rationality (CPR): Learn from

experience' (p. 22) to be applied in assessing particular technologies, not Technology in general. And this, he says, amounts to . . . having shifted our ground from worrying about providing an abstract philosophical justification for something that only philosophers worry about to a pragmatic condition of success. . . . To adopt this attitude is to reject . . . logical positivism, and to embrace pragmatism" (p. 40).

For the rest, I let Pitt summarize his own book. He does so in two places, one at the beginning and one at the end. In his preface, Pitt says: "The structure of the book is fairly straightforward. First, I develop a framework for thinking about specific issues that arise in the context formed by a specific technology [the Commonsense Principle of Rationality]. Second, I introduce and explore a set of concepts that are counterparts to concepts that have already been the object of intense analysis by philosophers of science . . . [e.g., explanation, evidence, law; although] I suggest that maybe science and technology ought not be thought of as so closely linked . . . [since] philosophical questions about technology [turn out to be] first and foremost questions about what we can know about a specific technology and its effects and in what that knowledge consists. This amounts to knowing what we as human beings can know about the world and our impact on it. That is why I think epistemological issues should be addressed before we engage in social criticism. I then proceed to attack a set of assumptions about 'technology' put forth by social critics. Whatever else 'it' may be, I argue that technology is not autonomous or a threat to democracy. I further argue that talking about technology in this way misleads in important ways. Finally, I address the problem of technological change. After examining extant models of scientific change, showing them to be inadequate, I explain the inadequacy by appeal to their failure to take into account the technological infrastructure of science and the manner in which science is embedded in and fundamentally tied to it" (pp. xii–xiii).

At the end, Pitt says: "I have looked at technological change as a counterpart to scientific change. I have argued that understanding scientific change required putting the science in context . . . [within] its technological infrastructure. The strong conclusion emerging from this . . . [is that] the growth of science can be seen in similar terms [to] the growth of human culture, that is, made possible by the tools and mutually interactive support systems we have come to call technology" (p. 138).

The critics—none of these represent the perspectives that Pitt hates—take several

points of view. For example, Davis Baird, “Organic Necessity: Thinking about Thinking about Technology”: “This leaves us with a final irony in Pitt’s work. He complains at length about ‘the social critics’ of technology. At one point, Pitt subjects the passage that gave the title to Langdon Winner’s book, *The Whale and the Reactor* (1986 p. 165) to extended and sharp criticism (pp. 72–75). In the passage, Winner describes returning to a California beach near his childhood home. He comes over a bluff and is confronted with a vista that sends him reeling. There nestled on the shores of a tiny cove, was the gigantic nuclear reactor . . . a huge brown rectangular block and two white domes. ‘At precisely that moment [he says] another sight caught my eye. On a line with the reactor a California Grey whale suddenly swam to the surface, shot a tall stream of vapor from its blow hole into the air, and then disappeared beneath the waves’ (Winner 1986 p. 165).

“Pitt decries Winner’s rhetoric, ‘the pitch to the emotions.’ Pitt correctly points out that Winner is ‘making a series of explicit value judgments.’ He complains that Winner is ‘pushing an ideology.’ As I understand this passage, Winner is attempting to change the value matrix that was in place in the mid-1980s. If successful, this might prompt different decisions about nuclear power. Pitt is right to rail against the idea that we fall helpless before the steamroller of Autonomous Technology. The social critics whom Pitt trashes are attempting to gain more insight and control over our technologies. They are fighting against an Autonomous Technology, and attempting to realize Pitt’s own vision of conscious human decisions creating technologies that offer ‘new and promising avenues of human development’ (p. 120).

“I like Oppenheimer’s phrase, ‘organic necessity.’ It captures two central features of the autonomy of technology. In the first place it recognizes a kind of autonomy. There is a necessity here. But it is not a logical necessity or an *a priori* necessity. It is an organic necessity. I understand this to mean it changes over time and it changes in response to our decisions about our technologies. We are not helpless victims of Autonomous Technology. Neither are we Masters of the Universe. The relationship is more complex and interdependent, more organic.”

Kristin Shrader-Frechette, “Reductionist Philosophy of Technology: Stones Thrown from Inside a Glass House”: “Pitt’s selective citation of the philosophy of technology literature, his countering the claims of his opponents with falsehoods and without citations, and his falling into ideology and rhetoric are

problems about which this essay has been especially critical, in large part because Pitt was so brutal in his criticism of others for allegedly making the same mistakes. When someone like Pitt proceeds from a moral-relativist, positivist, technocratic, autocratic stance, then one expects him to defend his position, particularly because he is critical of others who do not share his stance. Yet there is no adequate defense anywhere in Pitt's book. He argues for his ethical relativism, for example, in one short, 7-sentence paragraph that is nothing more than a string of question-begging claims. Ethics demands better.

“Given that a philosopher of science could make a good case for an epistemic emphasis in philosophy of technology, the fundamental problem with Pitt's volume is not its overall theme. The problem is that he has handled his theme badly, that he has so many gratuitous, undocumented, ideological claims, while he criticizes others for these faults. Pitt should be wary of throwing stones at other thinkers when the glass of his own house is so extraordinarily thin.”

Paul Thompson, “Thinking about Thinking about Technology”: “In my view, E.P. Thompson's type of social history is part and parcel of an adequate epistemological analysis of technological change, as is Borgmann's type of existential epistemology. I am not sure that Pitt would disagree, but there are tendencies in *Thinking about Technology* to suggest that he might. One is the aforementioned tendency to emphasize engineering design and breakthrough technology. The ‘how it works’ question relevant to seventeenth-century rural villages is simply that roads and wagons make it much cheaper (meaning physically easier and less time consuming) for someone who has already harvested a crop and put it in bags to search for millers and bakers who will offer the most attractive terms of trade. The ‘how it works’ question relevant to Borgmann's 1984 discussion of devices concerns the way that, in making our lives easier, they may deprive us of experiences that enrich and give meaning to our lives. In my view, these are still epistemological points, and social ones at that, but is this ‘technical explanation’ in Pitt's sense?

“The more disturbing tendency is Pitt's quickness to find ideology, rather than philosophy, in the thinking of the social critics. This is particularly evident in Pitt's patronizing advice to social critics: ‘[R]ecognize that not everyone will accept your values and that others are equally well justified in rejecting your claims of superiority. You will have to work toward building a consensus, and this is fundamentally a political activity, not necessarily one governed by reason’ (p. 120). So tell me, Joe, if consensus building is not governed by reason, why

have you led us through a hundred odd pages of griping about the need to introduce more rigor into the social critique of technology? It is not as if the social critics have no arguments at all. We must evaluate those arguments, improve them when possible and reject them when necessary. You are right to tell us that we should attend to 'how it works,' when evaluating, improving or rejecting those arguments, but we must see both epistemology and social critique as amenable to improvement to do that. And for a pragmatist that is what 'governed by reason' comes down to."

Douglas Allchin, "Thinking about Technology and the Technology of 'Thinking about'": "Under Pitt's new definition of technology, philosophy counts as a technology: a tool for making sense of things. He also views technology assessment as essential. Here, then, honoring the spirit of Pitt's comments, I assess his own philosophy of technology. . . Finally, I comment on the dynamics of social discourse, where we need an effective technology for reflecting jointly, for building consensus, for rational discourse. I think a model of consilience through reasoned discourse and creative problemsolving is missing in most philosophy—including Pitt's."

Pitt replies to each of his critics in turn, but to me (even though I edited the collection), these accusations and replies reflect the atmosphere of an author-critics session at a philosophy meeting more than they reflect the real controversies that Pitt and his critics want to get involved in. Some of the atmosphere is further tainted by Pitt's pugnacious attitude in such meetings. Here is my attempt to get at what the real issues are that the critics and Pitt are involved in:

1. I begin with Shrader-Frechette, whose surprisingly personal attacks on Pitt (he may have deserved it) mask her agreements with those friends in history and philosophy of science from whom Pitt says he derived his concerns about the actual content of philosophy of technology as they understand it. They believe, as Pitt claims, that philosophers of technology, as he and they read them, offer no account of technological explanation, evidence, or laws (if there are any technological laws) that would parallel treatments of such features in philosophy of science. Shrader-Frechette limits herself to saying that Pitt limits himself to only one model of explanation (a somewhat old-fashioned one), and that his commonsense principle of rationality is too vague to satisfy any tough-minded philosopher of science.

2. There is a real issue here, and it takes us back to Mitcham's controversies with those philosophers he lumps under the label, "engineering philosophy of technology." While opposing them, Mitcham recognized that at least some of them wanted to develop careful analyses of what goes on in actual technological communities. (See Chapter 5 on Bunge, above.)
3. Thompson also gets somewhat carried away by the tone of the situation, focusing on Pitt's misreadings of Heidegger and Winner. But he really wants to push Pitt to practice more of the pragmatism that both claim to espouse. Like Shrader-Frechette, he wants something more than Pitt's commonsense principle of rationality; he wants philosophers to engage, actively, with those who are attempting to do something about the regulation of such things as agricultural biotechnology. (See Thompson in Chapter 23 below.) Here the controversy is over the degree to which philosophers ought to get actively involved in real-world settings. (See Chapter 14 on Hickman, where he and Thompson, both avowed pragmatists, disagree on the issue.)
4. Baird's version of "Pitt should get his facts straight before criticizing others" also masks a serious issue. Baird ends up defending a limited sense of technological determinism that he finds acceptable in Winner, whereas Pitt finds it offensive. The issue of technological determinism is a serious one, with a whole range of responses. (See Chapter 11 on Winner.)
5. Allchin raises what may be the crucial issue for Pitt's approach. His focus is on the public disputes that so often accompany technological decisionmaking, and Allchin (as the quote above says) favors "consilience" or reasoned discourse and creative problemsolving. Pitt replies, citing David Hume, that what is likely to win out in most such controversies is not reasoned discourse but raw political (often meaning economic) power, and disputants are more likely to insist on having things their way than on the reasonable compromise Allchin seems to favor. This is a perennial issue, not only in philosophy of technology, but in all political philosophy. (Here it is treated in many chapters, including the one on Winner but also in the two chapters on Marxist thought, Chapters 4 and 12.)

Summarizing these controversies, Pitt has opponents even in his favored philosophy of science community. He favors a radical change there, introducing much more of a focus on the role of an instrumental infrastructure in scientific change than he thinks is customary in discussions of that issue among philosophers of science. (On this, see Chapter 10 on Ihde.) I don't count here objections such as that of Shrader-Frechette, that Pitt has been careless in what he set out to do; but Shrader-Frechette would be another advocate of philosophy of science who offers a critique of such ventures as technology assessment with which Pitt does not agree. She accuses Pitt of totally disparaging cost-benefit analyses—as some other philosophers of technology do—while she wants to improve the process, adding an equity dimension. There are also controversies over the role of raw power, and how to limit its scope, in discussions of technological controversies. To Marx-based critics and others like Winner, Pitt's Hume-based caving in to raw power seems more conservative than pragmatic. Which brings us to another set of controversies associated with Pitt: the extent to which his thinking is pragmatist, and the role pragmatism ought to play in philosophical treatments (I don't say “analyses” deliberately) of technological developments. And we should not forget that the basic point of Pitt's book is to attack philosophers of Technology with a capital T—the very sort of philosophy we have seen Mitcham defend as essential to a reform of technological culture as a whole.

In the end, the *big* controversy with Pitt is his very proposal—offered in the name of friends in the history and philosophy of science communities—to transform philosophy of technology into an academic discipline parallel to, and following the lines of, philosophy of science. All the other disagreements are mere quibbles in contrast with this.

As we will now see, during the next ten years, it continued to be other approaches that dominated in SPT, including the approaches of Heidegger-inspired Don Ihde and Pitt's nemesis, Langdon Winner.

Chapter 10

Don Ihde and the Hermeneutics of Technological Perception

Don Ihde, Carl Mitcham, and Albert Borgmann are probably the three SPT philosophers who are most widely known. Ihde (1979, 1983, 1990, 1993) has written more than the other two combined, and is universally praised among philosophers of technology. Nevertheless, his appearances at SPT meetings have been sporadic, though he has been a board member. Those appearances are only a tiny fraction of the appearances Ihde makes and the talks he gives all over the world. About Ihde, Mitcham says: “[He] not only wrote the first monograph on philosophy of technology in English, he has also produced the most extensive corpus devoted to the subject and has established a book series devoted to philosophy of technology” (1994, 78). On the other hand, Mitcham also raises questions about Ihde: “In light of the importance he gives to technology in human experience, his strong sympathies with pragmatism, and his criticisms of the critics of technology, . . . it is not clear to what extent his phenomenological philosophy of technology is truly other than a sophisticated and subtle engineering philosophy of technology”—as opposed to the “humanities philosophy of technology” that Mitcham favors (see Chapter 1 above).

Someone might fairly describe Ihde as standing outside though alongside SPT. But Ihde's philosophical position has earned for him academic success beyond most members of SPT. I think it is fair to say that the standards by which his work should be judged are Continental rather than—but especially in opposition to—anglophone analytical. (Ihde was a leader in the anti-analytical battles in the American Philosophical Association in the 1980s; see Mandt 1986). In spite of Ihde's fine-scale focus on particular kinds of technology-mediated experience, nevertheless his dependence on Heidegger, Merleau-Ponty, and especially Husserl—however much he personalizes his own account using them as sources—suggests that he would want to be measured by comprehensive-synthetic standards. If so, I think it is safe to say that, in spite of the large corpus of works Mitcham refers to, Ihde has not yet produced a comprehensive magnum opus on our technological world. Perhaps he has been too busy—editing his philosophy of technology series, speaking all over the world, and turning those speeches into relatively small-scale books—to produce that comprehensive magnum opus. (In a personal message after reading this, Ihde wrote me: “As far as a magnum opus, systematic, totalistic book—I never intended one, never promised one, never will do one”.)

My focus here is on what Ihde has written so far. I begin, however, with someone else's treatment, in a volume put together by a group of Dutch philosophers under the editorship of Hans Achterhuis. And the Achterhuis collection, midway through the book, turns to Ihde—longtime professor and chair of the philosophy department at the State University of New York at Stony Brook, and general editor of the Indiana Series in the Philosophy of Technology, in which the volume appears. Ihde's thought is there presented by Peter-Paul Verbeek.

Here is how he starts his summary of Ihde's thought: "Ihde . . . is a pioneer in two respects. First, he was one of the earliest philosophers in the United States to make technology the subject of philosophical reflection. He published his first book on the philosophy of technology, *Technics and Praxis*, in 1979, [and this was just] the first of over half a dozen books he has written in the field" (p. 119).

Verbeek says the second pioneering aspect of Ihde's work was "to apply to the study of technology the tools of the phenomenological tradition at a time when it was far out of the philosophical mainstream" (p. 119). This happened more or less in step with Hubert Dreyfus's applications of the same tradition to Artificial Intelligence. Verbeek does not make the connection, but presumably the volume editor, Achterhuis, would have us consider both Ihde and Dreyfus to be phenomenological pioneers outside the American philosophical mainstream in the 1960s to 1990s.

Whatever, Verbeek concludes his essay this way: "Ihde's work offers an entirely different perspective on technology than that of traditional phenomenology." Verbeek goes on: "The difference between Heidegger and Ihde stems from a difference in the ways in which each conceptualizes technology. . . . Ihde's approach . . . does not begin with [Heidegger's] world-interpretation, but with our dealings with . . . concrete technological artifacts" (p. 144). If there is anyone among the philosophers discussed in this volume who best exemplifies the transition from "transcendental" to "particular and pragmatic looks at [particular] technologies" (p. viii, referring to p. 6), it is Ihde himself.

As early as 1979, I had reviewed Ihde's first book in the field (see *Humanities Perspectives on Technology: Curriculum Newsletter of the Lehigh University HPT Program*, April). Here is what I said: Don Ihde's *Technics and Praxis* is the first full-scale philosophical analysis of technology by an American to appear in

English. . . .

Considering the importance of Martin Heidegger's work in German philosophy of technology—the dominant school so far—it is appropriate that Ihde's pioneering effort is an extension and adaptation of Heideggerian themes. Ihde's relation to Heidegger is not a simple one. On one hand Ihde begins with Heidegger: 'His analysis of tools pointed out that in use the tool 'withdraws' because what is focal is the 'work.' At the same time, he allowed for the disappearance of such transparency when the tool or instrument breaks down' (p. 28). Ihde even recommends . . . that the reader begin with Chapter 9, 'Heidegger's Philosophy of Technology.' On the other hand, Ihde says: 'In spite of the phenomenological correctness of Heidegger's analysis, the negative way in which the instrument emerges from transparency in use in his analysis casts a sense of disvalue. . . . In this essay I shall attempt to show . . .that what may be called instrumental opacity takes on positive phenomenological characteristics' (p. 28).

This is Ihde's thesis, a contention 'that the use of such [technological, especially scientific-information-gathering] instruments—or any technological artifact—is non-neutral.' Ihde immediately adds: 'I use this term very carefully and deliberately to suggest that there is some kind of transformation of experience in the use of instruments but I do not wish to suggest that this transformation is ipso facto either essentially 'good' or essentially 'bad"' (p. 16). In fact what Ihde ends up arguing is that instrument-embodied scientific knowledge, while it is good in the sense of expanding our horizons, can be bad if we come to think of the reduced-focus objects of technologically-enhanced science as the real world, as more real than the objects of ordinary everyday perception and experience. . . .

What Ihde offers in support of his thesis is what he repeatedly calls a 'close, phenomenological analysis' of technology, and more particularly (a) of the instruments that embody contemporary Big Science, and (b) of visual and information-oriented instrumental technologies. One clear instance and description of such an analysis comes in Chapter 6, 'Technology and the Transformation of Experience.' There Ihde says: 'I now begin the examination of technological transformations of [the] invariant set of direct perceptual structures. I shall here employ a set of variations upon visual instruments in what would be recognized as a typical [Husserlian] phenomenological exercise in the use of free variation, the aim of which is to isolate essential features or structures which are to be exhibited through the variations' (p. 70). The examples are

looking through a telescope at the moon, seeing objects through a microscope, and ‘infrared projection’—e.g., in looking for diseases in plants. These varying analyses, according to Ihde, reveal an ‘essential magnification-reduction structure’—that is, an expansion of direct visual (plus background) experience, necessarily accompanied by a reduction in field or a screening out of all but the desired objects. In the process of demonstrating this, Ihde draws one of his main conclusions: ‘This is historically what characterizes modern as contrasted with much ancient science. Modern science is technologically-embodied’ (p. 77).

Okay, so now we need something from Ihde's vast corpus, and what I suggest is his own self-characterization in his *Philosophy of Technology: An Introduction* (1993; pp. 111–115; a serious student might want to add detail from *Technics and Praxis*, 1979, and *Existential Technics*, 1983).

“Human-technology relations, patterned after a phenomenological analysis of human intentionality [see *Technics and Praxis* and *Existential Technics*], purport to show what is invariable in the ways humans experience their technologies. For example, *embodiment relations* are uses of technologies which enhance (and non-neutrally transform) our perceptual-bodily experience of an environment or world.

“In the case of science, the early use of optical technologies, such as telescopes and microscopes, revealed worlds heretofore not expected. But the very magnificational powers of early optics also oriented inquiry towards the *macro- and microworlds* revealed. As such, the instrument transformed not only what was seen, but its scale in relation to noninstrumental vision.

“What emerged from the analysis as a structural feature of instrumental use, was what I called a magnification-reduction transformation. For every enhancement of some feature, perhaps never before seen, there is also a reduction of other features. To magnify some observed object, optically, is to bring it forth from a background into a foreground and make it present to the observer, but it is also to reduce the former field in which it fit, and—due to foreshortening—to reduce visual depth and background. Such non-neutral transformations belong to all technologies.

“If embodiment relations enhance (and reduce) bodily-perceptual experience, *hermeneutic* (interpretive) relations take another mode of reference to observed objects. Here the analogue is to reading and language rather than sensory

perception, and is exemplified in instrumentation which uses various forms of measurement (dials which use numbers or spectra, etc.). The object is still being referred to, but is now translated into a dial reading which indicates some more abstract (and thus more reduced) aspect of the object, such as weight or heat. And the process requires a special reading skill which knows how the instrument refers.

“Both such human-technical relations exemplify ways in which humans—with technologies or instruments in a mediating position—experience an environment or world in a new or technological way. But such activities do not exhaust human-technical relations as others are of a more background character. For example, automatic or semi-automatic machinery—such as Borgmann's example of central heating—may function in the background and not occupy any focal attention. One may be experiencing the heat, but barely if at all aware of the switching which is going on and off (unless the system breaks down). Here technical systems begin to function as quasi-environments or technological cocoons within which our daily lives play out.

“It can be seen from this early set of examples that many of the features of technology in my analysis correspond to similar features in Winner and Borgmann. Like them, I was arguing that technologies are non-neutral and function in the human context like forms of life or worlds . . .

“Nor does the transformation of human experience stop with the directness of sensory or first person experience. In *Existential Technics* (1983) I turned to some of the reflexive ways in which a growing technologically mediated experience of the world reflected back upon such phenomena as human *self-interpretation* and its cultural variants. . .

“While both the above works were, in some sense, preliminary, *Technology and the Lifeworld* (1990) much more systematically outlined the theory of the technological lifeworld which I see. Like Winner and Borgmann, my approach has been one which takes patterned praxes as basic. Such patterns form gestalts which change from human historical period to period, and also from *different human cultures*. But there is both a structure and a variant upon structure to the human experience of technology, I argued.

“Human-technology relations—such as those which implicate our bodily-perceptual activities—are structurally crosscultural. And in *Technology and the*

Lifeworld I drew from both many historical and different anthropological contexts to show how this was the case. But at the same time, technologies in the ensemble are also *culturally embedded*. . . .

“To this point, one might see much in common with the analyses of Winner and Borgmann, although the perspective of *Technology and the Lifeworld* is much more multicultural than the more standard Western orientation of their works. However, when I turned to the strictly contemporary issues also discussed by Winner and Borgmann, a certain set of differences emerged.

“Both of [them] hold that modern technology is now a world phenomenon, and I agree. Both take it that such technology 'goes where it has not been' or moves toward a kind of totalization, and I again agree. But, I argue, the totalization is *presumptive* and at this juncture is beginning to show signs of serious strain which may harbor quite different directions.

“Modern technology and technoscience is clearly an invention originating in Western culture. It has clearly 'englobed' the Earth. But that is, while dominant, only one outward and expanding moment. I argue, with a metaphor of a tide with an undercurrent, that the undercurrent is one in which increasingly the underside of the dominant is the growth of two closely interrelated phenomena: (a) the first is the non-avoidable awareness of *Others*, i.e., non-Western cultures. This awareness is part of the communication technologies, particularly the image technologies (such as television, cinema, and all forms of visual networking) which daily brings us exotic cultures and makes clear the conflicts between cultures. . . . But (b) secondly, this multicultural undercurrent is itself multiple. In our image technologies, it is fragmented into culture bits which, in turn, become part of the now *postmodern* awareness. . . .

“I then argue that what is distinctive about the emergence of a postmodern moment is a different kind of vision—a *plurivision*. . . .

“However, this is not to say that this divergence from the set of worries exemplified by Winner and Borgmann are absent here; they merely are taking different form and direction. Our biggest worries, I am arguing, ought to be *global*, first in the sense of concern for the Earth's environment, and second, in finding post-enlightenment means of securing intercultural (and thus also interpolitical and intersocial) modes of tolerance and cultural pluralism. The first entails *limits* as Winner emphasizes, and the second a new species of intercultural

agreements which also must *limit* the cultural-religious forms of negative totalization which today characterize many global conflicts.”

With respect to *controversial* issues, throughout *Philosophy of Technology*, Ihde shows himself again and again to be admirably conscious of his relationship to friends and foes. For example, with respect to Mitcham (and some other early philosophers of technology in the USA), Ihde defends not only the importance but the type of small-scale studies he prefers. His chief differences with respect to Heidegger have to do with creating a hybrid by going back to insights from Husserl. He relates his work to an increasing number of philosophers of science who have something to say about its relation to technology: from feminist Sandra Harding to Patrick Heelan (like Ihde, also phenomenological) and Ian Hacking (more traditional), through Bruce Ackerman and Peter Galison on instrumentation (Ihde doesn't mention Pitt, but his focus on instruments in science shares some aspects), even including Bruno Latour—and all of these are interpreted as opposing earlier positivistic approaches. With respect to Langdon Winner and Albert Borgmann, Ihde thinks his differences are minimal: they are too Western in their emphases, rather than global, so do not include a “plurivision” focus and an effort to promote tolerance and a concern for the global environment. With respect to Hans Jonas (see Ihde's *Technics and Praxis*), Ihde would “positivize” the human relation to technology by contrast with Jonas's negativity. Ihde lumps Marxists together with Winner, but only in terms of the view that a “different mode of production results in different social relations.” Ihde often mentions Dewey (sometimes via Hickman), along with Heidegger, as an early forerunner on subordinating science to technology—but also as preceding Latour and other “technoscience” authors in erasing the distinctions between science and technology, especially within Big Science. Ihde's relationship to pragmatism may be a point on which he is not as admirably clear as on the other points (see Chapter 14 on Hickman).

In all of this, Ihde insistently pushes his own interpretation, even when, toward the end, he moves far away from a small-scale focus on technologically-mediated perception—together with the cultural contexts he says that entails—to the global issues of worldwide environmental degradation, of a “pluriculture” that supersedes the old notion of one-directional technology transfer, and of international justice issues that he feels are affected significantly by military technologies, including their proliferation in so-called under-developed cultures.

Ihde's larger role in the philosophical community in the USA in the mid-eighties,

defending Continental (and other non-analytical) philosophical approaches against the dominant analysts—perhaps along with his editing of the Philosophy of Technology series for Indiana University Press—make him a special case here. It is noteworthy, for example, that Pitt and his friends chose Heidegger as their focus of attack rather than Heidegger-based Ihde. So, as with phenomenology generally, the *big* issue here is not analysis versus anti-analysis, but whether or not phenomenological analysis is just as important philosophically as the sort of analysis commonly found in philosophy of science circles.

One last item in the context of the present book: Ihde has recently done his own analysis of the place of philosophy of technology in academia, in “Has the Philosophy of Technology Arrived? A State-of-the-Art Review” (*Philosophy of Science* 71, January 2004, pp. 117–131). Ihde's view is that it has not arrived, in spite of potential cultural importance, mainly because of a series of unhappy misfortunes.

Next we turn to Pitt's other arch-foe, Langdon Winner.

Chapter 11

A Non-Marxist Radical Critique: Langdon Winner

Langdon Winner says he is a “political theorist who focuses on the social and political issues that surround modern technological change.” He is the author of *Autonomous Technology* (1977), a study of the idea of “technology-out-of-control” in modern social thought; of *The Whale and the Reactor: A Search for Limits in an Age of High Technology* (1986); and editor of *Democracy in a Technological Society* (1992), along with many essays in a wide range of publications.

Winner is a superb promoter of his own ideas, as the following selection from his website shows: “Praised by *The Wall Street Journal* as ‘the leading academic on the politics of technology,’ Winner was born and raised in San Luis Obispo, California. He received his B.A., M.A. and Ph.D. in political science from the University of California at Berkeley. He is Professor of Political Science in the Department of Science and Technology Studies at Rensselaer Polytechnic Institute in Troy, New York, where he serves as co-director of the newly founded Center for Cultural Design.

“Winner has taught at the New School for Social Research, College of the Atlantic, the University of California at Santa Cruz, the University of Leiden in the Netherlands, and MIT and has lectured widely throughout the United States and Europe. He has also been a MacArthur Visiting Professor of University Studies at Colgate University.

“Winner was president of the Society for Philosophy and Technology. A sometime rock critic, he was contributing editor at *Rolling Stone* in the late 1960s and early 1970s and has contributed articles on rock and roll to *The New Grove Dictionary of Music and Musicians* and *The Encyclopaedia Britannica*. In the early 1980s he was consultant on Godfrey Reggio’s film ‘Koyaanisqatsi.’

“Winner’s views on social, political and environmental issues appear regularly in ‘Tech Knowledge Revue,’ published in the online journal *NetFuture*. His satires, including ‘The Masked Marauders’ and ‘Automatic Professor Machine,’ appear on occasion, sometimes announced, sometimes not.

“Winner explains his own position, ‘I regularly praise technologies that reflect

reasonable practices of democracy, justice, ecological sustainability, and human dignity. Unfortunately, a great many of the technical devices and systems that surround us are designed, built and deployed in flagrant disregard of humane principles. To an astonishing degree, today's technological society is based upon a collection of bad habits inherited from the past. A partial list of these habits includes: waste of material resources; destruction of living species and ecosystems; exploitation of working people; pollution of the air, land and water; surveillance as a means of social control; homogenization of cultural expression; militarism as first response to disagreement and conflict.

“To oppose these bad habits and the systems that embody them, as well as to suggest alternatives to them, is enough to get branded ‘anti-technology’ these days. Again and again, we are urged to celebrate the latest so-called ‘innovations’ regardless of the deranged commitments and disastrous consequences they often involve. What passes for leadership in our technoculture echoes the corruption of the Renaissance popes and foreshadows a new reformation. As Martin Luther King once observed, ‘A nation that continues year after year to spend more money on military defense than on programs of social uplift is approaching spiritual death.’ ”

In order to understand the issues in this chapter, and before getting back to Winner himself, it is helpful to orient ourselves within the broader issues of technology and politics. For that purpose, I like Patrick Hamlett's *Understanding Technological Politics* (1992). It provides an excellent introductory framework for understanding what Hamlett calls the “pathologies of technological decision making”—the fact that “technological decisionmaking in the United States [today] exhibits a number of troubling and undesirable features” (p. 2). Hamlett locates these pathologies among “three interlocking levels of problems.” Some of them are substantive and well known: “hazardous wastes, air, water, and land pollution, the exposure of workers to dangerous industrial chemicals, the greenhouse effect, dangerous weapons systems, and industrial robotics, among others”—to which Hamlett adds “worries about international competitiveness” (p. 3).

A second level Hamlett calls “flexibility problems” that “emerge because once technologies are actually in place, their structural features often drastically reduce the range of options available to decision makers” (p. 3).

Hamlett's “third level of difficulty focuses on . . . political decision-making”

where “the intersection of modern science and technology and our late eighteenth-century form of government is complex” (p. 5).

Hamlett's attempt at understanding these problems and political complexities begins with a framework that places technological projects and decisions within a set of “arenas”: corporate-managerial (consciously placed first as the most important set of actors, in Hamlett's view); executive-branch departments; the decentralized “legislative arena” with its powerful committee personnel and the lobbyists who influence them and members of Congress; the courts; regulatory agencies (here separated from other executive agencies because of the impact of regulatory decisions on science, technology, and their products); academic scientists and other technical professionals and their professional societies and publications; popular movements such as those claiming to protect consumers or animals or the environment; and, finally, “the labor arena”—meaning primarily labor unions—historically involved in a great many efforts to mitigate negative impacts of older technologies, but today facing “some of the most severe challenges in its history” (p. 70).

Just as Hamlett consciously ranks corporate managers at the top, he just as deliberately downplays the (effective) role of scientists and engineers (this in opposition to proponents of “technocratic” theories about who rules contemporary society), as well as of unions (downplaying “class struggle” analyses of contemporary technopolitics) and mass movements attempting to mobilize (often with the help of the media) against perceived technological threats. In this, Hamlett says he does “not depend on or assume any of these theoretical positions” (or, one might add, their opposites); instead, he proposes the “five concepts as an [untheoretical?] analytical framework” (p. 21).

Armed with his analytical framework, Hamlett examines five areas of technological controversy: international competitiveness (one area where labor unions have attempted, largely without success it seems, to influence technological decisions); “the military-industrial complex” (where, for example, the Strategic Defense Initiative, Hamlett thinks, has managed to stay alive in one form or another through several administrations and congressional upheavals—largely because of entrenchment within a government-supported technical community); environmental challenges (Hamlett focuses on reauthorization of the Clean Air Act and the Federal Insecticide, Fungicide, and Rodenticide Act [FIFRA] of 1972), where Hamlett discovers complete “political gridlock” (p. 149); the arena of risk management (example: carcinogen rules), where “It is not

surprising that the public quickly loses the ability to judge the validity of each sides's position, given the clamor and din of claims and counterclaims” (p. 175); and, finally, “the biotechnology revolution.”

In the last case, Hamlett concludes with this pessimistic summary: “For government decision makers, the choices are quite hard. They must find a balance between safety and profitability, between restrictions on new technologies and the worries many have that we are falling far behind our international competitors” (p. 206).

So it is clear that Hamlett's analysis is complex. It is less clear that he has avoided choosing theoretical sides. Clearly, defenders of environmental politics are not going to be happy with a view that balances union interests against theirs “even-handedly” (e.g., with respect to the North American Free Trade Agreement [NAFTA]). On the other hand, theoreticians who would see the labor movement, if appropriately enlightened, as a force for better control of technology (for example, Feenberg, 1999) are not going to be happy with Hamlett's relegations of labor to a low level of influence. And so on for theoreticians choosing for emphasis other arenas among Hamlett's set—not to mention wholesale optimists or pessimists about technologies' impact (Hamlett's principal opponents, p. 21).

In spite of criticisms, however, Hamlett's framework of political decision making with respect to science and technology seems to be a useful one—probably useful even for authors who would rank the arenas in the framework differently and blame different actors for the gridlock that so often affects technological society on such matters.

Now for my take on Winner, which I adapt, with very few changes, from my *Social Responsibility in Science, Technology, and Medicine* (1992).

Winner's *Autonomous Technology* restates one of the major theses in what he calls a “Great Debate” over technology: namely, that it has so far escaped human control. This is, obviously, Jacques Ellul's thesis now given a bold new restatement in terms of what Winner calls “technopolitics.”

Winner begins with an admirably clear statement of the state-of-the-issue on technology. “Technology,” he notes, in past decades “had a very specific, limited, and unproblematic meaning”; today it has become problematic in the

extreme, and “it soon becomes clear that in this enlightened age there is almost no middle ground of rational discourse . . . [as] conversations gravitate toward warring polarities and choosing sides.” Technology, in short, has become the subject of the Great Debate in contemporary culture.

Winner’s thesis is stated early: “Ideological presuppositions in radical, conservative, and liberal thought have tended to prevent discussion of . . . technics and politics.” Again, “Despite its widely acknowledged importance . . . technology itself has seldom been a primary subject matter for political or social inquiries. . . . Writers who have suggested the elevation of technology-related questions to a more central position have for the most part been politely ignored.”

The overall argument structure of *Autonomous Technology* is this. Winner first outlines “several issues centering on the phenomenon of technological change.” He then outlines, rather briefly, theories espoused to explain the phenomenon. He includes the theories of Lewis Mumford and Lynn White, Jr., of Max Horkheimer and Theodor Adorno, of Ellul, Heidegger, and William Leiss. All these are found wanting, as theories, in contrast with “technological politics”; what we need, in Winner’s view, is to “understand” by radical critique—a variation on Marx’s understanding-by-praxis.

The theory of technological politics . . . insists that the entire structure of the technological order be the subject of critical inquiry. It is only minimally interested in the questions of ‘use’ and ‘misuse,’ finding in such notions an attempt to obfuscate technology’s systematic (rather than incidental) effects on the world at large.

One would normally think, Winner’s argument continues, that socio-political means for understanding/handling the situation include conservative and liberal, as well as radical political approaches. But, Winner argues, none of these serves as an adequate critique: “[The] new breed of public-interest scientists, engineers, lawyers, and white-collar activists [represent] a therapy that treats only the symptoms [and] leaves the roots of the problem untouched.”

The solution [Don K.] Price offers the new polity is essentially a balancing mechanism, which contains those enfranchised at a high level of knowledgeability and forces them to cooperate with each other. [John K.] Galbraith’s cure holds out a virtuous elite within an elite to champion values lost in the new chambers of power.

The Marxist faith in the beneficence of unlimited technological development is betrayed. To the horror of its partisans, it is forced slavishly to obey imperatives left by a system supposedly killed and buried.

Winner concludes this part of his argument: “It can be said that those who best serve the progress of technological politics are those who espouse more traditional political ideologies but are no longer able to make them work.”

Winner then comes rapidly to his conclusion, namely, that the only thing that makes sense in a world of technological politics is “epistemological Luddism.” This approach “would seldom refer to dismantling any piece of machinery. It would [rather] seek to examine the connections of the human parts of modern social technology”—and undo them where they no longer serve human purposes.

Focusing on these bare bones of the argument of *Autonomous Technology* obscures the fact that Winner’s restatement of the thesis of technological politics—an amalgam of themes borrowed mainly from Ellul and Marcuse—is extremely nuanced. His exposition runs to over sixty pages and his argument in support of the view to about twenty-five pages.

Winner’s *Autonomous Technology* is an articulate, enlightened, intelligent book, extremely persuasive in its restatement of the theses of Ellul and Marcuse that so many have found unpersuasive heretofore. Whether it will ultimately be adjudged a wise book is a difficult one to answer. More likely, it seems to me, the book will be credited as the most useful exposition for Americans of those theses.

But Winner’s intellectual development did not end in 1977. I want now to turn to his equally articulate later book, *The Whale and the Reactor*.

Winner’s notion of “technological politics” had always needed clarification, and Winner has now provided that clarification in one of the papers reprinted as a chapter in *The Whale and The Reactor*: namely, “Techné and Politeia: The Technical Constitution of Society.”

In simplest terms, “technological politics,” as used in *Autonomous Technology*, had meant that choices of particular “technics” or technologies or technological systems for doing things have political implications. Setting up a particular sort

of system for manufacturing a product (and, eventually, for marketing and consuming it) nowadays almost always dictates the presumptively legitimate political relationship between authorities and subjects, between managers and workers—and often ultimately between the managerial classes and the working classes in society. What is especially peculiar about modern technologies, however, is that these political implications are very often completely obscured or hidden by appeal to the demands of technology or scientific rationality. “There is no other way to set up the machinery,” respondents to criticism would say, “if we want maximum return on our invested capital”—or “the most efficient use of our production system.”

This formulation of the thesis tends to mask its originality, as well as the exact sense in which it is an autonomous technology theory. In “Technè and Politeia,” Winner restates his thesis by an appeal to the history of political theory—to the way major political thinkers throughout Western history have dealt with technology. The crucial turning point for Winner is complex. What he does, in effect, is relate the American Revolution to the Industrial Revolution. “The framers of the American Constitution were, by and large, convinced . . . [that] republicanism and capitalism were fully reconciled.” But, according to Winner, the situation changed fairly quickly. “There are signs that a desire to shape industrial development to accord with the principles of the republican political tradition continued to interest some Americans well into the 1830s”—but not long thereafter. That is, early in the nineteenth century, political thinkers were still trying to control emerging technology constitutionally. By the end of the nineteenth century, Winner maintains, this was no longer the case. People were so convinced of the blessings that would flow from science that “the form of the technology you adopt does not matter.” Winner quotes a *Scientific American* writer in 1896 as saying that it makes no sense to worry any longer about ancient political philosophy concerns—the “empty speculative philosophy of the past.”

Winner’s version of the autonomous technology thesis is that this new tradition of repudiating traditional political concerns has become entrenched and expanded in the twentieth century. Today, he believes, almost no one thinks of asking what the political implications of new technologies might be—and he, along with other radical thinkers, is convinced that a great many technological systems are authoritarian in ways they need not be and in ways that democratic theorists ought to find objectionable.

The *Whale and the Reactor* includes several trenchant examples of this

forgetfulness of politics. None of these examples is stated more eloquently than the one that appears in the title essay at the end of the book: “Although I had known some of the details of the planning and construction of the Diablo Canyon reactor, I was truly shocked to see it actually sitting near the beach that sunny day in December. As [a] grey whale surfaced [in the distance behind the reactor], it seemed for all the world to be asking, “ ‘Where have you been?’ ”

Winner says his answer had to be that he had “been in far-away places studying the moral and political dilemmas that modern technology involves, never imagining that one of the most pathetic examples was right in [his] hometown.”

Immediately, Winner draws his “technopolitical” conclusion: “From the point of view of civil liberties and political freedom, Diablo Canyon is a prime example of an inherently political technology. Its workings require authoritarian management and extremely tight security. . . . What that means, of course, is that insofar as we have to live with nuclear power, we ourselves [as well as the plant workers] become increasingly well policed.”

Winner brings his essay—and the book—to a conclusion with a small anecdote: “Two years after my epiphany I was invited back to my hometown to give a lecture on technology and the environment. During the talk I argued that while Diablo Canyon was not a very good place for a reactor, it would still be a wonderful spot for a public park . . . [where] parents could take their children . . . and think back to the time when we finally came to our senses.”

Clearly Winner made this proposal tongue-in-cheek. But to me it is also a clear lesson about where Winner’s maturation as a thinker has led him.

John Dewey, a long time ago, claimed that: “It has been stated [here] that philosophy grows out of, and in intention is connected with, human affairs. . . . [This] means more than that philosophy *ought* in the future to be connected with the crises and the tensions in the conduct of human affairs. For it is held [here] that in effect, if not in profession, the great systems of Western philosophy all have been thus motivated and occupied.”

This is unquestionably true of Winner. Although, as I have noted, he provides in *Autonomous Technology* an extensive summary, analysis, and reinterpretation of the theoretical formulations of Ellul and Marcuse (among others), his intention from the outset had been explicitly to do something about the evils of our

technological world. In *Autonomous Technology*, the practical focus is on “epistemological Luddism”—not so much, he says, the systematic dismantling of particular machines as the *intellectual* task of bringing us to our collective senses about the hidden political implications of particular technological developments. (Note the plural.) Though an intellectual’s task, this is explicitly practical in orientation.

By the time Winner wrote *The Whale and the Reactor*, this practical orientation had become even more marked. Earlier I quoted Winner’s whimsical proposal to turn Diablo Canyon into a park where people could reflect on the time we came to our senses, reestablishing democratic political control over technology. Though made (at least partly) in jest, and certainly not practical in the ordinary sense of that term, this proposal clearly has a practical thrust—not just to come to our senses but to establish political control. And not over something as vague as technology in general—or Ellul’s “Technique”—but over nuclear technology, possibly starting with that one installation at Diablo Canyon.

It seems to me clear that Dewey would not have approved of the global part in the slogan Ellul has often used, “Think globally; act locally.” But at least in his more expansive and open-minded moments, he would have been forced to recognize the local, practical import of even the most global-sounding philosophers of technology. At that point, however, he would invite them to come down from the clouds and urge them to roll up their sleeves and get to work in serious—and concrete—reform efforts. I think Winner has, in his later years, come to a somewhat similar conclusion.

Objections to Winner’s writings—and to his presentations in innumerable public forums—have come not only from his primary targets, managers (whether governmental or private) of large undemocratic technological ventures, but from orthodox Marxists on the left to defenders of technology “in the service of humankind” (for example, some engineers) on the right. As mentioned, he has also attacked thinkers in the Social Construction of Technology school, and received counterattacks from them. In general, he always has suave and persuasive answers for all his critics, left, right, or center on the political spectrum.

Controversies? In his Berkeley student heyday, Winner would have been thought of as at least a socialist if not a Marxist—though in reality he has always been an independent thinker, in line with the tradition of historian Lewis

Mumford, whom he admires greatly. I think that makes him more of a *progressive* than a *socialist*. (Though he might think of himself as socialist-progressive, I'm not aware that he has ever used that kind of language.) Although he may have been attacked by Marxists, and may even have expressed some reservations about doctrinaire Marxism, Winner has always left vague his relationships with the radical left. On another hand, as noted, he has certainly attacked and been attacked by critics in the Social Construction of Technology school. But the sharpest jabs have come from Pitt (Chapter 9), who links Winner with Heidegger and claims that both prejudge issues in light of preconceived notions. Shrader-Frechette (as detailed in Chapter 9 on Pitt) is milder in her criticisms, but still thinks Winner should try to learn more about technical details of issues with which he deals. On still another hand (Winner is multidextrous), Heideggerians and Ellulians—even though Winner's early work gave Heidegger and Ellul due credit—think Winner does not paint a broad enough picture of the technological horrors of our age; to them he would be too *progressive* if not *pragmatic*. Hickman has said a few negative things, but I think he would also like to nudge Winner toward a more explicit pragmatism.

In general, then, Winner is a very elusive target for Pitt. He is as anti-academic as Pitt thinks, but his thinking is much more multifaceted than Pitt admits. And right up to the present, and the writing of this book, Winner has been as popular on the speaking circuit—and in the press—as Ihde. And he has thus been popular as a defender of a radical but non-Marxist critique of technology—really technologies in the plural (contrary to what Pitt would have us believe).

We next turn to another radical thinker, this time a Marxist—the neo-Marxist Andrew Feenberg, whom Pitt does not list among his prime opponents. That may seem surprising, because Feenberg's mentor, Herbert Marcuse, was also an influence on Winner, as well as on the whole radical tradition of technology criticism that Pitt is opposing.

Chapter 12

A Neo-Marxist Critique of Technology: Andrew Feenberg

This chapter is a companion piece to Chapter 4, above. The chief difference between Marx Wartofsky (there) and Andrew Feenberg is a matter of age. Feenberg is almost totally lacking in references to classical Marxism; he studied under Herbert Marcuse, and his references—whether on technology or any other topic—are mostly to neo-Marxists, not to classical Marxists or doctrinaire Soviet-connected Communists. Wartofsky's main body of work antedates the fall of the Soviet Union; Feenberg's, which continues right down to the present, never needed to refer much to the fall of Communism. If anything, his sources all eagerly anticipated that fall; he is, without qualification, neo-Marxist, though he is his own philosopher with his own particularized views.

Nonetheless, Feenberg has always been solicitous to situate himself precisely among recent authors who were influenced, in different ways, by classical Marxism; and this is nowhere clearer than in a review—combined with a summary of his own latest thoughts—of the Marxist/feminist philosopher, Sandra Harding: “On Bridging the Gap between Science and Technology Studies: Sandra Harding’s *Is Science Multicultural?*” (*Science, Technology, & Human Values* 24:4, Autumn 1999, pp. 483–494, specifically 483–5, 486–8 [abbreviated], 489–90 [abbreviated], 492).

Here are some longish selections from that review, beginning with Feenberg's summary of Harding's overall view. I include that in its entirety because Harding's and other feminists' technology-related philosophical views are not otherwise included in this book. Feenberg begins his review this way: “Sandra Harding’s several books (1986, 1991, 1998) attempt to introduce a political perspective into the understanding of science without falling into relativism or science-phobia. She argues that the politics of science have been systematically overlooked by the philosophy of science and by social and political philosophy as well. Yet she also claims that scientific and technical experts do know some things in the strong sense—that their accumulated knowledge is precious and that it should be enhanced by critique rather than destroyed. This is particularly obvious in fields such as women’s health. History records how precious medical knowledge is won not only in the struggle with the ordinary difficulties of research but also in opposition to long-standing prejudices. But as we will see, Harding extends the thesis well beyond this obvious instance.

“Harding at first drew primarily on feminist standpoint epistemology, an approach that incorporates a reflexive awareness of the knower’s social position. Standpoint epistemology privileges socially and economically inferior positions as opening up new cognitive perspectives—what Foucault called ‘subjugated knowledges.’ Harding’s approach is loosely based on the theories of class consciousness and reification of the early Marxist Lukács.

“Lukács argued that workers are in a unique cognitive position. Their subordination in the labor process reveals the contradiction between the forms of capitalist thought and administration and real life. The category of ‘profit,’ for example, masks the real relation of exploitation, which is immediately evident to the worker in situations in which the capitalist sees only the pursuit of greater efficiency (Lukács 1971, 166). Harding draws on this standpoint epistemology, which she transposes into the realm of gender. She generalizes from Lukács’s characterization of the relation of workers to capitalism to a theory of the subjugated knowledges associated with women’s subordinate roles in the scientific-technical systems of modern societies. She writes, ‘Insofar as women and men interact with different regularities of natural and social worlds, have distinctive interests in those regularities and in others that they share, stand in different relations to available discursive resources (metaphors, models, narratives, etc.), tend to organize differently the production of knowledge, and occupy a distinctive location in their culture’s diverse and complex power relations, they will tend to produce and sustain different patterns of knowledge and ignorance.’ (Harding 1998, 107.)

“These different patterns show up not only in everyday consciousness but also in the organized pursuit of expert knowledge by members of the group. Harding argues that nature can only be perceived and represented in a coherent body of knowledge from one or another social standpoint. Each standpoint opens some fruitful perspectives while closing off others that might be developed from another standpoint. No perspective is truly universal and identical with nature’s order, although all are significantly constrained by it (Harding 1998, Chap. 10). Thus, although it is indeed more powerful, in many senses but especially militarily, modern science is in these respects no different from the so-called ‘ethnoscience’ of non-Western and premodern societies. All have something to offer, and all contain systematic errors determined by the perspective from which they are constructed. None of them has final answers. The task of philosophical critique is to rectify where possible these systematic errors and to facilitate the

conversation of different knowledge traditions. No one approach can guide that conversation, not even Harding's own multicultural approach. Harding's refusal to endorse a single scientific tradition or a particular 'method,' supposedly guaranteeing objectivity, marks her distance from positivism.

“As she became involved with various United Nations commissions focusing on problems of economic development, Harding broadened her approach to include a postcolonial perspective on science and technology. In her latest book, *Is Science Multicultural?* Harding now moves beyond the feminist revision of philosophy of science to a concern for practical issues of global development that depend on technology. This is a shift in emphasis rather than a change in basic approach. The standpoint epistemology opens up to embrace yet another type of subjugated knowledge and its associated critique. If anything, postcolonial theory confirms Harding's basic argument that there is a fatal 'gap between marginalized interests and consciousness . . . and the way the dominant conceptual schemes organize social relations, including those of scientific and technological change' (Harding 1998, 159).

“According to Harding, the marginality of women and postcolonial peoples reveals aspects of both nature and the modern project masked from the standpoint of the official knowledge-producing institutions. Their pretension to universality and neutrality is imposed at the expense of valuable local knowledge that lacks the imprimatur of modern science. A critique from the margins brings to light the cognitive limitations that result from the close association of official science and technology with gender-biased and neocolonial politics and corporate interests.

“Harding asserts that all knowledge is local knowledge, although admittedly some local knowledge has a farther reach than others. But this view contradicts the widely held assumption that modern science is universal. A third tradition enters into Harding's work to address this problem. This is post-Kuhnian science studies, which offers theoretical tools for deepening standpoint epistemology. Post-Kuhnian science studies shows that the socially concrete forms of research, technical applications, and economic development are not value-neutral instances of some general rational capacity of the human mind, brought to perfection in modern science; their complex and socially mediated structure incorporates a variety of social influences and perspectives. Science is not a single unified edifice based on common methods grounding universal truths but a system of significantly different interacting fields in which communication takes place

across cognitive boundaries of all sorts. Science studies has shown the extent to which technology is a voice in that communication, and non-Western knowledge traditions can also be included. Post-Kuhnian science studies thus opens the door to the type of multicultural approach Harding favors.

“This seems a relativist view, but relativism has no way to resist ‘might makes right’ in the domain of knowledge. Without some cognitively pertinent way of ordering different knowledges as better or worse, there is no appeal from the logic of power. Harding must avoid relativism at all costs since the subjugated knowledges privileged by standpoint epistemology are precisely those of the less powerful. Yet how can she escape a scientific *realpolitik* without relying on traditional notions of method and verification?”

“It is important to recall that standpoints open as well as closed minds. The mere fact of a social background does not discredit claims to knowledge, which can still be verified by reference to experience and practice. If one takes seriously both the possibility of knowledge and its social situatedness, objectivity appears as an arduous and risky task that requires not only attention to evidence and argument but also the identification and elimination of deep-seated biases. These go beyond factual errors and concern distortions at the methodological level, at the level of fundamental forms of thought. ‘The issue is not that individual men (and women) hold false beliefs, but that the conceptual structures of disciplines, their institutions, and related social policies make less than maximally objective assumptions’ (Harding 1998, 135). Critique and argument can lead from less to more objectivity, if not to final truths. Harding contrasts the ‘strong objectivity’ achieved through engaged political and social critique with the usual view of modern science as objective just insofar as it is free of subjective sentiments and political interference. Such weak’ objectivity is unconscious of the systematic sources of error built into the perspectives underlying science.

“Science, in sum, is political whether it knows itself to be or not. The traditional scientific ideal of a perfectly neutral apolitical standpoint is seductive, but in reality no such standpoint exists. Apparent neutrality turns out in the end to be nothing more than acquiescence in a hegemonic consensus that is so well established it appears as common sense. Only an engaged standpoint from the margins can reveal the hidden biases of such hegemonic perspectives. Feminist and postcolonial critiques are thus vitally important, not just for the particular problems and abuses they bring to our attention but also for the new social conception of scientific knowledge they support.”

Feenberg next summarizes his personal take on Harding's book and situates it within the traditions of philosophy of technology: "I am sympathetic to this approach but have a reservation nevertheless. My question concerns the identification of marginality with specific gender and racial positions. There are two problems with this identification.

"First, Harding's standpoint epistemology can only offer a concrete basis for criticism in cases in which gender, race, and neocolonial status are at stake in modern scientific and technological systems (e.g., in domains such as women's health or Third World development policy). Women's struggle for control of reproductive technologies, such as birth control devices and the medical practices surrounding childbirth, offer significant examples. But important as these domains are, they are only a small fraction of the scientific and technological activity of modern societies. . . .

"This defense of Harding's epistemology against accusations of essentialism and irrationalism does, however, leave her stuck with the original problem I identified above—the limits of a critique of modernity based on the concrete issues that can be raised from a feminist and postcolonial standpoint. This problem is related to a second issue that concerns me. . . .

"The general subordination of the population in modern technical systems is not due to the 'essence' of technology or to injustices in the distribution of skills or the rewards of the system. Rather, the control of nature these systems offer is constrained by the imperatives of alienated administration. Whatever else they do, they are specifically designed to centralize power and to produce a subordinate population. This approach is embodied at the most basic level of the technical disciplines and requires no special ideological commitment or conviction on the part of technologists and managers. The most familiar application of this argument is the deskilling hypothesis of Braverman (1974) and Noble (1984), but it can be extended to all the technical systems of modern societies, regardless of their place in the social structure or the ruling political ideology, be it capitalist or communist. . . .

