Heidegger's Technologies

John D. Caputo, *series editor*

PERSPECTIVES IN
CONTINENTAL
PHILOSOPHY

Blank Page

DON IHDE

Heidegger's Technologies

Postphenomenological Perspectives

FORDHAM UNIVERSITY PRESS
New York ■ 2010

Library of Congress Cataloging-in-Publication Data

Ihde, Don, 1934–
Heidegger's technologies : postphenomenological perspectives / Don Ihde.
p. cm.— (Perspectives in Continental philosophy)
Includes bibliographical references (p.) and index.
ISBN 978-0-8232-3376-2 (cloth : alk. paper)
ISBN 978-0-8232-3377-9 (pbk. : alk. paper)
ISBN 978-0-8232-3378-6 (ebook)
1. Heidegger, Martin, 1889–1976. 2. Technology—Philosophy. I. Title.
B3279.H49I36 2010
193—dc22

2010020644

Printed in the United States of America

12 11 10 5 4 3 2 1
First edition

Dedicated to my Technoscience Doctorates:

Paul Thompson, the first
Followed by Evan Selinger
Ken Yip, Robert Rosenberger
Kyle Whyte, and soon, Adam Rosenfeld

Blank Page

Contents

Blank Page

Acknowledgments

Some of the essays in this book are reprinted, with modest revisions, from earlier publications: Chapter 1, "Heidegger's Philosophy of Technology," originally in my *Technics and Praxis: A Philosophy of Technology*, Vol. XXIV, Boston Series in the Philosophy of Science, Synthese Library, Vol. 130, copyright (Dordrecht: Reidel Publishing Company, 1979), pp. 103–29, reprinted with the kind permission of Springer Science and Business Media; Chapter 2, "The Historical and Ontological Priority of Technology over Science," first published in English in my *Existential Technics* (Albany: SUNY Press, 1983), pp. 25–46, published with the permission of SUNY Press; Chapter 3, "Deromanticizing Heidegger," from my *Postphenomenology: Essays in the Postmodern Context,* Northwestern University Studies in Phenomenology and Existential Philosophy, Editor: James Edie (Evanston: Northwestern University Press, 1993), pp. 103–15, published with the permission of Northwestern University Press; and "Interlude" from my *Technology and the Lifeworld: From Garden to Earth* (Bloomington: Indiana University Press, 1990), pp. 192–96, published with the permission of Indiana University Press.

Regarding my debts to others, the list would be too long for acknowledgments here, but I want to mention some few persons who more directly helped with this book project. Robert Crease, my department chair and colleague, has always collaborated with the technoscience research group and seminar at Stony Brook. His criticisms are always taken seriously, and he has so often also contributed to the seminar.

Robert Scharff, University of New Hampshire, while remaining "true" to Heidegger, has always been the loyal opposition to my increasingly critical take on Heidegger. The technoscience group, with its international scholars from both Asia and Europe, along with the Ph.D. students from various departments at Stony Brook, provides an active conversation dealing with technoscience and the philosophy of technology. Adam Rosenfeld did the indexing and much proofreading. Jose Jaime Galvan, Javier Aguirre, and Daniel Susser, too, helped with proofreading and comments. And Linda and Mark from the home front show patience when I retreat up to my study to work away by writing with both hands through my keyboard to visual display screen to print or e-attachment far from Heidegger's world.

Heidegger's Technologies

Blank Page

Introduction

Situating Heidegger and the Philosophy of Technology

This book is about, and in response to, Martin Heidegger's *philosophy of technology*. Heidegger is widely hailed as one of the major figures in the foundations of the philosophy of technology. And while it remains the case that in the early decades of the mid-twentieth century, he had a number of peers also interested in technology, particularly among European philosophers, if one judges by articles, books, and other publications today, Heidegger remains virtually the only one of these to continue to draw major comment.

Heidegger's death in 1976 marked his entrance into the company of the "mighty dead," as Robert Brandom calls those philosophers who continue to exert influence in the twenty-first century. That was three and a half decades ago—not that long ago in terms of philosophical time. Brandom's book *Tales of the Mighty Dead* (Harvard, 2002) already counts Heidegger among the mighty, but that comes at the end of a tale that begins with the early moderns Leibniz and Spinoza through the giants Kant and Hegel and then into the twentieth century, wherein Heidegger, along with other notables, is located. My approach is both more limited and more focused. Although I shall locate Heidegger among some of his peers and in this introduction relate him to his intellectual surroundings, I am focused primarily upon the origins and shapings of contemporary philosophy of technology and Heidegger's role therein.

If a period of three and a half decades is not long in philosophical time—Brandom goes back to the seventeenth century, which is still

"modern" in philosophical time—it is very long in terms of today's *technological time.* It is this anomaly that hints at part of the frame into which I will here fit Heidegger. And this is a factor of which any historically sensitive philosopher of technology must be aware. As I shall soon show, philosophies of technology are primarily developments of the twentieth into the twenty-first centuries, however many earlier philosophical anticipations may have occasionally occurred. Prior to contemporary philosophies, technologies played at most background, illustrative, or epiphenomenal roles in philosophy.

Heidegger himself argues that with respect to technology, *modern technology* is historically *later* than modern science. While I disagree with this thesis—and I will point out that Heidegger himself undercuts it by his counterclaim that technology is *ontologically* prior to modern science—Heidegger himself remains thoroughly *modernist* in this distinction. As Paul Forman has argued, modernists have simply assumed that science has priority over technology, an argument I will examine in more detail. For Heidegger, modern technology is, effectively, *industrial* technology—machinic, gigantic, mechanical, systemic, and complex. And there is some historical justification for this if one takes the Industrial Revolution as a model for modern technology. As I shall point out, it may well be that the Industrial Revolution was the alarm that finally awakened philosophers from their contemplative slumbers. But the Industrial Revolution itself also underwent dynamic changes. For example, in its earliest forms power was at first derived from "natural sources," such as ever-larger dams, windmills, and even animals, all of which could and did drive mills, machine shops, conveyances, and the like even into the nineteenth and even vestigially into the twentieth centuries. This gave way early in industrial times to new sources of power, at first primarily *steam* power. Massive steam engines pumped mines, ran multibelt machine shops, and powered engines with steam replacing sail and, on land, railways replacing horse trams. Later, steam engines were modified to become internal combustion engines, which existed alongside steam power.

The next dynamic change was the emergence of *electric* power. This power on introduction seemed mysterious and strange. Literarily it was celebrated in the now-canonical essay "The Dynamo and the Virgin" of Henry Adams (1900). He celebrated its quiet power, quiet enough that a baby could sleep next to the dynamo, yet a power that could run indefinitely many tools and machines. For Adams, it was an almost mystical power, like that of the religion of the Virgin, pervasive but not well understood. It is perhaps hard for us today to re-create this sense of

mysterious power in the midst of now commonplace electronic transformations of the electric. Yet this early sense was also much more pervasive than Adams's experience of forty-foot-high dynamos at the Great Exposition. I found some sense of this mystery recalled recently in a Broadway presentation of *In the Next Room; or, The Vibrator Play.* For also early in the twentieth century, the power of the electric drove the first vibrators, which became medical tools for the treatment of *hysteria,* also one of the maladies which stimulated Freud in his psychosexual theories early in the century. Strangely, today, this is a malady that effectively no longer exists (although vibrators do).

In 2004, I experienced an event that dramatized again the coming of electricity: it was the centennial celebration of the Wantasequet Trout Club in Weston, Vermont, a large lake property very near my own vacation property. Its history was telling. Originally the lake had been the head source for a series of water mills downstream from its runoff, which in turn powered grain mills, sawmills, and other nineteenth-century craft productive enterprises. Electricity had come early to Weston, in 1904, and as such this new power source put the downstream dams out of business—electric motors replaced waterwheels and turbines and now, also out of business, the source lake became a trout club, which remains its role even today. All of these changes characterized the beginnings of rapid technological transformations to be found in the Industrial Revolution and may be seen to be spread over approximately a hundred years, from the mid-nineteenth to the mid-twentieth centuries.

This speed, however, must today seem slow when compared with what has happened beginning from the mid-twentieth century. If we skip to today's frontier technologies, the list usually is led by bio-, nano-, and info-, to which we may add communication and imaging technologies. *All of these are effectively new since the mid-twentieth century.* And before locating these technologies in relation to Heidegger, I want to point out some interesting general features of these, now *technoscience* technologies:

The scientific "objects"—if I may call them such—with which these technologies deal are all *submicroscopic.* Biotechnology deals with genetic strands, DNA, RNA, proteins, and the like. Nanotechnology deals with objects at the molecular and atomic levels. Information is digitally processed and encoded, fitting into ever more compact chips and transmission processes. The same applies to communication technology, tied into networks that include satellites, wireless, and broadband systems. And, in much scientific imaging, objects as small as individual photons, ion streams, and electron

streams are utilized, particularly to go below even the early-twentieth-century limits of optical light. In short, these submicroscopic objects are the ultrasmall.