"Let me hasten to add two qualifications to this position, which I have tried to develop in my own critical theory of technology (Feenberg 1991, 1999). First, I do not claim that technocratic forms of oppression are entirely distinct from gender, race, and national oppression. Much technocratic oppression falls

precisely on these groups. Women, to take an example, have both general and specific relations to the technical systems of modern societies. As birthing mothers or employees in gendered work roles, they are exposed to forms of oppression shared by all patients and workers as well as gender-specific forms of oppression, many of which take a technical form. In such cases, significant resistances to the design of technical systems emerge directly out of women's subordinate position.

“Second, although both Harding and myself are critical of technoscience, that does not mean that we see no good in it. For example, we are both in favor of modern medical care for the many illnesses it can treat successfully. The point is not that modern medicine is altogether bad because of the way in which it disempowers patients but rather that it might be better if it were reorganized to recognize the legitimate claims to agency of those it serves. This is a democratic, not an antimodern, critique.

“Although Harding must feel rather isolated and frequently misunderstood among mainstream philosophers of science and social theorists, there is a tradition in which a radical democratic critique of modernity not unlike her own is commonplace. This is the tradition of American philosophy of technology that, under the influence of both native figures such as Dewey and Mumford and continental philosophers such as Heidegger and Marcuse, has addressed the failure of technocratic liberalism in our time. . . .”

Feenberg next elaborates on what he thinks is the benefit for Harding of relating her work to philosophy of technology: “In what follows, I will suggest ways in which Harding's argument could be enriched by [what I have, following Lukacs, called] standpoint ontology.

“Harding touches on the ontological issues at several points in her book, two of which are especially relevant to the problem of the institutionalization of rationality: the critique of the neutrality of modern technoscience and the suggestion that technoscience depends on other forms of local knowledge for its efficacy.

“Harding's discussion of the nonneutrality of science and technology is referenced to several contemporary science studies scholars, but there is no mention of Marcuse (1964), whose *One-Dimensional Man* offered a powerful critique of the neutrality thesis twenty-five years ago. She recapitulates much of

that critique when she assures us that ‘value-neutrality is not itself value neutral’ and goes on to argue that scientific abstractions are shaped by a biased social background that reappears clearly in their technological applications (Harding 1998, p. 140). The elimination of this bias cannot proceed simply by eliminating external political interference in science because ‘power is exercised less visibly, less consciously, and not on but through the dominant institutional structures. . . . Paradoxically, this kind of politics functions through the depoliticization of science—through the creation of *normal* or *authoritative* science’ (Harding 1998, p. 131). Harding concludes that science cannot be ‘pure’ since it is ‘conceptualized at its cognitive core in ways suitable to culturally local . . . purposes’. . . (Harding 1998, 170).

“These [Frankfurt School-based] reflections might be pursued to give substance to Harding’s critique of Eurocentric universalism as a ‘predatory conceptual framework’ (Harding 1998, p. 181). Harding argues that despite the pretension of modern science to replace all earlier forms of thought, ‘abstract concepts must in fact be accompanied by local knowledge about how to apply such concepts. . . . It is not that modern science actually replaces its pre-modern predecessor; rather, it insists on its continual reproduction as a devalued form of knowledge’ (Harding 1998, p. 181). The dependency of abstract formalistic technoscience on specific local knowledges for its implementation reveals its own limitations. Attending to the issues that emerge in implementation can open technoscience to suppressed interests and needs. Harding seems to be arguing that the way in which we elaborate concepts, categories, plans, and designs is subtly shaped not just by gender and national bias but also by the split between conception and execution that underlies modern industrialism. Scientific-technical rationality would bear the marks of the class-divided society in which it originated. . . .”

Feenberg next moves toward his overall conclusion, relating Harding's book to some recent science studies accounts: “Lukács’s critique of formalism has a suggestive resemblance to Harding’s critique of the universality of modern technoscience. On another occasion, I intend to pursue the similarities between these macrosocial projects and phenomenology-influenced approaches in science studies. A number of scholars, including Lucy Suchman, Geoffrey Bowker, Susan Leigh Star, and Michael Lynch, have shown how cognitive achievements efface the practical labor of their own construction and how the gaps and breakdowns that result from the limitations of formalized knowledge are resolved practically in the application. For example, Star (1995, p. 101) offers an account of technological ‘wizards,’ individuals who have the unusual ability to devise

practical ‘work-arounds’ for the biases and blind spots tacitly encoded in formalisms. And Suchman (1987) has shown how formalistic assumptions about rationality get embodied in the user interfaces of devices, frustrating the ‘situated action’ of users.

“Bruno Latour (1993) and Andrew Pickering (1995) have attempted to base general social theories on this type of analysis, but it is difficult to draw critical conclusions from their approach, surely one important function of a social theory. Harding, like Lukács and Marcuse, also goes beyond the microlevel questions to consider the larger political implications of structuring a whole society around formalized knowledge. This is an important complement to science studies in a scientized society and one that may locate the site of a bridge between traditions. Empirical research on the limitations of formal rationality in science and technology studies is thus a fragment of a far broader critique of modernity still in the making.”

Feenberg then brings his review to a close: “The attempt to generalize formal rationality as a culture, to found a civilization on it, is so bizarre that it commands our attention once it is noticed. Yet this is in fact the dystopian paradigm of modernity in our century. The critique of this astounding project in thinkers as diverse as Lukács and Heidegger, Marcuse and Foucault, should also command our attention. It points the way to a new type of social theory. On this, Harding and I are in full agreement: only a critical theory of science and technology can address the fundamental problems of modern society. The humanities are still too timid in the face of these powerful fields. They and we can only benefit from a more self-conscious reckoning with the potentials and dangers of modern knowledge.”

Even when harshly abbreviated, these are rather long quotations; but it seems to me worthwhile to include such long selections if only to give the flavor of Feenberg’s “critical” approach to technology, as well as some of the points on which he differs with other neo-Marxist interpretations of the role of technology in the contemporary world—especially the Marx-based but centrally feminist theorizing of Sandra Harding. One of the failings of my SPT bias in this book is a neglect of female scholars (with the exception of Kristin Shrader-Frechette, earlier, and Deborah Johnson, later). Harding attended only one SPT meeting, and relatively few other female philosophers have done so over the years.

Because the Feenberg (and Harding) material is so long, all I will add here is a

critique I once offered of Feenberg's *Critical Theory of Technology* (1991). The review appeared in *Research in Philosophy and Technology*, vol. 14, 1994.

I said there that one chapter of that book, “The Promise of Civilizational Change,” may fairly be taken as the culmination of Feenberg’s argument. He begins the chapter with an acknowledgment of the difficulties currently facing socialism: “Over the last decade socialist theory has responded to an accumulation of political disappointments.” What has the response been? It is a response “emphasizing its democratic heritage. That heritage offers the best basis for the survival of the socialist tradition now that communism is discredited even on the left” (p. 140). In concrete terms this means (for Feenberg) that one must give up on any Marxist references to “laws of history . . . leading from capitalism to socialism.” What must substitute for this conception is a matter of workers’ choice: “Capitalism supports one . . . civilizational project, and the Marxian model of socialist transition can be employed to define the logic of a corresponding socialist project” (p. 141). It is up to the workers of the world to make this “contingent” choice. It is a choice between a harsh, hierarchical capitalist reality—which admittedly supplies workers, at least in some countries, with a great many consumer commodities—and the promise of a possible better world, including one in tune with nature. What will that world, in broad outline, look like?

A contemporary list of measures capable of setting in motion such a process would include extensive (if not universal) public ownership, the democratization of management, the spread of education and lifetime learning beyond the immediate needs of the economy, and the transformation of technique and professional training to incorporate an ever wider range of human needs into the technical code (p. 142).

Feenberg says his “argument hinges on the *cultural and technical conditions* for the requalification of the labor force” (p. 143, italics added). Then he asks himself the tough question: “Does this new position represent a regression to a moralizing ‘ethical socialism’ of the sort Marx rejected so scornfully?” The rest of the chapter is devoted to showing how a new vision *can be* transformed into a cultural, democratic, and innovative new system of reality—though it never really answers the tough Marxist question about whether this might not be a mere pious hope. What Feenberg offers in place of a plan for political revolution is this: “The *generalized concept of suboptimization* explains how powerful ideological motivations can anticipate a new economic order” (p. 148, italics his).

Again: “It is impossible to predict the future, but one can attempt to outline a coherent path of development that would lead to a socialist outcome in favorable circumstances” (p. 151).

And finally: “*Deep democratization* implies significant changes in the structure and knowledge base of the various technical and administrative specializations [to accommodate an enlargement of workers’ freedom]. Furthermore, in advanced societies, where so many relationships outside the sphere of production are technically mediated, self-management in the workplace is only one dimension of a general attack on technocratic hegemony” (p. 155, italics in original).

Well, how likely is this? To his credit, Feenberg at least acknowledges the issue: “How plausible is this strategy?” he asks. Then, referring to the promise in his introduction, he answers: “I mentioned the importance of a culture of responsibility, without which those on the bottom of the system are unlikely to demand changes in the distribution of power. To be effective, this demand must meet a sympathetic response from a significant fraction of the technical elites to which it is addressed” (p. 155).

In short, the new “civilizational possibility” can become a reality if the workers are educated to recognize the benefits of a new socialized system and their demands are met with a “sympathetic response” on the part of technical managers newly enlightened by “a culture of responsibility.”

Traditional Marxists are clearly going to see this as an abdication of all that the words “class struggle” have always stood for. And even those of us who might be sympathetic toward Feenberg’s call for greater social responsibility on the part of technical elites should insist that he acknowledge how fierce the political battles are going to be to bring about his hoped-for antitechnocratic “civilizational change.” Further, despite Feenberg’s disparaging of the approach as a mere “moral reformism” (p. 166), one might wonder whether progressive liberal activism does not offer just as much hope as Feenberg’s ingeniously reinterpreted Marxism (see Chapter 14 on Hickman and Chapter 17 below).

Controversies? Feenberg is an avowed *neo-Marxist*. The clearest criticism of Feenberg is to be found in a reply in the Hickman author/critics volume in *Technè* (see Chapter 14 below). And Sandra Harding, with her *feminist standpoint epistemology*, despite his plea to her (above), has not given in to

Feenberg on the idea that such views as they share move her towards a pragmatism (if not toward Hickman's Dewey-based American Pragmatism). Neither does Feenberg give in to Hickman on this point. Others—who see him as nitpicking about who is most faithful to Marx's legacy (see Chapter 19 below)—have criticized Feenberg's Marxist “scholasticism” as well. Finally, with all Marxists, Feenberg would be expected to oppose *reductionist science*, including *meritocratic liberal politics*—and all forms of *idealisms*.

A side comment on Marxists and academia in the USA: in general, they have had difficulties getting accepted, especially during the Cold War era. But Feenberg is one among many Marxists who have had successful careers in academia. (Feenberg has recently taken a position in Canada, but he had a long career before that at the University of California at San Diego.) What is more, Marxists such as Wartofsky (Chapter 4 above) have not only held important appointments in major universities, but have been accepted into the inner circles of Pitt's favorite organization, the Philosophy of Science Association.

So far we have seen, as dominating SPT well into the 1990s, not only Pitt but the phenomenological analyst, Ihde (strongly influenced by Heidegger), and two radical critics, Feenberg and Winner, one Marxist, the other not. But this period also included strong links to European philosophers. Links to Germany had been there from the first international conference, in 1981; links to the Netherlands were strengthened by the third international conference, held there in 1985; and links to Spain were forged in the late eighties and early nineties. Our Dutch colleagues get a special chapter (19 below), but I turn now to Germany and Spain. Might Pitt find any supporters for his academic plea in those two countries?

Chapter 13

SPT Goes International

This chapter is difficult. I place it here because the next SPT president in our list was a Spaniard, Jose Sanmartin. But the chapter focuses, not on Sanmartin in particular but on international contacts of SPT. These contacts began with the cooperation of colleagues in what was then West Germany, and with the first international conference of the Society, hosted by German colleague Friedrich Rapp in Bad Homburg (a resort town near Frankfurt) in 1981. The third international conference, in 1985, was held at the University of Twente in the Netherlands. The 1993 conference was held in Peniscola (another resort town) in the northern part of the Valencian Community in Spain. I devote a special chapter, later in the book, to our Dutch collaborators, so this chapter has two parts, the first focusing on our German collaborators, the second on philosophy of technology in Spain.

Section 1. Germany

The proceedings of the Bad Homburg conference were published in separate books, in German and in English. The English version was published simultaneously in two series, *Boston Studies in the Philosophy of Science*, and the newly-minted series, *Philosophy and Technology*—both published by Kluwer (originally Reidel). A second German-hosted conference was held in Dusseldorf in 1997, but for a number of reasons (including a conflict with a German national philosophy conference held at the same time) the proceedings of that conference were not representative of the state of scholarship at the time either in SPT or in Germany. However, an earlier conference in the same year was hosted by Hans Lenk in Karlsruhe, Germany, with the collaboration of Evandro Agazzi and the International Academy of the Philosophy of Science as the academy's first foray into philosophy of technology. The proceedings of the Karlsruhe conference were first published in *Technè*, the electronic journal of SPT, and that volume is much more representative of the state of European philosophy and technology scholarship at the time, internationally but especially in Germany.

What follows is the table of contents of the *Technè* version of those proceedings (see spt.org on the internet), with enough background on each of the philosophers I take to be representative of the state of the art in Germany at the time to get the overall flavor.

Part I:

Evandro Agazzi (Fribourg) and Hans Lenk (Karlsruhe), "Advances in the Philosophy of Technology: Proceedings of a Meeting of the International Academy of the Philosophy of Science, Karlsruhe, Germany, May 1997; Introduction," sets the conference in context.

Kurt Hubner (Kiel), "Philosophy of Modern Art and Philosophy of Technology." The title suggests the content: primarily European focus.

Klaus Kornwachs (Cottbus), "A Formal Theory of Technology?" sketches out a formal theory; the question mark suggests the tentative character of the venture.

Hans Lenk (Karlsruhe), "Advances in the Philosophy of Technology: New Structural Characteristics of Technologies." The structure of contemporary technology, its systematic character in particular, demands changes in the philosophy of technology, making it more interdisciplinary.

Klaus Mainzer (Augsburg), "Computer Technology and Evolution: From Artificial Intelligence to Artificial Life." Computer technologies suggest that one needs to interpret them in evolutionary terms, possibly moving toward artificial life.

Part II:

Theodor Leiber (Augsburg), "On the Impact of Deterministic Chaos on Modern Science and Philosophy of Science: Implications for the Philosophy of Technology?" Chaos theory suggests, possibly demands, fundamental changes in both philosophy of science and philosophy of technology.

Hans Poser (Technical U., Berlin), "On Structural Differences between Science and Engineering." The title suggests the content.

Joachim Schummer (Karlsruhe), "Challenging Standard Distinctions between Science and Technology: The Case of Preparative Chemistry." Philosophy of technology in Germany now includes chemical technologies.

Part III:

Bernulf Kanitscheider (Giessen), "Humans and Future Communication Systems." Contemporary complex communication systems force us to consider new directions.

Karl Leidlmair (Innsbruck), "From the Philosophy of Technology to a Theory of Media." Similar to previous contribution.

Werner Rammert (Free Univ., Berlin), "Relations that Constitute Technology and Media that Make a Difference: Toward a Social Pragmatic Theory of Technicization." An exceedingly fine-tuned and complete theoretical definition of modern technology.

Friedrich Rapp (Dortmund), "The Material and Cultural Aspects of Technology."

Analytical philosophy of technology needs to incorporate cultural aspects of technological society.

Gunther Ropohl (Frankfurt), "Philosophy of Socio-Technical Systems." Recent advances in his systems approach to a general technology.

Ladislav Tondl (Czech Academy), "Information and Systems Dimensions of Technological Artifacts." A less formal systems approach, including engineering design.

Part IV:

Alois Huning (Dusseldorf), "Preferences and Value Assessments in Cases of Decision under Risk." Ethical approach closely linked to natural law theory.

Hans Mohr (Stuttgart), "Technology Assessment in Theory and Practice." More theory than practice.

Hans Lenk (Karlsruhe), "Conclusion: Technological Responsibility and the Humanities; the University of Karlsruhe." Lenk's standard approach emphasizing the responsibilities of technological actors, especially engineers, placed in a context of the long history of engineering humanities at the University of Karlsruhe.

Section 2. Spain

Jose Sanmartin was our first European president, and that was a welcome addition. But his body of work nowadays is mostly on particular technologies, such as genetic manipulation (see his book on “new redeemers”), and his recent work has been even more narrowly focused, devoted to the topic of violence in the contemporary world. There, much of his work has been archival, trying to put together an online set of documents related to violence that is the best in the world. More representative of the range of Spanish contributions to scholarship on philosophy and technology are the studies that Carl Mitcham collected, about ten years ago, in *Philosophy and Technology in Spanish Speaking Countries* (1993; volume 10 in the Kluwer Philosophy and Technology series). Here is Mitcham’s introduction to that body of work:

Introduction

Philosophy of Technology in Spain

“Philosophy of technology in Spain . . . can be traced back to the work of Ortega y Gasset, who was himself one of the philosophical originators in this field of philosophy. But during the Franco years (1939–1975) Ortega’s opening was left largely undeveloped. As in Chile, however, the return to democracy has led to the flowering of the philosophy of technology, especially within an interdisciplinary, interinstitutional effort known as the Instituto de Investigaciones sobre Ciencia y Tecnologia (INVESCIT or Institute for Research concerning Science and Technology).

“One of the best ways to judge the achievements of Invescit since its founding in 1988 is in terms of a series of publications it has sponsored, most but not all of which are authored by institute associates:

Jose Sanmartin. *Los nuevos redentores: Reflexiones sobre la ingeniería genética, la sociobiología y el mundo feliz que nos prometen* (The new redeemers: Reflections on genetic engineering, sociobiology, and the happy world they promise us]. Nueva Ciencia 1. Barcelona, Spain: Anthropos, 1987. Pp. 207.

Carl Mitcham. *Que es la filosofía de la tecnología?* [What is the philosophy of technology?]. Trans. Cesar Cuello Nieto and Roberto Mendez Stingle.

Nueva Ciencia 2. Barcelona, Spain: Anthropos, 1989. Pp. 214.

Santiago Vilanova. *Chernobil: El fin del mito nuclear—El impacto informativo y biologico del mayor accidente de la industria electronuclear* [Chernobyl: The end of the nuclear myth—The information and biological impact of the greatest accident of the nuclear electric power industry]. Nueva Ciencia 3. Barcelona, Spain: Anthropos, 1988. Pp. 278.

Jose Antonio Lopez Cerezo and Jose Luis Lujan Lopez. *El artefacto de la inteligencia: Una reflexion critica sobre el determinismo biologico de la inteligencia* [The artifact of intelligence: a critical reflection on the myth of the biological determination of intelligence]. Nueva Ciencia 4. Barcelona, Spain: Anthropos, 1989. Pp. 286. [Lopez Cerezo has been strongly influenced by STS work, e.g., in the Netherlands.]

Andres Moya. *Sobre la estructura de la teoria de la evolucion* [On the structure of the theory of evolution]. Nueva Ciencia 5. Barcelona, Spain: Anthropos, 1989. Pp.174. [A scientist/philosopher.]

Manuel Medina and Jose Sanmartin, eds. *Ciencia, tecnologia y sociedad: Estudios interdisciplinarios en la universidad, en la educacion y en la gestion publica* [Science, technology, and society: Interdisciplinary studies in the university, in education, and in public administration]. Nueva Ciencia 6. Barcelona, Spain: Anthropos, 1990. Pp. 222.

Josep Puig and Joaquim Corominas. *La ruta de la energia* [Energy path]. Nueva Ciencia 7. Barcelona, Spain: Anthropos, 1990. Pp. 480.

Gilbert Hottois. *El paradigma bioetico: Una etica para la tecnociencia* [The bioethics paradigm: An ethics for technoscience]. Nueva Ciencia 8. Barcelona, Spain: Anthropos, 1991. Pp. 205.

Jose Sanmartin, Stephen H. Cutcliffe, Steven L. Goldman, and Manuel Medina, eds. *Estudios sobre sociedad y tecnologia* [Studies concerning society and technology]. Nueva Ciencia 9. Barcelona, Spain: Anthropos, 1992. Pp. 334.

Nicanor Ursua. *Cerebro y conocimiento: Un enfoque evolucionista* [Brain and

knowledge: An evolutionist approach]. *Nueva Ciencia* 10. Barcelona, Spain: Anthropos, 1993. Pp. 377.

“As should be readily apparent, these volumes indicate a strong interest in issues arising from relations between society, modern biology, and biological technology. Five of the ten volumes (numbers 1, 4, 5, 8, and 10) are on genetic engineering, genetic theories of intelligence, evolutionary theory, and bioethics. A similar emphasis is reflected in the first and last papers contributed from Spain to the present volume, those by Maria Luisa Garcia-Merita and Jose Sanmartin, both members of the Invescit group.

“Garcia-Merita’s short essay, “Technology and Human Nature,” briefly sketches the theme of relations between technology and human nature. In so doing it points, as it were, to a general context of Invescit concern for what is called the social assessment of technology—although Garcia-Merita herself does not use this term.

“Manuel Medina, another Invescit member, in “Philosophy, Technology, and Society,” undertakes a much more substantial historico-philosophical analysis of science-technology-society relations in classical antiquity in a way that throws light on our understanding of their contemporary relations today. The argument of this paper, that theory reflects both practical skills and social organization—along with an essay in an earlier volume of the Philosophy and Technology series—are closely related to Medina’s *De la technè a tecnologia I: Technè y teoria: Los orìgenes y la epoca clasica* (Valencia: Tirant Lo Blanch, 1985).

“Ramon Queralto, who is not associated with Invescit, in “Does Technology ‘Construct’ Scientific Reality?” provides an alternative interpretation of the relation between theory and social practices. For Queralto, a constructive influence of technology on theory may exist, but it is more accidental than essential. [Queralto is much more traditional in his philosophical approach than the Invescit philosophers.]

“Miguel Angel Quintanilla, also not directly associated with Invescit, has written one of the most comprehensive philosophies of technology in any language. The article translated here, “The Design and Evaluation of Technologies: Some Conceptual Issues,” is taken from his *Tecnologia: Un enfoque filosofico* [Technology: A Philosophical perspective] (Madrid, Spain: FUNDESCO, 1989), and highlights the centrality of design as a little analyzed aspect of modern

technology. Related studies can be found in his articles on “ciencia” and “tecnica” in Miguel A. Quintanilla, ed., *Diccionario de filosofía contemporánea*, 3d edition (Salamanca, Spain: Sigueme, 1985). [Quintanilla is heavily indebted to Bunge, see Chapter 5 above.]

“Jose Sanmartin’s two essays, along with another published in an earlier volume of Philosophy and Technology, provide a good general overview of the philosophy of technology of the founding president of Invescit. In “From World3 to the Social Assessment of Technology: Remarks on Science, Technology, and Society,” he takes off from Karl Popper’s theory of objective knowledge to argue the need for social assessments of technology. Then, in “Genethics: The Social Assessment of the Risks and Impacts of Genetic Engineering,” he provides a specific example, a kind of case study of why and how a social assessment of technology might work. Both papers extend ideas argued in *Los nuevos redentores* [The new redeemers] (1987) and *Tecnología y futuro humano* [Technology and the human future] (Barcelona, Spain: Anthropos, 1990).

“Also of note, and indicative of the importance of the work of both Sanmartin and Invescit, are two special issues of the journal *Anthropos*. The first is one devoted to the thought of Sanmartin (issue nos. 82–83, 1988). The second is a special issue edited by members of Invescit on “Filosofía de la tecnología: Una filosofía operativa de la tecnología y de la ciencia” [Philosophy of technology: A practical philosophy of technology and science] (nos. 94–95, 1989), accompanied by a supplement 14, “Tecnología, ciencia, naturaleza y sociedad” [Technology, science, nature, and society], which collects texts from Heidegger, Husserl, Scheler, Ortega, Garcia Bacca, Mumford, Ellul, Habermas, and Kropotkin, along with a comprehensive bibliography of Spanish work and translations in the field of philosophy and technology. [Note: Medina has continued this sort of work under a new title, CIVISCIT—roughly, “citizens and the investigation of science and technology”; see web page at Prometeo 21 (Prometheus 21).]

“Although the most extensive section of this volume [on Spanish language philosophy of technology], the collection of materials from Spain nevertheless clearly falls short in at least one important respect. It fails to include any translation from the work of Carlos Paris, one of the teachers of Sanmartin. From *Mundo técnico y existencia auténtica* [Technical world and authentic existence] (Madrid: Revista de Occidente, 1973) through *El rapto de la cultura* [The kidnapping of culture] (Madrid: Manana, 1978; 2d edition, Barcelona: Laia,

1983) to *Critica de la civilizacion nuclear* [Critique of nuclear civilization] (Madrid: Libertarias, 1984; 2d edition, 1991), Paris has advanced a sustained critical analysis of the technological world. It is unfortunate that the editor failed to pursue vigorously enough the possibility of securing a contribution from Paris.”

Other European philosophers generally thought to be important but missing in these lists include the German emigre to the USA, Hans Jonas (especially *Das Prinzip Verantwortung*, 1979 [English version, *The Principle of Responsibility*, 1981]) and Jurgen Habermas (author of many books), lamentably missing in my book because he has never associated himself in any way with SPT.

The Belgian Gilbert Hottois is included among authors above, in the *Invescit* book series list.

And Javier Echevarria and Eulalia Perez Seden of CSIC (Consejo Superior de Investigaciones Cientificas, Instituto de Filosofia) are as representative of Spain as Sanmartin, Queralto, or Quintanilla.

It may not yet be obvious from these simple listings, but the diversity of thinkers in Spain and Germany is quite wide. If one were to summarize the controversies in those two countries, however, my guess is that the range today would fairly closely track the controversies among philosophers of technology in the USA. Not listed here, but at the first international SPT conference in Bad Homburg, the thought of Heidegger was brought up to date—and shunned by German colleagues!—by Wolfgang Schirmacher.

In general, the mainstream of German thought has been similar to Johnson's collaboration with professional engineering societies (see Chapter 20 below), though Rapp and others pursue an “analytical” (originally Bungean) line, alongside Ropohl's “systems” view (with more echoes in Bunge). But it is impossible to ignore Habermas and the Frankfurt group; Jonas; and at least later Heideggerians such as Schirmacher.

In Spain, Sanmartin (originally) and Medina had definite leftist tendencies; Echevarria is decidedly centrist (somewhat like Michalos in Chapter 2 above); Quintanilla is a Bunge/”exact philosophy” advocate (though he was a Socialist Senator and his disciple Ana Cuevas Badallo—see Chapter 15 on philosophy and engineering—is anti-Bunge); and there are a number of traditionalist

philosophers of technology, including Queralto. Some mention should also be made of the existentialism of Ortega y Gasset, and maybe the general humanism of Miguel Unamuno.

Thus quadrant schemes for:

Spain: Echevarria (social democrat)

Ortega (existentialist)

Medina (Marxist influence)

Quintanilla (Bunge)

The most recent generation would be less easy to locate; for example, Cuevas, though a Quintanilla disciple, is anti-Bunge, and Lopez Cerezo is strongly influenced by STS studies.

Germany:

Huning and Lenk (professional ethics)

Schirmacher (Heideggerian)

Frankfurt/Habermas

Ropohl (systems) and Rapp (Bunge-influenced analytic)

The 1997 Karlsruhe conference proceedings, representing the current generation, are, as is the case in Spain, more diverse—though I doubt that even the most recent work, in either country, would escape the fundamental controversies reflected in the two quadrant formulations that summarize the situation here.

So Pitt, who, we will see, finds many friends among our Dutch collaborators, could still find that too much of philosophy of technology in Germany and Spain is, in his term, "ideological" rather than implementing a philosophy of science model.

While these controversies continued to simmer within SPT, Larry Hickman, the

leading proponent of John Dewey as a philosopher of technology, became more active in the society. When Hickman became president of SPT—indeed earlier, while he was vice president and president-elect—he showed admirable pragmatic tolerance toward all our Continental collaborators, even while criticizing the writings of some of them.

Chapter 14

American Pragmatism and Technology: Larry Hickman

What follow are selections from a Southern Illinois University at Carbondale campus newspaper interview that Marilyn Davis conducted with Larry Hickman—the next SPT president in our series. (See Hickman’s website.) The interview provides a nice portrait with which we can begin.

Davis begins with a quote from Hickman: “Our sophisticated culture needs philosophy more than ever to help solve its problems.” With this as theme, she talks about Hickman’s position as director of the Center for Dewey Studies at SIUC, where he heads the world’s top resource on Dewey, which houses Dewey’s papers and other key materials in American philosophy and virtually everything ever written about Dewey in English. Hickman himself, Davis tells us, first visited the center as a philosophy professor at Texas A&M University in the late 1980s, when he was writing his first book about Dewey. Soon after arriving at SIUC, Hickman also turned his attention to preparing an electronic edition of the *Collected Works*, a massive task that involved re-keying and re-scanning text, proofreading it, and helping to develop a powerful search engine. The project’s chief funder, the National Endowment for the Humanities (Davis continues), also wanted an easily searchable CD-ROM edition of the letters to be the center’s top priority, which Hickman oversaw.

Hickman is an internationally known expert on American philosopher John Dewey, whose ideas on technology he has interpreted, publicized, and amplified. In between visits to speak in Poland, Mexico, Japan, China, and Italy, Hickman was named SIUC’s Outstanding Scholar for 2002.

Davis’s interview goes on to say that in two “widely praised” books—*John Dewey’s Pragmatic Technology* (1990) and *Philosophical Tools for Technological Culture: Putting Pragmatism to Work* (2001)—Hickman has made a name for himself by showing that Dewey had a well-developed philosophy of technology.

While some philosophers have suggested that philosophy is essentially dead—that it no longer has much to say to our highly technological society—Davis quotes Hickman to the contrary: “Hickman disagrees. Strongly.” She adds, again quoting Hickman: “Philosophy is alive and well precisely because it has

finally turned its attention to technical and technological themes. . . . Technology (he says), is essentially human inquiry: our use of tools and techniques to create something new from raw materials and stock parts.” Like Dewey, Hickman doesn’t limit his definition of tools to tangible objects. Tools are any human invention used in problem solving and creation.

In terms of the content of Hickman’s thought, Davis quotes him as saying, “If philosophy is worth anything, then it’s applied, in some way. Pragmatism is a forward-looking philosophy that says that where an idea comes from is less important than what it can do for you.” Dewey was interested in technology as a liberating force. He saw it as what human beings do naturally. In the same sense that spiders make webs, human beings make tools and techniques. And Davis adds another quote: “We live in a technological milieu. Those are our dominating metaphors. We move through the world technically and technologically. We have to find some way of understanding that if we’re to ameliorate our problems.” And Hickman says, “Philosophy is the way to do it.”

Davis says that Hickman was attracted to Dewey because Dewey’s interest in social progress and reform tied together technology, democracy, and education. And in keeping with his view that philosophy should be engaged in real-world struggles, Davis adds, Hickman agreed to be the faculty sponsor for the gay and lesbian organization at Texas A&M in its successful seven-year court battle to become a recognized student group.

Hickman’s other interests include film (Truffaut, Fellini, and Robert Altman are among his favorites) and video art. At Texas A&M, he taught a course called Philosophy and the Visual Media and gained state funding for an annual film and video festival. (See Chapter 24 below.)

Personalizing her account, Davis says, “Hickman is a lean, tall, fast-talking Texan who grew up in San Antonio, went to college in Abilene (Hardin-Simmons University) and Austin (University of Texas), and taught philosophy at Texas A&M for 20 years before coming to SIUC.”

I have reviewed both of Hickman's major books, and I repeat here some of what I said in those reviews.

I first take up Hickman's earlier book, *John Dewey's Pragmatic Technology* (1990). As I have said more than once elsewhere, I think the best account of

Dewey's philosophy that had been put forward before Hickman's is Ralph Sleeper's *The Necessity of Pragmatism: John Dewey's Conception of Philosophy* (1986). Sleeper's account, which follows Dewey's philosophical development from its earliest beginnings to what Sleeper views as Dewey's "mature philosophy" in *Experience and Nature*, and in *Logic: The Theory of Inquiry*, begins with the claim that, for Dewey, philosophy is "a force for change," an instrument for transforming the culture in which we live. And Sleeper ends, in a chapter that, he says, shows "the integrity of Dewey's work and some of its ramifications," with the claim that Dewey's philosophy is fundamentally *meliorist*. In an insightful and sharp contrast, Sleeper notes how: "Although Wittgenstein and Heidegger share something of Dewey's concern for the release of philosophy from the constraints of tradition, they share little or nothing of Dewey's concern with the application of philosophy once released. They have none of Dewey's concern regarding the practice of philosophy in social and political criticism."

Hickman goes one step further. Hickman's thesis is that Dewey's philosophy is explicitly and consciously a meliorist *critique of our technological culture*. Perhaps exaggerating Dewey's occasional hyperbolic expressions, Hickman says that for Dewey philosophy is a technology—an instrumentality—for the transformation of culture, in our case, of technological culture. In saying that a critique of technology was Dewey's main tool, Hickman is being only slightly less provocative than in his claim that Dewey's larger project was to restore meaning to a culture that had rendered not only science but also workaday skills and even the fine arts "technological." In other words, Hickman is claiming that Dewey both intended to be and *was* a philosopher of technology—and a better one than most who today give themselves that title.

In Chapter 6 of his earlier book, Hickman contrasts Dewey's treatments of the way technology dominates today's culture with several versions of Karl Marx, interpreted as an economic determinist, and with the "autonomous technology" thesis of Jacques Ellul. This is an important chapter in which Hickman demonstrates that Dewey would have had a powerful voice to contribute to some of the major controversies in philosophy of technology in the 1970s. (See Verene's version of Ellul in Chapter 16; Marxism in Chapters 4 and 12.)

Chapter 7 brings the book to a conclusion, examining social and political ramifications of Dewey's critique of technology and technological culture (and echoing Sleeper): "It is a widely accepted view among professional philosophers

that the most innovative and influential philosophers of the twentieth century are Wittgenstein, Heidegger, and Dewey. Of those three, only Dewey wrote extensively about public philosophy; only Dewey advanced a philosophy of education; and only Dewey had a coherent program to produce practical social amelioration” (p. 198).

Hickman’s book seems to me successful in demonstrating that Dewey was a philosopher of technology before the topic became popular, but also in showing that Dewey’s philosophy of technology, if put into action, could be a remarkable force for good in today’s world.

Turning to Hickman's more recent book, *Philosophical Tools for Technological Culture* (2001), he tells us explicitly that his first chapter “sets the agenda” for the volume, so I will make that chapter key to my summary and interpretation of the book. (Here the material is taken from a review I did in *Metaphilosophy*, July 2004.)

The chapter opens with a discussion of various uses of the term “technology” in recent years, then provides Hickman’s own definition: “Technology in its most robust sense . . . involves the invention, development, and cognitive deployment of tools and other artifacts, brought to bear on raw materials . . . with a view to the resolution of perceived problems . . . [which, together] allow [society] to continue to function and flourish” (p. 12).

In important ways, this is simply Dewey’s classic definition of “inquiry” (sometimes “logic”) as successful social problem solving, now clothed in language that makes the definition relevant to philosophy of technology controversies in the twentieth century. Dewey has sometimes been faulted for neglecting what his friend and colleague, G.H. Mead, called the “consummatory phase” that gives meaning to all the hard work involved in social problem solving; and Hickman might be accused of the same relative neglect.

But Hickman does emphasize the following: “[Dewey] sought to reconstruct [in *A Common Faith*, 1934] the noun “religion” as “religious,” an adjectival term that would refer to the qualities of energy and enthusiasm that infuse and motivate all those experiences that produce enhanced adjustment within life’s situations” (p. 77).

And in an edited collection, *Reading Dewey* (1998), Hickman places an essay by

Thomas Alexander, “The Art of Life: Dewey’s Aesthetics,” where he says Dewey would say it belongs, as the lead essay in the volume. Much misinterpretation of Dewey’s “instrumentalism” and Hickman’s broad use of “technology” might be avoided by making explicit how “social problem solving” is not all hard work, but includes—indeed is motivated by—a hoped-for “consummatory phase.”

Hickman turns next to what he calls the “naturalizing” of technology. He distinguishes between habitualized “technical platforms” that support routine implementations of technology as he has defined it and the “reconstruction of technological platforms [which] requires reflection . . . [and] is therefore best termed ‘technology’ . . . in its etymologically correct sense” (p. 16). Hickman then says: “My theme in this section is . . . locating technology within the evolutionary history of human development” (p. 17). At least for philosophy generally (and here Hickman is applying it to philosophy of technology), this is again classical Dewey.

Carl Mitcham (Chapter 1 above) had criticized Hickman’s earlier book, saying that, “If virtually all knowledge, and indeed all human activity, is or ought to be at its core technical, this raises the specter of reductionism . . . [and] the concept of technology becomes vacuous” (Mitcham, 1994, pp. 74–75). For Hickman, this is a misunderstanding. Using Dewey’s *Logic* (1938), Hickman makes the case for distinguishing the “technical”—activities that tend to be “habitualized or routinized”—from the “technological” in the good sense: “When habitualized techniques . . . fail . . . , then more deliberate inquiry into techniques . . . is called for” (p. 23). By “naturalizing” technology, Hickman wants us to see that not everything technical is “technological” in the sense he is using the term (claiming to follow Dewey faithfully).

The next section of Chapter 1 is one of the few places in the book where Hickman attacks analytical philosophy. Hickman’s (positive?) characterization of analytical philosophy is this: “Perhaps [analysts think] philosophy should restrict itself to analyzing and tuning up skills associated with natural and artificial languages.” (We have seen, in Chapter 6, that Margolis criticizes Dewey’s epistemological naivete in terms similar to this.) Hickman’s reply is that he and Dewey are, and as philosophers of technology should be, not concerned with academic but with real-world problems. Margolis might be right in saying that, in today’s philosophical world, one must be analytical to be taken seriously; but that can’t and shouldn’t be the end of the story. One part of analytical

philosophy that Hickman does consider legitimate is where analysts try “to deal with the specific problems engendered by the use and development of specific techniques . . . in [for example] medical ethics, agricultural ethics, and environmental ethics” (pp. 24–25). Here Hickman's reply, claiming to correct the narrowness of the analytical approach, also claims to carve out a niche for a Deweyan philosophy of technology: “Somewhere between these broad and narrow philosophical tasks—the theory of inquiry on one side and technical field-specific studies on the other—there lies yet another area of activity, uniquely philosophical but at the same time intimately associated with anthropology, sociology, history, and other disciplines, such as economics. This is the field known generally as the philosophy of technology, or the philosophy of technological culture” (p. 25).

The rest of Chapter 1 in Hickman's second book on philosophy of technology replies to objections and points out advantages of this Deweyan approach. It also includes an addendum on why Hickman will use the popular term “technoscience” in the rest of the volume. The point seems to be, primarily, to show where Hickman and Dewey would stand in recent science/antiscience controversies—that is, on the side of science, but only if it serves meliorist purposes.

In a special author/critics number of *Technè* devoted to the second Hickman book, which I edited (7:1, Fall 2003; see www.spt.org/journal), Hickman reacts to four critiques that I think are worth mentioning here.

Reacting to a charge by Albert Borgmann that his approach can offer no “firm norms” for the reform of technological culture, Hickman simply denies the force of the charge. Humans, working for reform from a great variety of intellectual disciplines, can *both* devise means to achieve a better social condition *and* adjust their goals—even providing “firm” goals if one feels that is necessary—as they go along. A both/and philosophy, Hickman says, is better than what seems to be Borgmann's point, *either* firm norms *or* unacceptable relativism. The question of relativism is a traditional issue in philosophy, and Dewey was often accused by his opponents of falling into it. (See Chapter 6 above, where Margolis defends what he considers to be an acceptable—even a necessary—level of relativism in any defensible pragmatism, but also criticizes Dewey's epistemological naivete.)

Next, in reacting to fellow pragmatist Paul Thompson, who claims that his book does not go beyond being a “propaedeutic” to actual involvement with the

experts who can help solve technosocial problems, Hickman admits there can be a tension between academic work and activism—though he thinks a professor's role allows for plenty of critical activism on the part of students, either now or in their future technical careers. Thompson thinks this is not enough; a genuine pragmatism should involve active cooperation in the real world of social problem solving. Again this is a perennial problem for philosophers, who often labor under the charge of being useless, of living in ivory towers. (Some, of course, are perfectly happy to do so.)

Andrew Feenberg's critique is that Hickman's and Dewey's liberal, pro-science politics is not what radicals were looking for in their calls for revolutionary reform in the 1960s and 1970s. Hickman, following Dewey faithfully, claims that the policies he favors are fairly close to socialist policies—others might call them Progressive—and, emphasizing the paradox, he says that Feenberg's recent proposals move him in the same direction. Whatever the merits of either side in this exchange, there is an issue here—a perennial one since the days of Marx—whether modern society needs revolutionary change or whether progressive reforms can do enough to make ours a better world. (Recall Sleeper's claim about Dewey's meliorist philosophy, and Hickman's endorsement of it.)

One last interchange from the *Techné* author/critics number that is worth mentioning here—to shed more light on Hickman's philosophy—pits Robert Innis against Hickman. Innis charges that Hickman has not been faithful to Dewey in terms of the much broader emphasis Dewey places on the role of "aesthetics" in his instrumentalism: our cultural settings provide the motivation to (as well as the culmination of) our efforts at social reform, and in general play a much larger role than Hickman allows for in his book. Earlier I noted that Hickman had edited another book on Dewey, in which aesthetics had pride of place, but that wouldn't undercut the charge that he unduly plays it down, or neglects it, in this book. In any case, the issue of a proper definition of instrumentalism, one that doesn't leave pragmatism open to the charge that it is excessively focused on problem solving, to the neglect of esthetic and other values concerns, is one that Hickman and any defender of pragmatism is going to have to deal with. One way this issue plays out returns us to Borgmann's charge, about "firm norms," above.

Summarizing *controversies*, Hickman objects to Mitcham's claim (echoed here by Innis) that his and Dewey's instrumentalism is "reductive," that it misses out on extra-instrumental or basic values. Hickman also rejects Margolis's claim

about Dewey's epistemological naivete; indeed he would say that Margolis's preoccupation with an analytical epistemology is inconsistent with the reform aims of Dewey's philosophy of technology. Hickman has also criticized Borgmann, along with many other philosophers of technology, who, he says have not used their broad theories to critically examine our social problems in the "instrumental" fashion favored by Dewey; and he has claimed, as we saw, that the *neo-Marxist* Feenberg has become a *pragmatist* without admitting it—though Feenberg retorts that he can't become just another liberal reformer, giving up the radicalism he learned from Marcuse.

There are other examples of specific controversies in the two books, with each opposing philosopher being dealt with at some length, but this is enough—it seems to me—to give the flavor of at least this part of Hickman's philosophy of technology.

It is important at this point to remind ourselves of one other controversy involving Dewey, Hickman's idol: we have seen Margolis, in Chapter 6, accuse Dewey of being epistemologically naive, of not meeting the standards of contemporary analytical epistemology. And, except for the recent resurgence of pragmatism in an analytical form, as summarized by Margolis, American Pragmatism was for several generations viewed with suspicion by analytical philosophers in what they viewed to be the mainstream. Hickman's work has figured prominently in a revival of the traditional meliorist version of American Pragmatism in American philosophical circles.

I now circle all the way back to Mitcham's concerns, in Chapter 1, that any philosophy that does not categorically reject engineers' claims that they are the ones who are actually doing something to make ours a better world, has no chance of "taking the measure" of our contemporary technological culture. That is, we next look at engineers' explicit claims to do philosophy, and at the handful of philosophers of technology who have taken engineering as a central focus of their writings.

Chapter 15

Philosophy of Engineering

In the introduction to a volume I edited, *Critical Perspectives on Nonacademic Science and Engineering* (1991), I argue that a philosophy of engineering is a mostly missing but much needed part of philosophy of technology. If I were to do justice to the topic here, I should include materials from all the authors included in that volume since each one has at least one book-length study of engineering from his or her philosophical perspective. Some I leave out here because they are represented elsewhere in this book—Carl Mitcham, for example, has an excellent summary of what engineers have to say about their discipline in *Critical Perspectives*, and I also included historical studies and materials on engineering education. There are also selections on ethics and politics. Here I can include no more than a few of the *Critical Perspectives* authors. I begin with Steven Goldman. I then add Billy Vaughn Koen—supplementing his defense of a philosophy of engineering by engineers with another defense by Samuel Florman, in *The Existential Pleasures of Engineering* (1976). I then add another *Critical Perspectives* author, Ronald Laymon, on the epistemology of engineering; to this I add a contribution that is more recent, by Ana Cuevas Badallo, who provides another epistemological analysis based on the so-called engineering sciences. I conclude with values issues in engineering, citing another *Critical Perspectives* author, Henryk Skolimowski, plus an early philosopher of technology cited by Mitcham, Friedrich Dessauer.

All of this needs the context of history, and for my purposes the best history of the role of engineering, and the engineering professional societies, in the USA is David Noble's *America by Design* (1979; see also his 1984). Noble (following the lead of philosopher Herbert Marcuse) spells out, in relentless detail, and wherever possible in the words of corporate managers and their allies in the engineering professional societies, the *total* way in which the ideology of science and technology in the (alleged) service of society came to permeate every aspect of society in twentieth-century America.

Philosophers, along with historians, have challenged the applied science model of Bunge (Chapter 5 above), which is shared by many science policy experts and spokespersons for industrial research and development (R&D). For example, in *Critical Perspectives*, where Edwin Layton's historical critique (more narrowly focused than Noble's) appears, philosopher Steven Goldman (1991) argues,

paralleling the views of Noble, that the nature of engineering has been obscured by both scientists and engineers (along with managers and the public), who think along the lines laid out by Bunge. By cloaking their work in the mantle of praise for science—nearly always adding “for the public good”—engineers and their defenders (e.g., Samuel Florman), according to Goldman, are able effectively to mask the “social determinants of technological action” that actually drive modern engineering at every level, including the level of what counts as engineering *knowledge*. Using example after example of how engineering decision makers almost never pursue the “technical best,” deferring instead to managerial decisions about what to pursue and how far, Goldman concludes: “Engineering thus poses a new set of epistemological problems deriving from a rationality that is different from that of science. The rationality of engineering involves volition, is necessarily uncertain, transient and nonunique, and is explicitly valuational and arbitrary. Engineering also poses a distinctive set of metaphysical problems. The judgment that engineering solutions “work” is a social judgment, so that sociological factors must be brought directly into engineering epistemology and ontology” (Goldman, 1991, p. 140).

In my long experience working with engineers, industrial chemists, and others in science-based industry, this is not going to come as any surprise—though, on the other hand, these “captive” experts tend to see nothing wrong with the “applied science” model. Goldman attributes this to a kind of cultural blindness: “The purported value neutrality of the technical is an ideologically motivated strategem,” where he means that they are not consciously aware of what it is they are doing. (Goldman says engineers voluntarily go along with their managers, with whom, on this point at least, they share the ideology.) “It serves,” Goldman goes on, “to insulate from criticism the social factors determining technological action” (p. 141).

Goldman’s conclusion is controversial, but in my experience the defenders go along with the critics on the “captivity” of engineering practice. Defenders just claim that engineering, freed of managerial or public constraints, could be more objective—which is Bunge’s view as well (Chapter 5 above). Critics like Goldman say, instead, that we have to judge engineering—even engineering’s epistemology or knowledge claims—not by what it might be, but as it is in the real world.

I here quote from Goldman's study of the history of engineering and engineering education for the Office of Technology Assessment (unpublished; I have it in

mimeograph form):

The Value-Laden Character of Engineering Practice

“There is an overwhelming consensus among writers on engineering education that the engineering method is fundamentally different from the scientific method. Where the latter is essentially analytical, the former is based on design, expressing a synthesis of general theory and specific technical knowledge with relevant pragmatic judgments of workable means of achieving predetermined objectives.

“Oboukhoff [in 1944: Proceedings] argued that science was incapable of generating a solution to an engineering problem. Science was abstract and Platonic where engineering was concrete and pragmatic. Koen [1985] argued that the engineering method was fundamentally unscientific, resting on the use of heuristics that were fallible, not justifiable scientifically and not unique. They were one engineer’s (or group of engineers’) best educated guess at one way to solve the given problem in the terms posed. Layton [1984] argued even more forcefully that the ‘universe of design’ was open-ended and indeterminate, non-scientific and permeated with values. Designs were in principle non-unique and the method for generating designs was non-algorithmic, but rather a chain of decisions each of whose links was a value judgment. ‘From the point of view of modern science, design is nothing, but from the point of view of engineering, design is everything’ [1976: Layton].

“Design means thinking out plans for accomplishing actions that always permit alternative combinations. There is no deterministic or scientific way to design a machine . . . design is never fully subject to logic or rule [1983: Hindle]. But neither is design monolithic. It differs in different branches of engineering [1986: Vincenti]. Nevertheless, technological innovation necessarily ‘depends on the relatively unstructured conceptual activity’ of high-level managers translating ‘often ill-defined commercial or military needs into a concrete technical problem for the level below’ [ibid]. The design problem acquires specificity through a process of interpretation that mirrors Layton’s metaphor of design as a chain, each of whose links is a value judgment. Only at the lowest level does the individual engineer encounter a well-defined, well-circumscribed problem to which technical knowledge can be directly applied. But even there, the most obvious technical solution may not match expectations at higher levels of what the solution needed to accomplish given a broader perception of the

problem, leading to its return for re-engineering.

“For others, ‘the essence of engineering is not design [but] the application of engineering judgment’ [Louis Guy: 1986 National Congress; also, 1944: Proceedings, essays by Young and by Everitt]. It is the fact that engineering design is an open-ended form of problem-solving, one with no uniquely correct solution, that gives engineering its character and defines its creative dimension [1970: Beranek; 1985: Koen; 1984: Layton; 1977: Ferguson]. What constitutes a solution to a particular engineering problem is not a statement about the way the natural world is, as it would be in the case of a scientific problem. It is instead a statement about the context within which a proposed solution is judged to be satisfactory, or not.

“The ‘solution space’ of engineering design problems, then, is defined by the interests of the (actual or projected) client for whom the design exercise is being carried out, together with the available technical knowledge base: from formal theories of matter and energy to machining capabilities. Scientists, by contrast, pursue patronage but, even for the radical sociologists of scientific knowledge, do not explicitly factor into the solutions they propose to scientific problems the expressed demands of their patrons, or of their peers.

“The consequences of these contrasting ‘solution spaces’ for the practice of engineering as distinct from the practice of science are profound. Values are revealed to be an ineluctable concomitant of engineering practice, manifesting themselves in the social relations of the institutions through which engineers and the public interact. The study of values and of the ways that values enter into and shape engineering practice thus find a natural place, in principle, in engineering education. [This is not a tendentious interpretation. It is explicitly argued in Mann, Wickenden and Hammond, Grinter and subsequent ASEE reports, Grayson [1974], the EEPUS reports and many, many others. It is one of the staples of the engineering education literature, in spite of the fact that it is virtually ignored in practice.] By contrast neither the social relations of scientific research institutions, nor the study of the flow of values-based influences between science and society are acknowledged by the scientific community as a whole as relevant to the study or practice of science.

“The EEPUS study ‘Engineering Undergraduate Education’ [1986] called for building into the undergraduate curriculum an ‘understanding of social and economic forces and their relationship with engineering systems, including the

idea that the best technical solution may not be feasible when viewed in its social, political or legal context.’ Louis Guy, speaking at the 1986 National Congress for Engineering Education, said: ‘It is not enough for engineers to know how to do the thing right; we must also know what is the right thing to do. Otherwise our education has failed us.’

“Both the EEPUS study and Guy were echoing William Wickenden who wrote, in 1934, that the engineer was a social pragmatist who followed the ‘apostolic injunction, ‘Test all things; hold fast to that which is good,’’ but for that very reason needed to ‘formulate some scale of social values in order to judge what is good.’ Simply accepting prevailing values uncritically, Wickenden wrote, meant reducing the engineer ‘to a mere servant of vested interests.’

“The integration of teaching about values into the engineering curriculum remains, 70 years after the Mann Report, in the realm of recommendations and proposals. It is also the widespread opinion of critics of engineering education that the teaching of design has suffered greatly in the last thirty years and the two may be related.”

Philosophizing among engineers is rare, but one engineer who does (and laments the fact that others don't), is Billy V. Koen. Ignoring Goldman and the other authors in *Critical Perspectives* (to which he contributed), Koen complains that “almost nothing” has been written about philosophy of engineering by contrast with philosophy of science. Here is a summary of Koen's view.

An Engineer's Philosophy:

Koen (1985, 1991, 2003) believes both that engineering has been almost totally ignored by philosophers and that *he* has captured the essentials of *the* engineering method. The essence of the engineering method that Koen thinks he has discovered can be summarized briefly (too briefly?) under two headings: *heuristics*, and *state of the art* (for Koen, “sota”).

Koen concludes: “My Rule of Engineering is in every instance to choose the [always fallible] heuristic from what my personal sota takes to be the engineering sota at the time I am required to choose” (Koen, 1991, p. 57).

And: “If . . . all engineers in all cultures and all ages are considered, the overlap [among their sotas] would contain those heuristics absolutely essential to define a

person as an engineer” (p. 58).

Koen has little use for definitions like that of Bunge, that engineering is applied science—though he readily admits that engineers’ sotas do include scientific knowledge. Nor does Koen agree wholeheartedly with Goldman’s anti-Bunge “captive engineering” view, though he does emphasize that the state of the art in any engineering project clearly must include managerial and other non-engineers’ constraints (including public and political, including regulatory, input). What Koen wants us to see is that good (he would even say the best) engineering practice always contains the fallibility of heuristics (he thinks unlike science), *but* it is also always bound by best practices of the time, the sota or state of the art.

Koen is willing to go far out on a weak branch to generalize. He says, “The responsibility of each *human as engineer* [is] clear. Everyone in society should develop, learn, discover, create, and invent the most effective and beneficial heuristics. In the end, the engineering method is related in fundamental ways to human problem solving at its best” (Koen, 1991, p. 59). And Koen’s latest book, *Discussion of the Method* (2003), even attempts to turn this generalization into *the* universal method of human problem solving, following in a long line of philosophers (and others) who have attempted to discover such a universal method. All of that, however, is far from my focus here.

A brief digression to bioengineering (see Chapter 22 below); Koen makes a few comments (2003, p. 249) that show how he would apply his universal method to an assessment of the state of the art today in that field: “Both behavioral and genetic engineers recognize that they want change in a highly complex, unknown system and, not surprisingly, instinctively appropriate the title engineer. Saying you are an engineer, however, doesn’t necessarily mean that you are a very good one.”

What is the source of Koen’s skepticism with respect to genetic (and behavioral) engineering? He goes on: “The present state of the art of both the behavioral and genetic engineer contains the appropriate heuristics for behavioral modification, but few of the heuristics of engineering. . . . Neither has the slightest notion of the importance of making *small changes in the sota, attacking the weak link, or allowing a chance to retreat*” (p. 249).

As I will say in Chapter 22, I am not as skeptical as Koen on this point; for

instance, in industrial or government R&D on genetic engineering, it seems to me that at least some important practitioners (who might, I admit, just call themselves scientists, or biologists) do take small steps, allow themselves to retreat, etc.

Samuel Florman's *The Existential Pleasures of Engineering* (1976) is one exception to Koen's claim that engineers have not attempted to do philosophy of engineering, but his approach is very different from Koen's. Here is the conclusion of his book: "The thrust of my argument has been to show that engineering is an occupation that responds to our deepest impulses, and is rich in spiritual and sensual rewards. Of necessity I have been speaking of engineering in the abstract—an ideal, if you will. The objection can be raised that this idealized definition of engineering cannot be applied in any meaningful way to the great diversity of individuals who are called engineers. We have already noted that the approximately one million American engineers exhibit an enormous variety of professional specialties ranging from designing electronic circuits to building dams, from devising theoretical models for systems analysis to testing new plastics, from conceiving new means of utilizing solar energy to selling machine parts. There are solitary geniuses working on discoveries that will amaze the world; and there are thousands of quasi-designers seated like galley slaves in huge drafting rooms. There are teachers and deans, brilliant teams in "think tanks," advisers to presidents, titans of industry, rugged individualists heading their own consulting firms; and there are thousands of frustrated inspectors for government agencies, and checkers of quality control in factories. Yet I visualize this vast, motley group as being part of one great profession, and I see each and every engineer as having access to the profound experiences I have discussed.

"Metaphorically, I think of an engineering project as the staging of a production at one of the great opera houses of the world. . . . Some of these people are more 'professional' than others. Some are more 'creative.' One or two may be geniuses. But at the magic moment when the curtain rises, a performance takes place which in a real sense is a creation of the many people who have been working in their varying capacities. Not only do they each deserve credit for the finished product, but they each *experience* the satisfaction of having participated in a great undertaking."

In *Critical Perspectives*, philosopher of science Ronald Laymon shows us what can be accomplished following Bunge's engineering = applied science model.

“Science and engineering both require the actual production of numbers. Theories cannot be tested without theoretically generated targets. The items and processes that are of interest to modern engineering cannot be built or controlled without calculated estimates of performance or behavior. But real computability in science and engineering requires the use of idealizations and approximations. Because idealizations are, strictly speaking, false, and the use of approximations may introduce falsity into a calculation, inferences based on actual calculations will virtually always be unsound. For the scientist, such unsoundness means that theories will be protected from a *modus tollens* disconfirmation. The failed predictions can always be blamed on the false idealizations or the approximations that have been used in conjunction with the theory to generate the prediction. For the engineer, the problem is that of justifying the practical reliability of a calculation that is known from the onset to be untrue. If the calculation proves adequate in some domain of application, the problem becomes one of projecting this success to new and untried areas. Obviously, a great many different types of argument get used in attempts to justify such projectability. A basic rule of thumb, unfortunately not totally reliable, is this: if calculation or analysis T_1 is less idealized and more realistic than T_2 , then T_1 can be expected to more reliably project to new cases than T_2 . This means that engineers by and large attempt to maximize the realism of their calculations, within of course the constraint of computational cost.”

I turn next to a relatively new perspective on philosophy of engineering, one that was not available when I edited *Critical Perspectives*.

Engineering Sciences:

Ana Cuevas Badallo, in her ambitious doctoral thesis (2000), discusses the role of the so-called *engineering sciences* in a new philosophy of technology that would be more adequate than any offered so far. After listing more than a dozen engineering sciences, classical and modern, she chooses to focus on the most traditional, so-called Strength of Materials. But her basic list (Cuevas Badallo, 2000, pp. 79–80)—a very standard list in engineering education—extends from strength of materials to aeronautic engineering, systems of control, management as a part of engineering, and on to bioengineering and genetic engineering. And she ends her thesis this way: “Here I have analyzed only one theory among the engineering sciences, so the future is open to see if the proposed characterization is correct in relation to other cases—a task beyond our present scope. The

conceptual framework presented here needs to be refined through studies of other engineering sciences and their relationships to other natural sciences, to mathematical sciences, and even to the social sciences” (p. 372; my translation).

Cuevas Badallo’s arguments are simultaneously simple and complex. The simplicity is to be found in a schema she borrows from Miguel Angel Quintanilla (1996; in this respect, Quintanilla does not depart far from Bunge’s line of argumentation). According to Quintanilla, knowledge of any kind must fall into one of four categories: tacit practical, explicit practical, tacit descriptive, or explicit descriptive. (The original Spanish has *operacional* and *representacional*, and Bunge sometimes uses English transliterations of those terms; but standard lingo in English-language philosophy of science—which almost never talks about the engineering sciences—is closer to “practical” and “descriptive,” even when it implicitly accepts Bunge’s applied science model.)

By contrast, the complexity in Cuevas's approach comes with her careful analysis of strength of materials as a set of engineering sciences going all the way back to Galileo at the beginning of modern science. From the beginning, “engineering” sciences (long before engineering was recognized as a separate cognitive enterprise)—for purposes of designing fortifications, bridges, and similar structures—had to adapt the laws of mechanics to suit practical purposes: “The engineering sciences [here, strength of materials] are permitted certain simplifications and abstractions which, from the point of view of the natural sciences [here, the laws of mechanics], would be unacceptable.”

Cuevas draws the following conclusions about the epistemological character of such engineering sciences as the formulas of strength of materials: they are simultaneously *both* practical—they are related to specific engineering goals—*and* descriptive: strength of materials equations share with the laws of mechanics (from which they cannot be derived by any process of application) the character of being *laws of nature* or descriptions of the world (here the *practical* world) *as it is*. (Cuevas acknowledges Goldman’s “captive knowledge” formulation, but she is attempting to characterize more precisely what he is getting at, using specific examples of theoretical-practical formulas used everyday, successfully, by engineers.)

Cuevas concludes that most philosophy of technology (she acknowledges not only Goldman but a few others as exceptions) is deficient in not recognizing both how important the engineering sciences are in engineering practice and how this

should affect our overall conception of technology—especially in grounding opposition to Bunge's applied science model.

Finally, I can't end this controversial chapter without addressing the role that values play in engineering—not Goldman's hidden or “captive” values, but the explicit values appealed to by engineers. Carl Mitcham (in *Thinking through Technology*, pp. 29–33; see Chapter 1 above) summarizes the thought of Friedrich Dessauer (1881–1963), one of the earliest philosophers of technology who was also a successful inventor and entrepreneur: “In *Philosophie der Technik*, and then again three decades later in *Streit um die Technik*. . . Dessauer attempts to provide a Kantian account of the transcendental preconditions of technical power, as well as to reflect on the ethical implications of its application . . .” (p. 31).

“Dessauer acknowledges previous analyses and admits that technological creation takes place in harmony with the laws of nature and at the instigation of human purpose. Nevertheless, nature and human purpose are . . . not sufficient. Instead there is something else, what Dessauer calls an ‘inner working at’ . . . that brings the mind of the inventor into contact [contra Kant] with a ‘fourth realm’ of ‘preestablished solutions to technical problems’” (p. 32).

“Following this metaphysical analysis, Dessauer proposes a theory of the moral, almost mystical, significance of technology. . . . For Dessauer . . . the pursuit of technology has the character of the Kantian categorical imperative or divine command. The autonomous, world-transforming consequences of modern technology are witness to its transcendent moral value” (p. 32).

This makes a case for a truly idealized assessment of engineering's role in modern culture. At a more down-to-earth level, Hans Lenk, in his contribution to *Critical Perspectives*, points out a major intellectual problem in claims about the social responsibilities of scientists and engineers. (See Chapter 20 below.) The concept of responsibility, even in famous declarations and codes of ethics of engineers, is often undefined and almost never differentiated in any hierarchical way. While that is true and important, another failing can be found in contemporary engineering. Henryk Skolimowski, in his contribution to *Critical Perspectives*, attacks a shortcoming that he finds even greater. Although many critics lament the lack of moral leadership in our technological world, almost no one steps forward to provide it. Skolimowski, using his Eco-Philosophy, dares to provide direction for particular technological ventures and for our age of

technological development as a whole. Koen's engineering method as human problem solving writ large; or Florman's glorification of the perceived contribution to a greater enterprise of even the lowest level engineer; even Dessauer's "discovery" (?) of the magic of engineering/invention—none of these bold claims goes as far as Skolimowski to offer a solution to all the problems of modern technological society in a single ecological imperative.

Controversies? Bunge and Laymon, though in different senses, both continue to view engineering as applied science. (For Laymon, philosophy of technology is applied philosophy of science.) Though *defenders* and *critics* of engineering come from all parts of the political spectrum, radical critics such as Noble tend to fall to the left, with defenders—especially glorifiers such as Dessauer—to the right. Florman may be one exception, calling as he does for explicit government regulation when problems cannot otherwise be solved. Goldman falls toward the left. Koen's and Cuevas's views may, on the surface, seem to be apolitical; but there is no reason to believe that, if pressed, they would not identify their preferred views of *engineering*—that is, not just their personal political views—as lining up somewhere along a left-to-right spectrum.

There is not much here with which Pitt and his fellow philosophy of science critics of philosophy of technology should disagree—except perhaps in a detail here or there. But metaphysicians among SPT members continued to make their contributions—some would say they continued to *thrive* well into the 1990s. I turn next to two of them, one of whom, Frederick Ferre, was severely castigated by Pitt at one of our regular SPT sessions held in conjunction with meetings of the American Philosophical Association.

Chapter 16

Metaphysics and Technological Culture: Frederick Ferre versus Donald Verene

There may be no really good reason for putting Frederick Ferre and Donald Verene together here, but they both think that any adequate philosophy of technology must be metaphysical. Pitting them against one another has the advantage of showing significant differences among metaphysical approaches. (Recall Mitcham in Chapter 1, and also look ahead to Borgmann in Chapter 18.)

I begin with Verene. He represents Jacques Ellul (as well as Giambattista Vico and Hegel, as we will see), and Verene had a strong interest in SPT in the early days when he thought it might more strongly oppose technicized thinking than turned out to be the case. What follow are two selections from Verene's contributions to SPT publications. He has written an important book (1997) that reflects many of these themes, and even includes two selections from SPT publications. But as with Margolis and Agassi in Part 1, it seemed better to use Verene's explicit contributions to SPT publications. The selections I have made, while severely truncated, are still much too long. But they do give the flavor of Verene's thinking, in his own words. And they place Ellul's approach to philosophy of technology (Ellul actually calls his work sociology), not otherwise represented in this volume, in a tradition going back to Hegel and Vico and on to the very beginnings of Western philosophical thought.

The first selection is from *Research in Philosophy & Technology*, vol. 5 (1982), pp. 281–284, 288–291 (with omissions), and 295.

Technology And The Ship Of Fools

“Giambattista Vico, the most original and least read thinker of the eighteenth century, but read by later thinkers such as Marx, Coleridge, Goethe, Croce, and Joyce, writes of a barbarism of the intellect and will that besets society at points in its over-development. Vico says: ‘But if the peoples are rotting in that ultimate civil disease and cannot agree on a monarch from within, and are not conquered and preserved by better nations from without, then providence for their extreme ill has its extreme remedy at hand. For such peoples, like so many beasts, have fallen into the custom of each man thinking only of his own private interests and have reached the extreme of delicacy, or better of pride, in which like wild animals they bristle and lash out at the slightest displeasure. Thus no

matter how great the throng and press of their bodies, they live like wild beasts in a deep solitude of spirit and will, scarcely any two being able to agree since each follows his own pleasure or caprice. By reason of all this, providence decrees that, through obstinate factions and desperate civil wars, they shall turn their cities into forests and the forests into dens and lairs of men. In this way, through long centuries of barbarism, rust will consume the misbegotten subtleties of malicious wits that have turned them into beasts made more inhuman by the barbarism of reflection than the first men had been made by the barbarism of sense.’

“The ‘deep solitude of spirit and will,’ of which Vico speaks, is brought about by the over-use of the intellect in human affairs, such that society and the human spirit lose touch with the natural forms of imagination. The common perspective, the *sensus communis*, that constitutes the basis of human society, that is spontaneously attained through the powers of language and custom, is replaced by the determinations of the intellect and rationally devised means of social organization. This barbarism of wit is more confining and inhuman than the conditions of primitive life out of which society originally arises. Vico knew that societies, or “nations” as he calls them, begin and end in history. Their rise and fall is part of an eternal pattern—the *storia ideale eterna*, the ideal eternal history. Societies are tragic. They begin, rise, and fall by a flaw present in their own origin.

“In this paper I wish to examine two points: (1) I wish to examine the flaw that leads to the ‘deep solitude of spirit and will’ of contemporary experience. This flaw is the determinate concept, what Kant called the determinate judgment (*bestimmende Urteilskraft*). It is the intellect itself that is catching up with us. (2) I wish to examine how it is possible to remain human in the barbarism of an end point in history. This is a question of human freedom. But I do not conceive this as a question of the freedom to prevent the end. There is neither freedom nor dignity in a delusional resistance to necessity. The freedom I wish to consider is that of the performance of the significant act, the experience of meaning in the face of meaningless conditions. Such freedom is not possible except at the time of an end. Prior to the sense of an end freedom can take the form of a project, even a project of the reform of adverse conditions. At an historical end-point such a conception of freedom is irrelevant.

“I wish to see the freedom of the end as dependent on the comic. The historical end-point is a moment that can be met only in terms of the opposition of the

comic to the tragic. Since the tragedy involved is one of metaphysical necessity, as articulated in the principles of ideal eternal history, the comic must base its opposition on a command of the metaphysical art of the manipulation of the seen and the unseen. This art connects with the power of the fool to release reality from the single-minded, determinate grasp of the concept. The fool shows us the world is still ours by his power to reverse the intellect. The fool is the master of the topsy-turvy, what Hegel calls the *verkehrte Welt*. My paper has two parts that follow the divisions of my title, except that I will replace the general term 'technology' with the more specific one, 'technical phenomenon.' . . .

"I take the term 'technical phenomenon' from the French philosopher of technology, Jacques Ellul. This term occurs in his first major work on technological consciousness, entitled, in the English translation, *The Technological Society*. In his remarks for the American edition, Ellul says that his purpose is to create awareness of technological necessity. He says, 'It is a call to the sleeper to awake.' . . . What his title implies is that all has been wagered by human society on one phenomenon—*technique*. . . .

"In his focus on technique as a single, overriding basis for the interpretation of experience, Ellul is following a long tradition in philosophical thought itself and specifically in the philosophical interpretation of history. The notion of interpreting the nature of things or experience through a single phenomenon, form, or idea has a long history from Thales to Plato, to Hegel, to Bergson and Whitehead. I think John Wilkinson, the translator of *The Technological Society* is right in his comparison of Ellul's approach to Hegel's *Phänomenologie des Geistes*, in his view that Ellul's view, although not a 'phenomenology of mind' is a "phenomenology of the technical state of mind.' . . .

"My point in showing this three-step movement from the Aristotelian concept to Galileo and modern science to the technical concept is to suggest that in it the scientific mentality undergoes the labor of an ideal eternal history. Science is not one thing and technology another. Technology is a stage of science. Technology is simply the barbarism of science. . . .

"What is important in technological society is management science, policy studies, behavioral studies, law enforcement and corrections, vocational guidance, media analysis and many others, all of which appear theoretically weak to the traditional mind of social science. This makes no difference, because these fields are simply centers of instinct. Their instincts are precisely those of the

generalized phenomenon of technical consciousness, the life of the mass.

The Ship Of Fools

“The question is not how history can be changed. The *enjeu* of our age is a lost wager. We are involved in one of the last points of a *corso*, a manifested pattern of Vico’s ideal eternal history. In the technical concept we feel the press of necessity. That societies and civilizations rise and fall is something every historian has understood who has examined the historical process as a whole from Voltaire to Gibbon, to Ranke, to Spengler and Toynbee. In every age there are those who believe they live at the end of history, at the end of their culture. Most of them are wrong, but, of course, some are right. The tragic sense of history derived from the necessity of the ideal eternal history corrects the commonplace that we can use technology for good or ill, that the problems of technical life can be solved. . . .

“Vico’s view points in a different direction. In Vico’s view the response to the tragedy of history is the recovery of origin. It involves the recovery of the poetic wisdom, the *sapienza poetica*, of the first form of human society, not as a force to remake human society, but as a way to assert humanity in the face of the final barbarism and rust of wit

“The image of the ship of fools has been most recently used by Katherine Anne Porter, in her novel, *Ship of Fools*, subsequently also the basis of a film by the same title. . . .

“I wish to see foolery as applied to metaphysics. My aim is to investigate something of the wisdom of fools, a wisdom that involves the manipulation of reality. I have in mind what might be called a kind of *sapienza sciocca*, which could be understood to accompany the *sapienza poetica* of Vico’s first humanity, which must be recollected as the basis of the philosophical science of narration. The fool is a kind of first human, who combines innocence and ignorance to produce wisdom. He fascinates us as a primordial part of ourselves. . . . What I wish to suggest is that the figure of the fool, and fools in the actual practice of their business, offer a basis from which to assert humanity in the face of the barbarism of technological advance. . . . Thus I am interested not only in how memory (*memoria*, which includes *fantasia* and *ingegno*), but how the laugh, the ironic business of the fool, opens humanity to itself in an age where the rational concept encircles all of experience. . . .

“To conclude, the rise and fall of the fool is a course of the human spirit that is important to recover within the larger course of decline marked by the emergence of the technical concept and its applications to all areas of human endeavor and thought. The problem we face is not the reform of the errors of technology. We have, as Ellul’s title suggests, made our wager, even though made in a twilight half-consciously in the early modern age. Once our stake has been risked, it cannot be withdrawn, but we must learn, with ordinary players of high games, the wisdom of memory and folly. The human moment available to us is not the actual improvement of our condition but the recognition of the folly of it. The fool is a practitioner of metaphysics.”

And here is Verene’s second contribution, from *Research in Philosophy & Technology*, vol. 7 (1984), more severely truncated (pp. 99–100, 105–106, 109–111, with omissions).

Technological Desire

“In this essay I wish to address two themes: (1) that our age is technological in form, and (2) that the infatuation with technique is based on the phenomenon of human desire. The first of these themes is not popular among scholars of technology. The second, I believe, is a new idea, but I doubt it will increase the popularity of the first. In relation to the first, I wish to employ the thought of Jacques Ellul and for the second, that of Hegel. My aim is to connect Ellul and Hegel in order to seek an answer to the question: from what element in human consciousness does the technical impulse stem?

“This is a philosophical and metaphysical question. It is not a psychological question. An answer to this question cannot be found through psychological research because the empirical methods and techniques of observation such research employs are themselves manifestations of the technical impulse. I exclude the theoretical reaches of cognitive psychology which might take up aspects of this question. To answer this question consciousness cannot be approached as *a factum*, as a thing done, that is open to observation. Instead, consciousness must be approached as a process of the whole human spirit, as a process capable of fixing itself in particular forms in relation to the conditions it encounters and of transforming itself at the same time into other forms. . .

II

“The infatuation with technique is based on the phenomenon of human desire. By desire I mean Hegel’s term, *Begierde*—eager desire, inordinate longing, avidity: carnal appetite, lust, concupiscence, greed. Hegel’s term is closest to the first three of these senses but for our analysis the sexual sense of desire cannot be overlooked. In another place I have suggested that technological persons, like the figures in the works of the Marquis de Sade, are transformed into mere ciphers of desire. They have lost inner life and are forever in the throes of the act, external persons who can fascinate, but not educate each other. . . .

“For what can we hope? It would appear that consciousness could pass on to other stages Hegel describes. This is a common and convenient way to interpret Hegel—to regard Hegel’s philosophy as meaning that whenever a particular form of historical experience is attained, it will be followed progressively by some higher stage. I have not presented the *Phenomenology* that way. Instead I see this work as presenting a primordial progression, an *Ur-Bewegung*, of the forms of consciousness. Once these moments are originally realized, they may enter into human experience in various ways. When we look behind what is before us, we find its meaning in an application of the *phenomenology* to it. I agree with Ellul’s view: ‘The technological system performs unintentionally. Hence, wherever it is applied, it produces a new kind of objectification which has nothing to do with Hegel’s: it is no longer an objectification of the subject, and does not enter a subject-object dialectics.’ The technological system does not develop toward a new form; its method is the repetition of itself in all spheres of experience. Technology expands but it does not show an internal movement toward any new ‘humanized’ version of itself. We cannot hope for a dialectical solution to technology.

III

“The eighteenth-century Italian philosopher, Giambattista Vico, sees history as a cycle: ‘Men first feel necessity, then look for utility, next attend to comfort, still later amuse themselves with pleasure, thence grow dissolute in luxury, and finally go mad and waste their substance.’ . . .

“For Vico, as for the French thinker, Jean-Jacques Rousseau, when men live under conditions of necessity, they live with the gods as their companions. But as luxury develops, men became uncomfortable with the presence of the gods. And, ‘Finally, they chased the gods out in order to live in the temples themselves,

or at least the temples of the gods were no longer distinguishable from the houses of the citizens.’ Luxury corrupts spirituality so that the world becomes rows of *maisons des citoyens*. The gods, without a place for their life, disappear. What is at issue in the question of luxury is the dissolution of morals (*moeurs*), and ‘the dissolution of morals, a necessary consequence of luxury, leads in turn to the corruption of taste.’ When *la dissolution des moeurs* and *la corruption du gout* is complete, we have modern man. Luxury is the social by-product of the perfection of the sciences and arts, ‘and our souls have been corrupted in proportion to the advancement of our sciences and arts toward perfection.’ Rousseau, like Vico, saw deeply into the barbarism of the modern age.

“The ‘Enlightenment’ view that history is progress dominates the mentality of writers on technology who hold that technology is man’s instrument and can be made to do his bidding. This is really to have no view of history at all. It is simply to advocate the technical phenomenon. It simply asks the *question of improvement* and the *question of application* of technology itself. It acts as if history is the notion of the future. Instead history is the notion of the past, of memory. Those who look at history, like Vico, see that all that is begun in it has a beginning, a middle, and an end. Things in history, like human lives themselves, come to ends. The question is not the reform of technological society; it is the question whether human meaning is possible in its world. . . .

“In conclusion, I have tried to do two things. One is to explore the claim that our age is technological as a metaphysical claim. There is nothing wrong with such a broad claim. To claim that all things can be understood through a single factor is nothing other than the philosophical aim itself. It has been so since Thales’ concern with water. To see technique as the master key to the reality of our time stands in such an ancient tradition. Second, I have tried to show how technique as an historical phenomenon is grounded in the general phenomenology of consciousness. This offers us no solution to technique as a reductionistic life-force. Instead it shows that technique is grounded in one form of what is permanently there in the human spirit, namely, desire. My last remarks are intended to redirect the relationship of philosophy to technique from that of co-worker on its general problems, to philosophy as a force that can enter into what Vico calls that ‘deep solitude of spirit and will,’ that *somma solitudine d’animi e di voleri* that characterizes mental life in technological existence.”

Verene places Ellul within a philosophical tradition, something that is rarely done by his followers—whether those who simply accept his view that he is doing

sociology, or those more impressed by his religious views. What follows could well be considered a counter-metaphysics.

Frederick Ferre took over for me as editor of *Research in Philosophy and Technology* (JAI Press) when SPT moved to Kluwer as publisher of the Philosophy and Technology series. Ferre does not completely escape Ellul's influence, although he thinks Ellul is much too pessimistic. Ferre is more indebted to Alfred North Whitehead, and there is much more of an analytical approach than Verene would find acceptable. The following selection comes from Ferre's "Philosophy and Technology after Twenty Years," a symposium included in volume one (Fall 1995) of *Technè*, SPT's electronic journal (spt.org/journal): "If we take the twenty years in our topic quite literally, our common starting point is 1975, which happens to have been an important year for me in my relations with philosophy and technology. Since the hills and valleys we travel on our personal journeys greatly influence our ways of looking at the landscape we finally reach, I shall review the highlights of my path to the present over the last two decades. In this I hope to share one personal perspective on our common fields of interest. I do not claim that either my outlook or the journey that brought me here is typical, but that is of no importance; mine is at least one possible way of seeing, and if sharing it enlarges anyone's view, I am content. . .

"The larger audiences I hoped to reach with [my] approach to philosophy and technology during the more recent decade were targeted through a book and a journal. The book was *Philosophy of Technology*, written in Bavaria under Chernobyl's cloud in 1986, and published by Prentice-Hall in the Foundations of Philosophy series in 1988. The journal was the scholarly annual, *Research in Philosophy & Technology*, of which I was general editor, following Paul Durbin, from 1986, and continuing until 1994, when Carl Mitcham agreed to take the helm.

"What I tried to do in the book has had a mixed reaction. Some people—including some on this panel—did not much approve. An earlier program of this Society allowed the airing of views pro and con. Others found it valuable enough for their classes and for their personal thinking to warrant a new edition, published by the University of Georgia Press, in September 1995. Clearly my approach to philosophy of technology, with the beliefs and values that have guided me for the past two decades, is not everyone's cup of tea. Still, they are my beliefs and my values; and just as they have led my teaching over the years, so they have undergirded both my authorship of *Philosophy of Technology* and

my editorship of *Research in Philosophy & Technology*. I conclude these remarks, therefore, with a short credo.

1. I believe that philosophy of technology should unite philosophical thinking about technology with the main philosophical traditions of the West.
2. I believe that technology and the technological culture we inhabit can be fruitfully illuminated by applying categories from epistemology, metaphysics, ethics, aesthetics, philosophy of religion, philosophy of science, social philosophy, and the like.
3. I believe philosophy of technology should be hospitable to a generous pluralism in its understanding of what counts as legitimate philosophical approaches.
4. I believe a comprehensive, critical pluralism of philosophical approaches to technology and the technological society can make a positive difference in improved self-understanding and social policy.”

Ferre's view is directly dependent on the thought of Alfred North Whitehead, and this selection from Ferre's *Philosophy of Technology* (1988, 1995) shows how he would incorporate those ideas into his interpretation of the philosophy of technology: “If we try to imagine, in an appropriately general way, what an organismic metaphysical and institutional framework would mean for postmodern technologies, the first thing we notice is that such technologies will aim at *optimization* rather than *maximization*. Healthy organisms and populations need homeostatic restraints. Bigger is not always better for an organism, and more is not always a healthy goal. These principles will make a vast difference to the character of artifacts and the system of economics in such a post-modern world. Systems of production will not automatically aim for maximum efficiency or profit. Stability, durability, sustainability, and satisfaction will be dominant considerations.

“Second, organismic thinking will lead to more technologies of *cultivation* and fewer of *manipulation*. Instead of adopting an externalist attitude toward nature, postmodern institutions like ecological agriculture will attend to internal biological rhythms and ecosystem restraints in food production. Pouring on petrochemicals will give way to methods of nurture. Regenerative farming, with

full attention to the needs of the land and its biota, would be the natural alternative to the energy-intensive, resource-depleting, variety-threatening, pollution-producing agribusiness of the modern era.

“Third, postmodern thinking of the sort we are considering will embody technologies of *differentiation* rather than *centralization*. Healthy organisms are mutually differentiated, internally related systems of information and energy. The parts participate in maintaining the whole and the whole benefits the parts. The personal computer, expressing the individuality of its user, but linked with others in larger and larger networks of interactive communicators, would be a good symbol for postmodern technology. So would be a cooperative interchange of electrical power among large numbers of small solar and wind generators, replacing the centralized power plant and the monopolizing electrical grid.

“In the end, of course, our speculations may only be so much utopian romance. The modern world may collapse with no such benign successor, or it may be surprisingly tough and may manage to survive into the indefinite future. Organismic models may, despite efforts, fail to articulate sufficiently coherent and adequate theories of reality as to warrant respect. Even ecology itself may eventually become a domain for reducers and analyzers, settling for parts rather than wholes and thus gaining—along with quicker experimental results and increased grant money—'modern' respectability in the eyes of the rest of the scientific establishment.

“This is not a book of prophecy, just an essay in the philosophy of technology. But the best way of seeing one's own country, they say, is to return to it from abroad. Then features that one might never have noticed—especially the pervasive features—come clear with the power of culture shock. Modern technology is where we live, in a technosphere that is immensely hard to avoid. This book has tried to provide a trip into the foreign lands of conflicting values and many unfamiliar tongues, so that now, at the end, a return home to modern technological civilization will permit all who were on this voyage to see their starting place—its blemishes and its delights—as never before.”

Quadrant? Obviously these two thinkers represent metaphysical thinking, unalloyed. But what we see here is two metaphysicians, each claiming that narrow technicist thinking is inadequate for our historical situation today; but also that there is a disagreement about what is called for. Verene, with Ellul, seems totally discouraged about doing anything positive: all we can do is lament

our sad technicist choices in the past and play the fool in rejecting technicist thinking about a “way out.” Ferre, on the other hand, thinks that if we adopt a Whiteheadian process metaphysics, perhaps combined with environmentalist thinking, we can *think* our way out of our dilemmas. I have not done so in my selections here, but it is useful also to remind ourselves of Mitcham in Chapter 1; his thought is metaphysical too, but he has lately even come to the point of speaking of himself (I think inappropriately) as pragmatic. We also need to look ahead to Chapter 18, on Borgmann, to see how a neo-Heideggerian addresses some of the same issues; for example, Borgmann is explicit that he finds his training in analytical philosophy to be helpful, where Ellul would disdain it. And Borgmann is, on balance, as optimistic as Mitcham about doing something to change our technological culture. Granting these differences, all four of our metaphysicians are opposed, not only to scientific technicism, but to Marxism and to Dewey's instrumentalism (though Ferre does occasionally refer to Dewey positively).

In my view, this sets the stage for the transition to the next phase of SPT's history.

Chapter 17

The Last Hoorah for Philosophy and Technology: Paul Durbin

This is a transitional chapter, in much the same way that I was a transitional president of SPT (1997–1999). The society was in danger of falling apart after a poor showing at the 1997 conference in Dusseldorf, Germany. We had bad luck there; poor planning led to a head-to-head conflict with a major German national philosophy meeting, and relatively few German philosophers of technology showed up, on their home turf! Only six months before, Hans Lenk had hosted a major philosophy of technology conference in Karlsruhe, where the Germans had shown up. (See Chapter 13 above.) So the nominating committee, remembering that I had been instrumental in getting SPT started—both in Delaware in 1975 and putting together (along with Fritz Rapp) the first international conference in 1981—and reflecting that I had never been president, asked me to run. I won, but it was clear to me that the handwriting was on the wall. We had to have a new generation take over. As we will see in Part 3, they did, but it was a new generation with new ideas about what SPT should become.

A little background on myself—perhaps unfairly giving more detail than I have managed to for others: I had begun my apprenticeship at the Aquinas Institute of Philosophy, outside Chicago, where the emphasis was on Thomistic philosophy of science. Already something of a rebel, I did my thesis—which ended up as a book, *Logic and Scientific Inquiry* (1968)—on a topic that challenged both Thomistic philosophy of science and the positivist views of Rudolf Carnap, with his so-called inductive logic. My focus was heuristic plausible reasoning (see Koen in Chapter 15 above, as well as C.S. Peirce's abduction or retrodution).

The Aquinas Institute allowed me to do most of my course work at the University of Chicago, where I encountered the thought of G.H. Mead, with his emphasis on the social dimensions of the discovery process in science. (I had read a good bit of Dewey before, but didn't then make the connection.) Reading Mead led me to abandon Thomism and take up the banner of American Pragmatism. And the whole rethinking process that this involved led me to focus more and more on real-world science; this in turn led to technology, scarcely distinct from science in the pragmatic view. This also happened to be a time in the USA (and worldwide) when technology was being widely criticized for its negative influences on contemporary society, not least with respect to the Vietnam War.

Everything then fell in line for me to take one more step, to work toward the institutionalization of philosophical discussions of technology, and the beginnings of the Society for Philosophy and Technology—the focus of this book.

I feel that my most important contributions (if any) to scholarship in the field are to be found in the volume I edited for the National Science Foundation and the National Endowment for the Humanities, *A Guide to the Culture of Science, Technology, and Medicine* (1980, 1984); as well as in my edited volume, *Critical Perspectives on Engineering and Science in R&D Settings* (1991); and in my *Social Responsibility in Science, Technology, and Medicine* (1992).

Other essays are collected on my website:

www.udel.edu/Philosophy/pdurbin/durbin.html.

The essays can be found under the heading, “Activist Philosophy of Technology: Essays 1989–1999.” The crucial essay there is “In Praise of a Social Work Philosophy of Technology,” which is adapted from the lead essay I did for a volume on philosophy of technology and activism in *Research in Philosophy and Technology* (1999), edited by Carl Mitcham.

If I have any disagreements with fellow pragmatists, it has to do with the relative importance of activism as *part of the professional work of a philosopher*. (See a mild version of this disagreement in Chapter 14 above, on Hickman.)

Finally, as long-time editor for SPT, I also pioneered in putting its publications online, in the electronic journal, *Techné*. Ours was one of the first professional societies to go that route. (The journal is now in the capable hands of Davis Baird; online, see www.spt.org/journal.)

But this chapter is not about my work as such. It's about how the first 25 years of SPT had a great deal of diversity. This did reflect my vision, but I thought it also reflected the vision of many members of the society—a vision of philosophy *and* technology as a kind of anti-discipline in academic terms. In Part 3, we will see how it has since come a long way toward becoming a subfield in academic philosophy—philosophy *of* technology.

The conflict over this issue has been around in SPT for a long time; see Chapter 9 above, on Pitt's criticisms of SPT. But around the turn of the twenty-first century

it took on a new urgency. It isn't that the new leaders are no longer interested in real-world issues. (See the long quote about a new beginning that opens the next chapter.) But they feel that a strong subdiscipline within academia can spread its message far and wide, influencing critics of technological culture in many different ways.

So here in Part 2 we have seen how Joe Pitt tried to start a philosophy of technology academic discipline. Nonetheless, from Ihde to Winner to Feenberg to Goldman to Verene and Ferre and many of our international collaborators—among others—the old non-analytic ways persisted. And Pitt continued to be disappointed. It wasn't that these philosophers are not academically respectable. Many of them hold prestigious positions in well-known American universities; a few have even been chairpersons of their departments, where presumably they were pressured to "maintain standards" in hiring and publications. But none of them saw—even today none of them sees—philosophy *and* technology as a narrow professional academic subspecialty. But, neither separately nor in concert, could they—we—hold the society together without taking a new turn. In Part 3 we can judge the extent to which the new beginning(s) is (are) successful—especially when judged against a major challenge to science-like hegemony, in academia and in the culture more broadly, that has been mounted (more or less in parallel with the rise of SPT) by so-called social constructionists, often in the name of “postmodernism.” (See Chapter 25.)

So what I see as the *controversies* associated with my presidency and with SPT at the beginning of the twenty-first century would simply sum up the controversies up to this point in this book.

Pitt, and Bunge before him (and European followers like Quintanilla), wanted philosophy *of* technology to parallel academic philosophy of science. Shrader-Frechette can be seen as sympathetic to the philosophy of science/philosophy of technology view. Margolis elevated this kind of view to its highest point, turning technology into the new clue to an adequate pragmatic version of analytical epistemology.

Mitcham and Verene (following Ellul) and Ferre weren't worried much about the is/of issue, but they argued, against all of the above, that the primary philosophical emphasis should focus on a metaphysical and historical *locating* of technology (and engineering) within a broader critical framework that would “take the measure of technological society” as a whole. Ihde, influenced by

Heidegger and other phenomenologists, also resisted the philosophy of science orientation, but in the name of a kind of analysis that he argued is superior to analytical philosophy Anglo-American style.

Marxist radicals, here represented by Wartofsky and neo-Marxist Feenberg, also argued for a radical critique, including a critique of academic analytical philosophy, but along very different—and opposed—lines. Winner, equally radical but not specifically Marxist, echoed the call for a radical critique.

This triangulated set of opponents was, in turn, opposed by philosophers I would label as “progressives” in various forms: Michalos argued in favor of social responsibility on the part of all technical professionals, including engineers as well as scientists; Byrne reflected labor union concerns but opposed much of the recent labor movement; and Hickman injected a Deweyan Pragmatist view into the mix.

Philosophers of technology in Germany and Spain reflected to an uncanny degree a parallel set of viewpoints. The minority of SPT philosophers who discussed philosophy of engineering as one, and maybe the most important, part of philosophy of technology fell into the same pattern.

Only Agassi joined with me in favoring activism over academicism, Agassi reflecting his Popperianism and myself reflecting what I interpret as Deweyan anti-academicism.

So there we were, poised for the new millenium with a laundry list of old controversies—and no satisfaction for philosophers like Pitt who wanted to see a true academic discipline emerge. I turn next to the “new generation” of SPT folk, who agree with the need for a new academic subdiscipline, but who turn to one of Pitt's foes, Albert Borgmann.

Part 3. Attempts to Establish an Academic Discipline

Chapter 18

Albert Borgmann and a Philosophy of Technology?

I begin this chapter with Higgs, Light, and Strong and their argument in *Technology and the Good Life?* (2000) in favor of the need for a new discipline:

Broadening the scope of Philosophy of Technology

“The set of questions a philosophy of technology should address in order to fulfill its promise are often at the intersection of it and other fields. In our opinion, philosophy of technology at its best should appeal to a very wide audience partly because it illuminates our shared, ordinary everyday life, such as with things and devices, and partly because the issues it probes cut across the full range of disciplines. Many of these issues are already vital matters of concern for these disciplines, such as ethics, social and political philosophy, aesthetics, art history, architecture, music, anthropology, religion, history, history of science and technology, cultural studies, sociology, political science, economics, linguistics, literary criticism, visual culture, and the hard sciences. For example, one of the interdisciplinary successes that philosophy of technology has had is with environmental ethics. Issues that join both fields are addressed in journals regularly, and numerous books have appeared. However, this kind of success should be occurring with other fields as well. What does philosophy of technology have to offer other disciplines? In the view of some of our contributors, traditional philosophical approaches may not be capable of questioning and challenging technology in a sufficiently radical manner. Nevertheless, we can show the kinds of questions a robust philosophy of technology can raise and address. . . .”

And on Borgmann as a focus:

Why Borgmann's Philosophy Of Technology?

“Albert Borgmann’s work is a good candidate to begin such a rethinking of philosophy of technology so that it is better prepared to answer the challenges laid before it. . . . His work falls in the tradition of the kind of substantive philosophy of technology initiated by Heidegger, Ellul, and Mumford. As a philosophy of technology it is far more comprehensive and ambitious than earlier philosophy of technology, setting its sights on larger issues of social criticism

while simultaneously meeting scholarly demands already established in the field by previous works. Specifically, there are four chief reasons why Borgmann's work deserves a central place in advancing the philosophical study of technology.

“The first reason is that Borgmann builds his theory from a descriptive phenomenological account. He takes up his field of inquiry with a description of the shift from 'things' to 'devices,' from fireplaces to central heating, from candles to sophisticated lighting systems, from wooden tables to Formica, from traditional foods and drinks to Lite versions, from shoelaces to Velcro, from craftwork to automation, from traditional performances and physical activities to home entertainment centers. For Borgmann these substitutions constitute a repeated pattern that can be described, a pattern that Borgmann claims also has repeated consequences (which can be similarly described) for our relationships to our physical surroundings, our relationships to ourselves and others. Discussing whether Borgmann's characterizations are accurate is a fruitful beginning for a discussion of how technology effects our assessment of the good life. . .

“Second are the diagnostic aspects of Borgmann's philosophy. Borgmann locates the problem of technology in relationships. His critique considers the adverse effects technology has on our relationships to our physical surroundings, and our human relationships in their political, social, and aesthetic dimensions. In this sense, the focus of Borgmann's work is not simply technology itself as an object of study, but more thoroughly human relationships and our relationships to our surroundings as they are inevitably affected by technology.

“Third, considered prescriptively and on the basis of his diagnosis, Borgmann argues that these relationships can be reconfigured into a socially reconstructive program. In fact, Borgmann's theory, along with others such as those of Andrew Feenberg and Langdon Winner, is one of the few attempts at developing a comprehensive series of reform proposals for technology. It also addresses questions of nature and environment, rather than restricting reform of technology to built space and artifacts, thus exceeding the traditional purview of the field. Focusing on Borgmann's work in conversation with and divergence from these other reform proposals will help to move the field forward.

“From another standpoint, Borgmann calls for a philosophical reassessment of social life that challenges received notions of what constitutes the good life. While many moral theorists of late have followed the charge of the communitarians to expand moral discourse beyond a thin assessment of the good,

Borgmann adds a call for attention to the material and artifactual foundations of a thicker reconception of the good.

“Borgmann’s is not an abstract theoretical contribution to an assessment of the good life but a grounding and practical means to create a context and a language whereby our material world can be normatively assessed as part of a more robust moral ontology. Borgmann puts it this way after briefly acknowledging a debt to Heidegger in formulating the wider contours of these views: ‘Heidegger says, broadly paraphrased, that the orienting power of simple things will come to the fore only after the rule of technology is raised from its anonymity, is disclosed as the orthodoxy that heretofore has been taken for granted and allowed to remain invisible. As long as we overlook the tightly patterned character of technology and believe that we live in a world of endlessly open and rich opportunities, as long as we ignore the definite ways in which we, acting technologically, have worked out the promise of technology and remain vaguely enthralled by that promise, so long simple things and practices will seem burdensome, confining, and drab. But if we recognize the central vacuity of advanced technology, that emptiness can become the opening for focal things. It works both ways, of course. When we see a focal concern of ours threatened by technology, our sight for the liabilities of mature technology is sharpened’ (Borgmann 1984, 199).

“And finally, fourth, Borgmann’s work is important because of the depth and breadth of his diagnosis and his prescriptions. Borgmann’s reform program advocates a set of issues that any political system must address if it is to be effective in a social sphere dominated by technology. The work is therefore potentially of interest to a great variety of political positions and not simply an appeal to the most effective program for the reform of technology by a particular ideological persuasion.”

It should be noted that, in his reply to his critics at the end of the volume, Borgmann is skeptical about the editors' claims about using his work as a focus of a new discipline: “As regards our position within academic philosophy, there is not much reason to lament insignificance within an enterprise that is itself insignificant.”

But given the optimistic assessment of the disciplinary potential in Borgmann's thought, especially in *Technology and the Character of Contemporary Life* (1984), I think we need here a review of his thinking as a whole. I attempted that in a review that formed the basis for a chapter in my *Social Responsibility in*

Science, Technology, and Medicine (1992). Here is that assessment, which I put under the heading of Borgmann as a “modest neo-Heideggerian.”

In *Technology and the Character of Contemporary Life*, Borgmann is poetic, as I noted in my review and book. I began both with these quotes from Borgmann’s book:

“The great meal . . . where the guests are thoughtfully invited. the table has been carefully set, where the food is the culmination of tradition, patience and skill and the presence of the earth’s most delectable textures and tastes, where there is an invocation of divinity at the beginning and memorable conversation throughout . . .

“The great run, where one exults in the strength of one’s body, in the ease and the length of the stride, where nature speaks powerfully in the hills, the wind, the heat, where one takes endurance to the breaking point, and where one is finally engulfed by the good will of the spectators and the fellow runners . . .

“Like a temple or a holy precinct, the wilderness is encircled and marked off from the ordinary realm of technology. To enter it, we must cross the threshold at the trailhead where we leave the motorized conveniences of our normal lives behind. Once we have entered the wilderness, we take in and measure its space step-by-step. A mountain is not just a pretty backdrop for our eyes or an obstacle to be skirted or overwhelmed by the highway; it is the majestic rise and elevation of the land to which we pay tribute in the exertion of our legs and lungs and in which we share when our gaze can take in the expanse of the land and when we feel the cooler winds blow about the peaks.”

Much of Borgmann’s focus is on these “focal things and practices,” which partly explains the poetry of his approach. But he is also intent on pointing out that amidst the clamor of our technological world, there are poetic authors who have highlighted focal things. The quotes above, about the culture of the table and running, are largely borrowed.

To discover more clearly the currents and features of this, the other and more concealed, American mainstream, I take as witnesses two books where enthusiasm suffuses instruction vigorously, Robert Farrar Capon’s *The Supper of the Lamb* and George Sheehan’s *Running and Being*. Both are centered on focal events, the great run and the great meal.

Borgmann even claims that he could not have undertaken his project—his phenomenological or “deictic” characterization of the truly important features that can redeem our troubled technological world—if there were not other souls with similar thoughts (and writings) to spur him on and give hope to the project.

But Borgmann is also a philosopher, and his book deserves to be analyzed—even argued with—as well as savored. One of the beauties of the book is that the philosophical argument is presented with as much simplicity and grace as the descriptions of focal things, events, and concerns.

Technology and the Character of Contemporary Life is a tightly structured philosophical treatise. Borgmann begins the book with a summary of the theories he opposes: “These summaries distinguish a multitude of approaches, but all distinctions fit well one of three essential types: the substantive, the instrumentalist, and the pluralist views of technology.” However, Borgmann is modest about the originality of his own theory: “Clearly, the theory of technology that we seek should avoid the liabilities and embody the virtues of the dominant views. It should emulate the boldness and incisiveness of the substantive version without leaving the character of technology obscure. It should reflect our common intuitions and exhibit the lucidity of the instrumentalist theory while overcoming the latter’s superficiality. And it should take account of the manifold empirical evidence that impresses the pluralist investigations and yet be able to uncover an underlying and orienting order in all that diversity.”

The theory that Borgmann proposes to meet these exacting demands is his own version of neo-Heideggerianism. He claims to discern a pattern of taking up with reality—the “device paradigm”—that characterizes life in the modern world. (I would paraphrase what Borgmann means by “device paradigm” roughly as the claim that humans, in the modern world, have tended more and more to look for gadgets or devices or systems that will make life easier—at the risk of emptying all “focal” things of their traditional significance.)

Before summarizing the various theories, Borgmann had characterized his mode of philosophizing as derivative from Aristotle as well as Heidegger (for both of whom, despite their differences, he says “there is no sharp dividing line between social science, or perhaps social studies, and philosophy”), yet it is also an approach that takes seriously “the metatheoretical turn” of analytical philosophy.

In the end, Borgmann says, he will show, by using it at the beginning, that an analytical approach to philosophy of technology must be an “inconclusive enterprise.” Even so, “the present study has to draw on many of the concepts, methods, and insights of mainstream philosophy to obtain a reflective and radical view.”

By the end of the book, all this is clarified—perhaps most succinctly in a chapter devoted to “political affirmation” of the possibility of reforming our technological way of dealing with reality: “These suggestions, drawn from the analysis of technology and the experience of engagement [with focal things], are mere hints, of course. But they shed new light, I believe, on a problem that has become puzzling and untractable within the liberal democratic tradition. They are essentially consonant, however, with the proposals to achieve greater social justice as they have been formulated by the best proponents of that tradition, for example, [John] Rawls, [Lester] Thurow, [and John Kenneth] Galbraith.”

That is, Borgmann is “radicalizing” the analytical theory of justice of Rawls and the post-Keynesian economics of Galbraith and Thurow by bringing out the “focal” concerns of a minority within technological culture—including himself, but also such authors as Capon and Sheehan, mentioned earlier. Borgmann is opposed to Marxist radicalism (a version, in his opinion, of instrumentalism, no matter that Marxists claim to oppose it), as well as the radicalism of the right (where, presumably, he would place Ellul—or, at least, Ellulians who would wish to return to a pretechnological golden age).

It is in part three that Borgmann discusses the possibilities of reform. Its main vehicle, Borgmann claims, is public “deictic discourse”—the reopening of “the question of the good life,” as opposed to continued preoccupation with the consumption of device-procured commodities. Borgmann ends the book, in a chapter on “recovery of the promise of technology,” with a nuanced summary of the basis of his hope: “The focal things and practices that we have considered . . . are not pretechnological, i.e., mere remnants of an earlier culture. Nor are they antitechnological, i.e., practices that defy or reject technology. Rather they unfold their significance in an affirmative and intelligent acceptance of technology. We may call them metatechnological things and practices. As such they provide an enduring counterposition to technology.”

How hopeful is Borgmann? I believe it is safe to say that, though he ends the book with an expression of hope that focal concerns will prevail, his worries

were serious enough to motivate him to write the book—perhaps as a warning, and at least as a rallying cry for the “concealed” minority who already care more about focal things than about the promise of technology to provide ever more commodities.

I returned to some of the same issues in my contribution to *Technology and the Good Life?* Here is the way I ended my essay: “What should we conclude from [my] retrospective and prospective? Abstractly, it would seem there are four possibilities. Some people will scoff. I had unrealistic hopes in the first place, they will say. Philosophy's aims should be much more limited—limited, for instance, to analyzing issues, leaving policy changes to others (to the real wielders of power whose efforts might be enlightened by the right kind of philosophical speculations); or limited to critiquing our culture (following Hegel) after its outlines clearly appear and it fades into history, imperfect like all other mere human adventures.

“Others will go to the opposite extreme. I set my sights too low, they will say. We must still hold out for a total revolution. The injustices of our age, as well as its ever-increasing depredations of planet Earth, demand this. Still others are likely merely to lament the fate to which technological anticuture has doomed us; we must resign ourselves to the not-dishonorable role of being lonely prophetic voices crying out against our fate.

“Then there is my own conclusion, a hope—following John Dewey . . . —that we will actually do something about the technosocial evils that motivated us in the first place. That we will abandon any privileged place for philosophy, joining instead with those activists who are doing something about today's problems. . . .

“Albert Borgmann might be read as endorsing any one of these options. . . . But I hope he would, with me, endorse the fourth option. We might, no matter how weak our academic base, still manage to succeed in conquering particular technosocial evils one at a time” (pp. 47–48).

And here is Borgmann's reply at the end of *Technology and the Good Life?* Up to a point, he seems to agree with me and Larry Hickman and Andrew Light: “What is the prospect of coming closer to a commonwealth of the good life? . . . As for concrete steps that philosophers should take, I join the pragmatism of Durbin, Hickman, and Light. I take from Durbin the commitment to social justice and social activism, from Hickman the diversity of approaches, and from

Light the call for a measure of cooperation” (p. 367).

But Borgmann agrees only up to a point: “Whatever else the philosophy of technology may be, it *is* philosophy and should recognize the standards of its guild and tradition. . . . Philosophies that we as professional thinkers admire and emulate have never been specialized. The great moral doctrines, e.g., have invariably been of a piece with an ontology or metaphysics, a psychology or epistemology, and a cosmology or theology . . . [and] not much light can be shed on any one part to the exclusion or in ignorance of all others.

“One honorable and helpful way of meeting this requirement is to draw on a great thinker or tradition, on pragmatism, phenomenology, the Frankfurt School, analytic philosophy, on Kant or Heidegger.”

At this point, however, Borgmann praises the work of a philosopher, David Strong, who has drawn on Borgmann's own work: “The immersion in technology may give a philosopher access to a strand of reality that, when fully traced, reveals a new vision of the fabric of reality” (p. 368). And the subtitle of Strong's book is enlightening: *Crazy Mountains: Learning from Wilderness to Weigh Technology* (1995). So in the end we are back to Mitcham's call (Chapter 1) for philosophy to “take the measure of technological society as a whole.”

Controversies? Right out of the box (if we remember other metaphysicians in Chapter 16 above), it is clear that Borgmann is more optimistic than Verene—speaking for Ellul (and Hegel and Vico). Borgmann's “substantive” predecessors, Heidegger as well as Ellul and Mumford, were all more pessimistic than Borgmann himself is. Since Mitcham (see Chapter 1) often seems to ally himself with Borgmann without reservation, there is no controversy there. All the metaphysicians agree that mere technical thinking is inadequate for the social criticism our culture needs—and they are equally strongly opposed to Marxist thought as the source of a valid critique, though Borgmann blesses the founding of one's thought on the Frankfurt School, as Feenberg does. The editors of *Good Life?* suggest that Borgmann's thought has much in common with Winner, but that seems unlikely unless Borgmann becomes more explicitly political. In my contribution to *Good Life?* I suggest that he could be more pragmatic, but as I read his reply he accepts that suggestion only up to a point. And Hickman has repeatedly attacked Borgmann as *idealistic*. Science opponents would include Pitt (Chapter 9), though his ire is directed at Winner and Heidegger rather than Borgmann.

A note: at the beginning of this chapter, Higgs et al not only said their hoped-for new academic discipline should build on Borgmann; it should also branch out to make connections to different areas of contemporary life, to deal with real-world and not merely academic issues. In the next chapter, I turn to the work of colleagues in the Netherlands, who are as resolutely academic as Higgs et al would hope but who also defend a wide diversity of approaches and cover a broad assortment of issues.