Ironically, however, many of the instruments (technologies) through which such observation-manipulation is possible are themselves both often large and always highly complex. My university administers the Brookhaven National Laboratory, whose National Synchrotron Light Source, begun in 1978 and enlarged and updated in 1982, manipulates light across the microwave spectrum, much beyond the limits of visible light. But this machine is dwarfed by the CERN Large Hadron Collider, only now partially operational after its beginning in 1998. It will examine the smallest subatomic objects currently theorized to exist.

Note, too, that these frontier technologies—technoscience technologies—are for the most part technologies that have come into being since the mid-twentieth century. I have often argued that a *second scientific revolution*, with as much difference with the first as the first was to premodern thought, has been and is occurring now.

I make two preliminary conclusions at this point: first, virtually all these frontier technosciences are *post-Heidegger*. I will comment upon this shortly. Second, these technosciences are in many ways qualitatively different from the earlier industrial technologies that, I shall also contend, marked the style of technology most familiar to Heidegger.

So, now, here are some very concrete examples concerning the observations just made and in relation to the technologies with which Heidegger was familiar:

Heidegger was clearly familiar with the beginnings of late modern communications technologies, for example, radio and television. Early public radio, for instance, was early recognized as a medium that could play an important political-propaganda role. It was frequently used by Adolf Hitler, and it was also used intensively by the Nazis in the occupied countries, as one of my former visiting scholars, Lars Nyre, has pointed out in his dissertation, *Fidelity Matters: Sound Media and Realism in the 20th Century* (2003). I am not aware of Heidegger texts that refer in any great extent to radio, but it was well known—and some texts relating to television will be noted later—that in his late life, Heidegger became very attached to television as a medium for broadcasting soccer games.

He was, of course, familiar with the mechanical technology of the typewriter, about which I shall have much to say, but digital word processing did not become widespread until the 1980s.

Nuclear physics did play a role in his later life and the atomic bomb enters several of his lists about the impact of Technology (capitalized to emphasize its "essence" features favored by Heidegger).

The Internet (beginning to be operational, but in very limited ways, by 1973) and the beginnings of nanotechnology (anticipated by Feynman as early as 1959, but not really described until 1974–77) remained basically post-Heidegger.

What was to become worldwide as entertainment technologies (the Walkman in 1979, since modified into the MP3 player and other more miniature music technologies), mobile phones (some early uses, but no practical networks until 1983), and digital photography, all *leapfrog technologies* by which I mean technologies today widely distributed in both developed and nondeveloped regions of the globe, are post-Heidegger.

While the structure of DNA became known in the mid-1950s, biotechnology in the form of practical manipulations of genetic materials did not become practicable until 1975.

In short, so much of the technoscience that dominates the texture of the twenty-first century is primarily a post-Heidegger phenomenon. This is not to say that the now "older" industrial technology has disappeared—it continues in updated and modified forms to operate alongside electronic and digital technologies—but it is to say that overall, today's technologies evidence a quite different flavor from what was prominent during Heidegger's lifetime. With that said, I may now return to placing Heidegger within his milieu and take some account of his role in *early philosophy of technology.*

Philosophers, as I have already noted, came late to the philosophy of technology. As a recognizable subdiscipline, philosophy of technology is primarily a twentieth- and twenty-first-century phenomenon—although there were a couple of notable nineteenth-century beginnings. Of course "philosophies of this and that" are also nineteenth-century philosophical genres that were originated by Hegel, who spoke of the philosophy of religion (*Religionsphilosophie*), philosophy of history (*Geschichtesphilosophie*), philosophy of science (*Wissenschaftesphilosophie*), and so on. And thus it is not surprising to note that it was two neo-Hegelians who could be said to have launched *philosophies of technology.*

One name will be familiar: Karl Marx. For although he never titled works "philosophies of technology," his early analyses of how material

modes of production produce different types of social organization were clearly early forms of technological determinism. By taking account of the different modes of production in different historical eras, Marx saw material modes of production—technologies—as formative of the varieties of economic culture. The other name, contemporary with Marx but less familiar, was Ernst Kapp, who, in this case did title his major work a philosophy of technology; his *Grundlinien einer Philosophie der Technik: Zur Entstehungsgeschichte der Kultur aus neuen Gesichtspunkten* (Fundamentals of a Philosophy of Technology: The Genesis of Culture from a New Perspective) was published in 1877. Here, again, one can see that technology is a primary determinant in the shaping of culture, although Kapp's take was quite different from Marx's. Kapp took technologies to be material transformations of bodily, anthropomorphic functions such that a stove for cooking food could be seen as something like an artificial or "technological" stomach, machines that amplified arm and leg power were extensions of human bodily powers, and so forth.

What is important about these early gestures toward philosophy of technology is a shift in *perspective.* Both Marx and Kapp begin to discern a focal role for *materiality*, particularly the materiality of technologies or produced tools, machines, and their organization in relation to human cultures. And while by today's standards the implied determinisms in both Marx and Kapp are overstatements, such early overemphasis could have been necessary to open the way to the new and distinctive analysis from philosophy of technology. Nor should one ignore the dominant past tendencies of philosophers here—so much of the tradition has focused upon what in a broad sense could be thought of as the "immaterial": ideas, theories, the abstract, ideality, and so on.

Before turning to the twentieth-century beginnings of philosophy of technology, I want to draw attention to a few obvious historical points. I have already noted that the most dramatic historical change, centered primarily on the nineteenth century, was the Industrial Revolution. Here was a technological revolution that involved the new power sources of steam, the internal combustion engine, and electricity, all of which could power new kinds of technologies. Already in the nineteenth century the telegraph and later the telephone, cables, and global connections, were employed. Machines could become larger and did; the "dynamo" and hydroelectric systems multiplied into most corners of human social life.

Today, retrospectively, a quite concrete image for this nineteenth-century change, highlighting its *technologically material* core, was made vivid for me in a 2008 American Museum of Natural History exhibit, "The Horse." This exhibit features displays from the ancient to present role of

horses in human societies and cultures. Stretching back to prehistory, the horse has played central roles in human migrations, wars, transport, and art, and has entered into so many nooks and crannies of earlier times. But what the exhibit points to by way of absence is precisely the lack of, or at most marginality, of horses today. Yes, next door to the exhibit, in Central Park, there are the horses still drawing tourist carriages; and there are the triple crowns of horse racing touted on the sports pages; and riding clubs remain existent—but all are at the margins of our now dominantly technological culture. The nineteenth century, the industrial century, was precisely the watershed era. Even at the very beginning of the twentieth century, New York City still had 150,000 horses within its boundaries. Reminders remain evidencing this bygone era: one can still find some nineteenth-century buildings that have "bumpers" covering the corners of ground-floor areas. These bumpers were originally there to protect the buildings from the frequent damage caused by runaway horse carriages or freight wagons that would scrape against the building corner. But horse-drawn trams, beer wagons, fire engines, and more are all gone, replaced by gasoline or diesel driven vehicles, leaving the police only with a horse guard for crowd control as a reminder of a now-transformed past. Lest one be nostalgic, we need remind ourselves that the twenty pounds or so of horse manure per horse per day, plus urine deposited on the streets, for which the city employed vast crowds of sanitation employees, are also gone. Nor was this simply a health hazard. Piles of manure would burst into flames and had to be put out by horse-drawn fire engines. And traffic deaths due to runaways or other horse-powered vehicles were actually high per mile traveled compared to the later automotive replacement era. In this sense the Industrial Revolution can be seen as both a replacement and new transformation of a form of life through technologies.