Chapter 19

Dutch Schools

Pieter Tijmes of Twente University, in a survey for *Techné* 3:1 (Fall 1997), provides the following summary of Dutch philosophy of technology: “In the past, Holland brought forth one great philosopher, Benedictus de Spinoza (1632–1677). At this moment there are many philosophers of technology, judging from the significant (quantitative) contribution to the Duesseldorf conference of the Society for Philosophy and Technology in the Fall of 1997. To be honest, today’s Dutch philosophers do not have the stature of Spinoza. He had philosophy as an avocation; he earned his living as a technician by grinding and polishing lenses. His Dutch descendants make philosophy their business today even a concern of the Dutch government. It is the difference between avocation and occupation. The Duesseldorf attendance was predominantly connected to the philosophy departments at the Dutch *technological* universities. A common characteristic of these departments is their claim of a mission to do research in philosophy of technology. In my endeavor to characterize their research for American ears I became aware of the particularities of the general educational system in Holland, and in addition to this of the specific local situation of the respective faculties: how big is the staff, who contributes to the philosophical research program, does the faculty offer a major in philosophy, and other issues of that kind. I shall pass over these relevant details and differences, but I shall mention the e-mail address of the program leaders who would be willing to inform readers who want more detail.

“At the University of Delft, philosophy of technology is close to what Carl Mitcham would call engineering philosophy. With the flourish of trumpets they insist on designing as the quintessence of engineering activity. Design and the development of technological products are considered their *pièce de résistance*. They like to follow Friedrich Rapp (1974) saying that "a methodological and even an epistemological analysis of the theoretical structure and the specific methods of procedure characteristic of modern technology" is to be emphasized. Philosophical reflection on designing activities is, in their view, also of utmost importance for discussions of the consequences of technology. Ethics appears within the context of the design and development of products. In other words, engineering praxis is central to their research. This philosophy of design means a critical evaluation of conditions and assumptions with regard to determinism or to social constructivist interpretations of technology. The prominence attached to

the phase of design is a specialty at Delft. Design is cherished as the key to contributing to the real-world problems of controlling and steering technology. Staff: 4 members; e-mail address: p.a.kroes@wtm.tudelft.nl.

“Let us next look at Eindhoven, where the engineering activity of design is also written in capitals. Their philosophical interest, however, is not to be confused with that of their colleagues at Delft. In Eindhoven, "philosophy and methodology of the technological sciences" are centered on the methodological analysis of the processes that create products. In this methodological analysis, they deal with the interplay of scientific, technical, economic, political, legal, and aesthetic factors in the engineering process of decision-making (S, T, E, P, L, and A factors). This design methodology—interdisciplinary in character—is in a developing stage; concrete projects with respect to specific products are their inspiring examples of the way ahead: e.g., refrigeration apparatus as based on the Stirling cycle, packaging machines, etc. Quality Function Deployment is a specific topic of interest. Research on this topic should be a means for finding concordances between technical realizations and social desirabilities. Again, concrete case studies are done as precursors of a successful and helpful theory on choices within the production process. Staff: 3 members; e-mail address: m.j.d.vries@tm.tue.nl.

“An agricultural university is the stage for philosophical reflection in Wageningen. There, agricultural and environmental sciences are the point of departure. Four themes are on the agenda. At Wageningen, the sciences contribute to practices as agricultural ways of living, with references to types of farmers, specific landscapes, and consumer behavior. Given the fact that technologists are in a sense undercover revolutionaries, the Wageningen people want to open the black box of science and technology. Philosophical analysis of the concept of sustainability is their second theme of attention. In their view, sustainability is a matter of the remoralizing of agricultural technology with all its ambivalent problems. A third philosophical topic concerns technological knowledge. In modern society knowledge is not limited to the traditional labs of universities and big corporations like Philips and Shell, but is also generated outside. And, fourth, the dimension of *political participation* in the complex networks controlling and steering technology is the crown of this program. It is a characteristic feature of the Wageningen philosophy that, starting their reflection from a broader analysis of society, they use it as a departure point for the analysis of the interrelation of technological and ethical aspects in practices and institutions. Staff: 11 members; e-mail address: michiel.korthals@alg.tf.wau.nl.

“The University of Twente is the youngest university. All sorts of philosophical disciplines are collected in a department of systematic philosophy that is doing research under the heading, Philosophy of Technological Culture. The program focuses on a ‘current affairs’ analysis aimed at clarifying our technological culture, and deals with problems and dilemmas—on both individual and collective levels—that result from recently introduced technologies. These questions range from social relations and ways of life, human possibilities and desires, to experiences of body and nature. In a permanent discussion with and a cautious opposition to the classical philosophy of technology, they want to give more context to their findings. Concepts such as the ‘megamachine’ (Mumford), *technotope* (Ellul), *Gestell* (Heidegger) are only used heuristically and not as *a priori* concepts. In this sense the Twente philosophers like to speak about an empirical turn within the philosophy of technology. From a philosophical point of view one can distinguish two main lines: hermeneutics of the technical experience, and social philosophy of technology. Under the hermeneutical heading, attention is paid to the mediating role of artifacts and to metaphors and representations generated by technology. Under the social philosophy heading the relationships between technology and politics are investigated. Scarcity as a constitutive feature of technological culture plays a privileged role. Recently there has been a convergence of interest on medical technology, sustainable technology, and information technology. Staff: 9 members; e-mail address: h.j.achterhuis@wmw.utwente.nl.”

Up to this point, Tijmes had not related his survey to North American philosophy of technology. So I will intersperse here another contribution from Tijmes's University of Twente. Hans Achterhuis's *American Philosophy of Technology: The Empirical Turn* details the work of his and Tijmes's colleagues at Twente (including the two themselves). The material here is taken from a review (for *Metaphilosophy*, July 2004) that I did of that book.

Achterhuis begins his book—a collection of profiles of American philosophers by Dutch colleagues in the philosophy department of Twente University in the Netherlands—with an introduction in which he attempts to justify his subtitle, “The Empirical Turn.” About that introduction, series editor Don Ihde (one of the philosophers profiled in the book) says this:

“The reader should take careful note of the introduction, which lays out the differences . . . between the high-altitude and ‘transcendental’ perspectives of our

acknowledged ‘god-fathers’ [for example, Martin Heidegger, Hans Jonas, and Jacques Ellul] and the lower-altitude, more particular and pragmatic looks at technologies of the Americans included here” (p. viii).

The Americans, discussed in alphabetical order, are Albert Borgmann of the University of Montana, Hubert Dreyfus of the University of California at Berkeley, Andrew Feenberg of San Diego State University, Donna Haraway of the History of Consciousness Program at the University of California at Santa Cruz, Don Ihde of the State University of New York at Stony Brook (where the book’s translator, Robert P. Crease, also teaches), and Langdon Winner of the Department of Science and Technology Studies at Rennselaer Polytechnic Institute. (The Dutch authors make much of the personal careers and affiliations of the American philosophers.)

Only a snippet from each Dutch author’s presentation and critique of one of the six Americans can be presented here, but I will try to give the flavor of each review.

Pieter Tijmes provides the discussion of the thought of Albert Borgmann, and here is his introduction: “I shall discuss how Borgmann diagnoses the ills of contemporary life, what his concept of the device paradigm of technology is, and what its implications are . . . in showing that technology is indeed a revolutionary factor in society” [today] (p. 11).

Tijmes thinks that Borgmann’s device paradigm, as a tool for diagnosing the ills (and potential promise) of our contemporary technologized society, “has a great advantage over Heidegger’s own method” (p. 14), which Tijmes views as too deterministic. Borgmann’s characterization, on the other hand (Tijmes says) “can help us understand how attractive technology has become in our society, and why” (p. 14). However, in the end, Tijmes is also critical: “Borgmann, I think, . . . speaks far too uncritically about natural [as opposed to cultural and technological] information, and is far too accepting of religious declarations about reality. . . [even when] borrowed from different religions” (p. 35).

In general, Tijmes seems fair to Borgmann, even when (in the end) he is critical; and he is extremely generous in showing how Borgmann’s analytical/phenomenological approach is an advance over Heidegger’s “ontological” characterization of Technology (capital T).

Even though he participated in the conference that gave rise to a Borgmann festschrift—Higgs, Light, and Strong, eds., *Technology and the Good Life?* (2000)—Tijmes makes no reference to that book or the editors' idea of making it the basis of a new academic specialty.

Philip Brey (who works in many fields associated with computers and information systems) provides the chapter on Hubert Dreyfus as the American critic of the set of computer-related technologies that have come collectively to be called Artificial Intelligence (AI). The basic issue here with respect to Dreyfus has to do with his relationship to philosophy of technology. There is no question that his work touches on technology—of all the technologies that have led people to call ours a “technological culture,” computer technologies in the broadest sense certainly are in the forefront—and Dreyfus is extremely well known, not only in American philosophical circles but worldwide. But many critics of philosophy of technology over the past twenty-five years have complained that it is overly abstract, concerned only with the vague notion of Technology with a capital T; which means that these critics often do not consider the philosophy of computers and AI to be part of the field. The criticism seems to me unfair, at least for the Society for Philosophy and Technology; every one of our conferences beginning with the second (1983) has had programs and papers on computers, and frequently on AI in particular. So since the society has always defined its scope as including any philosophical approach to any technological issue, we have always thought of Dreyfus, along with all others concerned with philosophy and computers, as part of the field.

That said, Dreyfus does not need as much of an introduction, for an American audience, as other philosophers of technology. Brey sums up Dreyfus's well-known themes this way: “Ever since his earliest work on the subject, Dreyfus has progressively honed and extended his philosophical critique of AI by broadening his use of the work of phenomenologists such as Heidegger, Merleau-Ponty, and Husserl, and by making use of the insights of other philosophers, including Michel Foucault and Soren Kierkegaard. One of Dreyfus's principal concerns, which appears with regularity throughout his writings, is to articulate the various ways in which human beings experience the world” (p. 39).

Brey's next point (equally well known) makes the link to AI: “Another regularly recurring concern is his critique of Cartesian rationalism. . . . Rationalism, as it crops up in AI and elsewhere, knows nothing of these original structures of reality and fails to do justice to the role of intuitive knowledge and skills” (pp.

39–40).

Brey later on turns this into an account of Dreyfus’s “most important criticism” of AI: “Dreyfus’s most important criticism . . . is directed against the epistemological assumption, underlying all forms of classical AI, that intelligent behavior can be reproduced by formalizing human knowledge (i.e., codifying it in rules). The application of formalized, rule-given knowledge, however, appears to run up against an important problem. . . . If one sought to make rules sensitive to context, all possible contexts would have to be formulated, or separate rules of application would have to be formulated. Both solutions appear to be without an end” (pp. 45–46).

And here is Brey’s summary of Dreyfus’s conclusion: “Human beings, Dreyfus observes, are able to interpret elements effortlessly from the context. Thus if they encounter a misspelled word in a text, they automatically fill in the right meaning, while computers grind to a halt. Human beings, Dreyfus concludes, have ‘common sense’ . . . [which] computers lack” (p. 46).

Probably the most interesting aspect of Brey’s summary of Dreyfus’s contributions to philosophy of technology is his conclusion: “Much of the inspiration for the development of [recent] work [in AI] can be traced back to the work of Dreyfus himself. Dreyfus was the one who introduced the ideas of thinkers like Heidegger and Merleau-Ponty into the AI world. The work of such AI researchers as [Terry] Winograd and [Fernando] Flores, and [Philip] Agre and [David] Chapman, was explicitly inspired by his ideas. Many other AI researchers, even including . . . [opponents Marvin] Minsky and John McCarthy, admit that Dreyfus’s critiques have influenced their own research” (p. 61).

And here is Brey’s last sentence: “Dreyfus is living proof that philosophers can indeed play a major role as critics of, and commentators on, science and technology in practice” (p. 61). They can, Brey is saying, even have a positive impact on the way science and technology—in this case, computer science and technology—are practiced.

The editor of this volume, Hans Achterhuis, also provides a chapter on the philosophy of technology of Andrew Feenberg. In this case, all the critiques come upfront, where Achterhuis dismisses Feenberg’s early books: “Many passages [in Feenberg’s first book, on Lukacs and critical theory] practice the kind of fastidious exegesis of sacred texts and indulgence in polemics with other

interpreters [of Marxism] who are deemed to be insufficiently orthodox that was popular some decades ago but has not worn well” (p. 66). And even when Feenberg turned to technology in his second book—Achterhuis says—“The persistence of a rigid (neo)marxist framework . . . makes it difficult to fully appreciate the very interesting ideas of Feenberg himself” (p. 66). These criticisms out of the way, Achterhuis almost uncritically accepts the theses of Feenberg’s later books, *Alternative Modernity* (1995) and *Questioning Technology* (1999). For Achterhuis, the key to understanding Feenberg’s innovative approach to philosophy of technology is a distinction between “primary and secondary instrumentalization.”

Here is Achterhuis on the first: “The first level of instrumentalization corresponds to the perspective of the classical philosophy of technology on modern technology, but also to the common sense conception of technology and the conception of technical experts themselves. This level concerns what Feenberg calls the “functional constitution of technical objects and subjects,” and addresses the meaning of modern technology apart from all the social meanings that it might receive” (p. 88).

But both Achterhuis and Feenberg are interested in a different picture: “More recent and empirically directed studies of technology, Feenberg points out, have allowed us to see that primary instrumentalization is only part of the story of modern technology. . . . In order for there to be an actual technological system or device, a second level of instrumentalization is necessary. ‘Technique must be integrated with the natural, technical, and social environments that support its functioning’” (p. 90).

After noting in passing, with inadequate justification, that “Feenberg regards the environmental movement as ‘the single most important domain of democratic intervention into technology’” (p. 91; Achterhuis should have spelled this out at greater length if he felt it is so central to understanding the recent Feenberg)—Achterhuis draws this conclusion: “The practical relevance of Feenberg’s theoretical distinction between the two levels of instrumentalization is that it suggests the possibility of a future in which, according to the apt last line of his book [*Questioning Technology*, 1999], “technology is not a fate one must choose for or against, but a challenge to political and social creativity” (p. 92).

Unfortunately, neither Feenberg nor Achterhuis says much about what kinds of social and political activity are called for. At one point in their younger days,

probably both would have endorsed some sort of Marxist (most likely neo-Marxist) rebellion, but since the demise of Soviet Communism it is important at least to hint at one's political program. Beyond theorizing "new possibilities," neither Feenberg nor Achterhuis does so.

In the Achterhuis collection, Donna Haraway's "socialist, feminist, and anti-racist" (p. 107) political philosophy is presented by Rene Munnik. Or, "Rather, her cyborg thesis is a description of an anthropological condition in which political issues are at stake" (p. 107).

Exactly what this means, even for Munnik, is a little unclear. But Munnik makes this attempt to clarify: "The cyborg is our ontology. . . . [Or, rather it] marks a fundamental turning point in philosophical anthropology . . . [which] is generally conceived as anthropo-ontology. . . . But at the end of the twentieth century these ways of being [of humans] are inextricably involved with technology: anthropontology is cyborgontology" (p. 102).

Munnik had earlier noted that, at one stage in her career, Haraway had been a primatologist, but she later joined an interdisciplinary—Munnik says even "antidisciplinary" (p. 100)—program at the University of California at Santa Cruz, where she developed her interest in the concept of a cyborg.

"Philosophical anthropology" is a strange sort of creature in American philosophy—generally popular only among philosophers with an interest in European ontology. And "cyborg" must be taken, at least minimally, as a metaphor. But Munnik ends his account in a curious way: he concretizes cyborgs in terms of "the half-alive, half-dead occupants" of intensive-care units in hospitals and says it would not be "surprising if it turned out that cyborgs make very poor coalition partners" (p. 116) in the kind of radical politics Haraway wants her philosophical anthropology to prepare for. This seems unfair to Haraway, no matter how fuzzy the cyborg concept may seem to be in its various "antidisciplinary" formulations.

The Achterhuis collection next turns to a philosopher who has unquestioned credentials in academia—Don Ihde, long-time professor and chair of the philosophy department of the State University of New York at Stony Brook. [I used this material in Chapter 10 above, so will skip most of it here.]

Here is how Verbeek begins his account: "Ihde . . . is a pioneer in two respects.

First, he was one of the earliest philosophers in the United States to make technology the subject of philosophical reflection. . . . He published his first book on the philosophy of technology, *Technics and Praxis*, in 1979, [and this was just] the first of over half a dozen books he has written in the field”. . . . (p. 119). (The rest is already in Chapter 10 on Ihde above.)

But there is one last philosopher discussed in the book, Langdon Winner, whose views are summarized and, to a limited extent, critiqued by Martijntje Smits. Smits focuses mainly on Winner’s key idea, that all “artifacts have politics,” that there are, ultimately, no politically neutral technologies. Along the way, she notes Winner’s “love-hate relationship with Ellul” (p. 154); “the empty box of social constructivism” (p. 163); and Winner’s (she thinks mostly implicit) commitment to a kind of democracy inconsistent with the politics embodied in most large-scale technological systems (p.165).

Smits’s main critique of Winner is that this last commitment, to a kind of democracy at odds with large technological systems, is left vague and abstract (p. 166). Here is her main conclusion: “Winner’s work searches to work out a middle path between the philosophy of technology . . . and social constructivism. . . . One might remark . . . that Winner has performed an important service in pointing out clearly how imperative it is to find a middle path. But the weaknesses of his ‘Artifacts/Ideas’ [1991] article also indicate how tricky it is to actually walk this middle path” (p. 166).

And later: “In assuming that direct democracy is an unproblematic norm, Winner implies that political power exercised in this way is ipso facto beneficent, and ignores the question of how power is actually exercised in those practices” (p. 167).

This may be unfair to Winner (see Chapter 12). In “Techné and Politeia” (1986), Winner calls for a kind of constitutional convention each time a new large-scale technological enterprise is considered. This does not say that direct democracy is “ipso facto beneficent”; only that ordinary citizens are to be trusted more than undemocratic technological elites. And this brings us back to John Dewey (rarely mentioned by Winner, and then mostly negatively), whose similar appeal to a sort of direct democracy does not assure a beneficial outcome in every exercise of democracy—though every social problem (here, sociotechnical problem) is still better entrusted to the people than to technical elites.

To sum up with respect to the Achterhuis volume: it clearly represents, in an only

mildly critical way, some of the most interesting philosophical work related to *technologies* that has been done in the USA in recent decades. It thus shows Dutch philosophy of technology (at least at Twente) to be heavily involved with American work, but also admirably diverse. As Tijmes notes, however, the other Dutch schools may in some sense be more original; and many observers think Tijmes's last example—science, technology, and society as perhaps best represented by Wiebe Bijker—is the most significant. (See Chapter 25 below.)

I now return to Tijmes's survey: “In this survey I have so far confined myself to the technological universities, where philosophers explicitly claim to do philosophy of technology. This is a limitation because there is also philosophy of technology outside these departments although more on an individual basis. On the other hand, I have also passed over those who are doing research in the field of Science, Technology, and Society. They do not claim to do philosophy, but their work could be of utmost importance to the programs mentioned.

“I certainly agree that members of the Society for Philosophy and Technology ought to be less narrow and more ecumenical. What is on parade as philosophy of technology might turn out really to be STS; or vice versa. Among the non-technical universities philosophy of technology is most heavily represented at the University of Maastricht, where it is part of an interdisciplinary STS program.

“The Netherlands Graduate School of Science, Technology, and Modern Culture (WTMC) is a formal collaboration of Dutch researchers, who study the development of science, technology, and modern culture. The school has a total of 48 affiliated researchers, who represent a variety of disciplines: philosophy, literature, history, psychology, and sociology. A considerable number of these researchers have been educated in the natural and technical sciences. The principal researchers in the WTMC program are affiliated with the University of Maastricht, the University of Amsterdam, and the University of Twente. However, agreements have also been reached with the University of Groningen, the University of Leiden, and the Agricultural University of Wageningen, which enable researchers from those institutions to participate in the graduate school. The institutes involved in the graduate school conduct the vast majority of the research in this area in the Netherlands.

“The increasing interpenetration of science, technology, and modern culture and society implicates five core questions, the answer to which can contribute to a diagnosis of the ills of modern society and culture: (1) What roles do science and

technology play in the transformation process in which societies are entangled, and how are these roles to be empirically researched and theoretically clarified? (2) How are science and technology influenced, substantively and organizationally, by the societal and cultural processes in which they are interwoven? (3) How are the boundaries to be drawn between science, technology, and the culture in which they are produced and reproduced, and how are these boundaries made visible or invisible? (4) How are normative questions concerning science and technology taking shape, and what does this imply about the way in which these questions are treated? And finally, the reflexive question, (5) how are analyses of the development of modern culture, and especially the position of science and technology, to be legitimated, without appealing to the prevailing epistemological paradigm which itself is a characteristic result of the rationalistic process?

STS or philosophy? Never mind. Ask the scientific director of the school: w.bijker@TSS.Unimaas.nl.”

The papers presented after this introduction in Tijmes's *Techné* survey—Tijmes continues—do not represent all of these perspectives. They are, simply, about half of almost a dozen Dutch contributions to SPT's tenth international conference, held at the University of Dusseldorf in September 1997. For another collection of Dutch contributions to the philosophy of technology, Tijmes adds that the interested reader can consult a volume he guest-edited in the *Research in Philosophy and Technology* series, published in 1998.

I might also mention in passing Egbert Schuurman, a Dutch engineer/philosopher and Senator, who attended a few SPT conferences; his perspective is religious, Dutch Reformed, and he is strongly influenced by Ellul, who has also influenced others in that denomination. I mention him just to complete the picture of Dutch philosophy of technology as I know it.

A second aside: in July 2005, the Technical University of Delft hosted the 14th international conference of SPT. Much in evidence, alongside a truly international gathering of philosophers from all over the world, was the Delft school's particular approach, as sketched above by Tijmes. But a philosopher from Twente, Peter-Paul Verbeek, had published a booklength version of his own take on philosophy of technology: *What Things Do: Philosophical Reflections on Technology, Agency, and Design* (2005). Verbeek has many views in common with the Delft group. Conveniently for my purposes here, Albert Borgmann did

a review almost as soon as the book was published.

Borgmann first provides a faithful summary of the book: “The three parts of *What Things Do* reflect the three phases of philosophy of technology. The first is defined by the founding fathers of the discipline, Martin Heidegger and Jacques Ellul, and extends roughly from 1925 to 1955. It was followed by a fallow period of some twenty years. In the United States, philosophy of technology began as a self-conscious discipline in the early seventies, largely through the organizing efforts of Paul Durbin and Carl Mitcham. The most influential philosophers of this group have been Langdon Winner, Don Ihde, Kristin Shrader-Frechette, and Andrew Feenberg.

“The second phase took philosophy of technology beyond its preparadigmatic jumble and established something like schools of thought and canonical texts. More broadly, it established 'technology' as the, or at least as one, defining term of contemporary culture. This phase is now reaching its end and has been overlapping with the third generation that includes Verbeek.

“His book is a careful and critical discussion of his predecessors, and it develops an original program on the basis of those discussions. . . .

“In the concluding part, Verbeek employs the positions and concepts he has elaborated in the first two parts to sketch an original relation of humans and technological artifacts. He does so by examining rival proposals, and he finds that they lose the material and sensible presence of technological devices by concentrating on their functions or their significations. In either case there are functional equivalents (and in fact improved versions) that can serve as signs or perform functions so that the particular technological realization is incidental and temporary. The criteria a properly designed device has to meet are transparency (so the device can be understood) and engaging capacity (so its presence in our lives will be vigorous).”

Borgmann then provides his neo-Heideggerian critique: “As for shortcomings, there are two I want to mention briefly. Neither is damaging to the central concern of *What Things Do*.

“The first concerns Verbeek's postphenomenological ontology. That humanity and reality interact and shape one another is a truism. Verbeek wants to get beyond that commonplace to a 'more radical phenomenological perspective in

which subject and object are not merely intertwined with each other but constitute each other' (p. 112). That position either comes to a fairly straightforward realism or it is incoherent. For assume the constitution of a person is resolvable into its constituents, i.e., into its subjective and objective elements. Then we are back in some sort of realism. Or assume the constitution is not analyzable into its elements. Then it is invisible as a constitution and no longer properly so-called.

“Verbeek tends toward the former interpretation, and to avoid a more or less naive perspective he resorts to Kantian things-in-themselves as the anchors to objects and subjects (pp. 112 and 164). But there is nothing new or radical in this. Verbeek could simply drop what he himself calls 'a transcendental construction' (p. 164) without any loss to his critiques or proposals.”

In this chapter on Dutch schools of thought in philosophy of technology, it would not be appropriate to get into the details of this disagreement. Enough to say that Verbeek is what I would call "Delftian," whereas Borgmann thinks he ought to move toward neo-Heideggerianism. Nonetheless, this disagreement allows me to bring this somewhat different chapter to a close.

Partly because the Dutch tend to set out their differences in close parallel to American differences, but partly also on their own terms, the Dutch schools seem to me to offer a fair parallel of the variety of *controversial viewpoints* that we have seen show up repeatedly in earlier chapters:

Wageningen school and Brey (not on Dreyfus, but his social democracy)

Tijmes (Heidegger)

Achterhuis (on Feenberg)

Delft and Eindhoven ("technical")

This leaves out Bijker and STS, but Chapter 25 below will include that as an anti-academic view.

Perhaps my inclusion of the Twente reflections on American philosophy of technology makes it too easy to say that the Dutch schools fairly closely mirror USA quadrants, but as we have seen in Chapter 13, the pattern also seems to hold

in Germany and Spain, so it does not seem out of step for the same to occur in the Netherlands. And by now the astute reader can see where this is heading. Contrary to many misrepresentations—including misrepresentations by some SPT authors—the philosophers affiliated with SPT, as well as those who have collaborated with them in Germany, Spain, and the Netherlands, are dealing and have from the beginning dealt with important traditional philosophical issues. These issues would often be said to cover the entire philosophical spectrum. I prefer to say—in order to underscore completeness—that they come from all the quadrants in the world of philosophy. See the essay at the end of this book.

Still, we need to stop and think here for a moment about the next several chapters: Chapter 20, on engineering and computer ethics; Chapter 21, on technology and the problems dealt with in environmental ethics and politics; Chapter 22, on biotechnology; and Chapter 23, on agricultural technologies. In some sense, these are all issues that have been around since the beginning, both within SPT and in developments alongside it. But it could be said—indeed, defenders of the “new discipline” in fact do say—that these can now be considered subdisciplines within the *new* philosophy of technology. In that respect, the core claim is that these areas require a level of professionalism that one should expect from an academic field; but, what is more, they require—for instance on the part of a young scholar entering any of the subfields—a high degree of specialized knowledge in some chosen area within the academic disciplines broadly speaking. You can't do engineering ethics without some knowledge of engineering, or environmental ethics without a grounding in ecology, and so on.

Chapter 24 will extend this broadening to still more features of the contemporary technological world, but I will save comments about that until we get there.

Chapter 20

Ethics in Engineering and Computer Technology: Deborah Johnson

Deborah Johnson has a body of work that represents two subfields partly neglected by philosophers in SPT: engineering ethics and computer ethics. And she has taken controversial stances relative to authors (not only philosophers) in both fields. This chapter gets us into some of the concrete issues that deserve to be mentioned alongside broader conceptual controversies. Johnson has also written on business ethics, and from this variety of contributions on concrete issues it should be possible to see where she is coming from in terms of her contributions to controversies in these areas. But Johnson's main claim to fame is that she has worked, almost as an insider, with and within professional technical societies attempting to regulate themselves.

Here is Johnson's own "Biographical Sketch for the Online Ethics Center": "She is currently the Anne Shirley Carter Olsson Professor of Applied Ethics in the Department of Technology, Culture, and Communication in the School of Engineering and Applied Sciences of the University of Virginia. Johnson was given the ACM SIGCAS Making a Difference Award in 2000. In 2001 she received the Sterling Olmsted Award for 'innovative contributions to liberal education within engineering education' by the Liberal Education Division of the American Society for Engineering Education.

"Johnson is the author/editor of four books: *Computer Ethics* (third edition, 2001); *Computers, Ethics, and Social Values* (co-edited with Helen Nissenbaum, 1995); *Ethical Issues in Engineering* (1991); and *Ethical Issues in the Use of Computers* (co-edited with John Snapper, 1985). She says she is currently at work on a new anthology, a reader in Science and Technology Studies, to be co-edited with Joseph Pitt.

"Johnson has also published over 40 papers in a variety of journals and edited volumes. Her papers have appeared in *Communications of the ACM*, *Ethics*, *Annals of the New York Academy of Sciences*, *IEEE Technology and Society Magazine*, *The Monist*, and *The Encyclopedia of Ethics*. She co-edits the journal *Ethics and Information Technology* published by Kluwer and is co-editing a book series on Women, Gender, and Technology with S. Rosser and M.F. Fox for the University of Illinois Press.

“Johnson has taught courses on ethical theory; information technology, ethics, and policy; engineering ethics; and, values and policy. During 1992–1993 she was a Visiting Professor in the Department of Civil Engineering and Operations Research of Princeton University where she worked on a National Science Foundation project on ethics and computer decision models. In 1994 and 1995 she received National Science Foundation funding to conduct workshops to prepare undergraduate faculty to teach courses and course modules on ethical and professional issues in computing. Currently she is co-principal investigator for another NSF grant to offer workshops on teaching computer ethics using the Internet.

“In her activities with professional organizations, Johnson was president of the Society for Philosophy and Technology and has taken on the presidency of a new professional society, the International Society for Ethics and Information Technology (INSEIT). In the past she has served as treasurer of the ACM Special Interest Group on Computers and Society and chair of the American Philosophical Association Committee on Computer Use in Philosophy.”

This last-mentioned kind of work on Johnson's part suggested to me that I might well include here an essay I once did about how effective (or not) such work with professional societies can be. I was accused of being excessively negative there, but for present purposes what the essay (the parts of it I include here) amounts to could stand as one objection to Johnson's kind of work, no matter how valuable for SPT on other grounds. So I start this chapter with an objection to one part of Johnson's work. I will follow that with her answers, as I understand them, including a very recent theoretical addition to her earlier work. (She presented the new outlook at the SPT international meeting in the Netherlands in 2005.)

Here is my set of objections, which can be found in my “Activist Philosophy of Technology: Essays, 1989–1999” (www.udel.edu/Philosophy/pdurbin/Pub.html, where the source is “Engineering Ethics and Social Responsibility: Reflections on Recent Developments in the USA,” *Bulletin of Science, Technology and Society* 17: 2–3, 1997: pp. 77–83):

Engineering Ethics and Social Responsibility

I offer here philosophical reflections on roughly twenty-five years of work on engineering ethics in the USA. (For other countries, see Lenk and Ropohl, 1987, and Mitcham, 1992.) My comments fall into three parts. In the first I discuss

efforts of philosophers to contribute to the field, and that is all I will include here—except for some final comments.

Philosophers and Engineering Ethics

In the early 1970s, engineering ethics seemed to be a promising field for philosophers to enter—along with the new field of bioethics, that had recently supplanted the old field of medical ethics, as well as business ethics and several other branches of what was coming to be called applied or professional ethics. Technology was being widely criticized. There were a number of scandalous cases or emerging issues associated with engineering and related areas of applied science. Old codes of ethics were seen as in need of updating and better enforcement. And some philosophers, perhaps especially those associated with technology and society programs in academia, thought they saw interesting issues ripe for conceptual analysis. Besides, it was a time of retrenchment in the graduate education of philosophers, so there seemed to be opportunities for employment in engineering-related settings.

There are several possible roles for philosophers to play when it comes to examining ethics and engineering.

One can, for instance, play the role of external gadfly, where ‘external’ refers to a position entirely outside the engineering community (see Churchill, 1978). This community, as I am defining it here, ought to include not only engineers in the strict sense but engineering managers and technicians as well as many other related technical workers—from chemists and applied physicists to econometricians engaged in technological planning or forecasting.

It is also possible to play the role of internal gadfly, within engineering (or research-and-development) institutions; some people consider this to be the proper role of the philosopher (or humanist critic) with respect to the engineering or any other professional community (see Baum, 1980). According to this view, one can be part of an ethics case review panel, or of a technology assessment team, or a philosopher/professor of engineering ethics in an engineering school and play the role of gadfly every bit as effectively as—perhaps even more effectively than—someone from the outside.

It is also possible, finally, to serve on one of these committees without thinking of oneself as a stranger or gadfly. Philosophers, for example, have been asked to

help revise codes of ethics. So we also serve as laypersons on ethics review panels for engineering (and other) professional societies.

What can we conclude about these efforts of North American philosophers over the past quarter century? I will try to summarize the results by looking at what happened at gatherings associated with the most ambitious project to be undertaken in the United States—the National Project on Philosophy and Engineering Ethics, directed by Robert J. Baum.

The first stages of the development of this project have been well described by one of Baum's colleagues, Albert Flores (1977). He starts by pointing out conflicts that persist for individual engineers even if they conscientiously follow their society's code of ethics; legal challenges to professional societies' activities; and thorny ethical issues associated with doing engineering in foreign cultures—in short, he recognizes that there are 'serious issues that challenge the professional engineer's commitment to acting as a true professional.' Then Flores asks himself whether anything might be done to help solve these problems and says this: "One plausible suggestion is that since these questions clearly raise moral and ethical issues, it seems reasonable to expect some helpful guidance from scholars and academics with competence in ethical theory." The National Endowment for the Humanities agreed and provided funding for a multi-year project in which engineers would learn something about academic ethical theory, philosophers would learn more about engineering, and philosopher-engineer teams would develop ethics projects of various sorts. An outstanding example of one of these projects is the textbook, *Ethics in Engineering* (1990), by philosopher Mike Martin and engineer Roland Schinzinger.

Another feature of the National Project on Philosophy and Engineering Ethics was a series of national conferences, beginning with one at Rensselaer Polytechnic Institute in 1979. Rachelle Hollander, a philosopher who is also the program manager for the agency of the National Science Foundation that funded the second and third national conferences, has described the second conference, held at the Illinois Institute of Technology in 1982. Hollander (1983) focuses on philosophical contributions: 'Philosophers . . . develop[ed] abstract principles on which engineering obligations could rest. One presentation attempted to ground engineers' whistleblowing rights in more general moral rights to behave responsibly, while yet another developed an argument that engineers are morally required to act on the basis of a principle of due care, requiring those who are in a position to produce harm to exercise greater care to avoid doing so.'

But Hollander also points out how these abstract principles were challenged at the conference, not only by engineers but by other philosophers. And she ends her report with a summary of some other disagreements—‘There was, for example, considerable discussion about whether whistleblowing is ever justified, about the [conflicting] loyalty that engineers owe the public, their clients, [and] their employers,’ and so on—along with recommendations for the future. Among these, Hollander points out how important social (as opposed to but encompassing individual) responsibility is; that risk assessment is a social problem; and that engineers, engineering educators, other educators, and a whole host of other actors must cooperate in solving such social problems.

The third national conference was held in Los Angeles in 1985, and it picked up on Hollander’s (and others’) focus on the concrete problem of risk assessment. The proceedings of the conference were edited by Albert Flores and published under the title, *Ethics and Risk Management in Engineering* (1989). Almost half of the contributions, following the earlier pattern, are by engineers. But philosophers and other critics outside the engineering community have interesting things to say in the volume. Deborah Johnson argues on moral grounds that government needs to have a role in dealing with the risks associated with toxic wastes; Thomas Donaldson appeals to well known ethical theories to raise doubts about whether international standards can be established to regulate such risks; and Kristin Shrader-Frechette argues that all risk assessments necessarily involve value judgments. In addition, Sheila Jasanoff discusses the differences between ethical and legal analyses of risk issues, while Carl Cranor focuses on the legal mechanisms—the law of torts and regulatory law—that currently control social responses to exposures to toxic substances and similar technological risks.

These are worthy contributions to the literature, both of engineering ethics and of applied philosophy, and these same authors have produced several books extending their contributions (see Cranor, 1992; Jasonoff, 1986; and Shrader-Frechette, 1991). But if we look beyond the three national conferences to the general body of philosophical literature in this period, one thing is overwhelmingly clear. Nothing approximating the pronounced movement of philosophers into the field of bioethics ever occurred; there simply was no groundswell of philosophers moving into engineering ethics. A diligent perusal of *The Philosopher’s Index* from 1975 right up to the present reveals only a handful of articles and even fewer books on any aspect of ethics in relation to

engineers. In spite of early promise, (philosophical) engineering ethics remained stagnant while bioethics boomed—indeed, engineering ethics very nearly disappeared from the philosophical literature.

No key concepts paralleling the so-called mantra of bioethics—autonomy, beneficence, non-maleficence, and justice—have ever been put forward. Philosophers have written introductory textbooks, and contributed articles or chapters to anthologies (see, for example, the contributions to Johnson, 1991), but nothing even remotely approximating the attempts of bioethicists to provide philosophical foundations for their field (see Engelhardt, 1986 and 1991) has emerged. I know most of the philosophers involved in engineering ethics, and, by these remarks, I mean no disparagement of their efforts. But I believe all of us who had high hopes in the 1970s for the development of philosophical engineering ethics have been deeply disappointed.

My two other sections, Engineers and Engineering Ethics, and Possibilities for Engineer-Philosopher Cooperation, turned up equally disappointing results. Engineering societies rarely actually police their members' unethical behavior, and widespread cooperation would require major changes in attitude and behavior on the part of both engineers and their would-be philosopher-collaborators.

Conclusion

To sum up, I believe that the recent history of engineering ethics in the USA is not a happy one. Philosophical engineering ethics has turned out to have an extremely limited impact in academia. And the efforts of engineers and their professional societies are too limited in both scope and impact.

This is a very different way for me to start a chapter, but Johnson's many contributions—both to engineering ethics and to computer ethics—constitute her reply to such objections. Mainly she replies with hope. In her *Ethical Issues in Engineering*, Johnson (echoing Noble and Goldman in Chapter 15 above) first notes the complexity of the issues: “We will focus on individuals and look at what individuals can and should do when confronted with tough ethical choices; and we will focus on engineering as a system (a set of practices created by laws, rules, and conventions) that encourages and constrains various kinds of behavior. The system includes engineering education, professional societies, the culture of corporations, laws regulating the work of engineers, and so forth.”

But this is followed immediately with this expression of hope against these odds: “The subject of engineering ethics is rarely discussed during the education of engineers. Yet many engineers experience ethical dilemmas while practicing engineering. This anthology of readings was assembled with the idea that engineers will be better able to deal with ethical questions that arise in their practice if they have an opportunity to reflect on these issues long before they face them.”

Johnson's parallel assessment of the situation among computer professionals, in her *Computer Ethics* (with Helen Nissenbaum)—where she remains confident that courses in ethics will help—is somewhat more hesitant: “In the case of computer professionals, because the profession is relatively new and not well organized, the commitment to public safety and welfare is neither well entrenched in everyday practice nor well articulated in professional codes or literature. . . .

“[But] the bottom line is that all of us will benefit from a world in which computer professionals take responsibility. . . . Ideally we would have all computer professionals working to shape computer systems for the good of humanity.”

In something of a departure from her earlier stance, Johnson has recently broadened her theoretical outlook on engineering ethics, using insights from the Science, Technology, and Society (or Science and Technology Studies) community (or communities).

Here is her first modification of her earlier approach: “STS accounts of technological development suggest that engineering decision making involves a variety of social and value decisions. Engineers work in a context that is far from isolated. Their work and their decisions take into account cultural notions, legal requirements, market conditions, limited knowledge, time constraints, and more. From the perspective of engineering ethics, this view suggests that engineers have more latitude than is typically ascribed to them by engineering ethicists.”

Johnson then adds: “STS accounts [further] suggest that many other actors, in addition to engineers, are also involved in making technology what it is. . . . Thus, STS accounts provide a much more complicated view of what it is that engineers are doing. It is a view that suggests that engineers have, on the one

hand, more latitude in design in that their decisions aren't dictated by an objective body of knowledge and, on the other hand, less latitude in the sense that many other actors are involved in technological development. . . . This calls for a very different view of the responsibilities of engineers.”

Johnson's second major modification of her earlier view (which, recall, reflects the view of other engineering ethicists as well) comes under the heading of “socio-technical systems”: “Were engineering ethicists to embrace the [STS] idea that engineers are not just making ‘things’ but making socio-technical systems, the view of what engineers do is broadened, and the range of factors for which engineers are responsible is significantly expanded. . . . The reframing provided by STS suggests that engineers already take into account and sometimes redesign not just the thing being produced but the social practices, social relationships, and meanings associated with the thing.”

Her third modification comes under the heading of “expertise”: “STS scholars have devoted a significant effort to better understanding the source, nature, and authority of expertise. Of particular importance for engineering ethicists is the STS argument that the authority of expertise is not derived from an (objective) value-neutral body of knowledge. The authority of expertise is dependent on a variety of social practices and this expertise is socially situated.”

At this point, Johnson introduces a reflective note of caution: “Because of the complexities it introduces, many engineering ethicists may be tempted to simply dismiss the entire STS discussion about expertise. But in the long run this would be detrimental to their endeavors. STS scholars are not the only ones questioning the notion of expertise—lawyers, legislators, and members of the public question engineering judgments on a daily basis and reject their claims to objectivity. . . . Thus engineering ethicists can view the STS conversation on expertise as a resource rather than a threat.”

I would add one caveat here: Johnson's reflective caution may not go far enough. As the so-called “science wars” show (see Chapter 25, below)—and as Steve Goldman has argued (in Chapter 15, above) in the name of the “social captivity of engineering”—not only engineering ethicists but engineers themselves, willingly echoing their managers and corporate leaders, may be more than “tempted” to resist the alleged insights of STS scholars; they may outright resist them as distortions of the objectivity claims that scientists have a right to make—and that engineers, in applying scientific knowledge, can claim objectivity and

expert knowledge for their work as well. In opening up her earlier view, Johnson may additionally have opened a hornet's nest.

Johnson's one-time colleague at Rensselaer Polytechnic Institute, Langdon Winner (see Chapter 11 above), is emphatic not only that STS scholars ignore such values challenges, but also that Johnson's calls for engineering ethics training are woefully inadequate. Winner emphasizes that in a democracy the public has a right to expect more than education in engineering ethics, even when coupled with engineering professional self-regulation. (As I argued above, there is all too little of that.)

Winner says: “On the one hand it is clear that, properly speaking, a person can be responsible only for his or her own decisions, actions, and their consequences. At the same time there is an important sense in which each person is now responsible for nothing less than the future of humanity itself. . . . Any effort to define and teach engineering ethics which does not produce a vital, practical, and continuing involvement in public life must be counted not just as a failure, but a betrayal as well” [Philosophy and Technology (Kluwer) series, volume 7, pp. 63–64].

Even some computer professionals, ignoring the caution of Johnson's outlook, have gotten involved in public life beyond that of their professional associations. As I noted in *Social Responsibility in Science, Technology, and Medicine*, Computer Professionals for Social Responsibility has been active in testifying before the U.S. Congress, in contacting the media and alerting the public about electronic invasions of privacy and other infringements of civil liberties, in promoting forums for the public discussion of issues such as the software requirements of the Strategic Defense Initiative (Star Wars) as well as privacy issues, in watchdogging the FBI's efforts to expand crime information records, and in publishing civil-liberties-related issues—along with the American Civil Liberties Union. CPSR also spearheaded the battle to get technical people to refuse to work on the Star Wars project.

Terry Winograd of CPSR describes his experiences in a selection in the Johnson/Nissenbaum anthology on computer ethics (pp. 25–26): “In talking about these issues I will not try to draw a careful link between terms such as 'ethics,' 'morals,' 'values,' and 'social responsibility.' These distinctions can be important for some purposes, but I will interchange them freely here with more of a concern for the ring of the sentence than for the precise differentiation of the

concepts.

“When I speak of my own work, I include more than the narrow pursuit of research and development in computer science. For almost ten years I have been a participant in the work of Computer Professionals for Social Responsibility (CPSR), an organization that has brought together people from around the country (in fact, around the world) to share understandings and to act collectively in many of the areas that are being discussed in this text. That activity is not a diversion but a critical part of the work of a computer professional. One of the things I want to highlight is the way in which organizations like CPSR and the National Conference for Computing and Values (NCCV) play a central role in ethical conduct for computer professionals.

“In addition, during the past three years, Helen Nissenbaum (now at Princeton) and I have developed and taught a course on 'Computers, Ethics and Social Responsibility' for undergraduate computer science majors at Stanford University. As all of us in academia know well, there is no better way to expand your own understanding than to throw yourself into a room full of bright undergraduates who want to master a difficult topic and expect you to help. Much of my understanding has grown from the generative interaction that comes in teaching, and that too is a central part of my work as a computer scientist. It has forced me into some hard and productive thinking about the questions being raised at a conference on Computing and Values. . . .

“In this paper I will present and contrast some common views of how ethics and values are related to computing and see what these views imply for the activities we can undertake to promote ethical behavior and social responsibility. My emphasis is on the fundamentally social nature of ethical concerns: with looking beyond the role of the individual to the larger context of discourse and action that generates the world in which individuals make choices and act. Rather than focusing on the isolated individual faced with an ethical dilemma, I want to direct our gaze to the larger swirl of human discourse, which is the source of the interpretations, values, and possibilities that make ethical choice meaningful.

“The announcement for the NCCV conference declared a vision: to integrate computer technology and human values in such a way that the technology advances and protects those values rather than doing damage to them.

“This will require acts of individual moral courage, and it will be based on a lot

more. We need to create an environment in which the consideration of human values in our technological work is not a brave act, but a professional norm. We need to produce a background of understanding in which it is simply taken for granted by all computer professionals that value considerations are foremost. We need to forge everyday practices and ways of teaching that reinforce that understanding.

“In that spirit, I will argue that the kind of inquiry and discussion that motivate the conference, and that have been at the heart of CPSR's ten years of work, are a primary form of ethical behavior.”

Finally, neo-Marxist radicals such as Andrew Feenberg (see Chapter 13, above) go even farther than Winner and Winograd, saying that political activity of just any kind is not enough; we need revolutionary thinking that will bring about a wholesale change in technological society before any meaningful change can take place. As it stands now, engineering ethics is at best dealing with symptomatic, not substantive issues.

So, *controversies*? If we recall the idealistic view of Friedrich Dessauer (Chapter 15) about engineers having a kind of post-Kantian categorical imperative to save the world, we have a fairly clear four-quadrant set of options:

Dessauer's idealism and engineering ethics reflecting it;

public activism on the part of engineers and computer professionals (CPSR);

professional self-regulation (Johnson, Lenk and colleagues in Germany in Chapter 13);

and finally radical criticism (Winner or Feenberg).

Chapter 21

Philosophy of Technology and Environmental Ethics: Andrew Light

Though this chapter focuses on the next SPT president after Johnson, Andrew Light, interest in the environment on the part of members of the society had been there from the very beginning. Kristin Shrader-Frechette (Chapter 3 above), along with Stanley Carpenter, had championed environmental concerns among philosophers of technology from the earliest days of SPT. Then, over the next decade or so, increasing numbers of philosophers noticed the connection between technological developments and the environment—most often to the detriment of the environment. (For one example, see the later work of Don Ihde in Chapter 10. For another, the *Research in Philosophy and Technology* series, after it was no longer the official publication of SPT, published bibliographies and more than one volume on technology and the environment.) Nonetheless, it was Light, beginning in the mid-1990s, who led the group of philosophers within SPT who focused more and more on philosophy of technology and environmental philosophy.

Light has now moved to the University of Washington, but his old NYU online bio is still a useful introduction: “Andrew Light, Ph.D. (University of California, Riverside, 1996), is Assistant Professor of Environmental Philosophy, Director of the Environmental Conservation Education Program and Co-Director of the Applied Philosophy Group at New York University. He is also a Research Fellow at the Institute for Environment, Philosophy & Public Policy at Lancaster University (U.K.), and a Faculty Fellow at the Center for Sustainable Development in the School of Architecture at the University of Texas at Austin. His primary areas of interest are environmental ethics and policy, philosophy of technology, and political and social philosophy.

“Light is the author of over sixty articles and book chapters on these topics, and is editor or co-editor of fourteen books. The ones I find relevant are included in the bibliography at the end.

“Most of Light’s work in environmental philosophy (he says) has focused on the failure of the discipline to fulfill its promise as a guide to formulating better, more morally responsible environmental policies. Identifying several theoretical debates in the field which have prevented it from aiding in the development of better policies, Light argues that a pragmatist methodology is needed to

transform environmental ethics into a more practical ethics, able to participate in the actual resolution of environmental problems. Consistent with this work, he has co-authored a book, *Environment and Values*, with John O'Neill and Alan Holland (2004), which offers a historical and community based approach to environmental valuation.

“In addition to these activities, Light works with many journals and professional societies. He serves on the editorial boards of *Environmental Ethics*, *Environmental Values*, *Ecological Restoration*, *The Journal of Architectural Education*, and *CNS*. In 1994 he co-founded the Society for Philosophy and Geography with Jonathan Smith (Texas A&M University) and co-edits the Society's journal, *Philosophy and Geography* (Carfax Publishers), which publishes interdisciplinary work on questions of space, place, and both urban and natural environments. He has also helped to organize eleven international conferences on environmental issues in North America and Europe, and is a past president of the Society for Philosophy and Technology.”

To give something of the flavor of Light's attitude toward deficiencies in the field of environmental ethics—which grew up almost exactly in step with SPT—I include here selections from the introduction to *Environmental Pragmatism* (edited by Light with Eric Katz):

Introduction: Environmental pragmatism and environmental ethics as contested terrain

“As environmental ethics approaches its third decade it is faced with a curious problem. On the one hand, the discipline has made significant progress in the analysis of the moral relationship between humanity and the non-human natural world. The field has produced a wide variety of positions and theories in an attempt to derive morally justifiable and adequate environmental policies. On the other hand, it is difficult to see what practical effect the field of environmental ethics has had on the formation of environmental policy. The intramural debates of environmental philosophers, although interesting, provocative and complex, seem to have no real impact on the deliberations of environmental scientists, activists and policy-makers. The ideas within environmental ethics are, apparently, inert—like Hume's *Treatise*, they fall deadborn from the press.

“The problematic situation of environmental ethics greatly troubles us, both as philosophers and as citizens. We are deeply concerned about the precarious state

of the natural world, the environmental hazards that threaten humans, and the maintenance of long-term sustainable life on this planet. The environmental crisis that surrounds us is a fact of experience. It is thus imperative that environmental philosophy, as a discipline, address this crisis—its meaning, its causes and its possible resolution.

“Can philosophers contribute *anything* to an investigation of environmental problems? Do the traditions, history and skills of philosophical thought have any relevance to the development of environmental policy? We believe that the answer is yes. Despite the problematic (and, heretofore, ineffectual) status of environmental ethics as a practical discipline, the field has much to offer. But the fruits of this philosophical enterprise must be directed towards the practical resolution of environmental problems—environmental ethics cannot remain mired in long-running theoretic debates in an attempt to achieve philosophical certainty. As Mark Sagoff has written: ‘[W]e have to get along without certainty; we have to solve practical, not theoretical, problems; and we must adjust the ends we pursue to the means available to accomplish them. Otherwise, method becomes an obstacle to morality, dogma the foe of deliberation, and the ideal society we aspire to in theory will become a formidable enemy of the good society we can achieve in fact.’

“In short, environmental ethics must develop for itself a methodology of *environmental pragmatism*—fueled by a recognition that theoretical debates are problematic for the development of environmental policy.

“This collection is an attempt to bring together in one place the broad range of positions encompassed by calls for an environmental pragmatism. For us, environmental pragmatism is the open-ended inquiry into the specific real-life problems of humanity’s relationship with the environment. The new position ranges from arguments for an environmental philosophy informed by the legacy of classical American pragmatist philosophy, to the formulation of a new basis for the reassessment of our practice through a more general pragmatist methodology.

“From the perspective of environmental pragmatism, we can return to our question: why has environmental ethics failed to develop its practical task? Perhaps one reason is methodological and theoretical dogmatism. Mainstream environmental ethics has developed under a narrow predisposition that only a small set of approaches in the field is worthwhile—that only some ways of

developing an environmental philosophy will yield a morally justifiable environmental policy. Although a wide variety of positions is discussed in the literature, the consensus it seems, is that an adequate and workable environmental ethics must embrace non-anthropocentrism, holism, moral monism, and, perhaps, a commitment to some form of intrinsic value. Those who wish to defend or develop different positions are rarely heard or taken seriously, and are always assumed to have the burden of proving just cause for deviating from the norms of current theory. It seems that anyone who is still questioning which is the correct side in the debates over individualism/holism, anthropocentrism/nonanthropocentrism, instrumental/intrinsic value and pluralism monism is seen as being unnecessarily obfuscatory.”

There is a now-famous “hotspots” claim (Mittermeier, 2000) that stopping the loss of biodiversity is “simply the right thing to do.” Moral philosophers, and more particularly environmental philosophers, rarely accept a claim that any activity is simply the right thing to do—without argumentation. And there is a lively debate among environmental ethicists about the priority, let alone unchallenged duty, of preserving biodiversity or saving species from extinction. (See Bryan Norton, *The Preservation of Species*, 1986.)

So I now turn to a *spectrum* of environmental ethics claims and the philosophers (and others) who make them.

Some people say that contemporary environmental ethics begins with the work of a scientist, Rachel Carson in *Silent Spring* (1962; see also Frank Graham, 1970). Others say the movement began earlier, with a famous debate between Gifford Pinchot, of the U.S. Forest Service, and John Muir, founder of the Sierra Club, over the Hetch Hetchy dam project in California in the early decades of the twentieth century.

But what I am talking about is not such disagreements among scientists; it is about philosophers’ disagreements over the principles on which they think answers to questions such as water pollution or dam building must be based—specifically, the spectrum of positions in environmental ethics.

Many of the disagreements can be followed in two books: Michael Zimmerman, ed., *Environmental Philosophy* (4th edition, 2004 [copyright says 2005]), and Joseph DesJardins, ed., *Environmental Ethics* (1999).