I cannot trace here the complex set of reactions to industrialization among intellectuals, although from literary and artistic voices there were both utopic and dystopic responses. Recognizing that the more brilliant sunsets of the nineteenth century were caused by what today we would call pollution, some extolled the "beauty" of industrially enhanced atmospheres, while others condemned what began to be understood as increased health risks arising from atmospheric toxicity. From early sociology came the traditions that decried "disenchantment" and "desacralization" of nature. Max Weber, an early sociologist spanning the turn of the century, was instrumental in establishing this tradition, and as mentioned before, a few philosophers—such as Marx and Kapp—began to relate technologies to the formation of social and cultural shape. But in a sense,

this is too fast a take on industrialization and its critical interpreters, particularly since, as both Thomas Hughes and David Nye, two of the most eminent of historians of technology, have pointed out, it was also the case that the terms "technology," "technics," and the like did not actually come into widespread use until the early decades of the twentieth century, and mostly after World War II.[1] "Machines," "dynamos," and "industrial arts" were terms that preceded "technology." There is a parallel here to the somewhat earlier adaptation of terminology relating to *science*. Most historians locate the rise of early modern science in the seventeenth century, but the term "scientist," for example, was not coined nor did it come into popular use until after 1840! Before that time "scientists" were called *natural philosophers*. Within the Royal Society, in the 1840s, a debate, inaugurated by William Whewell, opened concerning nomenclature leading to "scientists." One of the arguments related to "economists," with those preferring "scientists" holding that this was a good parallel to this social science change.[2] Needless to say, in that period there were not yet any "technologists," although "engineers," those who practiced the industrial arts, and of course "inventors" could be found. The implicit suggestion here is that often complex practices and material developments often *precede* the naming process.

By the beginning of the twentieth century it was clear to most observers that industrialization brought with it a rapid and machinic development of technologies, but variations occurred quite differently in the developing continents. While industrialization was early, particularly in Britain but also in the United States, it was slower to arrive but faster to develop in Germany. As V. R. Berghan, cited by Michael Zimmerman, claims, "Nowhere else in Europe did the transition from an economy based on agriculture to one dominated by industry occur with the same rapidity as in Germany."[3] Zimmerman notes, "From 1880 to 1913, German coal output quadrupled, during the same period, steel production increased tenfold and outstripped British production by 1913."[4] With the twentieth century, industrialization not only accelerates but also, as might be expected, is adopted into *military* contexts, culminating in the early part of the century in World War I. Indeed, the figures just cited point to the German buildup before 1914. Ironically, I will claim, that war, along with the Industrial Revolution, may have been a primary factor in waking philosophers from their slumbers concerning technologies. War, parallel to industrialization, was actually responded to ambiguously with both utopic and dystopic takes thereon. Industrialization through its technologies was seen as inevitable and with often agreed upon effects: it was perceived to be a threat to older European culture, particularly high culture. It was

thought to bring about a leveling of humans, the destruction of bourgeois culture and the coming of "mass man." But it was also thought to be the epitome of the attainment of humans to dominate and control nature. And all of these ideas reached an apogee in World War I.

Clearly, there were different attitudes to the military industrialization taking shape, but one strand of particular importance for what was to become Heidegger's take may seem in retrospect somewhat surprising. These were the movements that *glorified* technologization and saw it as a revolutionary opening to a new era. One early strand of such a response to technology was the appearance of Italian futurism before the war. Filippo Marinetti gathered a group of younger artists, proclaimed a futurist manifesto (1909), and began a movement that eventually affiliated with Italian fascism. The futurists wanted to reject and overthrow the past: "We will fight with all our might the fanatical, senseless and snobbish religion of the past, a religion encouraged by the vicious existence of museums."[5] Instead of the moldy past, the futurists glorified speed, technology, youth, and violence. The car, the airplane, and the industrial city were the forms futuristic technologies would take. Here, too, violence begins to be aestheticized, and a war culture taken as a kind of to-be-enjoyed "horror movie."

In Germany there were similar movements, also associated early with National Socialism, and in Heidegger's case, particularly in the work of his 1914 generation contemporary, Ernst Jünger. Michael Zimmerman has done a highly definitive analysis of this period and the interrelationships of the National Socialist program, Jünger's work, and the impact upon Heidegger in his *Heidegger's Confrontation with Modernity: Technology, Politics, Art.* I could not do a better job of showing the close Jünger-Heidegger relationship; neither will I extensively repeat Zimmerman's analysis. However, it is clear that Jünger, a war hero of the 1914 generation, remained very much in tune with the futurists. With both, there was a glorification of extreme masculinist virtues: manliness, courage, resoluteness, hardness, discipline, and honor (in contrast to the industrial masses, the proletariat).[6] These notions and phrases are echoed by Heidegger repeatedly in his texts and speeches from the early 1930s. And in Jünger's case there was a romanticization of his actual war experiences: "The baptism of fire! There the air was so laden with overwhelming manliness that every draw of breath intoxicated, that one would have to weep without knowing why. Oh, hearts of men who could feel that!"[7] As Zimmerman notes, "For him courage in war was an ecstatic, erotic experience, 'That is a frenzy beyond all frenzies . . . a fury without consideration and limits, comparable only to the violence of nature . . . man is like a raging storm,

the churning sea, and the roaring thunder.'"[8] After now nearly a century of wars and terrorism, it is difficult today to perceive such a milieu.

But while Jünger was perhaps Heidegger's most immediate intellectual association before World War II, there was also a much older set of ideas that were part of early industrial German culture also adapted by Heidegger. A common theme in Europe, but with particular nuances in Germany, was that both industrial capitalism, American but also including "Anglo-Saxon" Britain, and Soviet communism centered on Russia, were both positive about the industrialization process, embracing it with "metaphysically equivalent" stances that reduced workers to either salary slaves or a classless proletariat. Germany, however, could have a different destiny according to Heidegger, and to Jünger and the National Socialists as well, Germany could use the industrialization process to form a new and revolutionary humanity still linked to the older romantic notions of *Volk*. Technologization and industrialization provoked ambivalence. On one hand, the notion of "mass man," industrial slavishness, and the proletariat was seen as a degradation of previous culture—both "high" culture, but also peasant and rural culture. Zimmerman notes that the *völkisch* movement already appears in the late nineteenth century: "Repelled by the egotistical, commercial and spiritless mentality of modern economic society, *volkish* [thought] called for renewed contact with the natural and cosmic forces which, while inaccessible to the rational mind, were capable of rejuvenating and transforming the increasingly mechanized German spirit."[9] This was a sort of techno-romantic hybrid that also fit into the very widespread notion that Europe—particularly Germany—could opt for a third way between the Anglo-Saxon-American West and Russian/Eastern modernizations. Heidegger's Marburg colleague Paul Natorp had "argued that to the east, Germany faced the moral inferior, backwards masses of Russia, and to the west, it faced the materialistic, rationalistic powers of Britain and France."[10] Similarly, another contemporary, Oswald Spengler, had characterized technologization as a "Faustian" phenomenon by which "man turned nature into a stockpile of raw materials whose only value lay in their usefulness for his titanic purposes."[11] In short, what we cannot help but see here are harbingers of Heidegger's philosophy of technology, these are also echoes of a Euro-German common intellectual attitude toward modernization in its technologized form.

Heidegger, however, was to add an interesting emphasis to this Germany-between-East-and-West theme by subsuming both to "Americanism." As Zimmerman points out, "In 1935, Heidegger echoed the party line by saying that Germany was being crushed between Russia and

America, which were metaphysically the same despite their political differences: 'the same dreary technological frenzy, the same unrestricted organization of the average man.'"[12] This was a theme both enunciated by numbers of intellectuals of the time, including Natorp, Jünger, and Heidegger, but also of the Nazi Party itself. A Nazi election campaign poster proclaims:

> The German farmer stands in between two great dangers today: the one danger is the American economic system—Big Capitalism! . . . It enslaves man under the slogans of progress, technology, rationalization, standardization, etc. . . . The other danger is the Marxist system of BOLSHEVISM. It knows only the State economy . . . it brings the rule of the tractor, it nationalizes the land and creates mammoth factory-farms.[13]

Or, even better, from Joseph Goebbels, Hitler's propaganda minister, in *Deutsche Technik:*

> We live in an era of technology. The racing tempo of our century affects all areas of our life. There is scarcely an endeavor that can escape its powerful influence. Therefore the danger unquestionably arises that modern technology will make men soulless. National Socialism never rejected or struggled against technology. Rather, one of its main tasks was to consciously affirm it, to fill it inwardly with soul, to discipline it and to place it in the service of our people and their cultural level. National Socialist public statements used to refer to the steely romanticism of our century. Today this phrase has attained its full meaning. We live in an age that is both romantic and steellike. . . . *National Socialism understood how to take the soulless framework of technology and fill it with the rhythm and hot impulses of our time.*[14]

Which is the voice, which the echo? Between the metaphysically equivalent technologizers, Russia and America, stands the steely romantic, but *romantically soulful*, German transformation of technology. Yet, in the end, Heidegger also argues that ultimately Bolshevism itself must be but a variant upon *Americanism.* As America entered the war, by 1942 Heidegger claims:

> Today we know the Anglo-Saxon world of Americanism has decided to destroy Europe, and that means the homeland, and that means the incipient event of the West. What is incipient is indestructible. The entry of America into this planetary war is not the entrance into

history, but is already always the final American act of American history-lessness and self-destruction.[15]

And finally, it is Americanism that absorbs Bolshevism: "Bolshevism is only a variety of Americanism. The latter is the genuinely dangerous form of the measureless, because it arises in the form of bourgeois democracy and is mixed with Christendom, and all of this in an atmosphere of history-lessness."[16]

My task in this introduction is to place Heidegger within the largely twentieth-century development of the philosophy of technology. To this point I have been concentrating primarily upon the earlier part of the last century, at most glimpsing what was occurring between World War I and the entry of America to the European sector of World War II. In so doing, Heidegger may be seen as belonging to the "reactionary modernist" tendency that was quite prominent during this era. I have not here compared Heidegger to his most prominent contemporaries who also addressed questions of technology, among them Karl Jaspers and José Ortega y Gasset; neither shall I do so, although they, like Heidegger, commented extensively upon technologization. Part of my reason for this omission is that retrospectively it is clear that Heidegger remains the most prominent "survivor" of these early philosophers concerned with technology. In spite of the gradual dwindling of early-twentieth-century "European dystopianism," as I have called it, Heidegger retains much more citational prominence than his chronological peers. This is easily checked in any overview of philosophy of technology anthologies since the year 2000. While many of these include historical references to philosophers dealing with technologies, almost all give much higher prominence to Heidegger. For example, the Robert Scharff and Val Dusek *Philosophy of Technology* anthology with Blackwell contains an entire section on Heidegger. And even the recent collection by Jan Kyrre Berg Olsen, Evan Selinger, and Søren Riis, *New Waves in the Philosophy of Technology* (Palgrave Macmillan, 2008), which contains the youngest group of authors—many of whom have forgotten or ignored Heidegger—still retains chapters by one "true believer" and a few with carefully critical Heidegger chapters. No other early-twentieth-century philosopher of technology receives this much treatment. Yet, as the narrative has shown, Heidegger in this early period is very much part of the European, particularly German, attempt to hybridize romanticism with technologization and to proclaim this as a unique response to technological modernism.

I have not looked here at the contraries to reactionary modernism, the utopians of this same period. Does there lurk, especially in the Anglo-American and Soviet programs, which were more enthusiastic adaptations

of modernist technologies, a greater optimism? Probably so, since the Leninist programs in Russia saw technologies as means for the revolutionary reformation of a communist society, and in America the progressivism associated with John Dewey through his instrumentalism, which he later indicated he wished he had called "technologies," for the improvement of democracy. Both, in effect, enlisted modern technologies as means by which to reform society and culture. Yet neither such movements associated their strategies with the *völkisch* romanticism favored by Heidegger and his kin.

I now want to make a philosophical claim about this early-twentieth-century situation regarding "early" philosophy of technology: Just as technologies may become antiquated and abandoned, so, I believe, should "philosophies of technology" be seen to become antiquated and be abandoned! Unfortunately there are some very deeply held academic habits that mitigate against this claim. First, the discipline of the *history* of technologies, itself quite young, has tended to focus upon the successful development of technologies, of technologies that come-into-being and play some historical role in relation to the embedding culture or society. For example, the history of steam power has been intensively dealt with—and in particular the role of railway development (dominated early by steam powered locomotives) and the impact upon modernization in the early industrial societies—and thus is rich with technological and social relations and other related phenomena. Contrarily, there is far less historical attention paid to technologies that fail to be developed, that are abandoned along the way, or that simply drop out of use over time. I remember with amusement, as we approached the "millennium," the various retrospective looks backwards with their often-utopian hopes. In one case the *New York Times* republished a 1900 newspaper that predicted which technologies would transform the then-arriving twentieth century: the claim was that compressed air machines would be the wave of the future! From the simple communication compressed air devices in department stores (used to send sales receipts up to the accounting office and sales slips returning), it was projected that subways, tube railways, elevators, and the like would all be powered by *compressed air.* Not only did this not happen, but except in very limited and local applications, compressed air machinery also has simply vanished. Similarly, even in today's sophisticated STS (science-technology studies) analyses, failed or abandoned technologies are rarely written about. Two prominent exceptions have reached major citational notice: Bruno Latour's *Aramis: Or the Love of Technology* (1996), which is about a planned but canceled individual car railway system for France, and John Law's *Aircraft Stories* (2002), which is about a

highly financed but ultimately abandoned Cold War fighter bomber under development in the United Kingdom. I am willing, however, to wager that far more technologies *fail* to develop successfully than those that succeed, and of course one can point to a very vast history of no-longer-extant technologies. An Acheulian hand ax, a tool for a million-plus years, may now grace my desk as a paperweight, and my friend's archaeologist son may make and throw an atlatl, a spear-throwing device superseded by archery millennia ago, but I know of no one writing in cuneiform—all these are antiquated and abandoned technologies. Before leaving the historian's habit of focusing upon successfully developed technologies, one should also note that there is also massive unevenness to abandonment—hand scythes to cut grain were the dominant technologies for this task for centuries in many parts of the world, including medieval Europe. The McCormick reaper, much analyzed by historians, was its early industrial replacement, yet in many parts of the world the hand scythe is still used.[17] Technologies can and do often overlap, or to put the case in a different way, massive general replacements are usually quite rare in technological histories.

The second deeply ingrained habit associates with the discipline of *philosophy*. Many philosophers still hold that philosophy should be both a general (if not universal) style of thinking, and that philosophical notions should be either *atemporal* or at least very long lasting. But, insofar as a philosophy of technology in particular can be a relevant and critical reflection upon technologies, then if the historical observations just made have bite, this should also point to the historical contingency of temporally changing technologies, which in our own era are often very rapid. Fortunately today, both philosophy of science and philosophy of technology seem to be self-aware that they are fallibilist, contingent, and socially historical practices.

I now return to the narrative locating Heidegger in the twentieth-century development of philosophy of technology. I am suggesting that the reactionary modernism that hybridizes industrially styled technologies to a *völkisch* romanticism is no longer a viable position for philosophy of technology. Here is what I surmise concerning its development and demise: As Zimmerman pointed out, the *völkisch* movement had its origins in the late nineteenth century; Italian futurism, immediately before World War I, and the Jünger generation of 1914, which glorified violence, speed, and hypermasculinism took their shapes in and around that war. World War I, however, was a military-technological watershed. The propaganda for recruitment still remained that of glory and precisely the features described above concerning the Homeland. In short, war remained

anachronistically conceived as the struggle between a masculine set of contesting armies perhaps still shadowing that of a "Napoleonic" era, when civilians could have picnics on hills overlooking battlefields. No picnics could be near the artillery overarched and poison gas atmospheres of trench warfare. Overlaying this older romantic and glory motivated notion was the first genuinely "industrial" set of military technologies: tanks, machine guns, poison gas, artillery and even the first aerial warfare, again with heroes seeking to be "aces." As many historians of this period have noted, the command structure on both sides remained unimaginatively trapped in older battle plans that stalled and produced no movement as trench platoon after platoon would rush the other side only to be slaughtered by the newer, more efficient machines—the tragedy of the Maginot Line. Thus deep within the "history" of World War I there were sedimented two anachronisms—that of the romantic soldier sacrificing himself for the Fatherland, and that of a command structure that did not accurately perceive the changed role brought about by an industrial military set of technologies. Thus, if my surmise is persuasive, the interwar period, precisely the period of Heidegger's and the reactionary modernists' philosophy of technology, was already antiquated. And, indeed, this form of early philosophy of technology did not successfully propagate itself.

Neither do I want to reduce Heidegger to the general characteristics of the techno-romanticism of this interwar period. Because it was also in this period that some of what many of us take as his most brilliant insights into what was to become his philosophy of technology took shape—I refer to his early analyses of technologies in *Being and Time* (1927). Although Zimmerman holds that "*Being and Time's* phenomenological 'description' of everyday life was in part a negative political evaluation of industrial society,"[18] and although most of the famous tool analysis does indeed focus upon ordinary workshop items such as a hammer, its prescience concerning the primacy of technology over science goes much deeper than that. Nor should one forget that the turn signals of then state-of-the-art automobiles were also analyzed. Rather, intermixed are references to soldiers on the march, the springhead in the dale, and railway rain roofs, all of which are placed in his then phenomenological framework. I discuss this formation in comparison to the later "question" concerning technology in Chapter 1.