Among the disputants, I will begin with Light and *Environmental Pragmatism*. Most of Light's work in environmental philosophy (judging from his own web site, above) has focused on the failure of the discipline to fulfill its promise as a guide to formulating better, more morally responsible environmental policies. Light argues that a pragmatist methodology is needed to transform environmental ethics into a more practical ethics, able to participate in the actual resolution of environmental problems. Concretely, he works on ethical issues in *restoration ecology* and has been actively involved in that movement.

Light's (and others') environmental pragmatism and work on such issues as ecological restoration (typically around urban centers such as Chicago) brings criticisms from opponents all along the environmental ethics (and politics) spectrum.

The most extreme among critics of environmental activism are those who say there is no problem and restoration is wasted effort; some of these critics are people associated with the so-called Wise Use or Anti-Takings movements. (See, among others, Ron Arnold, 1999; and Gregg Easterbrook, 1995.)

Less extreme, but still somewhat politically conservative in my opinion, are defenders of ecological economics, such as Herman Daly. He critiques the standard environmental economics that underlies some anti-environmentalism (definitely conservative if not reactionary). Daly offers his criticisms in the name of measures of sustainability that include calculations of the values contributed to society by natural phenomena; these can be seen, among other places, in books such as Daly's *Valuing the Earth* (1993).

From the other end of the environmental (and/or political) spectrum come critics, like J. Baird Callicott (for example, in the Zimmerman anthology), who worry that environmental pragmatists (he explicitly mentions Light) are simply avoiding the basic issue of environmental ethics—whether or not, and to what extent, non-human beings such as animals and plants and ecosystems have either interests or rights that conflict with human beings' rights. Callicott himself is a long-time defender of Aldo Leopold's "land ethic," which he has updated, turning it (he thinks) into a defensible holistic ecocentrism.

There are also Marxist and ecofeminist environmental philosophers for whom environmental problems are the result of various divisions both within society *and pitting humans against nature*—class divisions, male domination ideologies,

false nature/humans dichotomies, and so on. In my opinion, Karen Warren is the best defender of such views, and her latest version (possibly her best?) is also to be found in the Zimmerman volume.

I should add here radical defenders of wilderness for its own sake, such as David Strong in *Crazy Mountains* (1995).

In line with Hickman (Chapter 14 above) and American Pragmatism, I side with Light, and other environmentalists calling themselves pragmatists, against their critics. Callicott challenges them—us—saying that we have set up “a false dichotomy between the classical activity of theory building . . . and the activities that they call for philosophers to take up instead” (in Zimmerman, p. 15). This seems to me to have things backward; I think its Callicott who has set up a false dichotomy. John Dewey, for the most famous example in American Pragmatism, was a lifelong opponent of dichotomized thinking. (See *The Quest for Certainty*, 1929; but for that matter any of Dewey's works.)

Callicott, along with his criticism, offers an irenic add-on: “In the very spirit of pluralism that the environmental pragmatists laud, it would be better to represent activities—such as popular value description and clarification and policy formation—as complementary to the more theoretical concerns of ‘traditional’ environmental philosophers than as an alternative to them.” And Callicott applauds Bryan Norton's *Towards Unity among Environmentalists* (1994).

However, it seems to me that Callicott betrays his own irenic hopes when he accuses pragmatists of implicitly “trying to discourage exploring the theoretical question . . . so that the old conventional answer to that question—only human beings [are morally considerable]—will prevail by default” (p. 15). His failure, it seems to me (I should say this modestly if I want to join him in irenicism), lies in limiting pragmatists to “popular value description and clarification and policy formation.” Those are not by any means the only things pragmatists advocate; indeed, in Callicott's formulation, these activities sound suspiciously like philosophical activists “advising” their fellow activists from some high ground of theory. Hickman for one (see Chapter 14 above), following Dewey, is not just calling for philosophers to describe or clarify values—even to help environmental policy makers formulate policies from some “higher” ground. The Deweyan or American Pragmatist plea is to jump in together with other activists, experts and non-experts alike, to work out “on the ground” some practicable (hopefully defensible) solution to the problem at hand. Dewey says

we should give up forever the idea that we are some sort of Platonic philosopher-kings with advice for the less enlightened to follow.

Complementarity and working together and respecting other people's values (even other philosophers' value systems) are important. But for pragmatists it's the urgency of the problems that counts. When philosophers say, "Yes, but we won't solve those problems unless we can first be clear about what count as good or acceptable solutions," that creates a problem. Usually we don't have the time—centuries?—to wait for philosophers to come to agreement on theoretical issues. On issues such as the loss of biodiversity at alarming rates worldwide, if we wait we are likely to be too late. That's what gives force to Mittermaier's moral imperative. And the same is true for global climate change and a number of other urgent global environmental issues.

Pragmatists, moreover, are not the only kind of activist environmental philosophers. I mentioned Karen Warren and ecofeminism earlier. In her introduction to the section she edited in Zimmerman (4th ed., p. 147), Warren says: "Ecofeminism has always been a grassroots political movement by pressing pragmatic concerns. These include issues of women's and environmental health, to science, development, and technology, the treatment of animals, and peace, anti-nuclear, anti-militarism activism. The varieties of ecofeminist perspectives on the environment are properly seen as an attempt to take seriously such grassroots activism and political concerns by developing analyses of domination that explain, clarify, and guide that praxis."

And Warren (p. 148) quotes approvingly Noel Sturgeon's characterization of ecofeminism, as a social movement through which change is produced by numerous kinds of "action," including that of the deployment of symbolic resources, shifts in identity construction, and the production of both popular and scholarly knowledge—as well as direct action, civil disobedience, strikes, boycotts, demonstrations, lobbying, and other more traditionally recognized forms of political action.

Warren's own contribution to the Part 2 she edited—"Ecofeminism and Social Justice"—is, I think, a brilliant summary of the range of ecofeminist writings, as well as one of the best summaries she has written of her own anti-dichotomies approach (pp. 252–279).

But there may be limits to Warren's—and Sturgeon's and other ecofeminists'—

commitment to activism, if they want activists to wait until anti-dichotomous thinking has replaced dichotomous thinking in contemporary society. It may well be the case, environmental pragmatists would say, that we can't ultimately address important environmental issues in an effective manner until people generally—and especially political and ideological leaders—come to see that misguided dichotomies are destroying and will continue to destroy both society and the environment so often falsely separated from it. But, they say, we often can't wait for "ultimately": for example, faced as we are with rapid species destruction, to wait is too late. Recognizing this, some ecofeminists say we should work simultaneously on both symbolic and real-world challenges.

Controversies in environmental ethics and philosophy of technology? Light is clear that he is a *pragmatist* (restoration ecologist). His website says he is opposed to the whole now-standard environmental ethics spectrum (whether we view this as a range extending from environmental economics to "deep ecology," or as a left/right political spectrum), because it has "not achieved what it set out to accomplish." But critics doubt that Light's favored restoration ecology will work—or that it is even necessary. Ecofeminists want to deal with the strongly "symbolic" issues of false dichotomies.

And, in the most fundamental challenge (in these terms) to environmental pragmatism, Callicott says it abandons the field, giving up on the effort to devise a defensible holistic or biocentric rather than human-centered philosophy—thus, by default, ending up with a human-centered view which will not lead to "pragmatic" solutions that match the environmental challenge.

There is a certain irony here. Light had been a leader among the trio calling for a new academic philosophy of technology subspecialty (Chapter 18 above). But as I have presented him here, he sounds like an activist (like myself, see Chapter 17) opposing academic arguments over the foundations of environmental philosophy. What this suggests is that there is more than a little tension in the call for an academic specialty. We next turn to a philosopher with radical, even Marxist roots, who ended up spending a good part of his career as a regulatory bureaucrat—on biotechnology issues—in Washington, D.C.

Chapter 22

Philosophy of Biotechnology: Sheldon Krimsky

Before I get to Krimsky (whose biographical materials I will give later), some general comments are in order about the current state of philosophical thinking on biotechnology. Though I have presented the following material elsewhere, most recently at the 2005 SPT conference in Delft, it has not previously been published. So I present it here as new.

Philosophical work to date has followed traditional lines, beginning with ethics.

One of the earliest attempts by a philosopher—an analytical philosopher in this case—to be balanced in his approach was that of Jonathan Glover, in his *What Sort of People Should There Be?* (1984); there Glover gives a cautious green light to some sorts of genetic engineering. At about the same time, a Heideggerian, Wolfgang Schirmacher (1987) offered his reflections on the early debate in Germany; Schirmacher's endorsement was even more positive, arguing that we have a responsibility to use genetic manipulations to improve human behavior, so often less than moral up to now.

I have found at least four books with “genethics” or a variant in their titles: David Heyd, *Genethics: Moral Issues in the Creation of People* (1992); Kurt Bayertz, *GenEthics: Technological Intervention in Human Reproduction as a Philosophical Problem* (1994); reflects the same German debates as Schirmacher; David T. Suzuki, *Genethics: The Clash between the New Genetics and Human Values* (1989); more critical; and David T. Suzuki, *Genethics: The Ethics of Creating Life* (1988).

Nor does this exhaust the list. There are at least two collections with similar titles: Justine Burley and John Harris, *A Companion to Genethics* (2002); contributions mostly by philosophers; and M. Khoury, W. Burke, and E. Thomson, eds., *Genetics and Public Health in the 21st Century: Using Genetic Information to Improve Health and Prevent Disease* (2000); mostly non-philosophers and mostly optimistic.

In addition (and finally, because my intent is not to be exhaustive), there are two textbooks on related subjects: Michael Boylan and Kevin E. Brown, *Genetic Engineering: Science and Ethics on the New Frontier* (2001); and Michael C.

Brannigan, *Ethical Issues in Human Cloning: Cross-Disciplinary Perspectives* (2001), which includes an interesting range of perspectives from religious ethicists.

Politics would be the next heading, and many things have been written about the politics of various aspects of genetics, including the exporting of genetically modified foods and seeds to various countries. But one philosopher has had the field almost to himself in providing balanced, judicious assessments of all aspects of biotechnology. That philosopher is Sheldon Krimsky, and I will take up his work at length later in this chapter.

Next would come philosophy of science approaches to biology, though for the most part philosophers of biology—though that subfield is flourishing—have had little to say about biotechnology. On the other hand, they have had much to say about genetics, where one big issue has been whether genetic explanations are (rightly or wrongly) reductionist.

The basic science (accessible to an intelligent lay reader) can be found in Michel Morange, *The Misunderstood Gene* (2001). Morange is not a philosopher but a biologist and historian of science; however, his treatment of genetics is judicious and balanced enough to satisfy any philosopher. He also, conveniently, has authored a *History of Molecular Biology* (1998).

The basic reductionist text is Richard Dawkins's *The Selfish Gene* (1989). Kim Sterelny, *Dawkins vs. Gould* (2001), summarizes one controversy. And Richard Lewontin, in *It Ain't Necessarily So: The Dream of the Human Genome and Other Illusions* (2000a), and *The Triple Helix: Gene, Organism, and Environment* (2000b), provides the best-known anti-reductionist counterpoint.

Many traditional philosophers of science, including philosophers of biology, are critical of social-constructionist interpretations of the sciences, including the biomedical sciences. (See Chapter 25 below.) The major social constructionist who has worked closely with biological research communities and provided detailed quasi-anthropological accounts of what goes on there is Karin Knorr-Cetina, beginning with her *The Manufacture of Knowledge* (1981), but continuing in such studies as "Image Dissection in Natural Scientific Inquiry" (1990, with Klaus Amann). Knorr-Cetina's work neither takes sides in the reductionism controversy nor deals directly with biotechnology, but it could support the claim that much of what passes for pure science in biology is closely

akin to goal-directed biotechnology as found in the industrial genetics labs studied by Krimsky (below).

Finally I'd like to raise the issue as to whether there ought to be a philosophy of biotechnology proper in any kind of general sense. Here I will pick up several threads from Chapter 15 above on philosophy of engineering. One of the reasons why traditional philosophers of biology have little to say about biotechnology beyond the issue of genetic reductionism is that they often (at least implicitly) buy into the notion of biotechnology as simply applied biology. So that is a good beginning here.

The philosopher who has identified technology (in general) with applied science is Mario Bunge, and he has spelled out his approach to biotechnology explicitly in his magnum opus, Treatise on Basic Philosophy (multivolume, each volume with a different date, beginning in 1983; the material on biotechnology is in volume 7, 1985, pp. 246ff.).

Bunge begins: “This section deals with biotechnology” (p. 246); and it becomes obvious very quickly what Bunge’s approach is: “Iatrophilosophy, or the philosophy of medicine . . .”—where he identifies philosophy of biotechnology with philosophy of medicine. Unfortunately, according to Bunge, not much “serious iatrophilosophy” has been published yet, so there is “much that analytically oriented philosophers could do to prepare the terrain” (p. 246).

Bunge continues: “Medicine [recently tapping biology in general and molecular biology in particular] . . . is now on the right track, though it has a long way to go before attaining the rigor and effectiveness of engineering” (p. 246).

For Bunge, “Therapeutics [is] a branch of biotechnology” (p.2 48). And he provides what for him is a telling example: “Once . . . a [biochemical] mechanism [of a pathogen] has been unveiled, the technical problem of designing drugs inhibiting the pathogen can be posed in precise terms” (p. 249). So medicine can become a science, and medical cures are straightforward “engineering” applications of that science.

If this seems too narrow and deterministic, Bunge admits that, “Over the past decades, medicine has gradually . . . adopted the *systemic* model of man as a biopsychosocial entity” (p. 249)—so the range of medical sciences to be applied in bioengineering and biotechnology has been broadened considerably. But

whatever the branch of medical science and therapeutics as straightforward bioengineering, the model is the same: science applied equals engineering or technology. For more detail, see Martin Mahner (with Bunge), in *Foundations of Biophilosophy* (1997).

As we saw in Chapter 15 (as well as in Chapter 5 on Bunge), there are many critics of the application model. Historians of science and technology, for more than 25 years, have attacked the notion that technology (or engineering) is simply applied science (see, for example, Edwin Layton, “A Historical Definition of Engineering,” 1991, where Layton summarizes his own previous work and that of other historians). But I am not aware that any of them have challenged Bunge on biotechnology. Philosophers similarly have challenged the applied science model. For example, in the same volume in which Layton’s historical critique appears, philosopher Steven Goldman (1991) argues that the nature of engineering has been obscured by both scientists and engineers (along with managers and the public), who think along the lines laid out by Bunge. By cloaking their work in the mantle of praise for science—nearly always adding “for the public good”—engineers and their defenders, according to Goldman, are able effectively to mask the “social determinants of technological action” that actually drive modern engineering at every level, including the level of what counts as engineering knowledge. Using example after example of how engineering decision makers almost never pursue the “technical best,” deferring instead to managerial decisions about what to pursue and how far, Goldman concludes: “Engineering thus poses a new set of epistemological problems deriving from a rationality that is different from that of science. The rationality of engineering involves volition, is necessarily uncertain, transient and nonunique, and is explicitly valuational and arbitrary. Engineering also poses a distinctive set of metaphysical problems. The judgment that engineering solutions “work” is a social judgment, so that sociological factors must be brought directly into engineering epistemology and ontology” (Goldman, 1991, p. 140).

These “captive” experts tend to see nothing wrong with the “applied science” model. Goldman attributes this to a kind of cultural blindness: “The purported value neutrality of the technical is an ideologically motivated stratagem.” (Goldman says engineers voluntarily go along with their managers, with whom, on this point at least, they share the ideology.) “It serves,” Goldman goes on, “to insulate from criticism the social factors determining technological action” (p. 141).

Goldman's conclusion is controversial, but it seems to me that both critics and defenders of engineering agree on the "captivity" of engineering practice. Defenders seem to claim that engineering, freed of its constraints, could be more objective—this is clearly Bunge's hope. Critics like Goldman say, instead, that we have to judge engineering—even engineering's epistemology or knowledge claims—not by what it might be, but as it is in the real world.

None of Goldman's examples has anything to do with biotechnology, but so many of the large biochemical and pharmaceutical corporations have their research and development departments involved in biotechnical development that it is easy to see how Goldman's view would be instantiated there as "captive biotechnology."

As I said in Chapter 15, because I think engineering is a key component of any adequate philosophy of technology (see also Durbin, 1991, introduction), I pause for a moment to consider the philosophizing of an engineer, Billy Vaughn Koen (1985, 1991, 2003), who believes both that engineering has been almost totally ignored by philosophers and that he has captured the essentials of *the* engineering method. It also happens that, in his latest book (2003)—which ambitiously turns his engineering method into *the* universal method of human problem solving—Koen also includes a brief comment on the current state of bioengineering, as we will see in a moment.

The essence of the engineering method that Koen thinks he has discovered can be summarized briefly (too briefly?) under two headings: heuristics, and "sota" or state of the art. Koen concludes: "My Rule of Engineering is in every instance to choose the [always fallible] heuristic from what my personal sota takes to be the engineering sota at the time I am required to choose" (Koen, 1991, p. 57).

And: "If . . . all engineers in all cultures and all ages are considered, the overlap [among their sotas] would contain those heuristics absolutely essential to define a person as an engineer" (p. 58).

Again as noted in Chapter 15, Koen has little use for definitions like that of Bunge, that engineering is applied science—though he readily admits that engineers' sotas do include scientific knowledge. Nor does Koen agree wholeheartedly with Goldman's anti-Bunge "captive engineering" view, though he does emphasize that the state of the art in any engineering project clearly must

include managerial and other non-engineering constraints (including public and political input). What Koen wants us to see is that good (he would even say the best) engineering practice always contains the fallibility of heuristics (he thinks unlike science), *but* it is also always bound by best practices of the time, the *sota* or state of the art.

I mentioned that Koen is willing to go far out on a weak branch to generalize: “The responsibility of each *human as engineer* [is] clear. Everyone in society should develop, learn, discover, create, and invent the most effective and beneficial heuristics. In the end, the engineering method is related in fundamental ways to human problem solving at its best” (Koen, 1991, p. 59).

And Koen’s latest book, *Discussion of the Method* (2003), attempts to turn this generalization into *the* universal method of human problemsolving, following in a long line of philosophers (and others) who have attempted to discover such a universal method. And what is relevant here is Koen’s few comments (2003, p. 249) that apply his universal method to an assessment of the state of the art today in bio-engineering: “Both behavioral and genetic engineers recognize that they want change in a highly complex, unknown system and, not surprisingly, instinctively appropriate the title engineer. Saying you are an engineer, however, doesn’t necessarily mean that you are a very good one.

“The present state of the art of both the behavioral and genetic engineer contains the appropriate heuristics for behavioral modification, but few of the heuristics of engineering. . . . Neither has the slightest notion of the importance of making *small changes in the sota, attacking the weak link, or allowing a chance to retreat.*”

This is a serious indictment of genetic (and behavioral) engineering, as currently practiced, and here it comes from an engineer/philosopher, not from one of the public critics of bioengineering and biotechnology.

But Koen's assessment (however brief) of the current state of bioengineering can be challenged. Doing so provides a third step toward a general philosophy of biotechnology. To repeat one more item from Chapter 15, Ana Cuevas Badallo, in an ambitious doctoral thesis (2000), discussed the role of the so-called *engineering sciences* in a new philosophy of technology that would be more adequate than any offered so far. After listing more than a dozen engineering sciences, classical and modern, she chose to focus on the most traditional, so-

called Strength of Materials. But her basic list (pp. 79–80), a very standard list in engineering education, extended from strength of materials to aeronautic engineering, systems of control, management as a part of engineering, and—our focus here—bioengineering and genetic engineering. And she ends her thesis this way: “Here I have analyzed only one theory among the engineering sciences, so the future is open to see if the proposed characterization is correct in relation to other cases—a task beyond our present scope. The conceptual framework presented here needs to be refined through studies of other engineering sciences and their relationships to other natural sciences, to mathematical sciences, and even to the social sciences” (p. 372; my translation).

I believe Cuevas offers a worthwhile qualification on Koen's offhand dismissal. Are there engineering sciences (not unlike cookbook formulas, but at a higher theoretical level) in biotechnology? Cuevas does not say, but her conclusion (above) hints that her thesis might be applicable in that area of engineering every bit as much as in structural engineering. To support this hint, I refer to four crucial discoveries in genetic engineering: cutting DNA strands using *restriction enzymes*; *recombining them*; proliferation of useful genetic materials through *polymerase chain reactions*; and so-called “knockout” or *gene inactivation* studies for the purpose of determining gene activities in a precise way. All of these discoveries are complex and have led to what outsiders might view as cookbook formulas somewhat parallel to strength of materials equations, but it is interesting that people have been awarded major *science* prizes for their discovery, however inseparable the discoveries are from practical goals. I make no claim to being a bioengineering or biotechnology expert, but those who are refer to these breakthroughs as *both* scientific *and* practically oriented in the sense described by Cuevas: Michel Morange says, “The experiment carried out at Stanford by David Jackson, Robert Symons, and Paul Berg and published in 1972 in the *Proceedings of the National Academy of Sciences* marked the beginning of genetic engineering. In this article, Jackson, Symons, and Berg describe how they obtained *in vivo* a hybrid molecule containing both the DNA of the SV40 oncogene and the DNA of an altered form . . . that already included the *E. coli* galactose operon” (Morange, 1998, p. 187).

According to Morange (1998, p. 186), others disagree and credit earlier work—of Werner Arber, Hamilton Smith, and Daniel Nathans, summarized by Arber (1979)—on the use of restriction enzymes to cut or cleave DNA at precise points, of which the Berg group's work was a “natural development.”

The fact that Berg did not receive a Nobel Prize and his predecessors did does not detract from the point made here. Both accomplishments have been recognized (Berg won other prestigious prizes) *both* as important scientific breakthroughs *and* as key techniques for future practical work in genetic engineering.

Still following Morange (1998, p. 231), we come next to PCR, the polymerase chain reaction technique—which Morange says (p. 242), “More than any other technique, has changed the work of molecular biologists.” Here is Morange’s summary of how it has done so: “In 1983 Kary B. Mullis developed a technique for amplifying DNA called the polymerase chain reaction (PCR). [See Mullis, 1990.] PCR can amplify virtually any DNA fragment, even if it is present in only trace amounts in a biological sample, thus allowing it to be characterized. It can aid forensic medicine by characterizing DNA molecules present in biological samples such as hair, traces of blood, and so on. It is sufficiently sensitive to permit the detection and characterization of the rare DNA molecules that persist in animal or human remains thousands of years old. This technique also makes possible a genetic diagnosis on the basis of a single cell. . . . Finally, it permits the early detection of bacterial or viral infections” (p. 231).

All these practical applications led one seemingly jealous previous Nobel Prize winner to call PCR “a mere technical trick” when Mullis won his Nobel in 1993. But Morange (1998, p. 242) clearly thinks it *was* a significant scientific breakthrough as well as a significant breakthrough in genetic engineering.

In a more recent book, Morange (2001, pp. 64ff.) talks about a completely different technique, or set of techniques. The book focuses on gene *function* rather than genes in the abstract or genetic engineering; indeed, Morange says: “My description of gene function is . . . as concrete as possible, giving a precise image of their functions in the most fundamental life processes: development, aging, learning, behavior, the establishment of biological rhythms, and so on” (Morange, 2001, p. 4).

And in that context one particular technique, so-called “gene knockouts,” seems particularly important to him. “Inactivating [a] gene makes it possible to see in which tissues and organs its action is necessary. Conversely, when the product of a gene has been sufficiently studied . . . [even] fully described, it may seem unnecessary to verify the function *in vivo* by a knockout experiment. However, knockout experiments . . . have produced more surprises than even the most

enthusiastic partisans of this new technique expected” (p. 64).

In this case (these cases), the practical payoff is not usually bioengineering but some scientific discovery that may have an impact, say, on clinical medicine. So I may be stretching in bringing this in here, but it does seem to me that such gene knockout experiments represent another case of the kind of theory-practice combination that might exemplify what Cuevas would be seeking in a more complete philosophy of biotechnology.

Summarizing what I have here suggested are first steps toward a comprehensive philosophy of biotechnology, I will first refer to a more recent paper of Cuevas (forthcoming), in which she takes great pains to show that many contributions need to be taken into account in an adequate philosophy of technology (in general). Even Bunge’s applied science model sometimes works, as do approaches that make scientific advances dependent on technological or instrumental advances (e.g., Pitt, 2000)—and a whole host of other approaches; Cuevas is, reluctantly, even willing to say that “technoscience” constructivist approaches (see Hughes, 1988) are sometimes useful. Her point is not that her engineering sciences approach is better than the others. All are necessary, and complementary, for an adequate and complete philosophy of technology in general or any particular technology or set of technologies.

Here I have emphasized, in my approach to an adequate philosophy of biotechnology (including bioengineering), the ethics and politics of biotechnology and genetic engineering, debates about genetic reductionism, and approaches to an *engineering* philosophy of biotechnology for which I have borrowed ideas from Goldman, Koen, and Cuevas. Biotechnology, if we combine these views, is a part of “captive” engineering (Goldman); is necessarily related to the state of the art at any given time (Koen says current genetic engineering is deficient in this regard); and involves key bioengineering theories/techniques (where I have supplemented Cuevas with references to historian of genetics Michel Morange). As Cuevas Badallo says for *any* technology, I would say *biotechnology* is highly complex and has a variety of complicated relationships with genetics and other biological sciences.

A final surprise in all of this can be seen if we turn to the public furor over biotechnology. Far from being illegitimate, public concerns about biotechnology and genetic engineering ought to be expected—even welcomed. Biotechnology may be “the wave of the twenty-first century” (as some say), but if the twentieth

century has taught us anything, scientific and technological developments are fraught with social consequences. Originators of the Human Genome Project were wise to try to deal in advance with the ethical, legal, and social implications of the venture (the so-called ELSI program; see Marshall, 1996; and National Human Genome Research Institute, 1997); and promoters would do well to consider the same for bioengineering, genetic engineering, and biotechnology generally. If developments in biotechnology are to be truly valuable for society, there ought to be public input into their evaluation and management. This does not mean we have to take seriously every outspoken critic of biotechnology or genetic engineering; only that, in a democratic society, public discussion of such issues is welcome.

Sheldon Krimsky's writings open the door to exactly this, and after this long introduction, it's time now to get to Krimsky. He is a product of the Boston University philosophy department in the heyday of Marxists Robert Cohen and Marx Wartofsky (see Chapter 4, above), but he found his academic home at Tufts University in an environmental policy program. He was active in Cambridge-area efforts to control recombinant-DNA developments in the 1970s, and this led to long association with the Federal government's Recombinant-DNA Advisory Council (RAC). See the following Krimsky books: *Genetic Alchemy: The Social History of the Recombinant DNA Controversy* (1982); *Biotechnics and Society: The Rise of Industrial Genetics* (1991); and *Agricultural Biotechnology and the Environment: Science, Policy, and Social Issues* (1996).

What follows is long, selected, and severely truncated, and is taken from Krimsky's *Biotechnics and Society* (1991), Chapter 11 (pp. 205ff):

Biotechnology Assessment: Dilemmas and Opportunities

“Before the introduction of a new biotechnological product or licensing of a new technological production plant, its impact on the general welfare, health, economy, labour situation, culture and socioeconomic structures, etc. should be studied. –Cary Fowler et al., 1988, Rural Advancement Fund International

“Biotechnology is a global issue. It cannot be assigned such attributes as positive, negative, or neutral. Like any other technology, it is inextricably linked to the society in which it is created and used, and will be as socially just or unjust as its milieu . . . rational biotechnology policy must be geared to meet the real needs of the majority of the world's people and the creation of more equitable

and self-reliant societies while in harmony with the environment. –The Bogeve Declaration, 1987

“Previous chapters in this book have shown how the industrialization of applied genetics has contributed to a new generation of social, ethical, legal and ecological problems. The R&D and industrial sectors in biotechnology have aggressively sought product opportunities in the tradition of other high-tech ventures like microelectronics, computers, and robotics. But these industrial revolutions cannot compare to the commercialization of genetics in the public apprehension associated with their successes. Geneticist Steve Gendel asks: 'Why has biotechnology become such a focus for ethical, social, and economic debate while other technologies are all but ignored?' His answer focuses on the subject matter. 'Clearly biological issues touch a sensitive aspect of our culture and lead to deeper and more passionate examination of issues than do issues raised by any other technology.' I would argue that part of the difference lies in the fact that traditional ways of addressing the externalities of industrialization. These challenges are confounding to government regulators and entrepreneurs who place their confidence in the established norms of social governance. . . .

Political Ideology And Biotechnology

“Environmental Traditionalists. Environmentalism, as distinguished from political and social ecology, is rooted in the constellation of laws that protect humans and segments of the ecosystem from the products and processes of industrialization. The vast majority of these laws that have been enacted at the federal level came in response to public concerns over the hazards of the chemical, nuclear, and fossil fuel industries. Environmental traditionalists advocate a modification of the current regulatory system to address the problems of biotechnology. Some modifications, additions, and adaptations to the established regulatory regime of FIFRA, TSCA, and to a lesser degree the Food and Drug Acts, have already been made in response to biotechnology. The vast body of environmental law has not been amended by Congress. However, minor modifications of the existing statutory framework are well within the purview of the traditionalist response to the biotechnology revolution.

“Reactionism. Among those who reject environmental traditionalism are individuals who advocate a libertarian model of technological innovation. According to this view, society should not assume the technology is hazardous before it is *proven* hazardous. Secondly, it is argued that the costs of pursuing

'phantom hazards' is too great for society to bear. They cite ice minus as an example. It took five years and millions of dollars of regulatory review and litigation before an outdoor field test was permitted for an organism with a 'mere' single gene deletion. The tradition of reactionism has attracted those who would eliminate the Delaney amendment for food additives, do risk-benefit balancing in assessing technological hazards, and place more emphasis on tort law and less on regulatory bureaucracy.

“Social Ownership. Proponents of social ownership or social directorship of biotechnology argue their case from either a capitalist or socialist perspective. From the capitalist perspective, social investment should reap social benefit, while private investment should reap private benefit. Since the entire field of biotechnology arose directly from federal funding of molecular biology, under the logic of the economic system the public sector should be a key beneficiary in the outcome. In support of this view Barry Commoner stated: 'We have to ask ourselves about the morality of allowing publicly produced knowledge to be taken over by the owners of capital.' This view is antithetical to the patenting of life-forms or the private appropriation of federally supported discoveries.

“From a socialist perspective, society will get the most out of biotechnology if its productive resources are directed by a state planning group or decentralized planning councils representing broad constituencies in society. Proponents of social ownership cite the direction that biotechnology takes under free market conditions. Profitability, and not social needs, dictates product development.

“Commoner, who advanced a similar argument for the direction of the energy industries, cited public control of technology at the sources of innovation and production as the solution. 'A fundamental question that any of us concerned with biotechnology have to deal with is the problem of governing the development of a new industry. I'm not talking about regulating its impact on the environment. I am talking about the social governance of the means of production.'

“Without socially directed industrial development, Commoner and others argue, biotechnology will serve the interests of large established industrial corporations (petro-chemical and agribusiness) and leave to pure chance the match between the productive capacity of the new technology and its contributions to the central problems of civilization (malnutrition, disease, environmental degradation, lack of inexpensive and clean sources of energy, prohibitively expensive health care).

A Fourth Way: Market Innovation And Social Selection

“Socialist solutions to the problems of postindustrial capitalism have lost much of their currency since the Reagan-Gorbachev era. With the world's major socialist economies (China and the USSR) exploring market alternatives, the rhetoric of centralized planning has far less appeal, even among democratic socialists. There is still much to be socialist about beyond the command economy and state ownership of the modes of production, particularly the public's role in determining the size and allocation of the federal budget for social needs. But state economic socialism does not provide a sensible solution to harnessing biotechnology for the masses—at least not in the advanced capitalist nations.

“What alternatives are there beyond the three cited for the governance of biotechnology? I shall describe a system of social guidance that I refer to as 'market innovation-social selection.' It is based on five premises.

1. The innovation sector and the social guidance sector shall be distinct. The main purpose of the former is to create new marketable ideas—to always be innovating—while the latter must evaluate these ideas within a highly articulated system of social directives.
2. The state shall expand its role in the assessment of new technologies. All new technologies must be evaluated on health and safety, ecological, equity, and ethical criteria.
3. Public participation in the assessment of new technologies shall involve all levels of political jurisdiction.
4. The state shall support maximum innovation in the private sector, but by a conscious process of selection, reinforce those innovations that meet important social needs and provide selective negative pressures against unneeded or unwanted innovations.
5. Only in cases where a robust system of private initiatives fails to meet public needs shall the state assume the role of innovator. However, in such cases (e.g., orphan drugs or recycling projects), innovation and social governance shall be the function of independent government

bodies.

“This system of social guidance for technology is modeled on Darwinian principles where two opposing processes (mutation and selection) provide the basis of growth, change, and balance. Innovation is essential for technological change. But the state's role in selecting among competing technologies has been too limited and weak, and leaves too much to the control and self-interest of the innovation (production) sector. The current system is too product-centered. As a consequence it fails to account for technological directions. Social choices about the broad goals of technology are often the result of, or held hostage to, microeconomic decisions. The position I am advocating builds on a nascent form of technology assessment that began nearly two decades ago.”

Krimsky devotes a long section of his chapter to this fourth possibility, under the heading “Critical School of Technology Assessment,” and in that section he looks at three “critical” approaches to particular biotechnological innovations, beginning with BGH or Bovine Growth Hormone.

“A technology is undesired by some constituency when it is perceived to offer a greater balance of negative to positive utility. The public responds to undesired technologies exclusively through the marketplace. As an example, suppose a new technology is developed for sex selection of children. It may be argued that this technology is not needed by society (there are no sound reasons for selecting the sex of a child) and that it is also unethical as it may create imbalances in the world population or reinforce misogynic social mores. But this argument will not convince everyone and there will most assuredly be a demand for sex selection if it is available. The ‘mixed’ column in Table 11.3 [omitted here] illustrates this scenario. Alternatively, there are technologies that some experts believe society needs but popular opinion is against, such as nuclear power. For commercial genetics, the social discussions over technology have become increasingly complex. In some instances, debates are fruitless because proponents construct basically incommensurate arguments derived from the different variables for technology assessment. A characteristic of such debates is that claims and counterclaims fall on unreceptive ears. There are ideological niters within each camp that treat information or analysis derived from the other as illegitimate. I shall illustrate these along with other issues of technology assessment by applying the assessment parameters in Table 11.2 to several early and promising products of biotechnology. The first case I shall consider is bovine growth hormone (BGH). . . .”

Krimsky then adds similar detailed discussions of herbicide-resistant plants and of developments involving human growth hormone (HGH). He then comes to a final conclusion: "Biotechnology has been responsible for a myriad of technological innovations covering multiple sectors of the economy. These innovations have been amply summarized in this and other works. At the root of these innovations is the conscious rearrangement of biological forms (biotechnics) through genetic controls (gentechnics). Microchanges in the fundamental chemical units of living entities are reflected in the macrochanges taking place in the reconfiguration of the industrial sector. The new symbols applied to genetic science speak to a mechanistic and instrumentalist vision of living things. Yanchinski's terminology 'setting genes to work' and Yoxen's 'life as a productive force' are expressive of the links between the science of living forms and the technology of manufacture that have become the signature of the biotechnological revolution. Goodman et al. use the term 'bio-industrialization' to describe the 'increasing transfer and interchangeability of both industrial processes and inputs between the food, chemicals, and pharmaceuticals sectors.'

"Innovation investment, and development in applied genetics have been robust. The fervor of bio-industrialization is as strong in private as in public sector institutions. It can be felt at the state, federal, and international levels. Not since the discovery of antibiotics has there been this level of expectation associated with biomedical developments. Not since the introduction of hybrid seeds has there been as much excitement within industrial agriculture. The aggressive exploitation of genetic science for practical ends is by and large a healthy development. But equally important are the processes and social mechanisms through which selection of potential applications is carried out. I have argued that the current methods of assessing the impacts of biotechnology and for choosing among alternative technological paths have not been commensurate with the incentives to develop and market new products and to transform methods of production. There are several reasons for this.

"First, there is a confusion of roles. Technological innovation of commercial products should reside primarily with the private sector. The public sector roles should serve to protect society from misdirected technologies. Currently, public sector institutions are too closely identified with the development side of biotechnology. This has resulted in conflicts within federal and state governments over the appropriate regulatory stance.

“Second, universities have lost their role as independent sources of analysis, valuation, and assessment of new biotechnologies. The academic research community in applied genetics has become integrated into a system of commercial development that has brought industry, government, and the university into an unprecedented peacetime partnership.

“Third, the biotechnology revolution has emerged at a time when the social demands on technology are far more complicated than they once were. The social guidance systems have not kept pace with social attitudes. Productivity is only one of several competing values that form part of the public's assessment agenda for technological change. Greater attention is being placed on secondary impacts of technology beyond its direct effects on human health. A new powerful metaphor, Gaia, the organism of earth, is placing new demands on innovations in manufacture and production.

“There is also a new global economic perspective on the effects of technological change. If we modify our packaging materials or develop a microbial process for making cocoa, we may inadvertently but predictably accelerate the rapid depletion of the world's rain forests. These considerations, once the province of fringe ecotopians, have become normalized into public values. Thus, our assessment methods for technology are deficient because social expectations have changed. Periodically, there are examples where the regulatory sector is baffled by a public outcry over what is viewed as an orderly and statutorily correct response to a problem. For example, ALAR, a chemical used to control the ripening time of apples and shown to cause cancer in animals, was eliminated from use when significant segments of the public refused to purchase produce sprayed with the chemical. A similar reaction prompted emergency restrictions on the use of the pesticide ethylene dibromide (EDB) in grain products.

“I have shown that some of the concerns expressed about products derived by genetic engineering techniques fall outside the responsibility of regulatory bodies. Where a product has questionable or potentially negative human health effects or is a clear and present ecological hazard, it has issue-legitimacy within the existing regulatory sectors. However, for those products or technologies with second-order environmental effects, redistributive effects, or that raise ethical dilemmas there are no natural places toward which public debate is channeled. Our federal structure is not currently designed for the public to direct the course of technology, for constituencies to question the social utility of products that are not otherwise deemed hazardous, to evaluate the ecological impacts of

innovations in production, to propose directions for technological development or to solve complex ethical problems associated with new technologies. A market-dominated innovation system makes it extremely difficult for socially guided R&D programs to evolve. There is little guarantee, thus far, that the potential biotechnology offers will correlate with the hierarchy of social needs. Our examples are selective and do not tell the whole story. There are many applications of biotechnology that are not problematic and contribute quality or efficiency to systems of manufacture or the treatment of disease. Those are not the outcomes of biotechnology that place our current system of technology assessment to the test. The cases chosen in this analysis illustrate the complex problems of technological choice that biotechnology puts before us.

“Too many questions related to the effects of biotechnology are defined outside the responsibility of government. Too many of our agencies of government conceive of their role as promoting innovation and development rather than assessment and selectivity. Too many of those in whom we expect objectivity have vested interests in the financial success of a technology. The inevitable outcome of this situation is that organized efforts by nongovernmental groups give up working with federal agencies and work directly with the public and scientists lose their special status in society. We need new institutional models to examine the total system impact of innovations in biotechnology in a manner that responds to multiple constituencies. The assessment of innovations in biotechnology must rise above the current fragmentary approach defined by the regulatory sphere. Comments I made nearly a decade ago are as relevant today ‘The developments in a field bursting with innovative ideas and [unexplored] potential will put to the test the social guidance systems we presently have. But more so, they will test the moral and scientific wisdom of technologically advanced countries on their capacity to counteract the adverse effects of genetic technology before they are realized and become part of the social and economic infrastructure of society.’”

In terms of *controversies*, this seems to involve a set of quadrants at least similar to ones in previous chapters:

Environmental Traditionalists

Reactionism

Social Ownership

A Fourth Way: Critical School of Technology Assessment=From
Technology Assessment to Social, Guidance

Chapter 23

Paul Thompson and Agricultural Technologies

Here is what Thompson's online bio says: “Paul Thompson came to Michigan State in 2003 to assume a position in the Philosophy Department, with partial appointments in the Agricultural Economics and Resource Development Departments. Previously he held positions as Distinguished Professor of Philosophy and Director, Center for Food Animal Productivity and Well-Being, at Purdue University, and prior to that positions as Professor of Philosophy and Agricultural Economics and Director, Center for Science and Technology Policy and Ethics, at Texas A&M University. Professional Interests: American pragmatist approaches in practical ethics; Environmental ethics; Risks and ethics of agricultural and food biotechnology; Science policy; Philosophy of technology; Philosophy of economics.”

Selected Thompson publications are included in the bibliography at the end. The following selections come from only one of Thompson's several books.

Selection one, from *Agricultural Ethics* (1998, pp. 20–23): “. . . What seems likely to me is a regression to the traditionalist moralities of our feudal past. They have never completely left us for over 400 years, and they continue to be influential in agricultural issues today. Several chapters in this book discuss this 'new traditionalism' but the environmental ethics dimension of that discussion was the primary topic of *The Spirit of the Soil* (Thompson, 1995), and the central claims of that book are not repeated here. . . .”

(In a publicity blurb printed at the beginning of the book, Thompson, though he writes in the third person, says: “*The Spirit of the Soil* examines environmental problems in industrial agriculture and challenges environmentalists to think more deeply about the ethical dimensions of agriculture's impact on the environment. Professor Thompson considers environmental problems in industrial agriculture, such as the use of chemical pesticides and biotechnology, from an ethical perspective. He compares four 'world views'—productionism, stewardship, economics, and holism—which frame these issues, and the potential response to them according to different philosophical priorities. All four are found to have their inadequacies. . . . Thompson concludes his analysis with an open-ended and necessarily incomplete formulation of sustainability as the key goal for recapturing the spirit of the soil.”)

Then quote number 1 continues:

The New Traditionalism

“Thus far we have identified two types of change and seen how each gives rise to moral concern about agricultural production. The first type of change is changing technology. New technologies produce unintended consequences, and our attempt to evaluate these unintended and uncertain consequences brings moral considerations to bear on production decisions in new and unsettling ways. Questions about food safety and environmental quality loom large in this category. We have also experienced a second type of change, however, in the application of morality itself. Extension of moral concern to non-human animals has raised questions about farm animal well-being and animal rights. Extension of moral concern to future generations has raised questions about the sustainability of agricultural production. Extension of moral concern to plant and animal species and to natural systems provides the basis for a radical environmentalism that portrays agriculture in a darkly unfavorable light.

“This survey covers many of the value issues that commonly appear in ethical reflections on agricultural production. It omits some issues that are of vital importance simply because they are more frequently related to agricultural distribution and consumption—world hunger and population issues, for example. Those who feel that our technical capability entails a responsibility to solve distribution and consumption problems that have been with us since the dawn of civilization may want to include these issues under the category of technological change. It is not likely that such problems will be resolved by innovative production technology. They address a different class of value concerns altogether and these, too, have been omitted from the volume. Readers should consult William Aiken and Hugh La Follette, *World Hunger and Moral Obligations*, 2nd edition (1995). I have written on the philosophical debate over world hunger in *The Ethics of Aid and Trade* (1992).

“Even excusing this omission, however, an approach aimed only at considering technology’s consequences and the extension of moral concepts fails to touch on one question that has been prominent in every U.S. production policy debate since the turn of the century and has analogues in most industrialized nations around the world. What is the value of the family farm? Is there a moral obligation to save family farms? One might think that this question belongs in

the category of technological change. It is common knowledge that changes in production technology create several trends that militate against relatively small family farms. Technological innovation changes production efficiencies; this in turn changes economies of scale and, more important, creates the treadmill effect whereby farmers who innovate run faster to stay in the same place, while those who fail to innovate fail to survive. If small family farmers are technologically conservative (e.g., reluctant to adopt new technology) the treadmill effect constitutes a bias against them. Even when they are not conservative, the economic climate in which farm failures are accompanied by windfall profits to innovative farmers may well mean that successful farms grow larger. Technological change in other areas affect small farms, too. For example, transportation and information technology is partly responsible for the large supermarket chains that prefer to contract with large-scale suppliers.

“There is no disputing that technological change has made agriculture more competitive, and that this has sometimes made life more difficult for family farmers; but it has made life more difficult for harness makers, too. Simply noting these difficulties falls short of identifying a philosophical problem. Technological impact on the size distribution of farms is not morally significant unless we have some reason to think that the continued existence of family-type farms is valuable in the first place. This is not to say that the harm caused by farm structural change is insignificant. Enlightenment morality provides many reasons to think that harm to economically displaced individuals is very significant, but it is equally significant without regard to the occupation from which the individual is displaced. As such, while we may want to assure that suffering is minimized, or that losers are compensated, or that small farmers’ rights are not violated, we have no reason so far to be concerned about small farms as institutions. Even if we talk about the economic health of rural communities, we do not find a basis for moral concern about the demise of family farms understood as a social institution, for a rural community may do just as well with a tire factory or a rendering plant on its outskirts as it does with a few hundred small farms.

“Enlightenment morality, however it is configured, aims to protect and advance human interests in universal terms. Although Kantian ethics, for example, can explain why it is important that individuals have a high degree of personal autonomy in choosing and pursuing their careers, Kantian ethical categories provide no basis for saying that it is more important for individuals to have a right to farm than to have a right to sell encyclopedias, to become doctors, or to

operate a business establishment. Indeed, part of the achievement of Enlightenment morality is that it separated moral standing from social role. It should come as no surprise that attempts to apply Enlightenment moral theories to a defense of the family farm become tortured.

“Why, then, is family farming singled out for special treatment, and why are masses of non-farmers in industrialized societies willing to spend enormous amounts of public funds to preserve what they perceive to be family farms? The second part of this question has psychological overtones that will not be addressed; the point is to find a moral basis for finding the life of the family farmer special. The most potent thinking on this subject has issued from Kentucky poet and essayist Wendell Berry. The reason that small farms are good is that they cultivate virtue in the character of the farm family. The reasons Berry gives for thinking that farming cultivates virtue do not easily survive condensation and summarization. They have to do with the way that farm families experience the unity and diversity of life. Each member of the family performs diverse roles that are specialized by age and sex. Age and sex are, in turn, precisely the factors that define one’s place in the social order of the family. The family unifies these roles into an order that makes each person’s duty in assuring farm survival easy to grasp. The diversity of tasks are also reflected in the changing of the seasons and in the breadth of the cultural practices, but these, too, are unified by the farm itself. The farm family is at one with nature, and each person both values and is valued by the role relationships that the production practices of the small farm demands. Similar roles bind all members of the rural community (Berry 1977, 1981, 1987).

“What we have in Berry’s thought, then, is a revision of the old traditionalism of the feudal system. . . .

“In fact, Wendell Berry’s literary efforts are representative of an attack on the individualism and universalism of Enlightenment morality that has been sounded in other quarters as well. Alisdair MacIntyre’s *After Virtue* (1981) and *Habits of the Heart* (Bellah et al. 1985) by five co-authors have also taken up the pen against the way that Enlightenment morality fails to account for the historical and geographical rootedness of moral relationships. Both of these works have been linked to the defense of family farms (Comstock 1987). MacIntyre traces his preferred notion of virtue to the philosophy of Aristotle, and John Lyon offers an Aristotelian reading of Wendell Berry in a 1987 review (Lyon 1987). Communitarianism is the closest relative to neo-traditionalism in the

philosophical literature, and it is often taken to be a fundamental and important attack on Enlightenment interpretations of the concept of value (Sandel 1984). Assessing the validity of the communitarian critique of Enlightenment thought is also beyond the present scope.”

Second selection, also from *Agricultural Ethics* (1998, pp. 138–141 and 156–157): “The utilitarian tradition makes welfare considerations philosophically fundamental and justifies rights claims in terms of impact upon general welfare. Thinkers within the utilitarian tradition have remained committed to the idea that consequences for all affected parties must be weighed in the calculation, and that benefits and harms (or now costs) are the rough units in which consequences are to be measured.

“The second strategy has deep roots and clearly inspired the framers of the U.S. Constitution to include a Bill of Rights. It can be found in the writings of Aquinas, Locke and Rousseau, but more recent advocates include Gewirth (1982) and Rawls (1971). Here, rights are the fundamental philosophical concept. As noted, the rights view takes it that there are traits—rights—that must be protected or guaranteed, and that the morality of an act is to be judged according to whether it successfully respects the rights of others. The dual implication of this approach is that some acts judged moral by utilitarians in virtue of producing the greatest good will be judged immoral by rights theorists when individual rights are sacrificed, while some acts that are clearly inefficient when judged by the utilitarian standard are fully consistent with the terms of morality laid down by rights theory. As such, there is a deep philosophical tension between utilitarian philosophers and those who have constructed moral theories based on a concept of rights.

Ethics and Biotechnology

“There are three closing points to be made with respect to ethics and biotechnology. First, the distinction between welfare and rights extends into the deepest levels of philosophy, but there is no necessary correspondence between *philosophical commitments* to welfare or rights and practical, *conceptual commitments* to the assertion or denial of specific rights claims, nor between either of these and the *political commitment* to groups organized around animal welfare or animal rights objectives. The logical and causal links between philosophical views and political activism are contingent upon other factors which make ethical views a poor predictor of an individual’s opinion on

biotechnology.

“Second, although there are different philosophical beliefs and traditions to support rights philosophy, they converge on the belief that philosophies which fail to recognize the primacy of the individual over the general good abandon the most fundamental principles of ethics. As such, those who are philosophically committed to animal rights will conclude that social benefits from biotechnology are 'trumped' by harms to individual animals. Third, major figures in radical (e.g. animal rights) political organizations differ over which deeper philosophical principles best justify the radical initiatives on which they agree. These differences present opportunities for activists and biotechnologists to engage in more-sophisticated debate at the philosophical level than has hitherto taken place. Each of these three points is summarized below.

“Discussion of animal welfare and animal rights is confusing because the terms *welfare* and *rights* might refer to the deep philosophical tension between fundamentally opposing approaches to ethics, but they might refer to the more superficial distinctions already discussed. As just noted, no firm correspondence holds across levels. A utilitarian may well conclude that establishing a legal or custom right is the most efficient way to promote the greater good. A rights theorist who feels that no fundamental rights are at stake with animals may promote a welfare approach. There is certainly no correspondence between the philosophical and political levels, as some of the most radical activists are utilitarian (e.g. welfare-oriented) philosophers, while many rights theorists resist the extension of philosophical rights claims to non-humans.

“The potential for confusion is multiplied by the fact that there are several different philosophical theories that are often included under the rights banner. For the purpose of understanding animal rights views, however, the differences between these views are less important than the fact that they share a rejection of utilitarian emphasis upon making trade-offs between costs and benefits, at least where key rights are concerned. This point is made clear by Tom Regan in an article entitled 'The Case for Animal Rights' (1985).

“What has value for the utilitarian is the satisfaction of an individual's interests, not the individual whose interests they are. A universe in which you satisfy your desire for water, food and warmth is, other things being equal, better than a universe in which these desires are frustrated. And the same is true in the case of an animal with similar desires. But neither you nor the animal have any value in

your own right. Only your feelings do (p. 19).

“Regan goes on to criticize this view with a story in which the rich but stingy Aunt Bea is murdered and her wealth is distributed to needy people. Regan adopts the rights view because he thinks that utilitarianism justifies this act in virtue of the greater good achieved. Although this is a very incomplete argument for rights, it is a conclusion widely shared by rights theorists, including those who are unwilling to extend rights to animals. All those who argue philosophically for animal rights reject utilitarian ethics. The utilitarians themselves have extended moral concern to non-human animals for the simple reason that non-humans have feelings, too. Non-humans experience pain and satisfaction, though the character and degree of these feelings can be difficult to assess. For example, Peter Singer’s well-known work on animals derives from the simple observation that some animals, including most agricultural species, undoubtedly feel pain. Singer’s utilitarian views lead him to conclude that the suffering of non-human animals should be weighed against the benefits that humans derive from the use of animals. Singer’s philosophical work on animal suffering denies the validity of animal rights, except in so far as rights claims are based on underlying consideration of tradeoffs. Singer does not think that animals have a right to life and, indeed, has argued that humane slaughter of an animal is not a serious ethical affront to non-human animals. Nevertheless, Singer believes that the scale of modern animal agriculture makes it impossible to raise animals under appropriate conditions and to slaughter them humanely. He has, consequently, continued to advocate radical reform of animal agriculture and he has continued to be associated with political groups allied under the banner of animal rights (see Singer, 1979). Peter Singer is therefore one person committed to radical reform at the political level but opposed to animal rights at the philosophical level.

“Singer’s work has been criticized by philosophers such as Bernard Rollin and Tom Regan, who have found fault in the fact that Singer’s reasoning permits abuse of individual animals whenever the compensating benefits for humans or for other animals are great. Rollin and Regan themselves differ, however, on the question of how much reform is called for. Rollin (1981) supports relatively modest reforms of agricultural production systems which would protect an animal’s right to satisfy biological needs (Rollin, 1995). Regan (1983), however, argues that animals have a right to live out their natural lifespan, and though he does not stipulate this as an absolute right, Regan nevertheless feels that it is sufficient to require humans to practice vegetarianism under all but the most

extreme circumstances. Rollin is therefore an example of a person who might be classified as an animal welfare activist with respect to his political objectives, despite the fact that he is well-known for advocating a philosophical view of animal rights. Regan is clearly committed to animal rights both politically and philosophically.

Conclusion

“Although the philosophical distinction between welfare and rights may seem arcane to scientists working on biotechnology, seeing how the welfare/rights distinction is made at different levels of debate is crucial. A call for animal rights is not necessarily inimical to the interests of scientists, nor is a philosopher who, like Peter Singer, adopts an animal welfare rather than an animal rights perspective, necessarily supporting moderate reforms. Selections from the work of Singer, Rollin, and Regan are routinely taught in introductory philosophy classes that stress contemporary moral issues. These writings are attractive to philosophy instructors because they provide a clear contrast of how rights arguments differ from those that stress welfare or utility. A scientist who has obviously failed to master concepts taught in freshman philosophy classes will appear ignorant and unsophisticated to those individuals who received their most systematic exposure to animal issues in such classes.