The break that shatters techno-romanticism was the conclusion of World War II and the new magnitude of impact by industrialized military technologies. "Blitzkrieg," "The Battle of Britain" (with radar the new defensive technology, as important in defeating the Luftwaffe as were the

Spitfires), the efficiencies of Holocaust gas chambers . . . and one must include the whole-city decimations of fire bombing and ultimately by atomic bombing, all of which finally so numbed human sensitivity that techno-romanticism had to appear as not only antiquated, but obscene. And for Heidegger, the conclusion of World War II was a personal disaster. Given his Nazi party membership, his appointment as a pro-Nazi rector, and his writings of the times, Heidegger was interrogated by the occupying authorities and was placed under its denazification program.[19] He was involuntarily retired and forbidden to teach or give university lectures, and the French occupying authorities threatened to confiscate his house and personal library—but did not in the end do this.[20] Heidegger underwent a "nervous breakdown" and for a time was hospitalized in a psychiatric institute in 1946. Later, with the triumphant return to Germany of his former student and mistress, Hannah Arendt, who by now, 1950, was already well known to Germany, things began to change. And from this first postwar visit she also resumed her meetings and correspondence with Heidegger. It was during this period and through her help that the denazification strictures on Heidegger were also lifted in 1951.[21] Heidegger could return to public life. The resumed Arendt-Heidegger relationship continued until both their deaths. (See Chapter 6 regarding the sale of Heidegger's handwritten manuscript of *Being and Time* during Heidegger's last years, again with Arendt's help.) The 1950s and 1960s were to see a dramatic change in Heidegger's reputation and philosophy of technology.

World War II had indeed ended, and for Heidegger this was perceived as a kind of end of Europe as well. He noted that the war settled nothing but was simply one technological power overwhelming another, decried the decline of the German language, and noted that English, the language of technology, was replacing German on the world stage, and commented that Europe in many ways no longer existed. Of course, the political foreground for this attitude was the onset of a new set of configurations that arose from the beginning of the Cold War. Europe, now divided into the West and the countries affiliated through NATO with the "Anglo-Saxons," and the East, with the European satellites of the Soviet Union, thus no longer was there a "third way" for Europe, let alone Germany. Heidegger was not prescient concerning the later post-Soviet collapse and the development of the European Union, which did reestablish a powerful European presence for the contemporary world.

It was during this critical and traumatizing time in the mid-twentieth century, I shall argue, that Heidegger's philosophy of technology developed into its now best-known form, the form that still remains most associated with his heritage. Although even during his denazification he was

busy editing and drafting for publication a rather vast corpus of work, once released from the strictures of that program, his readers saw rapid publications appear in the mid-1950s, among them "The Question Concerning Technology" (1954). He himself recognized that it would be a major task to regain his earlier importance and philosophical reputation. Immediately after World War II and throughout the denazification period, Heidegger's reputation—not surprisingly—was negatively perceived. Alfred Kazin remarked to Hannah Arendt "that the name Heidegger seems to have become a sort of 'cuss word' in Germany, in academic and even other circles."[22] Yet, after 1951, mostly from 1953 on, the torrent of Heidegger publications again began to draw attention. *Being and Time* was reissued a number of times and began to be translated (the first published English translation was 1962—from the seventh edition), his edited works on his lectures and seminars were published in the mid-1950s, and, as mentioned, his works both on technology and science poured forth (behind the scenes, often helping him with new publisher contacts and contract negotiations, particularly for the English-speaking world, was Hannah Arendt). Hans Sluga, with his definitive study of Heidegger in the context of German philosophy under Nazism, *Heidegger's Crisis: Philosophy and Politics in Nazi Germany* (1993) concludes, "Of the German philosophers who became politically active in 1933, Heidegger in the end fared best."[23] I concur.

Here, however, my focus is on his philosophy of technology. Michael Zimmerman argues that much of what was to become his mature philosophy of technology (and science) was already being formed in the mid-1930s, and certainly some of the most salient and suggestive works are to be found in lecture form, such as "The Origin of the Work of Art" (lecture draft, 1935) and "The Age of the World Picture" (lecture draft, 1938); but most of these were redrafted only later, to be published in the 1950s, with some appearing for the first time, such as "Science and Reflection" (1954) and "The Question Concerning Technology" (1954). Heidegger clearly felt the world was ready for his concerns about the dangers (and possibilities) of technology. I will argue that this mid-twentieth century take is quite different in tone from that of his earlier thought, but to show this I must take some account of what remains, and what changes in this period.

To do this, however, I have to pose a problem of interpretation that arises from Heidegger's quite deliberate strategy, which seems to avoid doing anything like a concrete, empirical study of *actual technologies.* First, as Heidegger claims, "Technology is not equivalent to the essence of

technology. . . . Likewise, the essence of technology is by no means anything technological."[24] This may seem odd; for example, use the same formulation concerning other human practices: is the essence of art by no means anything artful? Or, even better, is the essence of philosophy by no means anything philosophical? What emerges from this claim is Heidegger's attempt to undercut the "standard view" of technologies, that is, that they are simply *neutral* and that they are instrumentally, anthropologically derived. What is technology? "Everyone knows the two statements that answer our question. One says: Technology is a means to an end. The other says: Technology is a human activity. The two definitions of technology belong together."[25] Heidegger goes on to say that this anthropological-instrumental view "makes us utterly blind to the essence of technology." But is this so? Today, with very few exceptions, no prominent philosopher of technology holds to a neutrality thesis, but contrary to Heidegger's claim about what causes blindness to the essence of technology, most philosophers of technology have derived *non-neutrality* from concrete analyses of *technologies*.[26]

A similar problem attaches to Heidegger's second claim about the essence of technology, that is, that there is a clear and drastic difference between *modern* and traditional or *handwork* technologies: "The instrumental definition of technology is indeed so uncannily correct that it even holds for modern technology, of which, in other respects, we maintain with some justification that it is, in contrast to older handwork technology, something completely different and therefore new . . . certainly a sawmill in a secluded valley of the Black Forest is a primitive means compared with the hydroelectric plant in the Rhine River."[27] Yet the justifications that Heidegger poses such as degree of complexity, the systematic interlocking of technical-industrial processes and a "systems" approach to technologies, fall rather short of his claim. (I address this issue more fully in Chapter 2.)

His third claim, however, is both the most interesting and the most bistable or ambiguous (without extensively dealing with actual technologies). Ultimately, Technology—which I here capitalize deliberately—is a *metaphysical* perspective. It is a paradigmatic view of the whole of nature that determines the essence of Technology. "Technology is therefore no mere means. Technology is a way of revealing. . . . The revealing that rules in modern technology is a challenging which puts to nature the unreasonable demand that it supply energy that can be extracted and stored as such."[28] I will not here unfold how "standing-reserve," "enframing," and other significations lie within this metaphysical perspective. But this is the

main theme that makes Heidegger's philosophy of technology his distinctive signature. It is also the means by which *all* technologies become, ultimately, subject to the *same high altitude analysis.*

My own problem here is to return to the Heidegger corpus, but with a different perspective, a perspective that today echoes so much of what has occurred in science-technology studies since the 1980s, *the empirical turn* or the close-up case study analysis of particular technologies. This is a more bottom-up than top-down strategy, but I shall also hold that it is more *phenomenological* than metaphysical. Now, while Heidegger does not follow out, even deliberately avoids, detailed concrete analyses, his texts *are full of fleeting examples* of technologies and other material artifactual examples, and it is from these that I draw my comparisons. (Chapter 3 is one such comparison, examining the normative attributions Heidegger places upon modern contrasted to traditional technologies.) It is by this turn that one can discern both what remains constant in Heidegger's response to technologies and what changes with the end of World War II.

Although Heidegger claimed that the war had decided nothing, and he even noted that this victory of one technological nation over another pointed now to a much longer epoch of technology, the constant of the threat of modern technology, if anything, stayed invariant and even was taken more negatively. Thus gigantism, complexity, a systems interlocking of technologies, all still threatened humanity and posed an ever-overwhelming danger. As I shall soon show, the emergent theme of much mid-twentieth-century philosophy of technology in both Europe and America became that of *autonomous technology*, that is, a runaway technology that exceeds, "Frankenstein-like," its inventor's control:

> No one can see the radical changes to come. But technological advance will move faster and faster and can never be stopped. In all areas of his existence [*Dasein*] man will be encircled ever more tightly by the forces of technical apparatuses and automatic devices. These forces, which everywhere and every minute claim, enchain, drag along, press and impose upon man under the *Gestalt* of technological installations and arrangements—these forces, since man has not made them, have moved along since beyond his will and have outgrown his capacity for decision.[29]

Thus Heidegger, just at the beginning of his 1950s publication splurge, also proclaims the theme of *autonomous technology*. With multiple variations, this theme continued to dominate Euro-American philosophy of technology through the mid-twentieth century.