“At this point in time, the relationship between concern for animal well-being and biotechnology is highly tentative. Individuals and groups associated with both animal welfare and animal rights (understood as a political distinction), which are already poised in opposition to scientists, have potential allies for political action in producer and environmental groups and have legitimate questions about the impact of genomic research on animals. To the extent that scientists come to be perceived as lacking compassion or as lacking the ability to address animal issues articulately, the stage is set for confrontation. However, biotechnology can also do much to improve the lot of animals. As such, the confrontational nature of this issue should not be regarded as fixed. Opportunities for communication and better understanding of the issues exist, and it is in the self-interest of scientists in biotechnology to conduct an open and thoughtful review of animal well-being issues (see Thompson, 1997a and b). . . .

Conclusion [on BST, pp. 156–157]

“The ethical controversy over BST arose because, like many technologies, it may

produce some effects that are unwanted. There is no reason to think that the unwanted consequences of BST are particularly dramatic or extreme, but the fact that decision makers within public research organizations and private companies can affect others makes these unwanted outcomes an issue of some significance. The significance has escalated, however, because of the food safety questions that have been raised, and because of the climate of uncertainty that they generated. It is the uncertainty issue that truly threatens to keep BST off the market at this writing, and it is one that the developers of the technology had no reason to expect.

“This, in turn, leads to the questions of trust that are crucial to democratic institutions. This is not to say that the success or failure of U.S. constitutional democracy hangs upon the BST decision, but this policy problem can be expected to recur in the future with respect to other technology. American society must resolve whether we can expect to develop biotechnology products in an orderly and efficient manner.”

Finally, I add an exchange with Hickman (see Chapter 14 above) in which Thompson differentiates his version of pragmatism from Hickman's: “My kind of pragmatism is particularly relevant with respect to problems in which technological artifacts, technically complex machinery or systems, and scientifically advanced forms of expertise figure prominently. Hickman's book offers a number of arguments and observations that establish the relevance of my own more detailed and context specific studies, and for that I am appreciative. First, lingering influences of foundational epistemology and 'straight line instrumentalism' create a cultural climate in which complexity can lead to stupidity. Second, values continue to be sadly neglected when technology enters the picture. Third, the cult of expertise is with us still, and the best response is to open the black boxes and have a look. Opening the black boxes, however, requires attention to the specific context and to details. Hickman certainly does not oppose philosophy that does this; he welcomes it. But precious few black boxes actually get opened in the pages of *Philosophical Tools*.

“So, is Thompson just bitching about the fact that Hickman does Hickman style philosophy, rather than Thompson style philosophy, despite the fact that they agree on every important question of substance? Is the problem that Hickman should have written about agricultural biotechnology, rather than the book he did write? In my own defense here, I will assert that questions of emphasis and choice of topic should matter more to pragmatists than they do to unreconstructed

analysts or postmodernists. Dewey argued for a reorientation of disciplinary philosophy toward more specific engagement with problems of nonphilosophers. As Michael Eldredge (1998) has demonstrated convincingly, Dewey lived up to his own demands for an alteration of practice (as has Hickman, as anyone familiar with his yeoman service to unpopular causes and marginalized groups at Texas A&M University will readily attest). Yet for both Dewey and Hickman, that practice has mostly been engaged in causes and problems that would conventionally be characterized as social or political, rather than technological. As such, Hickman stops short, I would argue, of really extending his view into the philosophy of technology.

“In fact, the philosophical work being done in *Philosophical Tools for Technological Culture* is merely a propaedeutic for engagement with technological practice. When Hickman is called upon to illustrate productive pragmatism, he does not cite my work (or Don Ihde or Andrew Feenberg or Stan Carpenter or Kristin Shrader-Frechette or Andrew Light), but two very political examples in which philosophers play minimal roles: the old Office of Technology Assessment, and Randy Shaw’s activism in San Francisco. Neither example tells us much about the reconstruction of philosophy, much less the philosophy of technology. . . .

“I am happy to be characterized as a fellow-traveler with Hickman, and I will probably find many occasions to cite this book. It is, nevertheless, something of a disappointment from the standpoint of pragmatic philosophy of technology. Neither pragmatic enough nor writing sufficiently *about* technological culture, Hickman fails to undertake a reconstruction of our field of philosophy on the principles that he advocates. Our current intellectual milieu, so depressingly like Dewey’s own, demands a philosophical practice that engages technological problems. Dewey gave us the arguments for doing that, and Hickman reiterates those arguments in an updated dialog with a host of intellectuals who still do not get it. That is a step in the right direction, but it is not yet putting pragmatism to work.”

As my selections earlier indicate, Thompson also has a focus on philosophy and agriculture more broadly than just agricultural biotechnology, with a large body of work to deal with. His writings on that are often technical, both in the technology assessment-statistical analysis sense and in his use of government documents. Some of these writings do not suit my framework here very well—for example, some of what I have already quoted, above, has little to do with

technology—but he has taken enough controversial stances on various broad issues for us to figure out where he would want to stand.

One final issue in this chapter. Thompson may at times seem to stand alone among philosophers associated with SPT in his focus on agriculture and even agricultural biotechnology. But as early as SPT's third president, Kristin Shrader-Frechette, I listed one of her publications (with Lynton Caldwell), *Policy for Land: Law and Ethics* (1992), that echoes some of Thompson's concerns. And still earlier, from the very beginnings of SPT, Stanley Carpenter had championed first “appropriate technology” and then later “sustainability” at many SPT conferences. And finally, in Chapter 21, we have seen Andrew Light champion restoration ecology (his efforts are shared by fellow editor of the Borgmann volume, Eric Higgs); that movement has caught on, not only with respect to demonstration projects outside big cities like Chicago, but also among some Midwestern farmers in the USA trying to restore prairies to something like the state they were in when the first white settlers moved west. Nor should I fail to mention that many philosophers in SPT share Thompson's interest in (if not necessarily his views on) the animal rights issue.

Controversies?

By his own account, Thompson is a pragmatist, though he and Hickman differ on what that means. For Thompson it means getting involved in regulatory processes, with respect to agriculture and agriculturally related biotechnologies. (In terms of liberal politics, I suspect Thompson is more centrist than Hickman, and far more than the near-socialism of Mead or Dewey.) Like Shrader-Frechette (in Chapter 3 above), Thompson's opponents are often bureaucrats not doing their job well in terms of protecting the public. But he also opposes activists who haven't done their homework. And Thompson has been critical of Borgmann, as well as Marxism.

In one sense, this completes my 30-year history of controversies within the Society for Philosophy and Technology. Thompson had not yet turned over the president's gavel in 2005, and his focus on biotechnology as applied in agriculture could be said to be the last major subfield to be explored within an academic philosophy of technology—and that, actually, by few SPT philosophers other than Thompson himself. However, I want to end the book with two challenges to the academic model.

The first comes from what amounts to a parallel field that never quite made it into the academic mainstream any better than philosophy *and* technology; it flies under several banners, but the best known group is the Popular Culture Association. With respect to technology, there is another group that does pretty much the same thing, the Humanities and Technology Association. These two associations, and others like them, emphasize *popular culture* within our technological society, rather than *technological culture* as a whole or on a grand scale. The challenge to SPT-type philosophizing here might aptly be characterized as Low Church versus High Church, or popular culture versus high culture—two themes that will come up in Chapters 24 and 25.

The second challenge is more direct. In the name of postmodernism, it challenges the very idea of academic respectability. I take up that topic in Chapter 25.

Chapter 24

Philosophy and “Quotidian” Technologies: Hickman and Light

In this chapter I look at a claim most commonly associated with John Dewey, who opposed dichotomized either-or thinking in every realm of thought. In the case at hand, Dewey opposed the standard distinction between High Art and the processes and products associated with normal everyday instrumentalities. Larry Hickman (see Chapter 14, above), taking a cue from Hannah Arendt, refers to them as "quotidian artifacts"—including not only the artifacts themselves but also their production and use. In another essay (in a volume edited by Lester Embree), Hickman is explicit about opposing traditional High Art to popular movies and TV. Andrew Light (see Chapter 21, above), in his *Reel Arguments* (2003), addresses some of the same issues in a single field, film and film criticism.

Hickman, in "The Phenomenology of the Quotidian Artifact" (1988), sets the tone for this chapter. He says: "In chapter four of *The Human Condition* Hannah Arendt suggests that quotidian artifacts, such as the tables and chairs that we utilize on a daily basis, serve to stabilize human life. Between the private vagaries (one might even say the randomness) of human subjectivity on the one hand and the 'sublime indifference of untouched nature' on the other, there is a man-made world protecting us from both.

"She continues: 'Only we who have erected the objectivity of a world of our own from what nature gives us, who have built it into the environment of nature so that we are protected from her, can look upon nature as something 'objective.' Without a world between men and nature, there is eternal movement, but no objectivity.'

"Arendt ultimately concludes that it is neither in the activities of *animal laborans*, whose goal is to break out of his servitude to nature and the earth, nor in those of *homo faber*, who is both creator of human artifice and, consequently, destroyer of nature, that we find the measure of all use-things. Rather, it is the activities of man the thinker and doer that provide such meaning. Her and his activities have no aim outside themselves. They allow for a continually receding horizon of human dreams, hopes, and self-definition. But man the thinker can neither succeed nor survive without *homo faber*, that is, without 'the help of the artist, of poets and historiographers, of monument-builders or writers, because

without them the only product of their activity, the story they enact and tell, would not survive at all.'

“The role of *homo faber* for Arendt is thus central to human life. It completes and supplants the activity of *animal laborans*, releasing him and her from their onerous tasks and stabilizing human life against the uncaring cycles of the household of nature. But it also renders palpable and permanent the various efforts of thinking man, rescuing him and it from the subjectivity of the private and unexpressed.

“To those of us who hold the view that the humanities and the social sciences have too long neglected the implications of the concrete moments of human experience during their long and severe bondage to an almost exclusive preoccupation with the abstract and transcendent features of our lives, Arendt's remarks are both suggestive and welcome. Her attention to concrete artifacts acknowledges and further excavates the very touchstone which has been lacking in large segments of the various traditions of abstract philosophy.”

Hickman continues: “But how does such stabilization take place?”

“Arendt has pointed the way to an answer with her suggestion that attention be turned to the functions of technical *quotidiana*. One such study was undertaken by Marshall McLuhan, who examined media as the extensions of man and laid bare what he called 'the folklore of industrial man.' One of McLuhan's best known theses was that changes in technological systems or paradigms alter the most fundamental ways in which human beings interact with their world; and that the agents of these changes are the quotidian artifacts that most of us ignore because of our very familiarity with them.”

Referring to a number of more recent authors, Hickman pursues the theme and connects it to American Pragmatism: “Their work is especially important in the sense that they seek to continue the work of the American Pragmatists, C.S. Peirce, John Dewey, and G.H. Mead, whose work has never been thoroughly mined for its many insights into this area. In true pragmatic fashion they are, for example, more interested in the *terminus ad quem* than in the *terminus a quo* of objects, and even analyze domestic objects as special kinds of signs, in the Peircean senses of that term.”

Hickman then launches into a long discussion of popular literature in terms of the

novels of John Updike, whom he calls the “most quotidian of contemporary American writers.” But Hickman is also interested in films or movies, and I will follow him and Andrew Light and start there.

Section One: "Film Criticism" versus the Movies and TV

In another essay, “Literacy, Mediacy and Technological Determinism” (1990), Hickman brings this kind of thinking to focus on what he takes to be a spurious opposition between art and film: “Those whom I designate 'text-type determinists,' including Albert Borgmann, grade texts into paper-based 'traditional' ones, which they claim to be superior because their use makes us critical, and mylar-, celluloid- and vinyl- based 'technological' ones, which they claim to be inferior because their use makes us lazy. Their argument is essentialist and determinist: it claims that texts have essences that determine the form of life of their users. Against them I advance the instrumentalist argument that texts have essences only in the functional sense that they comprise sets of constraints and sets of facilities. Regardless of their type, texts are tools which may be used to enhance delight and resolve difficulties; sorting them into inferior and superior types should be done on the basis of the extent to which this is possible. The development and use of critical intelligence is not uniquely linked to any one text-type. To be 'mediate' is to engage texts of all types, including traditional literary ones.”

Andrew Light, in his *Reel Arguments: Film, Philosophy and Social Criticism*, addresses some of the same issues in a single field, film and film criticism.

I quote from Douglas Kellner, another philosopher expert on these matters, as quoted on the outside of Light's book: “In *Reel Arguments*, Andrew Light dissects the discourses and politics embedded in a wide range of film ranging from Hollywood political thrillers to European art films. Light's interrogations show how philosophical scrutiny of films yields surprising insights and perspectives and how films are themselves more philosophical and political than most people are aware.”

Another tribute to the book comes from Charles Mills: “If you thought you had to choose between doing philosophy and going to the movies, think again. In this lively and accessibly written book, refreshingly free from the jargon of either side, Andrew Light demonstrates that you can do both. Whether it's the surveillance society or the urban wilderness, the politics of race and class or the

politics of environmentalism, films are definitely taking a position on socio-political issues—and Light provides an illuminating guide on how we can 'read' them philosophically.”

Here is the way Light ends his book, in a chapter called “Spike Lee, Chico Mendes, and the Representation of Political Identity”: “Conflicts over the meaning and implications of an identity exist for both the detached and attached varieties of political identity, and so both are important for trying to understand this kind of politics. A bad portrayal of any identity, especially one that fails to provide the motivation of characters depicting that identity, is an offense to the political commitment and motivations of actual people who hold these views. Part of the power of film, with its potential for portraying complex characters, is that it can rise above such failings and help us both to grasp the motivations of various political actors and groups and in turn enrich our understanding of our own moral, political, and social motivations. With this power comes responsibility, which, when exercised and balanced with lively and entertaining images, produces something truly beautiful” (p. 168).

Earlier in the book, Light had raised an issue about what he calls an “aesthetics of everyday life” by focusing on Wim Wenders's film, “Alice in the Cities.” Light uses that discussion, among other things, to examine “an unfolding debate between Albert Borgmann and Andrew Feenberg, two philosophers who have written extensively on the possibility of technological reform for the purpose of enriching everyday life” (p. 56).

Introducing these participants to debates over the esthetic meaning of everyday life—Borgmann a neo-Heideggerian and Feenberg a neo-Marxist—suggests that we are dealing here, at bottom, with a fairly standard range of esthetic views, from “socialist realism” to the esthetic permissiveness of non-Communist socialist countries to a popular culture versus high culture split, where it is alleged to be necessary to impose “objective standards” of beauty to distinguish between what is popular but crass and the truly beautiful (in this case, with respect to films; the broader issue will come up in the next section).

Here I have followed Light and Hickman in beginning with film or the movies, but I now want to look at some other arenas in which it is alleged that there are pernicious dichotomies separating—in thought and valuation—higher from lower arts or technologies.

The other issues I look at are: arts and the media more broadly than just the movies (“high culture” versus “mass culture”); education, including Dewey's old nemesis, “classical education” (including the manner in which it is supposed to be taught), and so-called vocational education; and the contemporary health or health economics crisis (where I will contrast academic bioethics with approaches that deal with health care concerns in the real world of hospitals and other institutions heavily dependent on large pieces of medical equipment and the experts trained to use them).

Such pernicious dichotomies predominate in many other areas both of contemporary scholarship and of policy literature as it appears in the media, whether print or electronic.

Examples include the dichotomies involved in focusing concerns about environmental sustainability on global issues rather on the sustainability of local communities; or, similarly, of emphasizing so-called globalization at the cost of negative impacts on local economies, especially in less developed parts of the world. In general, this is an issue of focusing on big problems and proposed solutions at the expense of smaller local issues. However, covering so many topics with so many nuances in this short chapter would take away from the general focus of this book: namely, the contributions, or lack thereof, of philosophers associated with SPT to controversies over such issues. By limiting myself to four cases, both the points made and the controversies involved should be clearer.

Section Two: Popular Culture versus High Culture Generally

Two organizations dealing with technology in the broad sense grew up in the USA more or less simultaneously with SPT: the Humanities and Technology Association, and the Popular Culture Association. A few members of SPT, including myself, attended annual meetings of these two associations, as did a small number of other philosophers.

But the meetings were dominated by historians and English professors and social scientists, all convinced that popular culture has much to offer the scholar in terms of issues, institutions, groups, and agencies in contemporary society to be taken more seriously as objects of study than is customary in academia today. Sex in a variety of forms is a perennial topic, but so are popular magazines, barbershops, the kitchen, and so on and on. Taking “technology” in the broad

sense of the term, these activities, agencies, and institutions—including the tools of the trade and other aspects of the material culture thereof, along with the people and groups involved—seldom appear in the pages of SPT publications, except when the focus is some native culture or some period early in the history of modern technology. Hickman and Light and a handful of other SPT philosophers lament this omission; and at least Hickman laments it out of deference to John Dewey.

As in all other aspects of his thought, Dewey deplored dichotomized thinking, but nowhere more than in terms of the all too popular distinction between the “high art” of museums and the popular or everyday arts and crafts, between “serious” artists or writers and ordinary workers making a living by making and doing ordinary things. It's not that Dewey didn't recognize a difference between pedestrian (he sometimes called it “mechanical”) work and work that is “meaningful”: his hope, in fact, was that through appropriate changes in education or schooling, more workers—including non-paid workers in the home—would come to find their work meaningful. A large portion of Dewey's book, *A Common Faith* (1934), is devoted to that theme.

Robert Westbrook, in *John Dewey and American Democracy* (1991, pp. 387ff), after devoting several pages to the relationship between Dewey and Albert Barnes—the eccentric art enthusiast and founder of the Barnes Foundation outside Philadelphia, with its unique art education program favoring ordinary people rather than the elite of the city—devotes several more pages to Dewey's aesthetics best represented in *Art as Experience* (1934). I particularly like this long passage from Dewey that Westbrook quotes: “In order to *understand* the esthetic in its ultimate and approved forms, one must begin with it in the raw; in the events and scenes that hold the attentive eye and ear of man, arousing his interest and affording him enjoyment as he looks and listens: the sights that hold the crowd—the fire engine rushing by; the machines excavating enormous holes in the earth; the human-fly climbing the steeple-side; the man perched high in air on the girders throwing and catching red-hot bolts. The sources of art in human experience will be learned by him who sees how the tense grace of the ballplayer infects the onlooking crowd; who notes delight of the housewife in tending her plants, and the intent interest of her goodman in tending the patch of green in front of the house; the zest of the spectator in poking the wood burning on the hearth and in watching the darting flames and crumbling coals” (*Art as Experience*, pp. 10–11).

Later Westbrook draws out the radical political implications of Dewey's views on esthetics: "*Art as Experience* was not incidental to the radical politics that absorbed Dewey in the 1930s. Indeed, it was one of the most powerful statements of that politics, for it clearly indicated that his was not a radicalism directed solely to the material well-being of the American people but directed as well to the provision of consummatory experience that could be found only outside the circulation of commodities" (pp. 401–402).

And Westbrook backs up this conclusion with another long quote from *Art as Experience* (p. 346): "Oligarchical control from the outside of the processes and the products of work is the chief force in preventing the worker from having that intimate interest in what he does and makes that is an essential prerequisite of esthetic satisfaction. There is nothing in the nature of machine production *per se* that is an insuperable obstacle in the way of workers' consciousness of the meaning of what they do and enjoyment of the satisfactions of companionship and of useful work well done. The psychological conditions resulting from private control of the labor of other men for the sake of private gain, rather than any fixed psychological or economic law, are the forces that suppress and limit esthetic quality in the experience that accompanies processes of production."

Sociologist Herbert Gans, in *Popular Culture and High Culture* (1974), makes a case for mass culture; he is even explicit about rejecting some cultural reformers' claims to be educating people in the appreciation of esthetically preferable materials: "Subcultural programming is intended to give people *what they judge to be good rather than what they want*, and thus strives for the same level of excellence as high culture, except that the standards used to define excellence will differ among taste publics. The choice of good culture is not monopolized by the high culture public; most of the time, people from all taste publics want the art, information, and entertainment they judge to be good and, unless they are deliberately seeking escape, few will intentionally choose what they think is bad. Even so, one of the purposes of entertainment is to satisfy the wish for escape, among high culture publics as well as others, and I see nothing wrong with it. . . . [Indeed] to deprive people of escapist culture in the hope of reforming them is a spurious policy; it treats the effects of deprivation and not the cause" (p. 137).

Gans's view here depends on two sets of definitions he had provided earlier: differing "taste publics and cultures" (in Chapter 2, Gans lists five: high, upper middle, lower middle, low, and "quasi-low folk"—which he then elaborates on, admitting newer forms, such as "youth" and ethnic, encompassing not only

African-American but other subcultures related to other cultural origins); and the “subcultural programming” that he espouses.

Subcultural programming is defined (pp. 132–134) as a policy that would “enable audiences to find content [for example, on radio and TV, but also in other entertainment arenas] best suited to their wants and needs, thus increasing their aesthetic and other satisfactions, and the relevance of their culture to their lives.” Gans goes on say it should “serve the taste publics which are poorly served today”—especially low taste publics and the elderly, but even middle-aged publics whose tastes do not match those of contemporary advertising-driven mass media.

Gans lists among the proponents of a “mass (or popular) culture critique” both authors on the left (he singles out Herbert Marcuse and other “new left” authors) and on the right (he lists Jacques Ellul among Europeans and Russell Kirk among Americans)—all of whom he accuses of a bias in favor of high culture standards. Perhaps because he was writing before the appearance of Daniel Bell's *The Cultural Contradictions of Capitalism* (1976), Gans does not specifically mention the latter's neo-conservative critique of the lack of cultural standards in “postindustrial” technological society. Nor does Gans discuss Dewey's (much less Hickman's later) rejection of any and all dichotomized thinking in terms of high and low cultures.

Section Three: Career or Vocational Training versus Lifelong Learning

This section will be short, but again Westbrook (pp. 173ff) is a good guide on Dewey's involvement in a “vocational education controversy” in the USA in the first decades of the twentieth century: “Just how radical Dewey's program for democratic education was became apparent in the arguments he advanced in the debate over vocational education which occupied American educators in the decade before World War I.”

A couple of pages later, Westbrook details the adversaries in the debate: “Although vocational education won wide support, the supporters profoundly disagreed about the direction such industrial training should take. The most prominent issue was whether industrial education should be integrated into the existing public school system or made a separate system under separate control. Business and labor split cleanly on this issue, with businessmen acting as the strongest advocates of a dual system” (p. 175).

Westbrook continues: “Dewey was one of the most vocal opponents of the dual system. He feared, above all, that the kind of vocational education favored by businessmen and their allies was a form of class education which would make the schools a more efficient agency for the reproduction of an undemocratic society. . . . [Dewey] noted that 'those who believe in the continued existence of what they are pleased to call the 'lower classes' or the 'laboring classes' would naturally rejoice to have schools in which these 'classes' would be segregated. And some employers of labor would doubtless rejoice to have schools, supported by public taxation, supply them with additional food for their mills” (p. 175).

I mention this controversy, not because it has much salience today—vocational education supporters long ago won their separate system in spite of labor unions' and Dewey's opposition—but as an introduction to what has been a hot topic in recent decades in the USA, calls for basic educational reforms. And Dewey, as an advocate of what they oppose as “progressive education,” has been a favorite whipping boy for conservative back-to-basics reformers. The movement has culminated in President George W. Bush's No Child Left Behind program put in place throughout the country in the first decade of the twenty-first century.

I dealt briefly with this issue in Chapter 4 of my *Social Responsibility in Science, Technology, and Medicine* (1992). But Larry Hickman, in his *Philosophical Tools for Technological Culture* (2001), deals with the issues at greater length—all the while trying to be faithful to Dewey's legacy and to update it to deal with contemporary problems. In Chapter 5, Hickman takes on the religious conservatives who are so often associated with the idea of back-to-basics reforms. One feature of his discussion has to do with teaching creationism in the schools, so it's obvious that he was writing before the current version of that controversy, so-called “intelligent design” and opening up the classroom to discussion of that as an alternative to teaching evolution in biology classes. But more important is where Hickman and Dewey stand on educational methods.

Here is Hickman: “What Dewey called 'a loose, scrappy and talkative education' . . . (a type of education that, he lamented, its proponents have sometimes termed 'progressive') tends to reinforce the worst elements of this [opinion polling] situation. Where such practices prevail, there has been little success in 'converting prejudiced and emotional habits of mind into scientific interest and capacity'

“But if Dewey was against what is 'loose, scrappy and talkative' in education, he was equally opposed to rigid hierarchical educational structures. He regarded such structures as both anti-technoscientific and anti-democratic” (p. 111).

Hickman goes on: “Dewey argued that the interests and aptitudes of child and worker alike must be engaged, coordinated, and liberated through education that continues throughout a lifetime. Where this fails to occur, both study and work become dull, rote, and 'mindless’” (p. 113).

And: “The danger of the propagation of 'creation science' in the classroom and among the wider public is not, then, that evolution as fact and as theory will cease to be a part of the body of technoscientific knowledge. . . . The danger is rather to the capacities of affected individuals to appropriate the technoscientific attitude in ways that allow them to adjust to changing circumstances” (p. 113).

Summarizing this section perhaps too succinctly, we see an opposition between “progressive education” and a back-to-basics approach, and between both of those and Dewey's “experimental” method of learning, not only in the schools but in a “lifelong learning” to accompany workers throughout their careers. Again eschewing dichotomies, Dewey (and Hickman with him) want an educational approach that is both rigorous *and* experimental, preparing students and future workers for a constantly changing world. Echoing Dewey's earlier concerns, Hickman would say “vocational education” involves the worst of both worlds: it is typically doctrinaire in its teaching methods, and it fails to produce critical thinking in either the students subjected to it or the technically-trained workers who are its normal products.

Putting the matter this way suggests that I side with Dewey and Hickman, no questions asked. But my approach throughout this book has been to recognize that opponents have arguments to make in rebuttal—here, to Dewey and Hickman. There are eloquent defenders of back-to-basics educational approaches (and not just religious conservatives).

There are still some defenders of “loose, scrappy and talkative” progressive education (though Dewey and Hickman would be loath to call it “progressive”). And, probably most popular of all today, there are defenders of a view that education ought, before anything else, to prepare students—to *really* prepare students—for the careers they will be taking on; vocational education, rather than a minority venture for mostly poor students, should be the norm from

kindergarten through higher education.

Section Four: Technology in Academic and Real-World Bioethics

Daniel Callahan, for example in *The Tyranny of Survival* (1973), is one of the few bioethicists who ever expressed any interest in SPT. Others would include H. Tristram Engelhardt and Edward Erde, and to a lesser extent David Thomasma and Tom Beauchamp. (See, for example, *Research in Philosophy and Technology*, volume 3, 1980). Few philosophers in SPT have done work in bioethics as well—though there are a few women related to SPT, such as Anne Donchin, who have focused especially on the technologies affecting women. Donchin's edited volume, with Rosemarie Tong, and Susan Dodds (2004), is an example, as is her co-edited *Embodying Bioethics: Feminist Advances* (1999), a collection of essays based on presentations at the First International Conference on Feminist Approaches to Bioethics.

Judy Wajcman, summarizing feminism and technology in Sheila Jasanoff et al., *Handbook of Science, Technology, and Society* (1995, 1999), refers mostly to historians or sociologists of science and technology rather than to philosophers, and to almost no SPT philosophers, including those concerned with such issues as women and reproductive technologies.

Callahan's (1973) book is philosophical and it is also one of a very few that address the issue of technology's pernicious impact on contemporary medicine. After a serious examination of ethical and political issues raised by the increasing influence on contemporary medicine of expensive machines and the experts who manage them, Callahan maintains that writings about the autonomy of technology “make provocative bedtime reading but little more than that.” People in present-day society are not going to do without their high-tech medicine. A decade later, Callahan would make a name for himself—would gain infamy rather than fame—for a related proposal: perhaps we *should* forgo high-tech medicine in our last stages of life and accept the inevitable. (His most famous supporter was Governor Richard Lamm of Colorado.)

Callahan also included an essay by Hans Jonas, “Toward a Philosophy of Technology,” in *Hastings Center Reports* (February 1979); there Jonas espoused his famous post-Kantian “heuristics of fear”—ethics should “consult our fears” rather than our hopes when it comes to such technologies as genetic engineering. It may have been the case, however, that Callahan was thinking as much of Jonas

as of Jacques Ellul when he counseled skepticism about autonomy of technology theories that “make provocative bedtime reading” and proposed realism instead in assessing biomedical technologies.

But my main interest here focuses on what I perceive to be a high culture versus low culture split in what is now a vast literature on bioethics. The high ground, as we will see in the next chapter on STS studies, is the part of bioethics (or biomedical ethics or, more traditionally, medical ethics) that emphasizes theory. This approach has come to be almost canonized in Tom Beauchamp and James Childress's *Principles of Biomedical Ethics* (5th edition 2000 and counting).

With that I would contrast a case study approach that got its greatest impetus from Albert Jonsen and Stephen Toulmin's *The Abuse of Casuistry* (1988). Jonsen elaborated the approach in an article, “Practice versus Theory” (*Hastings Center Report*, 1990). And a Jonsen team put it into concrete form in *Clinical Ethics* (5th edition, 2001), a vademecum for busy practitioners.

I made my views clear in an article on these issues a few years ago (2000): “Another lesson (I said) has to do with the urgency of the real-world problems that bioethics faces—which are, after all, what got philosophers involved in the first place. Medicine and the health care system generally—including those parts of it that operate in open or covert opposition to the entrenched power of physicians and hospitals—face enormous problems today, from rampant inflation and calls for rationing to the questioning of the very legitimacy of high-technology medicine. All the while, doctors and nurses, etc., must continue to face life and death issues every day. . . .

“It is probably inevitable, given the structure of philosophy today as an academic institution, that philosophical bioethicists will continue narrow technical debates among themselves about ultimate justifications of bioethical decisions. But academicism and careerism in bioethics should be recognized for what they are—distractions . . . from the real focus of bioethics.”

For all the issues here, quadrants would seem to exhibit a pattern similar to earlier chapters:

Classical educators, critics defending "standards"

Progressives opposing dichotomies

Meritocracy, career education

Marxist "education for the revolution," other radical views

Next, and finally, I turn to “postmodernism” and the all-out attack on academicism—especially on the hegemony of science in our technological (or “technoscientific”) culture. It has turned out to be a somewhat ironic attack, since all the critics have become comfortably ensconced in academia; indeed, to the dismay of defenders of science, they have pretty much taken over some humanities departments in major universities.

Chapter 25

Postmodernism and the Social Construction of Technology: Raphael Sassower and Stephen Cutcliffe

It is possible to take many different cuts at this material, but I will limit myself to two. In the first part I will organize the chapter by focusing my remarks on one philosopher long active in SPT, Raphael Sassower. The point in that part will be to relate SPT philosophers to the tradition of postmodern attacks on academia roughly in the same time period as the rise of SPT. In the second part I will turn to another parallel movement (really two movements often treated together) under the heading of Science, Technology, and Society—though the more academic of these two movements sometimes prefers the label Science and Technology Studies. Here one author who is not a philosopher, Stephen Cutcliffe, but who has long worked alongside and with SPT, will play a prominent role; see especially his book, *Ideas, Machines, and Values: An Introduction to Science, Technology, and Society Studies* (2000).

Section One: Postmodernism

Here I can be relatively brief, because Sassower is practically the only philosopher active in SPT to take literary postmodernism seriously. In his *Narrative Experiments* (1989), co-authored with Gayle Ormiston (who never got involved in SPT), Sassower and Ormiston make the strongest possible claim, coming from academics, that *all* literary works, including those in science and technology, are no more than—as the title suggests—*narrative experiments*, attempts by authors to persuade *particular* audiences of their authority. In the process of defending this claim, Sassower also attacks Richard Rorty (see below), social constructionists of science and technology, and literary postmodernists for betraying their own insights: while attacking the hegemonic claims of analytic philosophy, science and technology, and traditional literary criticism, all three—Rorty, social constructionists, and postmodernists—end up privileging their own views.

Ormiston and Sassower, on the other hand, take great pains to demythologize not only technoscience and its defenders but also themselves and other critics, with an explicit appeal to a persuasiveness standard.

Here are Sassower and Ormiston: “The incessant generation of interpretations,

narratives, fictions, systems, and so on presupposes and embraces the concept of plurality. However, it is not the kind of plurality or pluralism championed by Rorty, for example, nor the criteria-bound interpretive pluralism promoted by certain adherents of the social study or sociology of science, nor the hierarchical pluralism advocated in certain trends of contemporary literary criticism. When Rorty distinguishes the post-Philosophical and Philosophical cultures he announces his preference for the post-Philosophical *over* the Philosophical. Notwithstanding his desire for philosophical pluralism, Rorty's *preference* for the post-Philosophical establishes a rank ordering within the plurality. Rorty uses the post-Philosophical as a comprehensive Meta-narrative, thereby *eliminating* the plurality of cultures.

“Today, certain sociologists and philosophers study the scientific enterprise by examining and stressing the social context of that enterprise (as exemplified by the so-called Edinburgh School) and, by doing so, introduce the concept of interpretive pluralism, with respect to both texts and actions, into the picture. Rejecting the claim that the scientific enterprise can be judged only with reference to its particular ‘methodology,’ Steve Woolgar and Steven Yearly, for example, emphasize the social environment in which research is constructed and attempt to distill a plurality of interpretations based on the ‘facts’ supplied by textual records and laboratory activities. In distinguishing between kinds of interpretations, where interpretation is a ‘representational’ device, they declare a preference for a sociological or anthropological approach that will reflect the ‘real’ nature of science. Arguing for the comprehensive character of ‘ethnographical’ or ‘constructionist’ accounts, they privilege their accounts on the basis, as Lyotard would say, of what they do, while at the same time, they *remain* devoted to ‘the very idea’ of ‘science.’”

Despite what Sassower (from now on I will limit myself to him, as the SPT member) says, Rorty has recently, in *Achieving Our Country: Leftist Thought in Twentieth-Century America* (1997), come to a fairly nuanced position. He may attack it, but he admits that analytic philosophy still has its merits: “Nowadays, when analytic philosophers are asked to explain their cultural role and the value of their discipline, they typically fall back on the claim that the study of philosophy helps one see through pretentious, fuzzy thinking. So it does. The intellectual moves which the study of analytic philosophy trained me to make have proved very useful. Whenever, for example, I hear such words as ‘problematize’ and ‘theorize,’ I reach for my analytic philosophy” (pp. 130–131).

All that Rorty objects to in analytic philosophy (at least in this book) is its lack of imagination, its focus on “problems which no nonphilosopher recognizes as problems,” and the fact that it is “largely invisible to the rest of the academy, and thus to the culture as a whole” (p. 125).

In addition, Rorty is as critical of literary postmodernism within the academy—with which he is often associated by critics—as he is of academic philosophy: “I have no doubt,” he writes, “that cultural studies will be as old hat thirty years from now as was logical positivism thirty years after its triumph” (p. 132).

Again: “The Foucauldian academic Left in contemporary America is exactly the sort of Left that the oligarchy dreams of: a Left whose members are so busy unmasking the present that they have no time to discuss what laws need to be passed in order to create a better future”: (p. 139).

Joseph Margolis (see Chapter 6, above) suggests one final item in this first section on the humanities, literary postmodernism, and related topics: Sassower is not the first philosopher associated with SPT to claim that the sciences, even the so-called hard sciences, are as subject to “interpretive pluralism” (echoing the social constructionists) as are the humanities. In *Pragmatism without Foundations: Reconciling Realism and Relativism* (1986), Margolis defends a “robust relativism” in terms very similar to Sassower (and Ormiston): “If there is no convincing way in which to provide a theory of knowledge and inquiry in which inquiry itself is completely transparent, . . . then, globally, there is no way to demarcate the realist and idealist elements of human knowledge. . . . We should then have to concede a hermeneutic dimension to all human science, including the physical sciences” (p. 27).

Margolis then attacks a stalwart of analytic philosophy, W.V. Quine: “The Quinean program is as much an extravagance as the Heideggerian—and for the same reason: it betrays its own most forceful insight” (p. 209). (Margolis takes Quine's most forceful insight to be its legitimation of *praxis*.) Margolis then goes on to discuss what he thinks is a unique overlap in the otherwise opposed views of Heidegger and Marx. (They may be opposed, but they are often joined in postmodern critiques of science and technology.)

Despite the anti-foundationalism of Margolis's pragmatic relativism, it retains a “measure of objectivity,” an objectivity relativized to “the conditions of *praxis*.”

Here is the overlap that Margolis finds: “That transcendental arguments . . . are a species of empirical argument . . . is, broadly speaking, the consequence of Heidegger's thesis of historicity; and that our best clue about the validity of such arguments lies within the stablest technological features of social *praxis* . . . is, broadly speaking, the consequence of Marx's thesis about the relation of production and consciousness” (p. 208).

In the end, Margolis finds “extravagances” in all three philosophers: Heidegger's pessimism, Marx's optimism about laws of history, and Quine's foundationalist physicalism—which Margolis sees as incompatible with any defensible pragmatism. (See his *Reinventing Pragmatism*, 2002.)

So there we have it. Margolis's severely analytical pragmatism comes to many of the same conclusions as Sassower's (and Ormiston's) *Narrative Experiments*.

Section Two: High and Low Church STS, with Critics of Both

Now I turn to Stephen Cutcliffe, especially in his *Ideas, Machines, and Values* (2000). Though a historian of technology rather than a philosopher, Cutcliffe was always close to SPT and gives it more credit in his book than any other historians and sociologists of technology. Aside from myself, most of the philosophers he credits with contributing to advances in STS studies are feminists such as Haraway—originally a primatologist—and Sandra Harding (see Chapter 12 and Feenberg's critique). Surprisingly, he omits Sheila Jasanoff, in spite of her lead role in publishing the *Handbook of STS*, but more importantly in spite of her very philosophical work on science, technology, and legal issues.

Cutcliffe begins the passage I find most relevant with a framework (pp. 79–82):

A Conceptual Framework of Analysis

“Although STS has always had multiple foci, the theme for STS 'subcultures' was first systematically explored by Juan Ilerbaig in an essay published in the *Science, Technology & Society Curriculum Newsletter* in which he described a split between more disciplinary, theory-oriented scholars, often led by European sociologists of science, and more interdisciplinary, issue-centered educators, commonly led by philosophers of technology and engineering ethicists. He further characterizes the dichotomy by attributing to the former a strong science orientation with a more descriptive approach, while noting the latter's technology

focus accompanied by normative or evaluative approaches. In a prompt rejoinder in a subsequent issue of the same newsletter, philosopher Steve Fuller characterized the split as a 'High Church-Low Church' distinction, a catchy turn of phrase that quickly caught on with some STS scholars. In this view Fuller recognized what he saw as an unfortunate division between those programs, often at the graduate level, with 'a discipline-centered, scholarly bent' and those with 'a problem-centered, social activist bent.' Far better in his mind would be an STS *movement* that would at once meld the activist strains of STS with the body of sustained 'critical' knowledge regarding science (and technology) generated by sociological scholars.

“Other scholars continued the discussion, including Leonard Waks, who emphasized the distinction between what he sees as the knowledge and empirically oriented 'academics' and the more 'meliorist,' or 'activist,' social movement educators. Waks would apparently add the historians of science and technology to the lists of the former, but Luis Pablo Martinez took issue with this assignment of historians in a thoughtful paper in which he argues for an 'activist' role for historians of technology because of their ability to 'contextual [ize] accounts of technological developments in the past.' Although speaking to a different audience in his presidential address to the Society for the History of Technology, Alex Roland argued much the same point in rationalizing the value of the history of technology. He views the field as a community of scholars that has amassed a knowledge base essential to understanding how technology contributes to societal and contextual change.

“Still other scholars have pushed the debate even further. Li Bocong, a philosopher in the Department of Science and Technology at the Chinese Academy of Sciences, has called our attention to the cultural split between already developed, even postindustrial, nations and those such as China still in the process of industrializing, and the implications this has for the STS field. Richard Gosden of the Department of Science and Technology Studies at the University of Wollongong in an essay in *Technoscience*, the newsletter of the Society for the Social Studies of Science, sees the High Church-Low Church distinction, which he characterizes as being 'principally oriented in their research either to the problem of 'truth,' or alternatively, to the problem of 'justice,' as being further fragmented into what he views as four 'corner posts' for the field.

He identifies these posts as:

1. the dominant form of 'justice' within our society, that is capitalism or market justice (MJ);
2. its catchall alternative of victim justice (VJ);
3. the dominant epistemological authority within our society of scientific positivism (SP); and
4. its epistemological antagonist—science-as-social-construction, scientific relativism (SR).

“Gosden accepts that this depiction of the STS field is overly neat and subject to further change as the boundaries continue to readjust themselves.

“Philosopher of technology Carl Mitcham has, in similar fashion to Gosden, depicted a matrix of four alternative approaches to STS in theory and practice. On one axis he breaks STS down into an academic field on one end and as a social movement on the other, while on the second axis the division is between those who are supportive of technoscience and those who are critical of its societal implications. Thus, the STS social action movement, on the one hand as a form of protest, 'vocally questions whether the development of technoscience is always beneficial to society,' while, as technological management on the other hand, it 'aspires to infuse the management of science and technology with more consciously focused policy analysis and more thoroughgoing rational administration.' Among academic programs there is a similar sort of split among those that tend to critique the technocratic society and those that 'seek to instill the new technoscientific society with a deeper public understanding of the science and technology on which it relies,' so that citizens can be 'active, intelligent participants in social decisions that affect their lives.'

“I have argued that, in addition to the High Church-Low Church distinction among STS programs, often characterized as Science and Technology Studies (S&TS) and Science, Technology, and Society (STS) respectively, there is a third approach often referred to as Science, Technology, and Public Policy (STPP) or sometimes Science, Engineering and Public Policy (SEPP). The first two are oriented toward the theoretical/explanatory and the social/activist respectively. In contrast, STPP programs take a professional orientation with a focus on analyses of large-scale socio-technical interactions and their management. They stress the need for, and training in, appropriate policy and management fields.

Independent of whether one conceptualizes STS in terms of varied steeple heights (Fuller), as a three-legged tripod (Cutcliffe), or as a four-cornered field bounded by dueling 'whipping posts' (Gosden), I believe it is fair to say that there are a variety of approaches to STS, many of which are admittedly overlapping and not necessarily mutually exclusive.”

Cutcliffe goes on under another heading:

Crossing over the High Church-Low Church Aisle

“For STS, especially as it has developed within the academy, to have much societal consequence, it is necessary, and even fruitful, to begin within the 'academic' corner of STS where most of the so-called constructivist case studies reside. If we can accept, at least for the sake of argument, that these studies have in the main enhanced our understanding of technoscience as an inherently value-laden, multifaceted, and complex process, which suggests the real possibility of societally shaping science and technology, the question remains how best to move beyond the warehousing of ever more sophisticated cases. To translate effectively this already large, accumulated body of STS knowledge, it is possible for those STS academics 'critical' of the technoscientific society, as Mitcham would identify them, to push outward from their scholarship by outlining normative guidelines for action. Several examples of recent scholarship that I find instructive are illustrative of this movement.”

Later (pp. 121–123) Cutcliffe provides examples: “The individual who has probably done the most from an STS perspective to argue for enhanced democratic participation in the technoscience decision-making process has been Richard Sclove, founder of the Loka Institute, a nonprofit, citizen-action think tank and network. Underlying Sclove's work and that of others who promote enhanced public participation in the science and technology process is a commitment to 'strong democracy.' The ideas central to this notion are drawn from the work of Benjamin Barber and expanded upon by Sclove in his book, *Democracy and Technology* [1995], in terms of 'design criteria for democratic technologies.'

“The first two and most general criteria set the tone and framework for those that follow. Thus, Criterion A states: 'Seek a balance among communitarian/cooperative, individualized and transcommunity technologies. Avoid technologies that establish authoritarian social relations,' while Criterion B

says: 'Seek a diverse array of flexibly schedulable, self-actualizing technological practices. Avoid meaningless, debilitating, or otherwise autonomy-impairing technological practices.' Subsequent criteria dealing with democratic politics and self-governance stress the local and the sustainable over the global and exploitive. '[Organizing] society along relatively egalitarian and participatory lines,' Sclove argues, would entail adopting most, if not all, of a series of 'strategies' that would include the need to 'map local needs and resources,' while 'reach[ing] out to political movements [to] build coalitions.' The initiation of 'democratic R&D and design,' combined with expanded 'civic technological empowerment,' would help to 'democratize corporations, bureaucracy, and the state.' Sclove concludes his analysis by asking a penultimate question: 'Is it realistic to envision a democratic politics of technology?' Throughout he draws on the Amish by way of a small-scale example, suggesting the answer is 'yes,' but the more telling point is his final question: 'Isn't it unrealistic not to?'

“As illustrative examples of his approach to democratizing science and technology, Sclove likes to point to two possible approaches beyond the admittedly limited and religiously motivated Amish. One, which has been in place for some time, is the so-called science shop, found at its most developed state in the Netherlands, the other being what are known as 'consensus panels,' European-style citizen advisory panels for science and technology policy. Although differing in approach, in both cases the intent is to provide expanded knowledge to, and to allow greater participation by, the general public.

“In the case of science shops, which are, in effect, university-based community research centers, academic faculty, staff, and students are available to provide research for organizations, whether they be environmental, labor, or other nonprofit types, which do not have the expertise nor the resources to conduct their own research on issues of local or regional import. Subsequently, such groups make use of this 'academic' research as part of their input into the decision-making process, thereby providing a way around the argument that the 'public' is not expert enough to contribute knowingly to the deliberations. Presently there are almost forty such science shops in the Netherlands, while numerous other nations including Denmark, Germany, England, and even the United States have developed similar community research centers. Most recently the Canadian Social Science and Humanities Research Council has initiated a national network of twenty-two community-based research centers called CURA (Community-University Research Alliances). There is even a newsletter coordinating activities among the informal network of such centers.

“Consensus conferences, pioneered in Denmark and conducted under the auspices of their Board of Technology, offer an opportunity for panels of everyday citizens who are nonstakeholders to inform themselves deeply on given topics in science and technology and then, following open discussion and debate, to reach a decision that is announced publicly as an advisory report at press conferences. Such reports are not binding, but they do stimulate broad popular debate and increase public understanding, and can help change policy and thus acceptance levels. They are offered as advisory input which the Danish Parliament can then act upon as it sees fit. The first such Danish consensus conference was held in 1987, and since then numerous others have been successfully conducted. By way of specific example, a 1989 citizens' panel on the Human Genome Project encouraged support for basic genetics research, but it also called for further work on the societal consequences and influenced the Danish Parliament to enact legislation prohibiting employment and insurance decisions based on genetic information. In March 1999 a Danish citizens' panel examined the issue of genetically engineered foods. While the panel stopped short of calling for a moratorium, they did call for stricter regulatory control, including better consumer labeling practices and restrictions on corporate monopolies with regard to genetic technologies.

“At least a dozen nations have now organized or are about to hold such citizens' panels. For example, Japan held a consensus conference on human gene therapy in March 1998 and is planning a second on the 'High Information Society.' Canada held a conference on food biotechnology in March 1999, while England held its second such meeting on the topic of radioactive waste disposal in May 1999. Other nations such as Australia and South Korea are considering holding similar consensus conferences on topics of import to them, further testifying to the value of this sort of mechanism for enhancing citizen participation in deliberations regarding important and potentially controversial technoscientific issues.

“In April 1997 [Cutcliffe concludes] Sclove organized the first such citizens' advisory panel in the United States on an experimental basis with NSF funding and the support of the Massachusetts Foundation for the Humanities and MIT's *Technology Review* magazine among others. Held on the campus of MIT, the conference explored the issue of 'Telecommunications and the Future of Democracy.’”

I have done brief historical sketches of developments in two related fields, laboratory studies (as part of the field called Social Studies of Scientific Knowledge to distinguish it from earlier sociology of science) and the Social Construction of Technology. I did this in an essay comparing alleged progress in these fields with alleged lack of progress in philosophy of technology. (See *Technè* 4:1, at spt.org/journal.) I repeat that material here as a complement to Cutcliffe:

From *Sociology Of Science To Sociology Of Scientific Knowledge (SSK)*

According to one source (Gaston, 1980), sociology of science as a subspecialty within sociology only dates back to the 1950s. From the mid-fifties until 1980, the field was dominated by one giant figure, Robert K. Merton, though his *On the Shoulders of Giants* (1965) is an eloquent defense of the claim that intellectual originators, no matter how creative they may seem, always owe enormous debts to those who have gone before them. Between the 1950s and the late 1970s, almost all sociologists of science felt that they owed a major debt to Merton. His model of objective science as requiring the sharing of information, mutual criticism, disinterestedness, and universalism (disregarding social characteristics in the recognition of the importance of contributions to science) became the basis of other sociologists' research. As Gaston summarizes the situation: "The model of a social system of science in which scientists pursue knowledge in a social environment, hoping and expecting to receive recognition for their original contributions, provides a multitude of research questions, what has come to be called 'Mertonian' sociology of science" (Gaston, 1980, p. 475). This approach continues to have its followers, most notably in the various forms of the Science Citation Index and cognate series, but hardly anyone today thinks of this tradition when referring to advances in social approaches to the study of science.

In 1979, Bruno Latour and Steve Woolgar published *Laboratory Life: The Construction of Scientific Facts*, and a new tradition was launched. One of its principal aims was to undercut the Mertonian model and the positivist philosophy that was perceived to lie at its core. Since then, the "sociology of scientific knowledge," as the field was renamed to emphasize its focus on the actual doing of scientific work rather than on allegedly authoritative products of successful scientific work, has been perceived by almost everyone in science and technology studies as one of the most prolific, rapidly advancing fields in all of academia. Joseph Rouse dates the revolution from the so-called "Edinburgh

Strong Programme," associated especially with the names of Barry Barnes (1974) and David Bloor (1976), and he goes on to list the fragments of later social constructivism as including "Bath relativism, ethnographic studies, discourse analysis, actor/network theory, and constitutive reflexivity" (Rouse, 1996, p. 1). But he and nearly every other commentator treats constructivism as an advancing, if not monolithic, field. Indeed, nearly everyone who is not unalterably opposed to it (see Gross and Levitt, 1994) thinks of the constructivist school(s) as advancing at an amazing pace.

What I want to do here is contrast later with earlier stages of one of these strands, laboratory studies. If we date this subspecialty in constructivist studies from Latour and Woolgar's *Laboratory Life* (1979), it is fairly easy to demonstrate that there have been a large number of later developments building on earlier ones. In Karin Knorr Cetina's summary in the *Handbook of STS* (1995), the developments extend Latour and Woolgar's examples, from Eisenstein (1979) on the printing press as a social agent of change, to Amann and Knorr Cetina (1990) on image interpretations in molecular biology, to Henderson (1991) on computer graphics, to Hirschauer (1991) on sex-change surgery, to broader sets of examples in Lynch's *Art and Artifact in Laboratory Science* (1985) and Latour's *Science in Action* (1987). (See Knorr Cetina, 1995, p. 155.) Indeed, it sometimes seems that any adequate list would be too long to summarize. (Knorr Cetina tries, in her 1995.)

It would take a churlish critic to deny that there has been progress here, and I have not even referred to advances in actor/network theory and similar approaches.

Nonetheless, even Knorr Cetina as the loyal chronicler of these advances admits that her favored approach, laboratory studies, has its limits. The most important ones she lists have to do with their microscopic focus on individual laboratories rather than on consensus building among larger groups of scientists; and with their failure to account for larger societal contexts that influence laboratory life (Knorr Cetina, 1995, pp. 161–162).

And of course this does not even mention criticisms by jealous defenders of science's progressivism (Gross and Levitt, 1994), who view what is alleged to be progress here as no more than an ever-broadening smear campaign against more and more hardworking scientists.

In concluding this section, it seems fair to say that advances in laboratory studies continue right down to the present; but it is also fair to say that such studies have their limits and their critics.

Social Constructivist Studies Of Technology

Moving closer to a direct parallel to philosophy of technology, several sociologists (and sociologically-oriented historians) in the mid-1980s extended their constructivist studies, in an explicit way, to the study of technology, usually, of particular technologies.

It was this group of scholars whom Winner was attacking in his paper, “Upon Opening the Black Box and Finding It Empty” (1991). And representatives of this school have fought back. (See Bijker, 1993, and Aibar, 1996.)

Wiebe Bijker, in his summary of developments in the field in the *Handbook of STS* (1995), traces its roots to Thomas Hughes, the historian, in his masterly study, *Networks of Power: Electrification in Western Society, 1880–1930* (1983). Hughes then combined with Bijker and Trevor Pinch to edit the book that others often list as the beginning of the new tradition, *The Social Construction of Technological Systems* (1987). That does not leave much time for a great deal of development between 1987 (or even 1983) and Bijker's summary (1995). Nonetheless, people do perceive the constructivist study of technological systems as a rapidly advancing field.

But what kind of advance has there been? Bijker and John Law, in *Shaping Technology/Building Society* (1992), offer an answer. According to them, technology studies had earlier been “fragmented”: there are internalist historical studies; there are economists who are concerned with technology as an exogenous variable; more productively, there are economists who wrestle with evolutionary models of technical change; there are sociologists who are concerned with the “social shaping” of technology; and there are social historians who follow the heterogeneous fate of system builders (p. 11).

By the end of the book, which summarizes the evidence in a somewhat heterogeneous collection of essays, though written by leading figures in the field, Bijker and Law conclude that a “first step” has been taken in understanding “that technical questions are never narrowly technical, just as social problems are not narrowly social” (p. 306).

Back in the introduction, Bijker and Law had summarized the progress made so far: the last five years has seen the growth of an exciting new body of work by historians, sociologists, and anthropologists, which starts from the position that social and technical change come together, as a package, and that if we want to understand either, then we really have to try to understand both (p. 11).

In short, all that Bijker and Law are claiming as advances in the new field so far is that there has been a “development of an empirically sensitive theoretical understanding of the processes through which sociotechnologies are shaped and stabilized” (p. 13). But everyone knows that theoretical arguments are never-ending, and if there is to be any progress in this new field it will show up in detailed studies that confront theory with evidence. And Hughes had already displayed that process admirably, in *Networks of Power*, in 1983.