Nor was Heidegger alone with this preoccupation. This was also the heyday of the Frankfurt School, "critical theory" movement. Some of its best-known voices were actually Heidegger's students. But critical theorists split regarding their response to Heidegger: Theodor Adorno and Max Horkheimer became vociferous critics of Heidegger; Hannah Arendt and Herbert Marcuse became positive developers of Heideggerian thought. Jürgen Habermas remained somewhat ambivalent, but also had more closely adapted a quasi-Husserlian lifeworld stance. Members of the Frankfurt School were part of the very large group of scholars, mostly Jewish, who fled National Socialism, mostly from 1934 to 1938, after which escape was difficult. Indeed, all five critical theorists mentioned earlier ended up in the United States, with equally many returning to Germany between 1949 and 1950 for lectures and/or permanent posts. The roots of Frankfurt School critical theory included neo-Marxian strands, neo-Enlightenment values concerning rationality and civil freedom norms, but also most regarded modern or industrial technologies to threaten cultural (especially "high" cultural) values and to encourage "mass man" uniformity.[30] Also, precisely because these well-placed émigrés entered the Anglophone world and began to publish in English, the mid-twentieth century Anglo-Saxon world began to take note.[31]

If this clearly negative analysis of modern technology had remained constant, even intensified, from its earlier basis in Heidegger, the second feature of his 1930s position, the techno-romanticism that reflected earlier *völkisch* themes and became attached to the third way through technology to be realized by Germany, *seems* to disappear. The hypermasculinist, nationalistic take on technologies does not appear with the postwar 1950s writing. But, I say *seemed* to disappear—rather, it *shifts.* The romanticization of handcraft tools, from the hints of *Being and Time*, now become as pronounced not only with respect to premodern technological examples, but even more may be associated with the *techné* related to "works of art." Here the list of extravagantly praised material artifacts: shoes, jugs, handwriting pens, traditional windmills, stone bridges, watermills, Greek temples draw forth the same sense of reverie and romantic rhetoric as earlier, but no longer in its reformist and militaristic guise. (Again, see Chapter 3 for detailed discussion.) To be sure, this sideways move still recalls the earlier moves of both Italian futurism and Jünger, both of which *aestheticize* technologies, including, in an earlier period, war technologies. I would argue that this aestheticist move, which, here using more contemporary terms, perceived through Heidegger's use of *techné* (a poetic production process which he claims from the Greeks), applies both to technologies and to works of art. However, "modern"

technologies come out looking "bad," while carefully wrought works of art look "good." But both are products of *material culture.* The umbra under which the productivity of *techné* takes this double direction continues Heidegger's—and one can say ever since the nineteenth century, the German, preference for things Greek. Yet both technologies and art works are material artifacts that phenomenologically belong to their respective contexts.

The third variant that remains in postwar Heidegger is the metaphysical high-altitude take on Technology. In its mode of *disclosure*, technologies—at least modern technologies—all are subsumed under the *same* analysis. Indeed the lumping together of long strings of technologies is heightened in the postwar texts. For although the posthumously published *Der Spiegel* interview of 1966 reasserts a similar list, Schirmacher has cited one earlier version during the time of the Berlin blockade: "Agriculture is now a motorized food industry, essentially the same thing as the fabrication of cadavers in the gas chambers of the extermination camps, the same thing as the blockades and the reduction of countries to famine, the same thing as the fabrication of hydrogen bombs."[32] If one then adds from the repertoire on other modern technologies—steel bridges, dams on the River Rhine, typewriters—it is clear that "modern" technologies all fall under the sign of the *same*. Such "essentialism," I have argued, keeps one from seeing particularities of technologies and thus makes it impossible to discern the differences of contexts or of cultures into which technologies are embedded. (See Chapter 6 for a more detailed critique.) To Technology-as-metaphysics, the nuanced change from the tool as *figure* against its set of assignments or context (*Grund*) of Heidegger's *Being and Time* period, gives way to his postwar systems and complexity analysis where the "object" itself disappears within the "system" of the machine.

This has been a very brief exposition of the Heidegger of the *Kehre*, the turning he ascribes to himself once he returns to professional life after denazification. His publications begin to reestablish him as one of the twentieth century's most prominent philosophers, and through his newly established former émigré student contacts he begins to be known in the Anglophone world.

Before turning to this newly receptive area, I also need to take notice of the simultaneous work of Jacques Ellul, a French sociologist-theologian. He was to become, at the origins of North American philosophy of technology, a voice equal to and complementary to that of Heidegger. Ellul published *The Technological Society* in 1954, a treatise that traced the ever more powerful movements of techniques and technologies into daily life. His thesis was yet another variant upon "autonomous technology,"

and it so impressed Aldous Huxley that Huxley helped get Ellul's work published in English as well. Ellul was to become a second major figure for Anglophone philosophy of technology. Gilbert Simondon, contemporary, remained known within Francophone areas.

It is to the Anglophone reception and development in philosophy of technology that I now turn. As Carl Mitcham has well shown, the earliest professional and institutional groups relating to philosophy of technology were not only of European origin but also were first organized in Europe—not incidentally first in Germany. Similarly, philosophy of technology also began early in, and today thrives, particularly in the Netherlands as well as in Germany. Mitcham, Hans Achterhuis, and others have already well chronicled these movements.[33] I, however, will now focus primarily upon the roots which took hold in North America, in part because I can now play the parts of both witness and participant. Heidegger himself never traveled to the United States, but his aforementioned émigré students, along with many others, including Werner Marx, Hans Jonas, Hans-Georg Gadamer, and others all began to introduce Heidegger's thought to students and through publications. And at the same time, there was also a growing Ellul following, particularly among those interested in the impact of technology upon society.

In addition to these European thinkers, North America had its own. There was Lewis Mumford, intellectual historian, writing from the 1930s, with *Technics and Civilization* (1934) perhaps his best-known work, though his later *Myth of the Machine* (1970), turned largely dystopian, was known and widely read. And of course, there was John Dewey. However, as Larry Hickman shows in his *John Dewey's Pragmatic Technology* (1990), Dewey had not been thought of in relation to what was to become philosophy of technology.[34]

Here we reach the mid-twentieth century. I now turn somewhat autobiographical: As an undergraduate at the University of Kansas, it was clear that the first European-originated postwar thought, already highly popular in the mid-1950s, was *existentialism.* Whether in or out of class, Camus, Sartre, Nietzsche, Kierkegaard, and Jaspers were all eagerly read and discussed. By a decade later, Arendt and Marcuse belonged to this "canon" as well, with Marcuse's *One Dimensional Man* (1964) virtually a cult classic. I taught Marcuse, along with Arendt's *The Human Condition,* in my first postdoctoral position at Southern Illinois University during the mid-1960s. Marcuse's thesis closely followed the "autonomous technology" theme previously announced by Heidegger: technology, which he also described as style of thinking patterned upon "calculative" or "analytic" thinking. The impact of technology and its analytic rationality were thought by Marcuse to reduce humanity to one dimension such that

genuine *freedom* becomes nearly impossible. Only a type of rebellious freedom was possible; thus, Marcuse was to feed the thinking that erupted globally in the events of 1968 in Paris, New York, Berlin, and Tokyo.[35]

I have been treating these philosophical, intellectual movements as background to philosophies of technology. It was not to be until the 1960s that *philosophy* of technology itself began to be discussed in the North American context. Recall that *Being and Time* was not translated until 1962, and the first systematic exposition and interpretation of Heidegger, William Richardson's *From Phenomenology to Thought*, appeared the following year. Yet in terms of any academic, institutional, subdisciplinary philosophy of technology, all this, even in the mid-1960s, is premature. Yes, *Technology and Culture*, as early as 1962, did publish a special issue on the question, Can there be a philosophy of technology? But, as indicated early in this introduction, naming and institutionalization often *follows* chronologically what had been developing incipiently much earlier. The ferment, though, was apparent. There were informal discussions among those who were later to form the Society for Philosophy and Technology, Paul Durbin, Carl Mitcham, Robert Mackey. And, as I have suggested Ellul, Heidegger, and Mumford were widely read. The tone remained dark and the theme remained that of a runaway autonomous technology.

This may be quite understandable, since outside the academic world there continued the Cold War, the Korean War, later the Vietnam War, with the ever-constant threat of a technological destruction of civilization, even humanity, associated with the fears of a nuclear holocaust should mutually assured destruction fail as a deterrent. My wife well remembers the atomic attack exercises undertaken in elementary schools and the real fears that accompanied the Cuban Missile Crisis. I remember the newspaper ads for home underground shelters and was aware of the large intercontinental underground missile silos near my father's Kansas farm. Even later, when summering in my isolated Vermont place, the regular flights of B-52s from an air base in Massachusetts, headed across the pole toward Russia, would regularly interrupt the stillness of the forest.

We have now reached the 1970s. With this decade there began to be a proliferation of publications. Mitcham and Mackey produced the first reader, *Philosophy and Technology: Readings in the Philosophical Problems of Technology* (1973). The first meeting of what was to become the Society for Philosophy and Technology was held at the University of Delaware, 1975. (I was on a panel concerning Hans Jonas's ethics for technology.) Following this meeting the long-lived *Research in Philosophy and Technology*, which published collected articles from the bi-annual SPT meetings,

emerged.[36] Philosophy and technology, not yet self-named philosophy *of* technology, was now in its North American birth pangs. This movement was beginning just at the very end of Heidegger's life, in 1976. Thus, from the birth of North American philosophy of technology, it would be posthumously that Heidegger's influence continued.

Books, too, followed: Langdon Winner's dissertation on autonomous technology appeared as a book in 1977. My own *Technics and Praxis: A Philosophy of Technology*, often cited as the first philosophy *of* technology book in the Anglophone world, came out in 1979, only 102 years later than Kapp's. Then, the 1980s and 1990s produced a deluge of books: Albert Borgmann's *Technology and the Character of Contemporary Life* (1984), Langdon Winner's *The Whale and the Reactor* (1986), Michael Zimmerman's *Heidegger's Confrontation with Modernity* (1990), Larry Hickman's *Pragmatic Technology* (1990), my *Technology and the Lifeworld* (1990), and Andrew Feenberg's *Critical Theory of Technology* (1991). As I had claimed in *Technics and Praxis*, this set of books all issued from praxis traditions—phenomenology, critical theory, pragmatism, with its background figures primarily Dewey, Ellul, and Heidegger. In short, by 1990, North American philosophy of technology was established, with its own authors as well as drawing from the earlier years of the twentieth century, among the godfathers of which Heidegger remained a large presence.

Here I wish to draw from two recent interpretations concerning technologies that claim to show significantly changed trajectories. The first comes from Paul Forman, noted historian of science and intellectual history, who, in 2007, published in a special issue of *History and Technology* a thesis titled, "The Primacy of Science in Modernity, of Technology in Postmodernity, and of Ideology in the History of Technology." I begin with a highly abbreviated version of his abstract:

> The abrupt reversal of culturally ascribed primacy in the science-technology relationship—namely from the primacy of science relative to technology prior to circa 1980, to the primacy of technology relative to science since about that date—is proposed as a demarcator of postmodernity from modernity: modernity is when "science" could and often did denote technology too; postmodernity is when science is subsumed under technology. . . . The reversal in primacy between science and technology ca. 1980 came too unexpectedly, too quickly, and, above all, too unreflectively to have resulted from the weight of evidence or the force of logic. Rather, it was a concomitant of the onset of postmodernity.[37]

Although Forman, somewhat in passing, recognizes Heidegger's reversal of this very primacy (already clearly latent in *Being and Time*), his 1980

watershed could also be described in terms of the convergence of many new trends, including the birthing of philosophy of technology that I have been tracing. I would be amiss were I not to mention that the 1970s and 1980s also saw the birth of the new "sociologies" of science, such as the Bath School and the "strong program in social constructionism" arising from British sources such as Trevor Pinch, Harry Collins, Steve Woolgar, and Andy Pickering; simultaneously, "actor network theory," also looking at science practice, originated in France with Michel Callon and Bruno Latour, and there came the emergence of a new science-interested feminism (Donna Haraway, Sandra Harding, Evelyn Fox-Keller, and others), all of which noted the ways in which science—*as practice*—involved technologies, laboratory practice, and social dynamics in the "construction" of scientific objects. Not quite here a primacy of technology à la Forman, but *technoscience*, the synthesized science-technology of postmodernity. While Forman includes his own list of prominent thinkers—including Heidegger—it is clearly one of the strong implications of Heidegger's trajectory to have been prescient concerning technoscience. (See Chapter 4 for a more detailed analysis.) This shift clearly implicates an early Heidegger insight for what became a late-twentieth-century direction in science-technology studies.

The second interpretation is that of the University of Twente group work on developments in the philosophy of technology. The spokesman and primary editor of two significant books on this topic is Hans Achterhuis, himself a major Dutch philosopher of technology. The first of two books was *De Maat van de Techniek* (The Measure of Technology, 1993), which reviewed and analyzed a group of six forefathers for the philosophy of technology: Martin Heidegger, Lewis Mumford, Jacques Ellul, Hans Jonas, and two figures less known outside Europe, Gunter Anders and Arnold Gehlen. Then, in a follow-up in 1997, Achterhuis edited *Van Stoomachine til Cyborg: Denken over techniek in de nieuwe wereld* (From Steam Engine to Cyborg: Thoughts on Technics in the New World; an enlarged translated version appeared in 2001 as *American Philosophy of Technology: The Empirical Turn*), which, again, included six figures: Albert Borgmann, Andrew Feenberg, Don Ihde, and Langdon Winner, to which were added two thinkers newly baptized into philosophy of technology, Hubert Dreyfus and Donna Haraway. In this case, the Dutch interpreters had chosen a generation of North American philosophers of technology whom they deemed had begun to take new directions. Continuing my Heidegger focus, one can easily see that the first Achterhuis book continued to recognize Heidegger as a founding figure. In the second, four of the principals could be said to have been deeply influenced by Heidegger,

with Borgmann and Dreyfus remaining closely sympathetic to origins, while Feenberg and Ihde had become more critical. But there were new directions, according to Achterhuis. In his introduction, Achterhuis characterized the founding figures as more interested in technology writ large: "The classical philosophers of technology occupied themselves more with the historical and *transcendental* conditions that made modern technology possible than with the real changes accompanying the development of a technological culture."[38] Achterhuis went on to note the often dystopian and romantic tone set by the founders, "The issue [now] . . . is to understand this new cultural constellation, rather than to reject it nostalgically in demanding a return to some prior, seemingly more harmonious and idyllic relations assumed to be possible between nature and culture." And then in a move that applies both to the North Americans being analyzed and to the wider "empirical turn" being taken by science and technology studies in the 1990s:

> About two decades ago, dissatisfaction with the existing, classical philosophical approach to technology among those who studied new developments in technological culture as well as the design stages of new technologies led to an *empirical turn* [emphasis added] that might roughly be called constructivist. . . . This new generation of thinkers opened the black box of technological developments. Instead of treating technological artifacts as givens, they analyzed their concrete development and formation. . . . So the new, more empirically oriented philosophers of technology began to speak of the co-evolution of technology and society.[39]

Achterhuis thus saw in this new generation of philosophers of technology, a more pragmatic, more empirical, and more concrete approach to technologies. And in the analysis of each, one could trace the particular projects take shape: Dreyfus on AI, expert systems, and the Internet; Feenberg on Minitel and Japanese manufacturing techniques; Borgmann on information theory; Ihde on scientific and imaging technologies. And this included, for the new generation, something of a change in tone as well. I accept Achterhuis's interpretation as applied to my generation of philosophers of technology.

In this introduction I have introduced something of an overall framework. Heidegger clearly remains thought of as perhaps the most important pioneer thinker for contemporary philosophy of technology. Yet, his death occurred before many of the frontier technologies that help shape the postmodern world had come into being. I have also traced some of the prominent currents of the early to mid-twentieth century that surrounded

Heidegger while he formulated his thoughts about technology. In the text to follow, I have arranged the early chapters, which have been previously published, in their chronological order of appearance. Chapter 1, "Heidegger's Philosophy of Technology," was my own first look at Heidegger on technology. This was one of the earliest interpretations of Heidegger on technology to appear in English. The subsequently republished chapters show two things: first, as the reader will detect, my take on Heidegger began early to become critical, and second, each chapter began to take shape as a perspective upon Heidegger. Chapter 2, "The Historical and Ontological Priority of Technology Over Science," was originally a presentation at the first German-American philosophy of technology conference at Bad Homburg in Germany in 1981. This chapter is a historical perspective. I argue that Heidegger is historically thin with respect to both the histories of science and technology, and reread certain aspects of the history of technology that challenge Heidegger's views. Chapter 3, "De-Romanticizing Heidegger," was first presented at the Dreyfus-Zimmerman conference on "Applied Heidegger" at Berkeley in 1989. This chapter is a perspective on Heidegger's deep romanticism, which, I argue, blinds him to the variety of aspects of technologies that more phenomenologically could have been better discerned. The interlude, "The Earth Inherited," is not in chronological order but follows up a satirical look at romanticism and what it can hide. It was drafted while I was on a research leave in Italy, living in a romantic, old farmhouse on the side of Mount Albano. Its perspective parallels that of the previous chapter, but shows how Heidegger's selective *revealing* obscures a much darker *concealing* with respect to his valorized technologies.