Winner, the critic of social constructionism (who also recognizes its merits), does his own history. (See *Science, Technology, & Human Values* 18:3, 1993, pp. 365–367.)

The plea frequently voiced by the social constructivists is that we open the ‘black box’ of historical and contemporary technology to see what is there (Pinch and Bijker 1987). The term *black box* in both technical and social science parlance is a device or system that, for convenience, is described solely in terms of its inputs and outputs. One need not understand anything about what goes on inside such black boxes. One simply brackets them as instruments that perform certain valuable functions.

“In my view, the social constructivists are correct in criticizing writers in the social sciences and humanities who have often looked upon technological developments as black boxes while neglecting any comprehensive account of their structures, workings, and social origins. To find more precise, detailed descriptions and explanations of the dynamics of technical change is a goal well worth pursuing.

“As they go about opening the black box, the historians and sociologists in this school of thought follow methodological guidelines established during the past two decades within the sociology of science, in particular an approach that studies the sociology of scientific knowledge (Collins 1983). In this mode of analysis, there is a strong tendency to regard technology as the lesser relative of

science. Because science deals with the fundamentals of human knowledge, it is considered the more elevated and significant topic. In that light, for both historians and sociologists, the 'turn to technology' is sometimes portrayed as a kind of intellectual slumming (Woolgar 1991). There is even some doubt that sociologists of scientific knowledge will benefit greatly from studying such grubby technological matters at all. Sociologists of science see social studies of technology as a new field in which to apply a powerful but as yet underutilized research apparatus that had been successful in studies of the sociology of scientific knowledge.

“From that vantage point, most past and contemporary work in the philosophy of technology is greeted with scorn. As Pinch and Bijker (1987) conclude in their widely cited survey, 'Philosophers tend to posit over-idealized distinctions, such as that science is about the discovery of truth whereas technology is about the application of truth. Indeed, the literature on the philosophy of technology is rather disappointing. We prefer to suspend judgment on it until philosophers propose more realistic models of both science and technology' (p. 19).

“In quest of 'more realistic' models of their own, social constructivists employ a methodological posture, 'the empirical programme of relativism,' commonly used in the sociology of science. Adapting this stance to the study of technology requires some modification. What social analysts do in this new focus is to study the 'interpretive flexibility' of technical artifacts and their uses. One begins by noticing that people in different situations interpret the meaning of a particular machine or design of an instrument in different ways. People may use the same kind of artifact for widely different purposes. The meanings attached to a particular artifact and its uses can vary widely as well. In this way of seeing, sociologists and historians must locate the 'relevant social groups' involved in the development of a particular technological device or system or process. They must pay attention to the variety of interpretations of what a particular technological entity in a process of development means and how people act in different ways to achieve their purposes within that process.

“I want to emphasize that social constructivism is by no means an entirely unified viewpoint. There are some important differences among its leading practitioners. For some who work in this perspective, the conventional distinction between technology and society has finally broken down altogether. In the approach of Michel Callon and Bruno Latour, for example, we find the methodological premise (eventually upheld as a basic social truth) that the

modern world is composed of actor networks in which the significant social actors include both living persons and nonliving technological entities.”

Others like Trevor Pinch and Wiebe Bijker prefer to maintain the notion that society is an environment or context in which technologies develop. But despite such differences of emphasis, the basic disposition and viewpoint of social constructivism is fairly consistent.

“As a way of studying the dynamics of technological change, this approach does offer some interesting advantages. It offers clear, step-by-step guidance for doing case studies of technological innovation. One can present this method to graduate students, especially those less imaginative graduate students who need a rigid conceptual framework to get started, and expect them to come up with empirical studies of how particular technologies are 'socially constructed.' Indeed, the social constructivists promise to deliver a veritable gold mine of those most highly valued of academic treasures: case studies. They have studied the development of Bakelite, missile guidance systems, electric vehicles, expert systems in computer science, networks of electrical power generation and distribution, and several other corners of technological development. Research results usually indicate that technological innovation is a multicentered, complex process, not the unilinear progression depicted in many earlier writings. Another useful contribution of this approach is to reveal the spectrum of possible technological choices, alternatives, and branching points within patterns sometimes thought to be necessary. Social constructivist interpretations of technology emphasize contingency and choice rather than forces of necessity in the history of technology.

“Although they are not alone in doing so, the social constructivists have been quite helpful at calling into question the sometimes highly arbitrary distinctions between the social sphere and the technical sphere. In my view, the ability to break down such arbitrary distinctions opens up some interesting possibilities for those who want to understand the place of technology in human experience. For that reason alone, the literature in the new sociology of technology is well worth a philosopher's attention.

“As they proceed with their work, social constructivists are eager to call attention to the inadequacies of their predecessors, identifying their accomplishments as a clear advance over earlier ways of thinking about technology and society. Theirs is said to be a more rigorous, methodologically refined, and clear-sighted vision

of technology and society than what came before.

“What are the significant points of comparison? Among the cast of characters, one would certainly have to include the whole range of thinkers who have written about the origins and significance of modern technology. Among those explicitly or implicitly criticized are sociologists of technology like William Ogburn, historians of technology like Lynn White, and a variety of economists who have written on the economic correlates of innovation. Not far in the background are the likes of Lewis Mumford, Jacques Ellul, Ivan Illich, members of the Frankfurt school of critical theory, and any number of Marxist social theorists, not to mention Marx and Engels themselves.

“As they refer to earlier generations of sociologists, the social constructivists often appear to be saying, 'Yes, these were, indeed, great thinkers, but they were wrong and we are right.' Whether or not this judgment comes to be accepted by the scholarly community as a whole, only time will tell. But the aspirations of social constructivism are fairly evident. Part of what is going on here is a social construction of knowledge that seeks to depict earlier and contemporary approaches as outmoded or dead. Clearly, one of the ways in which this approach can be said to be 'more complex' than previous ones has something to do with the Oedipus complex.”

Winner rounds out his history with his main point, a serious criticism: “Before we join the swelling applause for social constructivism and anoint this school as the cutting edge in technology studies, we must pause to ask whether or not their approach does amount to an improvement over other approaches. Before we forget our Marx or our Mumford, Ellul, or Heidegger, it is important to notice what one gives up as well as what one gains in choosing this intellectual path to the study of technology and human affairs.”

And what Winner says we give up is the *evaluative* stance of the earlier authors mentioned: they were willing to say what they found to be wrong with technological societies—especially *our* type of technological society—in ways that the social constructionists (Winner says constructivists) eschew as “unscientific.” That is, in Sassower's terms, after de-privileging others' views, they give their own a privileged place. They want theirs to be *the* way of doing science and technology studies in academia. And of course non-academic social critics are thought to be worse even than scholars of older persuasions.

So finally we come to the set of *quadrants* we have been leading up to throughout this book: *idealists* like Verene and Ferre are usually also academics, but Sassower and Ormiston would say their writings have no more authority than their ability to persuade; *social activists*, especially progressives like Mead (and myself) or Social Democrats like Michalos, either prefer not to worry about academic credentialing or despise that whole game as privileging academics over fellow-activist citizens; *academic philosophers*, historians, and philosophers of science and technology (Bunge's "exact philosophy" might be the most extreme example) do worry about "getting the story right," wanting their scholarship to be as sound as their scientist and engineer colleagues in academia; *radical critics* can also be academics (though some had difficulty holding jobs in US universities during the period of SPT's short history), while the most radical want to deprivilege academics.

I leave it to the reader and his or her sympathies to decide where postmodernists and social constructionists fit within this picture, though I am sympathetic toward Sassower's claim that they sometimes betray their own best insights in privileging their approaches as better than their predecessors.

A Concluding Essay On Quadrants And Discourse Synthesis In The Philosophy Of Technology

I want to end the book by expanding on ideas presented in my introduction. One key issue, for me, is the utility—or not—of Walter Watson's quadrant or four-pole analytical scheme in *The Architectonics of Meaning: Foundations of the New Pluralism* (1985). The other issue is the significance of the whole project.

1. A Quadrant Scheme and Discourse Synthesis

Watson's scheme has two aims. The first is to be comprehensive, to leave out no significant voice in whatever discourse is being analyzed. For example, Watson himself had to add a voice to those generally taken into consideration by his mentors, such as Richard McKeon—the voice he calls “creative,” elevating Protagoras's approach among Greek philosophers to a position as a legitimate philosophy to stand alongside the philosophies of Plato and Aristotle and the Greek atomists. The second aim is to provide such a comprehensive framework as a kind of *global* map that will allow one to see where any particular thinker (philosopher or other) is “coming from,” in that tired phrase, when he or she takes on an opponent on a controversial issue within a field of discourse.

For whatever reason, Harry Collins and Nicholas Mullins do not seem to have felt the need to do anything other than identify networks, with no organizing framework. But Collins does make comments—for example, about the “conservatism” of philosophers George Herbert Mead and John Dewey—that suggest that he is at least thinking about a *political* spectrum (though he is otherwise mostly silent about the salience of philosophers' places in the political spectrum).

What Watson's scheme allows us to see is the inadequacy of the traditional left-right political spectrum, as of *any* bipolar system. If one insists on linear spectra (possibly because that's easier to present in a book), with respect to politics there should be at least two such spectra crossing one another at right angles: left to right, and, at the center, at least two middle positions, not side by side but one above (or below) the other, creating another linear spectrum with all the possible variations of hue in a color spectrum. (See Rokeach, 1973, for an empirical sociology version; Cohen, 1962, for a political philosophy version.) Nearly everyone recognizes the limitations of overly simple bipolar spectra in all sorts of intellectual settings. Watson goes beyond this standard complaint, recognizing in

addition that, even within a four-pole system, there are many, many variations within each of the resulting quadrants. As the publishers note on the cover of his book, Watson intends his book to be “the first truly useful taxonomy of all ideas.” That is surely an extravagant claim, but trying to be encyclopedic seems to me a noble goal.

So, at least, I said in my contribution to the McInnis volume mentioned in the introduction. (See Raymond McInnis, *Discourse Synthesis: Studies in Historical and Contemporary Social Epistemology*, 2001.) There I identified four historical patterns for achieving an encyclopedic integration of knowledge: *creating* order out of chaos, disciplinary *synthesis* (in McInnis fashion), integrating within a *comprehensive whole*, and *disciplinary synthesis* in Watson's Aristotelian mode. Defenders of one or another approach identify themselves by their *opposition* to (at least one of) the other approaches. This was based on some earlier ruminations of mine—the first version in conjunction with Cesar Cuello.

As I said in the introduction but will repeat here pretty much verbatim, that first effort is to be found in a Society for Philosophy and Technology publication (see Cuello and Durbin in *Technè 1:1*). We included there a note on methodology. We said that making explicit the methodology used in discovering the underlying assumptions of parties to *sustainability* debates in environmental philosophy can move us to a deeper level, toward links with predictable philosophies of technology. Knowing the risks, we nonetheless used Watson's scheme—without endorsing the exaggerated claim about “the first truly useful taxonomy of all ideas.” Stripped of such an exaggerated claim, Watson's book seemed to offer us an interesting *hermeneutic*.

In Watson's view as I summarized it earlier and will repeat here in abbreviated form, every author or public speakers betrays his or her philosophical assumptions by differentially utilizing the four necessary components of any piece of literature:

author's *perspective* (which may be entirely personal or that of a tradition and may be hidden even from the author);

objects discussed;

the text itself, and especially the *methods* that link items to one another;
and

the goals or *principles* (ideals, values, etc.) that drive or motivate the text, which almost always reflect sets of background assumptions, such as the cultural values influencing both individual authors and intellectual traditions.

According to Watson, authors or speakers who stress objectivity above the other three components employ a *scientific* writing style (not Watson's term). They tend also to use logical methods, invoke *reductionistic* aims, and try to avoid values as much as possible. Authors, on another hand, who consciously stress values and see the objects of their discourse as this-worldly shadows of otherworldly realities—typically linking the two by a method explicitly referred to as *dialectical*—Watson links to Plato. They tend to emphasize comprehensiveness, and often disparage narrow technical scientific knowledge. Authors, third, who stress method and discipline (in the school subject matter or *professional discipline* sense), and who emphasize the pigeonholing of objects within large *encyclopedic* schemes, Watson links to Aristotle.

The fourth perspective, as I said in the introduction, requires a little more elaboration. Authors in this group emphasize their own subjective *perspective*, their own *creativity*, as an end in itself. In terms of method, they often tend to be anti-methodical, to utilize any means that will move the narrative (story, drama, etc.) along. Watson links this group to the Greek Sophist Protagoras (for whom humans are “the measure of all things”) and defends this as a philosophical perspective fully parallel with the other three.

Finally, it should be noted that Watson acknowledges that the four basic groups do not exhaust the stylistic field; many authors combine modalities. For example, as Watson recognizes, almost all the great philosophers of the modern period, after Descartes, have tended to use hybrid styles—though a hybrid style is recognizable, Watson thinks, as a joint use of two or more of the four basic styles.

This short summary of Watson's very complicated scheme—I am arguing—may be enough to suggest that a hermeneutic approach, roughly along Watsonian lines, can help discover philosophical presuppositions implicit in the language used in all sorts of *philosophical debates*. However, where Watson's aim seems to be Aristotelian, to pigeonhole authors, Cuello and I called our aim (in Watson's terms) *creative*. We wanted to *let the authors have their own say* about

what it is they want to emphasize in the sustainability debate.

Cuello and I went on to attempt to figure out the mostly implicit philosophies of technology latent in controversies over the meaning of the slogan, “sustainable development.” In this book, I have recommended the same approach for *all the controversies* among philosophers of technology that I have taken up in this book.

Side note: though Collins feels no need for such a framework or background against which to situate the range (a truly incredible range!) of controversies that he chronicles, it seems to me that in at least two cases, his findings parallel mine and could well add details to the Watson scheme. I am thinking in particular of two epochs, Greek philosophy and the period roughly from the early nineteenth- to the early twentieth-century in Europe. This is most easily seen by looking at Collins's figures. If you combine figures 3.2 and 3.4 in Collins's chapter on Greek philosophy, to get the full picture from the original Greek schools to later recombined networks—and if you compare the result with Watson's admittedly oversimplified scheme—the results are more similar than Collins might want to admit. Then if you look at figure 12.2 in the chapter on the German university revolution—that is, at the American “schools” (loose sense) that developed from German university roots—once again there is a closer likeness to Watson's simplified scheme than a reader swept up in Collins's details might think.

I went on to make another attempt along these lines in another contribution to the SPT online journal *Techné* (1997), in the proceedings volume from a conference in Karlsruhe Germany earlier in 1997. (See Chapter 13 above.) My title was, “Advances in Philosophy of Technology?” (Note the question mark.)

Here are some excerpts: “Everything I have summarized so far in support of a claim that there have been advances in North American philosophy of technology since Bad Homburg is, actually, preparatory to the question I want to address in this paper. It should be obvious that there has been progress in the field of philosophy of technology in some sense. But exactly what do we mean when we speak of ‘advances,’ whether in the philosophy of technology or in any other similar field today? Is it just a matter of a continuing stream of new books and new journal articles published? I want to address this issue comparatively, by way of a comparison and contrast with developments in the philosophy of science and the sociology of science and technology.

“First, however, we need some definitions of what it may mean to speak of advancing or making progress in any academic field.

Scientific or quasi-scientific progress

“Discussing the rise of analytical philosophy in the early twentieth century, Bertrand Russell (1945) once claimed that, using logical techniques, analytical philosophy is “able, in regard to certain problems, to achieve definite answers” (in contrast with older philosophical approaches); in this respect, according to Russell, analytical philosophy’s methods “resemble those of science.” Like scientific advance, Russell was assuming, there can be similar philosophical progress, with one contribution building on others, and so on. In the United States at least, this has become the ideal of academic progress, with one article in a “leading” journal in a “cutting-edge” field worth more, in terms of merit and reward, than any other kind of publication, except possibly a “major” book reviewed (favorably) in all those leading journals.

Originality

“However, once this academic standard of progress was extended, by departmental committees and deans, to almost every field of higher learning it began to come under attack. An early and vituperous version can be seen in Jacques Barzun’s *Science: The Glorious Entertainment* (1964). These critics maintain that, when the standard is applied in humanities fields such as literature, history, and the arts, and many of the critics lump philosophy together with other humanistic disciplines, it is totally inappropriate. The only measuring rod we can use in these fields (and, as we will see below, later postmodern critics now say this is true even in the sciences) is greater and greater originality, especially in terms of persuading whatever are perceived to be the relevant audiences.

Idealistic standards

“A few transcendentalist metaphysicians and theologians object to both the strict (progressive) academic standard and the much broader “originality” (postmodern?) standard as retrogressive chasing after increasingly trivial minutiae. The only real progress moves in the opposite direction, toward more and more comprehensive syntheses, ever closer approaches to truth or beauty or goodness (sometimes capitalized as Truth, Beauty, and Goodness).

“Such Hegel-like synthesizers are, I admit, rare today; but there are ‘right-side-up’ dialectical materialist neo-Hegelians and others who insist on real social progress as the only appropriate standard. . . .

Disciplinary/encyclopedic standards

“Finally, still others insist on what I would call an Aristotelian model, recognizing that academic fields are divided along disciplinary lines, each with its own standards. At least some of the sciences may meet the standard criterion of progress within limited domains, but most intellectual endeavors can make only ‘intensive’ or ‘qualitative’ progress, providing no more than a deeper appreciation of, or new insights into, old truths, traditional arts and crafts, and so on.”

I should note here (as I did not in the original article) a non-pigeonholing aspect of this second scheme: upholders of one standard are often vitriolic in their opposition to others—sometimes to all three others. So, as above, hybrids are possible. For the best example, academics should recall how vitriolic defenders of the “progressive” or “best journal” standard are when viewing a candidate for a position such as tenure. If the candidate measures his or her own work by the postmodern/originality standard, we have the classic confrontation. But defenders of “standards,” in this sense, often also oppose Aristotelians and Hegelians and Marxists, along with feminists, and so on and on.

It now seems to me that this scheme—and this last comment—has much to offer us in reflecting on the debates within SPT chronicled in this book. For example, the worries of Joe Pitt and the “new discipline” advocates in Chapter 18 seem to me to reflect the current cultural hegemony of science in (at least) North American universities, which is reflected in the last sentence of the previous paragraph. The reader is likely to recall, at this point, that I stand with those in opposition to that hegemony. But aside from my own views, applying Watson's scheme in this context would suggest that, in fact, American universities are more open than the science-hegemony culture would lead us to expect. Not only philosophers but professors in many humanities disciplines, in the social sciences, in schools of education, in the arts, and so on, get tenure and even full professorships, even though (sometimes because) their work reflects the standards of one of the other quadrants in my version of Watson's scheme here. Since that seems to me clearly to be the case, Joe Pitt and his friends (Chapter 9) seem simply to be carrying academic bickering to a larger stage; and the

proposed "new discipline" of philosophy of technology (Chapter 18) is actually going to end up including most of the work of the philosophers they would seem to want to leave out—or to force to take a more academic approach.

I made those first two proposals in very restricted contexts. In a more general sense, Watson's view boils down to this: in the Western philosophy-based intellectual tradition (and I would extend this to the *personal intellectual* development of anyone, including philosophers, within this tradition), everything begins with *narrative* (myth, the world view we grew up in, etc.); this is typically first challenged in an "idealist" phase, when newly-critical adolescents (and others similarly situated in terms of their intellectual upbringing, including in graduate school) see old world views as failing by their own idealistic standards (this I would call "challenge from above"); then at least some (again especially young) people challenge old myths "from below," subjecting them to quasi-scientific "does the world *really* work that way?" critiques; and finally a few thinkers (more mature individuals, typically in mid life) look at all three of these approaches—narrative, idealistic critique, and scientific critique—and attempt to fit all known kinds of discourse within an "encyclopedic/disciplinary" superframework.

That is, Watson 1: "Protagorean" [artistic], "Platonic" [values], "Democritean" [objectivist/scientific], and "Aristotelian" [methodical/disciplinary/encyclopedic] literary *emphases*.

Or Watson 2: (quasi-) scientific, originality, "comprehensive/idealistic," and disciplinary/encyclopedic *measures* of alleged *progress* in an academic field.

Each of these is an abstract, idealized four-pole at an extremely abstract level. The commonalities are these: we begin with a narrative taken for granted in a culture (for example, the culture of the department in which we do our graduate research and writing); this is often critiqued "from above" by idealists (which usually means people who try to hold the local culture to its own stated ideals or values—though sometimes the values are imported from outside); or from below by "scientific" types (usually saying they're more interested in facts than values); and this whole development is then examined from a disciplinary/encyclopedic perspective, especially by others or by senior members of the particular intellectual group who put together an encyclopedia or handbook for whatever it is the group is working on (including science). *What I would suggest is that, whatever the field—artistic, values/idealistic, scientific,*

encyclopedic/disciplinary—something like this four-pole is operative, in terms of relationships with the other narratives/fields. (Also, I happen to think, *within* specific literary/narrative approaches.) But we should not forget either Watson’s warning, that people can utilize more than one approach or standard; or my warning, that nowadays people—especially philosophers—often take on a broad set of opponents.

What I am saying is that, *assuming narrative as basic*, most people most of the time will:

1. remain within a narrative framework uncritically, often glorying in it while also often resisting other approaches;
2. critique the dominant narrative/myth “from above,” contrasting it with some ideal;
3. critique it “from below” in a scientific or quasi-scientific fashion; or
4. attempt to make sense of all three of the above approaches in a “disciplinary/encyclopedic” synthesis (which is typically interpreted as opposing the other approaches)—and *we should not forget the possibility of combining emphases.* I maintain, along with Watson, that *something like this four-pole analytical framework has tended to dominate throughout the history of Western literature.* Something like it may even represent something of a trans-cultural universal.

The typical model has four sets of values: 0,0/0,1/1,0/1,1, arranged in boxes:

0,0	0,1
1,1	1,0

In any case, in this book we have seen, among the controversies within SPT in the last 30 years, philosophers of technology line up somewhat as follows.

People Watson would characterize as *idealist* in some sense (remember that he

allows many variations)—following in the footsteps of some of the first intellectuals characterized as or characterizing themselves as philosophers of technology, especially Martin Heidegger and Jacques Ellul—would include Donald Verene with no qualifications (except that he explicitly links Ellul's thought with, for example, Hegel); Frederick Ferre, combining some analytical philosophy lessons from graduate school with a Whiteheadian process philosophy; Albert Borgmann's neo-Heideggerianism; and Carl Mitcham's attempt to link a Borgmann approach with Aristotelian categorical schemes. To some critics, Don Ihde would also fall in this quadrant, though two of his claims—that (1) phenomenological analysis is a genuine alternative to dominant analytical philosophy, and (2) that at least his version of that approach leads in the direction of *postmodern* multiculturalism and concerns for international tolerance and global environmentalism—share much with other quadrants. (We should recall that Watson endorses the idea of combinations—and at the same time recognize that the thought of Ferre, Borgmann, and Mitcham may also not be idealists in any pure Watsonian sense.)

Since Mario Bunge and Joe Pitt are such relentless critics of idealist thinking, I can list next the philosophers in what Watson calls the *science* quadrant—beginning with Bunge and Pitt as pure instantiations (though Pitt also calls himself a pragmatist). These would include Deborah Johnson, especially in her cooperation with engineering and computer professionals trying to regulate themselves or avoid regulation by government, including government regulators claiming to speak for the public; and Kristin Shrader-Frechette, though her calls for Rawlsian equity—as a counter to the false claims of cost-benefit regulators (often really promoters) of technological developments as value-free—clearly puts her at odds with many people in the science quadrant. Joseph Agassi started out as a fairly straightforward Popperian philosopher of science—clearly in Watson's science quadrant—though his contributions to SPT put him in a position of challenging (in Popper fashion?) everyone in all quadrants to become active in mass movements to head off a technological apocalypse. Agassi's student Raphael Sassower also moved away from Popperianism, but in the direction of postmodernism—which claims to stand outside such a quadrant-segmented universe (but doesn't, as we will see).

Next we can look at some political philosophers that Milton Rokeach and Carl Cohen would list as *socialists*, but who would probably prefer for themselves a label such as Social Democrats (Alex Michalos explicitly) or Progressives. Since we have encountered no Aristotelians except Mitcham in our survey (and he

combines his Aristotelianism with a dominant idealism), my social democrat quadrant will fill the spot in Watson's scheme of Aristotelianism. Michalos is the most obvious dweller in this region, even though he has always been treated as pertaining to the science camp; the difference lies both in his untypical call for scientists and engineers to be socially responsible in their professional work and in his real-life political activities. Edmund Byrne is a left-of-center spokesperson for and critic of the American labor movement. Larry Hickman doesn't usually call himself a progressive, though opponents of his mentor, John Dewey, often blasted him for, among other things, what they perceive as the evils of "progressive education." I am explicitly Progressive (capital P), and Paul Thompson combines his pragmatism with work with (and criticism of) governmental regulators of agricultural technologies. I have here interpreted Sheldon Krimsky's advocacy of Critical Technology Assessment as social democratic because he sets it in opposition to Marxism (among other opponents). And Andrew Light, at least in his environmental pragmatism, seems to belong here.

That leaves the fourth Rokeach-Cohen political quadrant to *radicals* of various sorts, including Marxists such as Marx, Wartofsky and Andrew Feenberg. Joseph Margolis calls himself a "non-reductive materialist" to distinguish himself from other materialists, presumably including Marxist dialectical materialists; indeed, in his philosophy of technology as I have reconstructed it here, Margolis explicitly opposes Marx—along with Bunge (science quadrant) and Heidegger (idealism). Some people would say that moves Margolis toward the social democracy quadrant, but I'm willing to put him down as a very complex non-Marxist radical because he disapproves of Dewey-type progressivism as "epistemologically naive." Langdon Winner, on the other hand, is almost *the* classical non-Marxist radical in SPT circles. Steve Goldman, here presented as a critic of engineers' claims to be doing no more than applied science, is another non-Marxist radical.

In Chapter 13, I argued that similar groupings can be found in Germany:

Huning and Lenk (professional ethics)

Schirmacher (Heideggerian)

Frankfurt/Habermas

Ropohl (systems) and Rapp (Bunge-influenced analytic)

And in Spain:

Echevarria (social democrat)

Ortega (existentialist)

Medina (Marxist influence)

Quintanilla (Bunge)

[The 1997 Karlsruhe conference proceedings, representing the current generation, are, as is the case in Spain, more diverse—though I doubt that even the most recent work, in either country, would escape the fundamental controversies reflected in the two quadrant formulations that summarize the situation here. The most recent generation in Spain would be less easy to locate; for example, Cuevas, though a Quintanilla disciple, is anti-Bunge, and Lopez Cerezo is strongly influenced by STS studies.]

Similarly, in Chapter 19, on Dutch schools of philosophy of technology, I discovered similar groupings. The Dutch schools, as presented by Tijmes (with detail interposed on the Twente team's summary of American work that they find interesting), sort out into an almost ideal set of quadrants:

Wageningen school and Brey (not Dreyfus summary, but social democrat work)

Schuurman (religious engineer) and Tijmes (Heidegger)

Achterhuis (on Feenberg)

Delft and Eindhoven

This leaves out Bijker and STS, but in Chapter 25, in spite of the constructivists' claim to be ideology-free, I find a similar grouping:

Bijker

(by definition no idealists, but recall Sassower)

Latour

Collins

2. The Significance (if Any) of the Project:

So we have arrived at the end of my project. But where is it that we have arrived? Isn't it obvious, a skeptic might ask, that philosophers from all sorts of perspectives would get interested in technology? And if they did, that their views would reflect standard controversies in the broader field, especially given enough time? Yes, this may be obvious. But within the limited scope of SPT over 30 years, it is easy to forget this. Philosophers, like all controversialists, get carried away by their arguments, and thus tend to focus just on the enemy in front of them. So keeping in mind a broad range of possibilities is a good suggestion.

But let's suppose that the skeptic is right, and philosophy of technology at least *ought* to reflect a broad range of controversies that have bedeviled philosophy since its beginnings in the West in ancient Greece. Setting aside the narrowness of some analytical philosophers in the twentieth century who would downplay the significance of any kind of philosophy they don't think meets their standards, *have philosophers of technology in the 30 years of SPT contributed anything really worthwhile either to academic philosophy in the broad sense or to society at large?*

1. I begin this look at the significance of issues with something academic, a look back at Joseph Margolis in Chapter 6. Margolis has had an interesting history in academic philosophy, taking on the biggest names in the business—Quine and Davidson and Putnam, as well as Rorty and Kuhn, not to mention Marx and Heidegger—doing so with an analytical style that, though dense, is always extremely well argued. His books come out with a regularity that is the envy of most academic philosophers, and from excellent presses. On the other hand, he has never received the recognition that he deserves. All that aside, his book on pragmatism (2002) is a tour-de-force, placing recent epistemological controversies in analytical philosophy in the widest (and deepest) possible context, while offering, for the future, an original way out of what he sees as the most profound dilemma lurking within these

controversies. But it was his contributions to SPT, summarized here in Chapter 6, which made clear beyond a doubt—to anyone who took the time to read them—that his solution is fundamentally *technological*. For Margolis, it is “the technological” in the human knower and what humans can know, that lets us see the shortcomings in the work of Putnam and Rorty and Bunge and Heidegger and Marx, as well as letting us see which insights from their works can contribute to a viable way out for the future. However difficult for the reader not expert in analytical philosophy to follow—and Margolis's style does make reading him difficult—here is surely a controversy in the philosophy of technology, from the earliest days of SPT, that ought to have captured the attention of even the most demanding analytical philosophers. I here count it as the *first significant controversy* within the scope of this book.

2. It is odd that Joe Pitt and his friends (Chapter 9) never referred to Margolis—indeed they also overlooked the even earlier work of Bunge—when they lamented the failures of SPT in its first decade. What Pitt says he wants (among other things) is a discussion of explanation in philosophy of technology to parallel those in philosophy of science. Well, it was there for him to see, in plain sight, in Margolis's contributions to SPT, and in Bunge's as well. (Overlooking Bunge—who in analytical circles at the time was considered to be *the* major figure doing philosophy of technology—is perhaps even more disconcerting than overlooking Margolis.) Is this just a matter of academic oversight, of being blinded in respect to the bigger picture by particular concerns? It might come as a surprise to some readers who have followed my essay all the way to this point, but I don't think Pitt was ignoring the obvious. He and his friends had a point.
3. And that brings me to what I consider the second *major controversy of wide interest* in my history of SPT. What Pitt and his friends in history and philosophy of science were concerned about was not the extent to which there was analytical philosophy in SPT, but the continued dominance in the society of what Mitcham (Chapter 1) calls “humanities philosophy of technology” in contrast to an engineering or technical approach. What Mitcham and others were saying is that no philosophy of technology is worth anything if it does not “take the measure” of technological culture as a whole. And this passion for a critique of technological culture did draw significant numbers of philosophers to

SPT; consider the contributions of Don Verene, echoing Jacques Ellul, in Chapter 16. In one sense this could be called just the mirror image of my first controversy—it might be said just to be the metaphysicians fighting back against the analysts. But as I see it, there is a bigger issue in play here—which I noted in particular in Chapter 16. It is the question whether or not metaphysical thinking of the traditional sort (that is, not counting so-called analytical metaphysics) continues to have any relevance in a technological culture. While Pitt and friends might hope it would just go away—might hope in particular that Heidegger and his disciples would just go away—the perennial relevance (or not) of traditional metaphysics is, and probably will continue to be, a major issue even in the most technologized of cultures.

4. There was still a third *major controversy* afoot in the earliest days of SPT. Our third president, and first woman president, Kristin Shrader-Frechette (see Chapter 3), started a trend in philosophy of technology that continues right down to the present. Her view amounted to a critique, simultaneously, of both the Heideggerians and those who had come to SPT from philosophy of science. Shrader-Frechette had worked for many years with technical commissions trying to control particular technologies (and not just nuclear technologies, as she was sometimes accused of); with respect to them, in book after book, she was a relentless critic of sloppy thinking, of masking pro-technology views behind a claim of value-free science (especially economics). At the same time, Shrader-Frechette was constantly challenging her fellow philosophers of technology to come down out of the clouds, to deal with technological regulators on their own turf and in ways they could understand. Nor was Shrader-Frechette alone within SPT in holding this view. Pitt often cites her as the exception to the rule when he calls for SPT philosophers to look at real-world efforts to control particular technologies rather than constantly talk about Technology with a capital T. But as we have seen—from Larry Hickman's pragmatism to that of Paul Thompson dealing with regulators of agricultural technologies, to philosophers of technology who joined forces with the environmental ethics movement, and even including the second of Pitt's pet hates, Langdon Winner—philosophers in SPT from the very beginning had wrestled with the problem of how to make philosophy relevant to the real world of controlling particular technologies in democratic ways. This continues to be a significant issue for philosophers, especially

environmental philosophers, where Shrader-Frechette has also directed much of her energy, and has been widely recognized as a leader in doing so.

5. This brings us to a second major oversight in Pitt's (Chapter 9) critiques of early philosophy of technology in SPT; I have in mind the work of Don Ihde (Chapter 10). Ihde had argued, simultaneously within and outside SPT, that there is another way of reading Heidegger—that fine-scale phenomenological analysis deserves a place alongside more standard analysis in academia. (Actually, Ihde thinks phenomenology is better than the standard mode of analysis dominant in the USA still today.) Pitt doesn't talk about this challenge to standard analytical approaches. Yet, in the mid 1980s this was a major issue in the American Philosophical Association (Mandt, 1986), and in the end Ihde and his fellow fighters for more openness won out. Analysis may still dominate in American philosophy, but other approaches—and not only phenomenology—have begun to be welcomed more every year, for example, at annual APA meetings from coast to coast. Still, there is *controversy* here, over what counts as academically acceptable philosophy. And the controversy in the larger discipline has played out, in almost exact parallel, within SPT.
6. When SPT began, there was a *major controversy* playing out in the broader culture, not only in the USA but worldwide, over the question whether our technosocial problems are or are not so fundamental that they require revolution rather than mere reform. The issue was broached most often by neo-Marxists of the New Left during the waning days of the Vietnam War, and it is reflected here in Chapters 4 (centered on the SPT presidency of Marx Wartofsky) and 12 (Andrew Feenberg). It might be thought that the end of the Cold War and the decline of Soviet Communism would have put an end, or at least dampened considerably the force of, this controversy. But Feenberg is by no means the only radical critic, inside or outside SPT, who believes that the battle has not been lost. Consider also Langdon Winner (Chapter 11), with his non-Marxist but still radical critique of technological developments, or even Albert Borgmann (Chapter 18), who views his neo-Heideggerianism as revolutionary. There is no doubt in my mind that this issue still has major salience, not least because it is so easy for Winner and Borgmann to get their work published. The same is true, to a lesser extent, for

Feenberg; and in Chapter 12 we have seen Feenberg ally himself with the radical feminist epistemology of Sandra Harding, who is more widely published than Borgmann or even Winner. The call for revolutionary thinking—along with opposition to it—is not likely ever to disappear in technological society.

7. Another peculiarity of the calls for a more respectably academic SPT brings up another major *controversy*. One of the biggest beneficiaries of the reform of the American Philosophical Association in the mid 1980s was American Pragmatism—in fact, traditional (non- or pre-analytical) American philosophy generally. The Society for the Advancement of American Philosophy grew almost in step with SPT, but its membership quickly outstripped ours many times over. It is now one of the most stable, and exciting, among many groups under the umbrella of the APA. When Larry Hickman (Chapter 14) became active in SPT, all the controversies that swirled around this revival (recall Margolis's critiques, in Chapter 6, of Dewey as epistemologically naive) were echoed within SPT. And Hickman took on his opponents, representing a good segment of the views represented in SPT (and others as well), with gusto. And, like Margolis, they fought back with equal force. This might seem to be a mere academic controversy, but in Hickman's view, following Dewey, it is a much larger issue—namely, of the enlistment of academics (not just philosophers) in the effort to improve our technosocial world, if not in radical, then at least in progressive ways. I would label this the controversy over the service dimension of academia, which has been with us since the formation of the American Association of University Professors (with support from Dewey).
8. In my contributions to SPT, I have pushed this service dimension even further (see Chapter 17, but also Chapter 14 on Hickman and Chapter 23 on Paul Thompson), urging philosophers, other academics, and technical professionals to join with activists to help bring about the social reforms called for in Dewey's Pragmatism. For me, this involves another important *issue*, whether the *professional* work of academics, including engineers and scientists and their professional societies, should include an activist dimension, or whether that should rather be considered to be something individuals do as citizens. This issue also comes up in Chapter 21 (Deborah Johnson), on engineering and computer ethics. It, fairly obviously, has connections with pragmatism (controversy 6 above)

as well as with calls for a more academically respectable SPT (Chapters 9, on Pitt, and 18, on calls for a new discipline of philosophy of technology using Borgmann's work as springboard); but in my mind this is not an academic issue. I think a democratic society has a right to expect its professionals to contribute to the improvement of society in more ways than just doing their jobs, however well. But I admit that this is a controversial point, even among social reformers.

9. Another issue I have been personally involved with in SPT has to do with the need for a philosophy of engineering as a significant (if not the most important) part of philosophy of technology. In that connection, I will merely remind the reader of Chapter 15, on philosophy of engineering, where a whole quadrant-like world of disagreements—exactly parallel to those in philosophy of technology more generally—can be found. In my mind, these are not just *academic issues*. For example, Steve Goldman's critical perspective on the “captive” character of engineering knowledge is intended to do more than just correct the naivete of philosophical characterizations of engineering as applied science; Goldman would clearly like to see engineers (and their managers) held more accountable for their deeds than they currently are. In that, he is very much like Sheldon Krinsky (Chapter 22), with his call for a Critical Technology Assessment of biotechnology.
10. Some might question whether controversies within and with respect to environmental ethics belong in this list—in spite of a series of joint panels at meetings sponsored by SPT and the International Society for Environmental Ethics (often promoted by Andrew Light). However, I see no reason to separate, here, SPT from ISEE controversies; they are all extremely important for contemporary society. In the text (Chapter 21), I talked about Baird Callicott's resistance to Light's environmental pragmatism. As I said there, the issue suggests a mild irony with respect to Light. On one hand, he pushes SPT (see Chapter 18) to become more academically respectable; on the other, he challenges Callicott as too academic, as too involved in theoretical debates to actually do anything to help solve urgent environmental problems in the real world. In part, this reprises earlier controversies (2, 3, and 7, in different ways). But this is a mere quibble by contrast with the major *environmental issues* our contemporary society faces—whether in terms of pressures to roll back environmental laws protecting the environment in the USA, global

issues such as climate change, or environmental degradation associated with world trade agreements (among many others). It seems to me that at least the SPT members who also work with ISEE have made significant contributions in this major controversial arena.

11. Chapter 24, on so-called quotidian technologies, raises many issues, but the principal one again has to do with academicism. There are echoes of issues 6 and 7, above, but what I would say here is that those philosophers in SPT who worry about everyday life in a technological or technoscientific world are deeply immersed in an age-old controversy over the standards to be used in evaluating any culture, including our own viewed from within. Dewey, in *The Quest for Certainty* and *Reconstruction in Philosophy*, takes on pretty much the entire history of Western philosophy. At least the anti-academics in SPT follow him in that. Collins dismisses this as out of the twentieth-century mainstream. And Margolis calls Dewey's early version of pragmatism naive.
12. Postmodernism and the social construction of technology in relation to SPT (Chapter 25) raise very similar issues; in my view, the main issue here is age-old, or at least as old as the rise of the universities in the West in the Middle Ages. It is the issue of the social contract—specifically the ever-changing *terms* of that social contract—between the broader culture and university culture. This issue echoes number 2, above, and it can be said to have been the core issue of SPT from the very beginning. That social constructionists have not appreciated the contributions of philosophy of technology generally, or SPT in particular, does not mean that they are right in their ignorance. (See Winner's controversy with social constructionists as reported in Chapter 25.)
13. Finally, it seems to me very significant that these controversies have salience all over the world, as illustrated here by the three national groups of philosophers with whom SPT has had the most contact—in Germany, the Netherlands, and Spain. (See Chapters 13 and 19.) Not only are these controversies worth getting involved in, as SPT members have from the beginning, but they have found others equally concerned wherever they have established institutional connections.
14. So for at least a dozen reasons, here summarized around a dozen important issues, I believe that philosophers in SPT have made important

contributions, not only to philosophy (in or outside academia) but to our contemporary world. This is, of course, just my personal opinion; but I said at the outset that what I offer here is an essay rather than the encyclopedic survey I originally set out to write.

References

Note: Unlike most bibliographies, this one is arranged as a set of references by chapter.

Introduction:

Adler, Mortimer, ed. 1958 and 1961. *The Idea of Freedom*. 2 vols. San Francisco, CA: Institute for Philosophical Research, and New York, NY: Doubleday.

Adler, Mortimer, et al. 1952. *The Great Books of the Western World; volumes 2 and 3, The Great Ideas of the Western World*. Chicago, IL: Encyclopaedia Britannica.

Collins, Randall. 1998. *The Sociology of Philosophies: A Global Theory of Intellectual Change*. Cambridge, MA: Harvard University Press.

Durbin, Paul T. 1988. *Dictionary of Concepts in the Philosophy of Science*. Westport, CT: Greenwood Press.

Durbin, Paul T., ed. 1990. *Philosophy and Technology, volume 7: Broad and Narrow Interpretations of Philosophy of Technology*. Dordrecht, Netherlands: Kluwer.

Higgs, Eric; Andrew Light; and David Strong, eds. 2000. *Technology and the Good Life?* Chicago, IL: University of Chicago Press.

Kuhn, Thomas S. 1962. *The Structure of Scientific Revolutions*. Chicago, IL: University of Chicago Press.

McInnis, Raymond G. 2001. *Discourse Synthesis: Studies in Historical and Contemporary Social Epistemology*. Westport, CT: Praeger.

Mitcham, Carl. 1994. *Thinking through Technology: The Path between Engineering and Philosophy*. Chicago, IL: University of Chicago Press.

Mullins, Nicholas. 1973. *Theories and Theory Groups in Contemporary American Sociology*. New York, NY: Harper & Row.

Watson, Walter. 1985. *The Architectonics of Meaning: Foundations of the New Pluralism*. Albany, NY: State University of New York Press.

Chapter 1:

Carl Mitcham's publications, all of which are relevant, include:

1972, 1983. *Philosophy and Technology*. Edited with Robert Mackey. New York, NY: Free Press.

1973. *Bibliography of the Philosophy of Technology*. Compiled with Robert Mackey. Chicago, IL: University of Chicago Press.

1984. *Theology and Technology*. Lanham, MD: University Press of America.
1986. *Philosophy and Technology II: Information Technology and Computers in Theory and Practice*. Dordrecht, Netherlands: Reidl.
1989. *Ethical Issues Associated with Scientific and Technological Research for the Military*. New York, NY: New York Academy of Science.
1993. *Philosophy of Technology in Spanish Speaking Countries*. Dordrecht, Netherlands: Kluwer.
1994. *Thinking through Technology: The Path from Engineering to Philosophy*. Chicago, IL: University of Chicago Press.
1995. *Social and Philosophical Constructions of Technology, vol. 15 of Research in Philosophy & Technology*. Greenwich, CT: JAI Press.
2000. *Engineer's Toolkit: Engineering Ethics*. Upper Saddle River, NJ: Prentice Hall.
2001. *Visions of STS: Counterpoints in Science, Technology, and Society Studies*. Edited with Stephen Cutcliffe. Albany, NY: State University of New York Press.
2002. *The Challenges of Ivan Illich: A Collective Reflection*. Edited with Lee Hoinacki. Albany, NY: State University of New York Press.

Mitcham is also the general editor of the four-volume *Encyclopedia of Science, Technology, and Ethics*. Detroit, MI: Macmillan Reference, 2005.

Note: In subsequent chapters, the publications of opponents tend to be included in the chapter bibliography of the opponent. In Mitcham's case, there are few explicit attacks on him to be found in the literature. One exception is Larry Hickman's response to Mitcham as found in his *Philosophical Tools* (2001); see Chapter 14, below. All I do here is refer the reader to Mitcham's main opponents, by chapter: Mario Bunge in Chapter 5; Don Ihde in Chapter 10; and Andrew Feenberg in Chapter 12.

Chapter 2:

Alex Michalos's publications that might be said to be relevant to philosophy of technology include:

1974. *Philosophical Problems of Science and Technology*. Boston, MA: Allyn & Bacon.
1978. *Foundations of Decision Making*. Ottawa, Canada: Canadian Association for Publishing in Philosophy.
1980. "Philosophy of Science: Historical, Social, and Value Aspects." In P. Durbin, ed., *A Guide to the Culture of Science, Technology, and Medicine*. New York, NY: Free Press. Paperback edition, 1984, with bibliographical update.

1980–1982. *North American Social Report: A Comparative Study of the Quality of Life in Canada and the USA from 1964 to 1974*. Dordrecht: Reidel.

1989. *Militarism and the Quality of Life*. Toronto, Canada: Science for Peace; Downsview, Canada: Stevens.

1991–1993. *Global Report on Student Well-Being*. New York, NY: Springer.

2003. *Essays on the Quality of Life*. Dordrecht, Netherlands: Kluwer.
Chapter 3:

All of Shrader-Frechette's books are relevant to controversies in philosophy of technology:

1980. *Nuclear Power and Public Policy*. Dordrecht, Netherlands: Reidel. Second edition, 1983.

1981. *Environmental Ethics*. Pacific Grove, CA: Boxwood. Second edition, 1991.

1984. *Science Policy, Ethics, and Economic Methodology*. Dordrecht, Netherlands: Reidel.

1985. *Risk Analysis and Scientific Method*. Dordrecht, Netherlands: Reidel.

1991. Ed., *Nuclear Energy and Ethics*. Geneva, Switzerland: WCC Publications.

1991. *Risk and Rationality*. Berkeley, CA: University of California Press.

1992. With Lynton K. Caldwell. *Policy for Land: Law and Ethics*. Lanham, MD: Rowman & Littlefield.

1993. *Burying Uncertainty: Risk and the Case against Geological Disposal of Nuclear Waste*. Berkeley, CA: University of California Press.

1993. *Method in Ecology*. New York, NY: Cambridge University Press.

1994. *The Ethics of Scientific Research*. Lanham, MD: Rowman & Littlefield.

1997. Ed. with Laura Westra. *Technology and Human Values*. Lanham, MD: Rowman & Littlefield.

2002. *Environmental Justice: Creating Equality, Reclaiming Democracy*. New York, NY: Oxford University Press.

Chapter 4:

Wartofsky, Marx W. 1968. *Conceptual Foundations of Scientific Thought*. New York, NY: Macmillan.

_____. 1992. "Technology, Power, and Truth." In L. Winner, ed., *Democracy in a Technological Society*. Dordrecht, Netherlands: Kluwer. Originally an address at the

SPT meeting in 1989.

Most of the following references come from my *Social Responsibility in Science, Technology, and Medicine* (1992; notes for Chapter 11), and are related to the continuing appeal of Marxism after the fall of Soviet Communism:

- Buchanan, Allen E. 1981. *Marx and Justice: The Radical Critique of Liberalism*. Totowa, NJ: Rowman and Allanheld.
- Feenberg, Andrew. 1991. *Critical Theory of Technology*. New York, NY: Oxford University Press.
- Genovese, Eugene D. 1974. *Roll, Jordan, Roll: The World That the Slaves Made*. New York, NY: Pantheon.
- Gould, Carol. 1988. *Rethinking Democracy*. New York, NY: Cambridge University Press.
- Marx, Karl. 1977. *Selected Writings*, ed. D. McLellan. Oxford, UK: Oxford University Press.
- Marcuse, Herbert. 1964. *One-Dimensional Man*. Boston, MA: Beacon Press.
- McLellan, David. 1979. *Marxism after Marx*. New York, NY: Harper & Row.
- Noble, David. 1977. *America by Design: Science, Technology, and the Rise of Corporate Capitalism*. New York, NY: Knopf.
- Osborne, Peter, ed. 1991. *Socialism and the Limits of Liberalism*. New York, NY: Routledge.
- Schoolman, Morton. 1980. *The Imaginary Witness: The Critical Theory of Herbert Marcuse*. New York, NY: Free Press.

Chapter 5:

Although, as noted in the text, Bunge's list of books is long, the most relevant sources are:

- Bunge, Mario. 1985. *Treatise on Basic Philosophy. VII: Epistemology and Methodology III: Philosophy of Science and Technology. Part II. Life Science, Social Science and Technology*. Dordrecht, Netherlands: Reidel.
- _____. 1979. "The Five Buds of Technophilosophy." *Technology in Society* 1:1 (Spring): 67–74.
- _____. 1966. "Technology as Applied Science." *Technology and Culture* 7:3 (July): 329–347.

The following references add material for critiques:

- Ellul, Jacques. 1964. *The Technological Society*. New York, NY: Knopf. French original 1954.

- Feenberg, Andrew. 1991. *Critical Theory and Technology*. New York, NY: Oxford University Press.
- Hickman, Larry. 1990. *John Dewey's Pragmatic Technology*. Bloomington, IN: Indiana University Press.
- Kirk, Russell. 1953. *The Conservative Mind*. Chicago, IL: Regnery.
- _____, ed. 1982. *The Portable Conservative Reader*. New York: Viking/Penguin.
- Latour, Bruno, and Steve Woolgar. 1979. *Laboratory Life: The Social Construction of Scientific Facts*. Beverly Hills, CA: Sage.
- Lovekin, David. 1991. *Technique, Discourse, and Consciousness: An Introduction to the Philosophy of Jacques Ellul*. Bethlehem, PA: Lehigh University Press.
- Marcuse, Herbert. 1964. *One-Dimensional Man*. Boston, MA: Beacon.
- Margolis, Joseph. 1984. "Three Conceptions of Technology: Satanic, Titanic, Human." In P. Durbin, ed., *Research in Philosophy and Technology*, vol. 7. Greenwich, CT: JAI Press. Pp. 145–158.
- _____. 1986. *Pragmatism without Foundations: Reconciling Realism and Relativism*. New York, NY: Blackwell, 1986.
- Nussbaum, Martha. 1986. *The Fragility of Goodness: Luck and Ethics in Greek Tragedy and Philosophy*. New York: Cambridge University Press.
- Padilla, Hugo. 1993. "Technological Objects and Their Epistemological Base." In C. Mitcham, ed., *Spanish-Language Philosophy of Technology*. Dordrecht, Netherlands: Kluwer. Pp. 121–131.
- Pickering, Andrew. 1992. *Science as Practice and Culture*. Chicago, IL: University of Chicago Press.
- Rapp, Friedrich. 1991. "The Limited Promise of Technology Assessment." In P. Durbin, ed. *Europe, America, and Technology: Philosophical Perspectives*. Dordrecht: Kluwer. Pp. 157–173.
- von Bertalanffy, Ludwig. 1973. *General Systems Theory: Foundation, Development, Applications*. New York, NY: Braziller.
- Winner, Langdon. 1977. *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought*. Cambridge, MA: MIT Press.
- _____. 1986. *The Whole and the Reactor: A Search for Limits in an Age of High Technology*. Chicago, IL: University of Chicago Press.

Chapter 6:

On Margolis:

Krausz, M., and R. Shusterman, eds. 1999. *Interpretation, Relativism, and the Metaphysics of Culture: Themes in the Philosophy of Joseph Margolis*. New York, NY: Humanities Books.

Margolis's writings are so numerous that even a partial listing is overwhelming. What follow are items I think are relevant to Margolis's views on technological society:

2004. *Moral Philosophy after 9/11*. University Park, PA: Pennsylvania State University Press.
2003. *The Unraveling of Scientism: American Philosophy at the End of the Twentieth Century*. Ithaca, NY: Cornell University Press.
2002. *Reinventing Pragmatism: American Philosophy at the End of the Twentieth Century*. Ithaca, NY: Cornell University Press.
1992. *The Heidegger Case: On Philosophy and Politics*. Edited by Joseph Margolis and Tom Rockmore. Philadelphia, PA: Temple University Press.
1986. *Pragmatism without Foundations: Reconciling Relativism and Realism*. New York, NY: Blackwell.

And these items are related to controversial issues about Margolis's views on pragmatism:

- Aboulafia, Mitchell; Myrna Bookman; and Cathy Kemp, eds. 2002. *Habermas and Pragmatism*. London, UK: Routledge.
- Clough, Sharyn. 2003. *Beyond Epistemology: A Pragmatist Approach to Feminist Science Studies*. Lanham, MD: Rowman & Littlefield.
- Dalton, Thomas C. 2002. *Becoming John Dewey: Dilemmas of a Philosopher and Naturalist*. Bloomington, IN: Indiana University Press.
- Davidson, Donald. 1986. "A Coherence Theory of Truth and Knowledge." In E. Lapore, ed. *Truth and Interpretation: Perspectives on the Philosophy of Donald Davidson*. Oxford, UK: Blackwell.
- Dewey, John. 1920. *Reconstruction in Philosophy*. New York, NY: Holt. Later editions 1948, 1957.
- _____. 1925. *Experience and Nature*. Chicago, IL: Open Court.
- _____. 1929. *The Quest for Certainty*. New York, NY: Minton, Balch.
- _____. 1930. *Individualism, Old and New*. New York, NY: Minton, Balch.

- Durbin, Paul T., ed. 2003. Special author-meets-critics number of *Techne*, 7:1 (<http://spt.org>, under "journal"), on the Deweyan philosophy of technology of Larry Hickman.
- Feffer, Andrew. 1993. *The Chicago Pragmatists and American Progressivism*. Ithaca, NY: Cornell University Press.
- Gale, Richard M. 1999. *The Divided Self of William James*. New York, NY: Cambridge University Press.
- Hickman, Larry A. 1990. *John Dewey's Pragmatic Technology*. Bloomington, IN: Indiana University Press.
- _____. 2001. *Philosophical Tools for Technological Culture: Putting Pragmatism to Work*. Bloomington, IN: Indiana University Press.
- _____. 2003. "Revisiting Philosophical Tools for Technological Culture." In Durbin, ed., special number of *Techne* (<http://spt.org>), above, pp. 74–93.
- James, William. 1907. *Pragmatism: A New Name for Some Old Ways of Thinking*. New York, NY: Longmans, Green.
- _____. 1909. *The Meaning of Truth: A Sequel to Pragmatism*. New York, NY: Longmans, Green.
- McDermott, John. 1967. *The Writings of William James: A Comprehensive Edition*. New York, NY: Random House.
- McGee, Glenn. 1997. *The Perfect Baby: A Pragmatic Approach to Genetics*. Lanham, MD: Rowman & Littlefield.
- Mead, George Herbert. 1938. *The Philosophy of the Act*. Chicago, IL: University of Chicago Press.
- _____. 1964. "Scientific Method and Individual Thinker." In A. Reck, ed., *Selected Writings: George Herbert Mead*. Indianapolis, IN: Bobbs-Merrill. Pp. 171–211. (Original 1917.)
- _____. 1964. "Scientific Method and the Moral Sciences." In *Selected Writings* (above), pp. 248–266. (Original 1923.)
- Menand, Louis. 2001. *The Metaphysical Club*. New York, NY: Farrar, Straus and Giroux.
- Morris, Charles W. 1938. *Foundations of the Theory of Signs*. Chicago, IL: University of Chicago Press.
- Nussbaum, Martha. 1986. *The Fragility of Goodness*. New York, NY: Cambridge University Press.

Palmer, L. M. 2002. "Vico and Pragmatism: New Variations on Vichian Themes." *Transactions of the Charles S. Peirce Society* XXXVIII: 3: 433–440.

Papini, Giovanni. 1913. *Pragmatismo*. Milan, Italy.

Peirce, Charles Sanders. 1903. "Lectures on Pragmatism." In C. Hartshorne and P. Weiss, eds., *Collected Papers of Charles Sanders Peirce*. Cambridge, MA: Harvard University Press. Section 5. 196.

Putnam, Hilary. 1980. *Reason, Truth, and History*. Cambridge, UK: Cambridge University Press.

_____. 1994. "Sense, Nonsense, and the Senses: An Inquiry into the Powers of the Human Mind." *Journal of Philosophy* 91:9 (September): 445–517.

Quine, W. V. 1969. "Epistemology Naturalized." *Ontological Relativity and Other Essays*. New York, NY: Columbia University Press.

Rorty, Richard. 1986. "Pragmatism, Davidson, and Truth." In E. Lapore, ed. *Truth and Interpretation: Perspectives on the Philosophy of Donald Davidson*. Oxford, UK: Blackwell.

_____. 1998. *Achieving Our Country: Leftist Thought in Twentieth-Century America*. Cambridge, MA: Harvard University Press.

Stebbing, L. Susan. 1914. *Pragmatism and French Voluntarism*. Cambridge, UK: Cambridge University Press.

Stuhr, John J. 2000. *Pragmatism and Classical American Philosophy: Essential Readings and Interpretive Essays*. New York, NY: Oxford University Press.

West, Cornel. 1989. *The American Evasion of Philosophy: A Genealogy of Pragmatism*. Madison, WI: University of Wisconsin Press.

Chapter 7:

There are two volumes of essays in honor of Agassi, both edited by I.C. Jarvie and Nathaniel Laor in the Boston *Studies in the Philosophy of Science* series, vols. 161–162:

1995. *Critical Rationalism, Metaphysics and Science*. Dordrecht: Kluwer.

1995. *Critical Rationalism, the Social Sciences and the Humanities*. Dordrecht: Kluwer.

Books by Agassi in English that have some relevance to this chapter include:

1985. *Technology: Philosophical and Social Aspects*. Dordrecht, Netherlands: Reidel

1990. *Introduction to Philosophy: The Siblinghood of Humanity*. Delmar, NY: Caravan.

Also:

1966. "The Confusion between Science and Technology in the Standard Philosophies of Science." *Technology and Culture* 7:3 (July): 348–366.

See also:

Popper, Karl. 1945. *The Open Society and Its Enemies*. 2 vols. London, UK: Routledge.

_____. 1961. *The Poverty of Historicism*. 2nd ed. London, UK: Routledge.

Russell, Bertrand. 1959. *Common Sense and Nuclear Warfare*. New York, NY: Simon and Schuster.

_____. 2003. Man's Peril, 1954–56. Vol. 28 of *Collected Papers*. London, UK: Routledge.

On Pugwash, see their website: www.pugwash.org.

Chapter 8:

Edmund Byrne's publications include:

1990. *Work, Inc.: A Philosophical Inquiry*. Philadelphia, PA: Temple University Press.

1989. Edited with Joseph C. Pitt. *Technological Transformations*. Dordrecht, Netherlands: Kluwer.

1969. *Human Being and Being Human*. Englewood Cliffs, NJ: Prentice-Hall.

1968. *Probability and Opinion*. The Hague: Nijhoff.

1998. *Public Power, Private Interests: Where Do We Fit In?* AuthorHouse. Self-published.

The literature on work and justice that Byrne refers to, implicitly or explicitly, includes the following:

Barry, Brian. 1973. *The Liberal Theory of Justice*. Oxford, UK: Oxford University Press.

Brown, Alan. 1986. *Modern Political Philosophy: Theories of the Just Society*. New York, NY: Penguin.

Daniels, Norman, ed. 1974. *Reading Rawls*. New York, NY: Basic.

Huizinga, Johan. 1967. *Homo Ludens: A Study of the Play Element in Culture*. Boston, MA: Beacon.

Lichtenburg, Judith. 1984. "Workers, Owners and Factory Closings." *Report from the Center for Philosophy and Public Affairs* (Fall), p. 12.

- Narveson, Jan. 1989. *The Libertarian Idea*. Philadelphia, PA: Temple University Press.
- Nozick, Robert. 1974. *Anarchy, State, and Utopia*. New York: Basic.
- Rawls, John. 1971. *A Theory of Justice*. Cambridge, MA: Harvard University Press.
- Sandel, Michael J. 1982. *Liberalism and the Limits of Justice*. Cambridge, MA: Cambridge University Press.
- Sclove, Richard E. 1991. "The Nuts and Bolts of Democracy: Toward a Democratic Politics of Technological Design." In P. Durbin, ed., *Critical Perspectives on Nonacademic Science and Engineering*. Bethlehem, PA: Lehigh University Press. Pp. 239–262.
- Solomon, Robert C., and Mark Murphy, eds. 2000. *What Is Justice? Classic and Contemporary Readings*. 2nd ed. New York, NY: Oxford University Press.
- Terkel, Studs. 1972. *Working: People Talk about What They Do All Day and How They Feel about What They Do*. New York, NY: Random House.
- Wolff, Robert Paul. 1977. *Understanding Rawls*. Princeton, NJ: Princeton University Press.

Chapter 9:

Joseph Pitt's books include a number of edited volumes:

1978. *New Perspective on Galileo*. Dordrecht, Netherlands: Reidel.
1985. *Change and Progress in Modern Science: 4th International Conference on the History and Philosophy of Science*. Dordrecht, Netherlands: Kluwer.
1987. *Rational Changes in Science: Essays on Scientific Reasoning*. Dordrecht, Netherlands: Kluwer.
1988. *Theories of Explanation*. New York, NY: Oxford University Press.
1989. With Edmund Byrne. *Technological Transformation*. Dordrecht, Netherlands: Kluwer.
1992. *Galileo, Human Knowledge, and the Book of Nature*. Dordrecht, Netherlands: Kluwer.

Also two of his own:

1981. *Pictures, Images, and Conceptual Change: An Analysis of Wilfred Sellars's Philosophy of Science*. Dordrecht, Netherlands: Reidel.
2000. *Thinking about Technology: Foundations of the Philosophy of Technology*. New York, NY: Seven Bridges.

And he is coeditor of:

2004. With Dhavad Saleh-Isfahani and Douglas Eckel. *The Production and Diffusion of Public Choice Political Economics: Reflections on the VPI Center*. Malden, MA: Blackwell.

Finally, I edited an author-critics number of *Techne*, the online journal of the Society for Philosophy and Technology, on Pitt's *Thinking about Technology*: 5:1, Fall 1999. See <http://spt.org/journal>.

Chapter 10:

Don Ihde's main works on philosophy of technology include:

1979. *Technics and Praxis*. Dordrecht, Netherlands: Reidel.

1983. *Existential Technics*. Albany, NY: State University of New York Press.

1990. *Technology and the Lifeworld: From Garden to Earth*. Bloomington, IN: Indiana University Press.

1993. *Philosophy of Technology: An Introduction*. New York, NY: Paragon House.

For a chapter on Ihde's philosophy of technology, see *Achterhuis* (2001), among the books in his series, below.

The ten volumes Ihde has included in his Indiana University Press series on the philosophy of technology to date:

Hickman, Larry. 1990. *John Dewey's Pragmatic Technology*.

Zimmerman, Michael E. 1990. *Heidegger's Confrontation with Modernity*.

Ihde, Don. 1990. *Technology and the Lifeworld*.

Ihde, Don. 1991. *Instrumental Realism*.

Crease, Robert P. 1993. *The Play of Nature: Experimentation as Performance*.

Feenberg, Andrew, ed. 1995. *Technology and the Politics of Knowledge*.

Hopkins, Patrick D., ed. 1999. *Sex/Machine: Readings in Culture, Gender, and Technology*.

Hickman, Larry. 2001. *Philosophical Tools for Technological Culture: Putting Pragmatism to Work*.

Achterhuis, Hans, ed. 2001. *American Philosophy of Technology: The Empirical Turn*.

Ihde, Don, and Evan Selinger, eds. 2003. *Chasing Technoscience: Matrix for Materiality*.

Chapter 11:

For background to this chapter, I chose Patrick Hamlett:

1992. *Understanding Technological Politics*. Englewood Cliffs, NJ: Prentice Hall.

Winner's book publications include:

1977. *Autonomous Technology: Technology-Out-of-Control in Political Thought*. Cambridge, MA: MIT Press.

1986. *The Whale and the Reactor: A Search for Limits in an Age of High Technology*. Chicago, IL: University of Chicago Press.

And as editor:

1992. *Democracy in a Technological Society*. Dordrecht, Netherlands: Kluwer.

Among his numerous other publications, Winner has attacked critics in the Social Construction of Technology school:

1993. "Upon Opening the Black Box and Finding It Empty: Social Constructivism and the Philosophy of Technology." *Science, Technology, & Human Values* 18:3 (Summer): 362–378.

The article was originally Winner's presidential address at a conference of SPT, and can be found in:

J. Pitt and E. Lugo, eds., 1991. *The Technology of Discovery and the Discovery of Technology*. Blacksburg, VA: SPT.

And he has been attacked in return:

Aibar, Eduardo. 1995. "Technological Frames in a Town Planning Controversy: Why We Do Not Have to Drop Constructivism to Avoid Political Abstinence." *Research in Philosophy and Technology*, vol. 15. Greenwich, CT: JAI Press. Pp. 3–20.

_____. 1996. "The Evaluative Relevance of Social Studies of Technology." *Techne* 1:3–4. See <http://spt.org/journal>.

Woolgar, Steve. 1993. "What's at Stake in the Sociology of Technology? A Reply to Pinch and to Winner." *Science, Technology, & Human Values* 18:4 (Autumn): 523–529.

Chapter 12:

Andrew Feenberg's notes to his Harding review in *Science, Technology, & Human Values* (24:4, Autumn 1999: 483–494) offer the best set of references to his work and background. For convenience, I have just left his own publications within his list.

- Borgmann, Albert. 1984. *Technology and the Character of Contemporary Life*. Chicago, IL: University of Chicago Press.
- Braverman, Harry. 1974. *Labor and Monopoly Capital*. New York, NY: Monthly Review Press.
- Feenberg, Andrew. 1986. *Lukacs, Marx, and the Sources of Critical Theory*. New York, NY: Oxford University Press.
- . 1991. *Critical Theory of Technology*. New York, NY: Oxford University Press.
- . 1995. *Alternative Modernity*. Berkeley, CA: University of California Press.
- . 1999. *Questioning Technology*. London, UK: Routledge & Kegan Paul.
- Galison, Peter, and David Stump, eds. 1996. *The Disunity of Science*. Stanford, CA: Stanford University Press.
- Goldmann, Lucien. 1973. *Lukacs et Heidegger*. Paris, France: Denoel/Gonthier.
- Harding, Sandra. 1986. *The Science Question in Feminism*. Ithaca, NY: Cornell University Press.
- . 1991. *Whose Science? Whose Knowledge?* Ithaca, NY: Cornell University Press.
- . 1998. *Is Science Multicultural?* Bloomington, IN: Indiana University Press.
- Hartsock, Nancy. 1983. "The Feminist Standpoint: Developing the Ground for a Specifically Feminist Historical Materialism." In *Discovering Reality*, edited by S. Harding and M. Hintikka. Dordrecht, Netherlands: Reidel.
- Hirschhorn, Larry. 1988. *Beyond Mechanization*. Cambridge, MA: MIT Press.
- Latour, Bruno. 1993. *We Have Never Been Modern*. Cambridge, MA: Harvard University Press.
- Lukács, Georg. 1971. *History and Class Consciousness*. Cambridge, MA: MIT Press.
- Marcuse, Herbert. 1964. *One-Dimensional Man*. Boston, MA: Beacon.
- Noble, David. 1984. *Forces of Production*. New York, NY: Oxford University Press.
- Pickering, Andrew. 1995. *The Mangle of Practice*. Chicago, IL: University of Chicago Press.
- Sohn-Rethel, Alfred. 1978. *Intellectual and Manual Labour: A Critique of Epistemology*. London, UK: Macmillan.
- Star, Susan Leigh. 1995. "The Politics of Formal Representations: Wizards, Gurus, and Organizational Complexity." In S. Star, ed., *Ecologies of Knowledge: Work and Politics in Science and Technology*. Albany, NY: State University of New York Press.

Suchman, Lucy. 1987. *Plans and Situated Actions: The Problem of Human-Machine Communication*. Cambridge, UK: Cambridge University Press.

Winner, Langdon. 1986. *The Whale and the Reactor*. Chicago, IL: University of Chicago Press.

Also see:

Durbin, Paul T. 1994. "Toward Civilizational Change" [review of Feenberg's *Critical Theory of Technology*], in F. Ferre, ed., *Research in Philosophy and Technology*, vol. 14. Greenwich, CT: JAI Press. Pp. 290–293.

Light, Andrew. 1997. "Critical Theorist of Technology: Feenberg on Marx and Democracy," in C. Mitcham, ed. *Research in Philosophy and Technology*, vol. 16. Greenwich, CT: JAI Press. Pp. 131–137.

Rothschild, Joan, ed. 1983. *Machina ex Dea: Feminist Perspectives on Technology*. New York, NY: Pergamon.

Wajcman, Judy. 1991. *Feminism Confronts Technology*. University Park, PA: Pennsylvania State University Press.

Chapter 13:

What follows is taken from the table of contents of the *Techne* (4:1–4 1997) version of the Karlsruhe 1997 conference proceedings (see <http://spt.org/journal>); although I take it to be representative of the state of the art in Germany at the time, an international database would have to be searched to find books by the various authors to provide a proper set of references.

Part I:

Agazzi, Evandro (Fribourg), and Hans Lenk (Karlsruhe), "Advances in the Philosophy of Technology: Proceedings of a Meeting of the International Academy of the Philosophy of Science, Karlsruhe, Germany, May 1997; Introduction."

Hubner, Kurt (Kiel), "Philosophy of Modern Art and Philosophy of Technology."

Kornwachs, Klaus (Cottbus), "A Formal Theory of Technology?"

Lenk, Hans (Karlsruhe), "Advances in the Philosophy of Technology: New Structural Characteristics of Technologies."

Mainzer, Klaus (Augsburg), "Computer Technology and Evolution: From Artificial Intelligence to Artificial Life."

Part II:

Leiber, Theodor (Augsburg), "On the Impact of Deterministic Chaos on Modern Science and

Philosophy of Science: Implications for the Philosophy of Technology?"

- Poser, Hans (Technical U., Berlin), "On Structural Differences between Science and Engineering."
 Schummer, Joachim (Karlsruhe), "Challenging Standard Distinctions between Science and Technology: The Case of Preparative Chemistry."

Part III:

- Kanitscheider, Bernulf (Giessen), "Humans and Future Communication Systems."
 Leidlmair, Karl (Innsbruck), "From the Philosophy of Technology to a Theory of Media."
 Rammert, Werner (Free Univ., Berlin), "Relations that Constitute Technology and Media that Make a Difference: Toward a Social Pragmatic Theory of Technicization."
 Rapp, Friedrich (Dortmund), "The Material and Cultural Aspects of Technology."
 Ropohl, Gunther. (Frankfurt), "Philosophy of Socio-Technical Systems."
 Tondl, Ladislav (Czech Academy), "Information and Systems Dimensions of Technological Artifacts."

Part IV:

- Huning, Alois (Dusseldorf), "Preferences and Value Assessments in Cases of Decision under Risk."
 Mohr, Hans (Stuttgart), "Technology Assessment in Theory and Practice."
 Lenk, Hans (Karlsruhe), "Conclusion: Technological Responsibility and the Humanities; the University of Karlsruhe."

On Spain a more appropriate set of references can be culled from:

Mitcham, Carl. 1993. *Philosophy and Technology in Spanish Speaking Countries*. Dordrecht, Netherlands: Kluwer.

Mitcham lists the following Invescit-related books as representative of recent work in Spain. The same list appears in the text, but I think it should be repeated here:

Sanmartin, Jose. 1897. *Los nuevos redentores: Reflexiones sobre la ingenieria genetica, la sociobiologia y el mundo feliz que nos prometen* [The new redeemers: Reflections on genetic engineering, sociobiology, and the happy world they promise us]. Barcelona, Spain: Anthropos.

Mitcham, Carl. 1989. *Que es la filosofia de la tecnologia?* [What is the philosophy of technology?]. Barcelona, Spain: Anthropos.

- Vilanova, Santiago. 1988. *Chernobil: El fin del mito nuclear—El impacto informativo y biológico del mayor accidente de la industria electronuclear* [Chernobyl: The end of the nuclear myth—The information and biological impact of the great accident of the nuclear electric power industry]. Barcelona, Spain: Anthropos.
- Lopez Cerezo, Jose Antonio, and Jose Luis Lujan Lopez. 1989. *El artefacto de la inteligencia: Una reflexion critica sobre el determinismo biologico de la inteligencia* [The artifact of intelligence: A critical reflection on the myth of the biological determination of intelligence]. Barcelona, Spain: Anthropos, 1989.
- Andres Moya. 1989. *Sobre la estructura de la teoria de la evolucion* [On the structure of the theory of evolution]. Barcelona, Spain: Anthropos.
- Medina, Manuel, and Jose Sanmartin, eds. 1990. *Ciencia, tecnologia y sociedad: Estudios interdisciplinarios en la universidad, en la educacion y en la gestion publica* [Science, technology, and society: Interdisciplinary studies in the university, in education, and in public administration]. Barcelona, Spain: Anthropos.
- Puig, Josep, and Joaquim Corominas. *La ruta de la energia* [Energy path]. Barcelona, Spain: Anthropos.
- Sanmartin, Jose, Stephen H. Cutcliffe, Steven L. Goldman, and Manuel Medina, eds. 1992. *Estudios sobre sociedad y tecnologia* [Studies concerning society and technology]. Barcelona, Spain: Anthropos.
- Ursua, Nicanor. 1993. *Cerebro y conocimiento: Un enfoque evolucionista* [Brain and knowledge: An evolutionist approach]. Barcelona, Spain: Anthropos.

Mitcham also mentions:

- Quintanilla, Miguel Angel. 1989. *Tecnologia: Un enfoque filosofico*. Madrid, Spain: FUNDESCO.

Chapter 14:

For background, see:

- Dewey, John. 1920. *Reconstruction in Philosophy*. New York, NY: Holt. Later editions 1948, 1957.
- _____. 1925. *Experience and Nature*. Chicago, IL: Open Court.
- _____. 1929. *The Quest for Certainty*. New York, NY: Minton, Balch.
- _____. 1930. *Individualism, Old and New*. New York, NY: Minton, Balch.
- _____. 1934. *A Common Faith*. New Haven, CT: Yale University Press.

_____. 1938. *Logic: The Theory of Inquiry*. New York, NY: Holt.

Mead, George Herbert. 1964. *Selected Writings*. Indianapolis, IN: Bobbs-Merrill.

Sleeper, Ralph. 1986. *The Necessity of Pragmatism: John Dewey's Conception of Philosophy*. New Haven, CT: Yale University Press.

Relative to Hickman himself, see:

Hickman, Larry A. 1990. *John Dewey's Pragmatic Technology*. Bloomington, IN: Indiana University Press.

_____. 2001. *Philosophical Tools for a Technological Culture: Putting Pragmatism to Work*. Bloomington, IN: Indiana University Press.

_____, ed. 1998. *Reading Dewey: Interpretations for a Postmodern Generation*. Bloomington, IN: Indiana University Press.

_____, and Thomas M. Alexander, eds. 1998. *The Essential Dewey*. 2 vols. Bloomington, IN: Indiana University Press.

In addition, I edited a special author/critics number on Philosophical Tools, in *Techné* 7:1 (Spring 2003); see <http://spt.org/journal>.

I also reviewed that book elsewhere; see:

Durbin, Paul T. 2004. "Book Review: Philosophical Tools for Technological Culture [Hickman] and American Philosophy of Technology [Achterhuis]." *Metaphilosophy*, 35:4 (July): 583–592.

Chapter 15:

For Mario Bunge's foundational view of technology, including engineering as applied science, see Chapter 5, above. What follow are the primary references in the text:

Cuevas Badallo, Ana. 2000. "Caracterización del conocimiento tecnológico y su desarrollo: Hacia un epistemología de las ciencias ingenieriles." Doctoral thesis in the Department of Logic and Philosophy of Science, University of the Basque Country, San Sebastian, Spain.

_____. 2005. "The Many Faces of Science and Technology Relationships." *Essays in Philosophy* [online journal, Humboldt State University] 6:1 (January).

Dessauer, Friedrich. 1927. *Philosophie der Technik*. Bonn, Germany: F. Cohen.

_____. 1956. *Streit um die Technik*. Frankfurt: J. Knecht. Abridged version published by Herder, Freiburg, in 1959.

Durbin, Paul T., ed. 1991. *Critical Perspectives on Nonacademic Science and Engineering*.

Bethlehem, PA: Lehigh University Press.

- Florman, Samuel. 1976. *The Existential Pleasures of Engineering*. New York, NY: St. Martin's.
- _____. 1981. *Blaming Technology: The Irrational Search for Scapegoats*. New York: St. Martin's.
- Goldman, Steven L. 1987. "The History of Engineering Education: Perennial Issues in the Supply and Training of Talent." Available in MS from the National Technical Information Service (NTIS), Springfield, VA, but technically unpublished. A report prepared for the U.S. Congress Office of Technology Assessment. [Note: For Goldman's numerous citations, the MS must be consulted.]
- Koen, Billy Vaughn. 1985. *Definition of the Engineering Method*. Washington, DC: American Society of Engineering Education.
- _____. 1991. "The Engineering Method." In P. Durbin, ed., *Critical Perspectives on Nonacademic Science and Engineering*. Bethlehem, PA: Lehigh University Press. Pp. 33–59. This is an abbreviated version of the previous entry.
- _____. 2003. *Discussion of the Method: Conducting the Engineering Approach to Problem Solving*. New York, NY: Oxford University Press.
- Laymon, Ronald. 1991. "Idealizations and the Reliability of Dimensional Analysis." In P. Durbin, ed., *Critical Perspectives* (above). Pp. 146–180.
- Noble, David F. 1979. *America by Design: Science, Technology and the Rise of Corporate Capitalism*. New York, NY: Knopf.
- _____. 1984. *Forces of Production: A Social History of Industrial Automation*. New York, NY: Knopf. Paperback 1986, New York, NY: Oxford University Press.

Chapter 16:

For Donald Phillip Verene, see:

1997. *Philosophy and the Return to Self-Knowledge*. New Haven, CT: Yale University Press.

Also:

Glenn Magee, ed. 2002. *Philosophy and Culture: Essays in Honor of Donald Phillip Verene*. Charlottesville, VA: Philosophy Documentation Center.

For Frederick Ferre, there is a longer list of relevant books, plus one key article:

1988. *Philosophy of Technology*. Englewood Cliffs, NJ: Prentice-Hall. Second edition, University of Georgia Press, 1995.

1996. *Being and Value: Toward a Constructive Postmodern Metaphysics*. Albany, NY: State University of New York Press.

1998. *Knowing and Value: Toward a Constructive Postmodern Epistemology*. Albany, NY: SUNY Press.

2001. *Living and Value: Toward a Constructive Postmodern Ethics*. Albany, NY: SUNY Press.

1995. "Philosophy and Technology after Twenty Years." *Techne* 1:1–2; see <http://spt.org/journal>.

Other pertinent references include:

Borgmann, Albert. 1984. *Technology and the Character of Contemporary Life: A Philosophical Inquiry*. Chicago, IL: University of Chicago Press.

Ellul, Jacques. 1964. *The Technological Society*. New York, NY: Knopf. French original 1954.

_____. 1980. *The Technological System*. New York, NY: Continuum. French original 1977.

Heidegger, Martin. 1977. *The Question Concerning Technology and Other Essays*. San Francisco, CA: Harper and Row.

Lovekin, David. 1990. *Technique, Discourse, and Consciousness*. Bethlehem, PA: Lehigh University Press.

Chapter 17:

Durbin, Paul. 1968. *Logic and Scientific Inquiry*. Milwaukee, WI: Bruce.

_____. 1968. *Philosophy of Science: An Introduction*. New York, NY: McGraw-Hill.

_____, ed. 1980, 1984. *A Guide to the Culture of Science, Technology, and Medicine*. New York, NY: Free Press.

_____, ed. 1991. *Critical Perspectives on Engineering and Science in R&D Settings*. Bethlehem, PA: Lehigh University Press.

_____. 1992. *Social Responsibility in Science, Technology, and Medicine*. Bethlehem, PA: Lehigh University Press.

_____. 1999. "In Defense of a Social-Work Philosophy of Technology." In C. Mitcham, ed., *Technology and Social Action*, volume 16 of *Research in Philosophy and Technology*. Greenwich, CT: JAI Press. The volume includes reactions and critiques.

_____. 2000. "SPT at the End of a Quarter Century: What Have We Accomplished?" *Techne* 5:2 (Winter): 1–12. See <http://spt.org/journal>.

_____. 2000. "Activist Philosophy of Technology: Essays 1989–1999." Available on Durbin

website, www.udel.edu/Philosophy/pdurbin/Pub.html.

Chapter 18:

For Albert Borgmann, see:

1984. *Technology and the Character of Contemporary Life*. Chicago, IL: University of Chicago Press.
1992. *Crossing the Postmodern Divide*. Chicago, IL: University of Chicago Press.
1999. *Holding on to Reality: The Nature of Information at the Turn of the Millennium*. Chicago, IL: University of Chicago Press.
2000. "Reply to My Critics." In E. Higgs, A. Light, and D. Strong, eds., *Technology and the Good Life?* Chicago, IL: University of Chicago Press.

The Borgmann-based volume used in the text is:

Higgs, Eric, Andrew Light, and David Strong, eds. 2000. *Technology and the Good Life?* Chicago, IL: University of Chicago Press.

See also the special issue of *Techne*, edited by Phil Mullins, on Borgmann's *Holding on to Reality*: 6:1 (Fall 2002) at <http://spt.org/journal>.

Chapter 19:

The basic source for the text is:

Tijmes, Pieter. 1997. "Preface: Dutch Chandeliers of Philosophy of Technology." *Techne* 3:1 (Fall). Tijmes provides the summary of Dutch philosophy of technology that was used in the text; see <http://spt.org/journal>.

But see also:

Achterhuis, Hans, ed. 2001. *American Philosophy of Technology: The Empirical Turn*. Bloomington, IN: Indiana University Press.

Durbin, Paul T. 2004. "Book Review: Philosophical Tools for Technological Cultures [Hickman] and American Philosophy of Technology [Achterhuis]." *Metaphilosophy*. 35:4 (July): 583–592.

Verbeek Peter-Paul Verbeek. 2005. *What Things Do: Philosophical Reflections on Technology, Agency, and Design*. University Park, PA: Pennsylvania State University Press.

Chapter 20:

Baum, Robert J. 1980. *Ethics and Engineering Curricula*. Hastings-on-Hudson, NY: Hastings

Center.

- Chalk, Rosemary, Mark Frankel, and Sallie B. Chafer. 1980. *AAAS Professional Ethics Project: Professional Ethics Activities in the Scientific and Engineering Societies*. Washington, DC: American Association for the Advancement of Science.
- Churchill, Larry. 1978. "The Role of the Stranger: The Ethicist in Professional Education." *Hastings Center Report*, 8:6:13–15.
- Cranor, Carl F. 1992. *Regulating Toxic Substances: A Philosophy of Science and the Law*. New York, NY: Oxford University Press.
- Durbin, Paul T. 1992. *Social Responsibility in Science, Technology, and Medicine*. Bethlehem, PA: Lehigh University Press.
- _____. 1997. "Engineering Ethics and Social Responsibility: Reflections on Recent Developments in the USA." *Bulletin of Science, Technology and Society* 17: 2-3: 77–83.
- Engelhardt, H. Tristram, Jr. 1986. *Foundations of Bioethics*. New York, NY: Oxford University Press.
- _____. 1991. *Bioethics and Secular Humanism: The Search for a Common Morality*. London, UK: SCM Press, and Philadelphia, PA: Trinity Press.
- Flores, Albert. 1977. "National Project on Engineering Ethics to Bring Together Engineers, Philosophers." *Professional Engineer* 47:8:26–29.
- _____, ed. 1989. *Ethics and Risk Management*. Lanham, MD: University Press of America.
- Harris, Charles E., Michael S. Pritchard, and Michael J. Rabins, eds. 2005. 3d ed. *Engineering Ethics: Concepts and Cases*. Belmont, CA: Thomson/Wadsworth.
- Hollander, Rachelle. 1983. "Conference Report: Engineering Ethics." *Science, Technology, & Human Values* 8:1:25–29.
- Jasanoff, Sheila. 1986. *Risk Management and Political Culture: A Comparative Study of Science in the Policy Context*. New York, NY: Sage.
- Johnson, Deborah, ed. 1991. *Ethical Issues in Engineering*. Englewood Cliffs, NJ: Prentice Hall.
- Layton, Edwin D. 1971. *The Revolt of the Engineers: Social Responsibility and the American Engineering Profession*. Cleveland, OH: Press of Case Western Reserve University.
- Lenk, Hans, and Günter Ropohl, eds. 1987. *Technik und Ethik*. Stuttgart, Germany: Reclam.
- Martin, Mike, and Roland Schinzinger. 1990. *Ethics in Engineering*. 2d ed. New York, NY: McGraw-Hill.

- Mitcham, Carl. 1992. *Engineering Ethics throughout the World: Introduction, Documentation, Commentary, and Bibliography*. University Park, PA: STS Press.
- _____. 1991. "Engineering as Productive Activity: Philosophical Remarks." In P. Durbin, ed., *Critical Perspectives on Nonacademic Science and Engineering*. Bethlehem, PA: Lehigh University Press. Pp. 80–117.
- Noble, David F. 1977. *America by Design: Science, Technology, and the Rise of Corporate Capital*. New York, NY: Knopf.
- Shrader-Frechette, Kristin. 1991. *Risk and Rationality: Philosophical Foundations for Populist Reforms*. Berkeley, CA: University of California Press.
- Winner, Langdon. 1990. "Engineering Ethics and Political Imagination." In P. Durbin, ed., *Broad and Narrow Interpretations of Philosophy of Technology*. Dordrecht, Netherlands: Kluwer. Pp. 53–64.

Chapter 21:

Andrew Light's books, some edited jointly with others, include:

1996. Ed. with Eric Katz. *Environmental Pragmatism*. London, UK: Routledge.
1997. *Space, Place, and Environmental Ethics*. Lanham, MD: Rowman & Littlefield.
1998. *Social Ecology after Bookchin*. New York, NY: Guilford.
2000. *Race, Class, and Community Identity*. Amherst, NY: Humanity Press.
2000. With Eric Higgs, and David Strong, eds. *Technology and the Good Life?* Chicago, IL: University of Chicago Press.
2000. *Beneath the Surface: Critical Essays on the Philosophy of Deep Ecology*. Cambridge, MA: MIT Press.
2003. *Environmental Ethics: An Anthology*. Malden, MA: Blackwell.
2003. *Moral and Political Reasoning in Environmental Practice*. Cambridge, MA: MIT Press.
2004. *Animal Pragmatism: Rethinking Human-Nonhuman Relationships*. Bloomington, IN: Indiana University Press.

On environmental ethics more generally than just the relation to technology:

- Arnold, Ron. 1999. *Undue Influence: Wealthy Foundations, Grant-Driven Environmental Groups, and Zealous Bureaucrats That Control Your Future*. Bellevue, WA: Free Enterprise Press.
- Callicott, J. Baird. 2005. "Introduction" [to part 1, "Environmental Ethics". In Zimmerman et al.,

- Environmental Philosophy*, 4th ed. Upper Saddle River, NJ: Prentice Hall. Pp. 5–15.
- _____. 1999. *Beyond the Land Ethic: More Essays in Environmental Philosophy*. Albany, NY: State University of New York Press.
- Carson, Rachel. 1962. *Silent Spring*. Boston, MA: Houghton Mifflin.
- Daly, Herman. 1993. *Valuing the Earth: Economics, Ecology, Ethics*. Cambridge, MA: MIT Press.
- DesJardins, Joseph, ed. 1999. *Environmental Ethics: Concepts, Policy, Theory*. Mountain View, CA: Mayfield.
- Dewey, John. 1929. *The Quest for Certainty*. New York, NY: Minton, Balch.
- Easterbrook, Gregg. 1995. *A Moment on the Earth: The Coming Age of Environmental Optimism*. New York, NY: Viking.
- Graham, Frank. 1970. *Since Silent Spring*. Boston, MA: Houghton-Mifflin.
- Leopold, Aldo. 1949. *A Sand County Almanac*. New York, NY: Oxford University Press.
- Mittermeier, Russell, et al. 2000. *Hotspots: Earth's Biologically Richest and Most Endangered Terrestrial Eco-Regions*. New York, NY: Conservation International, and Chicago, IL: University of Chicago Press.
- Norton, Bryan. 1986. *The Preservation of Species: The Value of Biological Diversity*. Princeton, NJ: Princeton University Press.
- _____. 1991. *Towards Unity among Environmentalists*. New York, NY: Oxford University Press.
- Strong, David. 1995. *Crazy Mountains: Learning from Wilderness to Weigh Technology*. Albany, NY: State University of New York Press.
- Warren, Karen. 2005. "Introduction" [to part 2, "Ecofeminism and Social Justice"]. In Zimmerman et al., *Environmental Philosophy*, 4th ed. Upper Saddle River, NJ: Prentice Hall. Pp. 139–154.
- _____. 2005. "The Power and the Promise of Ecofeminism, Revisited." In Zimmerman et al. Pp. 252–279.
- Zimmerman, Michael E. et al., eds. 2005. *Environmental Philosophy: From Animal Rights to Radical Ecology*, 4th ed. Upper Saddle River, NJ: Prentice Hall.

Chapter 22:

Sheldon Krimsky's three relevant books are:

1982. *Genetic Alchemy*. Cambridge, MA: MIT Press.
1991. *Biotechnics and Society: The Rise of Industrial Genetics*. New York, NY: Praeger.
1996. *Agricultural Biotechnology and the Environment*. Urbana, IL: University of Illinois Press.
- The following references help to flesh out a general philosophy of biotechnology:
- Arber, Werner. 1979. "Promotion and Limitation of Genetic Exchange." *Science* 205: 361–365.
- Bayertz, Kurt. 1994. *GenEthics: Technological Intervention in Human Reproduction as a Philosophical Problem*. New York, NY: Cambridge University Press.
- Boylan, Michael, and Kevin Brown. 2001. *Genetic Engineering: Science and Ethics on the New Frontier*. Upper Saddle River, NJ: Prentice Hall.
- Brannigan, Michael C. 2001. *Ethical Issues in Human Cloning*. New York, NY: Seven Bridges.
- Bunge, Mario. 1985. *Treatise on Basic Philosophy*, vol. 7, part II. Dordrecht, Netherlands: Reidel.
- Burley, Justine, and John Harris. 2002. *A Companion to Genethics*. Malden, MA: Blackwell.
- Cuevas Badallo, Ana. 2000. *Caracterizacion del conocimiento tecnico y su desarrollo*. Doctoral thesis, University of the Basque Country, Spain.
- . 2005. "The Many Faces of Science and Technology Relationships." *Essays in Philosophy* [online journal, Humboldt State University] 6:1 (January).
- Dawkins, Richard. 1989. *The Selfish Gene*. New York, NY: Oxford University Press.
- Durbin, Paul T. 1991. "Introduction." In P. Durbin, ed., *Critical Perspectives on Nonacademic Science and Engineering*. Bethlehem, PA: Lehigh University Press. Pp. 11–23.
- Glover, Jonathan. 1984. *What Sort of People Should There Be?* New York, NY: Penguin.
- Goldman, Steven L. 1991. "The Social Captivity of Engineering." In P. Durbin, ed., *Critical Perspectives on Nonacademic Science and Engineering* (above). Pp. 121–145.
- Heyd, David. 1992. *Genethics: Moral Issues in the Creation of People*. Berkeley, CA: University of California Press.
- Hughes, Thomas P. 1988. "The Seamless Web: Technology, Science, et cetera, et cetera." In B. Elliot, ed., *Technology and Social Process*. Edinburgh, Scotland: University of Edinburgh Press. Pp. 9–19.
- Jackson, David, Robert Symons, and Paul Berg. 1972. "Biochemical Method for Inserting New

- Genetic Information into DNA of Simian Virus 40,” *Proceedings of the National Academy of Science*, 69: 2904–2909.
- Khoury, M., W. Burke, and E. Thomson. 2000. *Genetics and Public Health in the 21st Century*. New York, NY: Oxford University Press.
- Koen, Billy Vaughn. 1985. *Definition of the Engineering Method*. Washington, DC: American Association of Engineering Education.
- _____. 1991. “The Engineering Method.” In P. Durbin, ed., *Critical Perspectives on Nonacademic Science and Engineering* (above). Pp. 33–59.
- _____. 2003. *Discussion of the Method*. New York, NY: Oxford University Press.
- Knorr Cetina, Karin. 1981. *The Manufacture of Knowledge*. New York, NY: Pergamon.
- Knorr Cetina, Karin, and Klaus Amann. 1990. “Image Dissection in Natural Scientific Inquiry.” *Science, Technology, & Human Values* 15: 259–283.
- Layton Jr., Edwin T. 1991. “A Historical Definition of Engineering.” In P. Durbin, ed., *Critical Perspectives on Nonacademic Science and Engineering* (above). Pp. 60–79.
- Lewontin, Richard C. 2000. *It Ain’t Necessarily So: The Dream of the Human Genome and Other Illusions*. New York, NY: New York Review of Books.
- _____. 2000. *The Triple Helix: Gene, Organism, and Environment*. Cambridge, MA: Harvard University Press.
- Mahner, Martin, and Mario Bunge. 1997. *Foundations of Biophilosophy*. New York, NY: Springer.
- Marshall, Eliot. 1996. “The Genome Program’s Conscience.” *Science* 274: 488–490.
- _____. Morange, Michel. 1998. *History of Molecular Biology*. Cambridge, MA: Harvard University Press.
- _____. 2001. *The Misunderstood Gene*. Cambridge, MA: Harvard University Press.
- Mullis, Kary B. 1990. “The Unusual Origin of the Polymerase Chain Reaction.” *Scientific American* 262 (April): 36–43.
- National Human Genome Research Institute. 1997. *Ethical, Legal, and Social Implications of the Human Genome Project*. Bethesda, MD: National Human Genome Research Institute.
- Quintanilla, Miguel Angel. 1996. “The Incompleteness of Technics.” In G. Munevar, ed., *Spanish Studies in the Philosophy of Science*. Dordrecht, Netherlands: Kluwer. Pp. 89–102.

- Schirmacher, Wolfgang. 1987. "Homo Generator: The Challenge of Gene Technology." In P. Durbin, ed., *Technology and Responsibility*. Dordrecht, Netherlands: Reidel. Pp. 203–225.
- Sigman, Mike. 2002. "Bio-Feedback: Biotechnology is the wave of the future, and Delaware is riding the crest." *Delaware Today*, November, pp. 73ff.
- Sterelny, Kim. 2001. *Dawkins vs. Gould*. Lanham, MD: Totem.
- Suzuki, David T. 1989. *Genethics: The Clash Between the New Genetics and Human Values*. Cambridge, MA: Harvard University Press.
- _____. 1988. *Genethics: The Ethics of Creating Life*. Don Mills, Ontario: Stoddart.

Chapter 23:

Paul Thompson's books and articles—some authored or edited with others—include:

1992. *The Ethics of Aid and Trade: U.S. Food Policy, Foreign Competition, and the Social Contract*. New York, NY: Cambridge University Press.
1995. *The Spirit of the Soil: Agriculture and Environmental Ethics*. New York, NY and London, UK: Routledge.
1997. *Food Biotechnology in Ethical Perspective*. London, UK: Chapman and Hall.
1998. *Agricultural Ethics: Research, Teaching, and Public Policy*. Ames, IA: Iowa State University Press.
2000. Ed. with Thomas C. Hilde. *The Agrarian Roots of Pragmatism*. Nashville, TN: Vanderbilt University Press.
2003. "The Environmental Ethics Case for Crop Biotechnology: Putting Science Back into Environmental Practice." In A. Light and A. de-Shalit, eds., *Moral and Political Reasoning in Environmental Practice*. Cambridge, MA: MIT Press. Pp. 187–217.
2003. "Value Judgments and Risk Comparisons: The Case of Genetically Engineered Crops." *Plant Physiology* 132: 10–16.

On the animal rights issue, see:

- Cohen, Carl, ed. 2001. *The Animal Rights Debate*. Lanham, MD: Rowman & Littlefield.
- Regan, Tom. 2004. *The Case for Animal Liberation*. Berkeley, CA: University of California Press. Original 1983.
- Rollin, Bernard E. 1992. *Animal Rights and Human Morality*. Buffalo, NY: Prometheus Books.

Singer, Peter. 1990. *Animal Liberation*. New York, NY: New York Review of Books and Random House.

See, for different takes on Pragmatism:

Eldredge, Michael. 1998. *Transforming Experience*. Nashville, TN: Vanderbilt University Press.

Hickman, Larry. 1990. *John Dewey's Pragmatic Technology*. Bloomington, IN: Indiana University Press.

_____. 2001. *Philosophical Tools for Technological Culture*. Bloomington, IN: Indiana University Press.

Chapter 24:

Arendt, Hannah. 1958. *The Human Condition*. Chicago, IL: University of Chicago Press.

Beauchamp, Tom, and James Childress. 2001. *Principles of Biomedical Ethics*, 5th ed. New York, NY: Oxford University Press.

Bell, Daniel. 1978. *The Cultural Contradictions of Capitalism*, 2d ed. New York, NY: Basic Books.

Callahan, Daniel J. 1973. *The Tyranny of Survival*. New York, NY: Macmillan.

Dewey, John. 1934. *A Common Faith*. New Haven, CT: Yale University Press.

_____. 1934. *Art as Experience*. New York, NY: Minton, Balch.

Donchin, Anne, ed. 1999. *Embodying Bioethics: Feminist Advances*. Lanham, MD: Rowman & Littlefield.

Durbin, Paul T. 1992. *Social Responsibility in Science, Technology, and Medicine*. Bethlehem, PA: Lehigh University Press.

_____. 2000. "Bioethics as Social Problem Solving." In Durbin, "Activist Philosophy of Technology: Essays 1989–1999," available online at www.udel.edu/Philosophy/pdurbin/Pub.html.

Original version appeared in J. Monagle and D. Thomasma, eds., 1998, *Health Care Ethics: Critical Issues for the Twenty-First Century*. Gaithersburg, MD: Aspen.

Engelhardt, H. Tristram, and Edward Erde. 1984. "Philosophy of Medicine." In P. Durbin, ed., *A Guide to the Culture of Science, Technology, and Medicine*. New York, NY: Free Press. Pp. 364–461. Original 1980.

Ellul, Jacques. 1964. *The Technological Society*. New York, NY: Knopf. French original 1954.

- Gans, Herbert. 1974. *Popular Culture and High Culture*. New York, NY: Basic Books.
- Hickman, Larry. 1988. "The Phenomenology of the Quotidian Artifact." In P. Durbin, ed., *Technology and Contemporary Life*. Dordrecht, Netherlands: Reidel. Pp. 161–176.
- _____. 1990. "Literacy, Mediacy and Technological Determinism." In T. Casey and L. Embree, eds., *Lifeworld and Technology*. Washington, DC: Center for Advanced Research in Phenomenology and University Press of America. Pp. 117–131.
- _____. 1991. *John Dewey's Pragmatic Technology*. Bloomington, IN: Indiana University Press.
- _____. 2000. *Philosophical Tools for Technological Culture*. Bloomington, IN: Indiana University Press.
- Jonas, Hans. 1979. "Toward a Philosophy of Technology." *Hastings Center Reports* 9 (February 1979): 34–43.
- Jonsen, Albert, and Stephen Toulmin. 1988. *The Abuse of Casuistry*. Berkeley, CA: University of California Press.
- _____. 1990. "Practice versus Theory." *Hastings Center Report* 20:32–34.
- _____, et al. 2002. *Clinical Ethics*, 5th ed. New York, NY: McGraw-Hill.
- Kirk, Russell, ed. 1986. *The Conservative Mind: Burke to Eliot*. Chicago, IL: Regnery.
- Light, Andrew. 2003. *Reel Arguments: Film, Philosophy and Social Criticism*. Boulder, CO: Westview Press.
- Light, Andrew, and Jonathan M. Smith, eds. 2005. *The Aesthetics of Everyday Life*. New York, NY: Columbia University Press.
- Marcuse, Herbert. 1978. *The Aesthetic Dimension*. Boston, MA: Beacon Press.
- Thomasma, David C. 1980. "Cultural Issues in Medical Research." In P. Durbin, ed., *Research in Philosophy & Technology*, vol. 3. Greenwich, CT: JAI Press. The volume includes a number of related articles by other bioethicists, including George Agich, Ronald Benson, and H. Tristram Engelhardt.
- Tong, Rosemarie, Anne Donchin, and Susan Dodds, eds. 2004. *Linking Visions: Feminist Bioethics, Human Rights, and the Developing World*. Lanham, MD: Rowman & Littlefield.
- Wajcman, Judy. 1995. "Feminism and Technology." In S. Jasanoff et al., *Handbook of Science and Technology Studies*. Thousand Oaks, CA: Sage. A 2000 edition added bibliographical references but was otherwise unchanged, and the arrangement of the bibliography makes it all but impossible to know what was added.

Hickman calls Updike the "most quotidian" of contemporary writers and cites:

Updike, John. 1960. *Rabbit Run*. New York, NY: Knopf.

_____. 1970. *Bech: A Book*. New York, NY: Knopf.

_____. 1971. *Rabbit Redux*. New York, NY: Knopf.

_____. 1978. *The Coup*. New York, NY: Knopf.

_____. 1981. *Rabbit Is Rich*. New York, NY: Knopf and Random House.

_____. 1982. *Bech Is Back*. New York, NY: Knopf and Random House.

_____. 1984. *The Witches of Eastwick*. New York, NY: Knopf and Random House.

Westbrook, Robert. 1991. *John Dewey and American Democracy*. Ithaca, NY: Cornell University Press.

Chapter 25:

Aibar, Eduardo. 1995. "Technological Frames in a Town Planning Controversy: Why We Do Not Have to Drop Constructivism to Avoid Political Abstinence." *Research in Philosophy & Technology*, vol. 15. Greenwich, CT: JAI Press. Pp. 3–20.

_____. 1996. "The Evaluative Relevance of Social Studies of Technology." *Techne* 1:3–4. See <http://spt.org/journal>.

Amann, Klaus, and Karin Knorr-Cetina. 1989. "Thinking through Talk: An Ethnographic Study of a Molecular Biology Laboratory." In Jones, Hargens, and Pickering, eds., *Knowledge and Society*, vol. 8. Greenwich, CT: JAI Press. Pp. 3–26.

Barnes, Barry. 1985. *About Science*. Oxford, UK: Blackwell.

Bijker, Wiebe. 1993. "Do Not Despair: There Is Life after Constructionism." *Science, Technology, & Human Values* 18: 113–138.

_____. 1995. *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociological Change*. Cambridge, MA: MIT Press.

_____. 1995. "Sociohistorical Technology Studies." In S. Jasanoff et al., eds., *Handbook of Science and Technology Studies*. Thousand Oaks, CA: Sage. Pp. 229–256.

_____, and John Law, eds. 1992. *Shaping Technology/Building Society*. Cambridge, MA: MIT Press.

_____, Trevor Pinch, and Thomas P. Hughes, eds. 1987. *The Social Construction of*

Technological Systems. Cambridge, MA: MIT Press.

- Bloor, David. 1991. *Knowledge and Social Imagery*, 2d ed. Chicago, IL: University of Chicago Press.
- Collins, Harry M. 1985. *Changing Order: Replication and Induction in Scientific Practice*. Beverly Hills, CA: Sage.
- Cutcliffe, Stephen H. 2000. *Ideas, Machines, and Values: An Introduction to Science, Technology, and Society Studies*. Lanham, MD: Rowman & Littlefield.
- Eisenstein, Elizabeth. 1979. *The Printing Press as an Agent of Change*. Cambridge, UK: Cambridge University Press.
- Ellul, Jacques. 1964. *The Technological Society*. New York, NY: Knopf. French original 1954.
- Fuller, Steve. 1992. "STS as Social Movement: On the Purpose of Graduate Programs." *Science, Technology & Society Curriculum Newsletter* 91(September): 1–5.
- Gaston, Jerry. 1984. "The Sociology of Science and Technology." In P. Durbin, ed., *A Guide to the Culture of Science, Technology, and Medicine*. New York, NY: Free Press. Original 1980.
- Gross, Paul R., and Norman Levitt. 1994. *Higher Superstition: The Academic Left and Its Quarrels with Science*. Baltimore, MD: Johns Hopkins University Press.
- Heidegger, Martin. 1977. *The Question Concerning Technology and Other Essays*. New York, NY: Harper & Row.
- Henderson, Kathryn. 1991. "On Line and on Paper: Visual Culture and Computer-Graphics in Design Engineering." Doctoral dissertation, University of California at San Diego.
- Hirschauer, S. 1991. "The Manufacture of Bodies in Surgery." *Social Studies of Science* 21: 279–319.
- Hughes, Thomas P. 1983. *Networks of Power: Electrification in Western Society, 1880–1930*. Baltimore, MD: Johns Hopkins University Press.
- Ilerbaig, Juan. 1992. "The Two STS Subcultures and the Sociological Revolution." *Science, Technology & Society Curriculum Newsletter* 90 (June): 1–6.
- Illich, Ivan. 1973. *Tools for Conviviality*. New York, NY: Harper & Row.
- Knorr Cetina, Karin. 1995. "Laboratory Studies: The Cultural Approach to the Study of Science." In S. Jasanoff et al., eds. *Handbook of Science and Technology Studies*. Thousand Oaks, CA: Sage. Pp. 229–256.
- _____, and Klaus Annan. 1990. "Image Dissection in Natural Scientific Inquiry." *Science*,

Technology, & Human Values 15: 259–283.

- Latour, Bruno. 1987. *Science in Action: How to Follow Scientists and Engineers through Society*. Cambridge, MA: Harvard University Press.
- _____, and Steve Woolgar. 1986. *Laboratory Life: The Social Construction of Scientific Facts*, 2d ed. Princeton, NJ: Princeton University Press. Original 1979.
- Lynch, Michael. 1985. *Art and Artifact in Laboratory Science*. London, UK: Routledge & Kegan Paul.
- Marcuse, Herbert. 1964. *One-Dimensional Man*. Boston, MA: Beacon Press.
- Margolis, Joseph. 2002. *Reinventing Pragmatism*. Ithaca, NY: Cornell University Press.
- _____. 1986. *Pragmatism without Foundations: Reconciling Realism and Relativism*. New York, NY: Blackwell.
- [Merton](#), Robert K. 1965. *On the Shoulders of Giants*. New York, NY: Free Press.
- Mumford, Lewis. 1967, 1970. *The Myth of the Machine*, 2 vols. New York, NY: Harcourt Brace Jovanovich.
- Ogburn, William F. 1922. *Social Change with Respect to Culture and Original Nature*. New York, NY: Viking.
- Rorty, Richard. 1997. *Achieving Our Country: Leftist Thought in Twentieth-Century America*. Cambridge, MA: Harvard University Press.
- Ormiston, Gayle L., and Raphael Sassower. 1989. *Narrative Experiments: The Discursive Authority of Science and Technology*. Minneapolis, MN: University of Minnesota Press.
- [Rouse](#), Joseph. 1996. *Engaging Science: How to Understand Its Practices Philosophically*. Ithaca, NY: Cornell University Press.
- Sclove, Richard E. 1995. *Democracy and Technology*. New York, NY: Guilford.
- Wajcman, Judy. 1991. *Feminism Confronts Technology*. University Park, PA: Pennsylvania State University Press.
- Winner, "Upon Opening the Black Box and Finding It Empty." *Science, Technology, & Human Values* 18:3 (1993): 362–378. Original, 1991.
- Woolgar, Steve. 1991. "The Turn to Technology in Social Studies of Science." *Science, Technology, & Human Values* 16 (Winter): 20–50.
- White, Lynn, Jr. 1962. *Medieval Technology and Social Change*. Oxford, UK: Oxford University Press.