"Was Heidegger Prescient Concerning Technoscience?" was originally presented at the Heidegger Conference at Fordham University (2001). It examines retrospectively Heidegger's philosophy of science in relation to the inversion to the primacy of technology. Chapter 5, "Heidegger on Technology: One Size Fits All," was presented in a much shorter version at the meeting of the Society for Phenomenology and Existential Philosophy (2009). It is here fleshed out to examine not only Heidegger's essentially metaphysical view of Technology, but to examine some of the inconsistencies in his use of and interpretation of his own technologies. Chapter 6, "Concluding Postphenomenological Postscript: Writing Technologies," is a historico-phenomenological analysis of variations of "writing technologies" in order to indicate both the limitations to Heidegger's philosophy of technology and a counterstrategy for technological analysis. It serves as a concluding summary of this series of perspectival critiques.

1

Heidegger's Philosophy of Technology

Among the few philosophers to date to have taken technology seriously, it should be apparent that Martin Heidegger is a pioneer in this field. He was among the first to raise technology to a central concern for philosophy, and he was among the first to see in it a genuine ontological issue. This is the case in spite of the dominant and sometimes superficial interpretations of Heidegger that see in him only a negative attitude to technology.

It will be the aim of this essay to examine some of Heidegger's main theses concerning technology and to elucidate the strategies that motivate them. To make the task manageable, I have chosen to limit myself to his 1954 lecture "The Question Concerning Technology" and the earlier foundational work *Being and Time* (1927).[1] As an interpretative device, I shall read these two works retrospectively. That is, I shall isolate what emerge as the principal themes concerning technology from the lecture and then show how they reflect and are anticipated by *Being and Time*.

In so doing, I shall show how Heidegger's philosophy of technology is directly phenomenological in the sense of exhibiting the *existential foundations* of the technological enterprise. This type of phenomenology, already apparent in *Being and Time*, gives a certain priority to what I call the *praxical dimension* of human existence, and it continues to be a key to the later work on technology.

It is my conviction that Heidegger's philosophy of technology is one of the most penetrating to date. By examining the ontological grounds of

technics, Heidegger has begun to lift technology out of its subjectivistic and merely instrumentalist interpretations and made of it a primary philosophical question. But this is not to say that this first work concerning technology is also the last word. There are implicit limitations in the Heideggerian program that established the basis for the current misinterpretations of Heidegger and for which Heidegger himself must be blamed. I shall point to some of these along the way.

Finally, although I will not develop this theme in substance, I do wish to point up the resultant internal need within the Heideggerian program concerning technology for the emergence of an "aesthetic" as the counterfoil to the limitations of technology as Heidegger sees them. The *poiesis* that characterizes much of the "late" Heidegger's work arises directly as a response to technology. I will point to how this is the case within the exposition.

The Question Concerning Technology

The question referred to by the title of the lecture is one that takes recognizable phenomenological shape quite immediately. The query is into the *essence* of technology in its *relationship* with human *existence*.

> We shall be questioning concerning *technology*, and in so doing we should like to prepare a free relationship to it. The relationship will be free if it opens our human existence to the essence of technology. When we can respond to this essence we shall be able to experience the technological within its own bounds. (QT 287)

The analysis is to make the phenomenon of technology stand out such that its horizon, its limit, is bared, but this in relationship to human existence. These are the typical marks of Heidegger's version of phenomenology in which the intentional arc of *human-existence relation-world* are interpreted existentially such that intentionality is best described as an *existential* intentionality.

To uncover the phenomenon, it must be free from its layers of less adequate interpretation which, again in typical fashion, Heidegger attributes to a "subjective" understanding, here called the instrumental and anthropological definitions of technology.

> One says: Technology is a means to an end. The other says: Technology is a human activity. The two definitions of technology belong together. For to posit ends and procure and utilize the means to

them is a human activity. The manufacture and utilization of equipment, tools, and machines, the manufactured and used things themselves, and the needs and ends that they serve, all belong to what technology is. The whole complex of these contrivances is technology. Technology itself is a contrivance—in Latin, an *instrumentum.*

The current conception of technology, according to which it is a means and a human activity, can therefore be called the instrumental and anthropological definition of technology. (QT 288)

Such a definition implies that technology is merely an invention of a "subject" and functions as a mere neutral instrument. The definition, Heidegger characterizes, is *correct.* But then, in a move directly reflective of his earlier analysis of logical or propositional truth in relation to truth as disclosure, he notes that what is correct is not yet *true.*

Correctness turns out to be "true" in a very limited sense, true with respect to some aspect or part of a larger whole. The whole, however, is more than that which contains parts; it is ultimately the set of conditions of possibility that found the parts.

> The correct always fixes upon something pertinent in whatever is under consideration. However, in order to be correct, this fixing by no means needs to uncover the thing in question in its essence. Only at the point where such an uncovering happens does the true come to pass. For that reason the merely correct is not yet the true. (QT 289)

The phenomenological form of the argument here is that correctness is not in itself untrue but is limited or inadequate, and it may be characterized as a partial truth, in which case it now covers over the larger or more basic truth that founds it. It then becomes *functionally* untrue by concealing its origin. Moreover, it is only by comprehending the whole that founds correctness that it can be seen as partial. Thus what is involved in taking correctness for truth is like a fallacy of taking a part for the whole. But it is also more than that in that comprehension of the whole is a necessary condition for recognizing what is a part.

Heidegger's strategy becomes clearer if it is seen that his overall theory of truth is, in effect, a complex field theory. Truth is *aletheia*, translated as "unconcealedness," brought to presence within some opening that itself has a structure. Beings or entities thus *appear* only against, from, and within a background or opening, a framework. But the opening or clearing within which they take the shapes they assume, is itself structured. Overall this structure has as an invariant feature, a concealing-revealing ratio. Thus one may say that it always has some selectivity factor as an essential feature.

Understood in this way, it becomes clear that beings as such are never simply *given*: they appear or come to presence in some definite way that is dependent upon the total field of revealing in which they are situated. Preliminarily, it is important to note that the field or opening in which things are "gathered" is, in a sense, given. It is given historically as an epoch of Being. This is to say that the Heideggerian notion of truth has something like a "civilizational given" as a *variable*. It is what is taken for granted by the humans who inhabit such a "world." Variables given in this sense are particular shapes of the invariant revealing-concealing structure of truth.

What is usually missed concerning this complex field theory of truth is its phenomenological role in Heidegger. The phenomenology of truth isolates the invariance of truth as the revealing-concealing structure itself, the ratio of gathered presences to what is not revealed. Thus, any particular variant is but a variant upon this overall structure. Most interpreters have missed this and failed to see that Heidegger's use of the Greeks, for example, serves as a contrasting variation upon the contemporary scene in order to point up the specific features of our epoch of truth. The interpreters often miss the counterpart characterization of the Greek modes of concealedness to which Heidegger also refers.

Thus, in Heidegger's sense, one must see beyond correctness if one is to attain truth, since correctness is grounded upon some framework that makes it what it is. The process by which this penetration is accomplished is familiar from *Being and Time* as well. One begins with what is called the *ontic* in *Being and Time*. But then, by what I call an act of *inversion*, Heidegger seeks through it an *ontological* condition. It is only through the ontic that the ontological can be understood, but the ontological dimension is in turn the field of the conditions of possibility that founds the ontic.

It is precisely this strategy that Heidegger applies to technology. The anthropological-instrumental definition of technology is functionally ontic, correct but partial, limited to a subjectivistic set of conditions. Heidegger inverts this definition by asking a question that belongs to the transcendental tradition of philosophy: what are the set of conditions of possibility that make technology possible? Technology, as Heidegger sees it, is not only ontic but also ontological.

At first such a move seems strange, but placed within the Heideggerian theory of truth, it begins to make sense in the following way. The things of technology (instruments) and the activities (of subjects) that engage them appear as they do only against the background and founding stratum of some kind of framework. Technology in its ontological sense is

not just the collection of things and activities, but also a *mode of truth* or a field within which things and activities may appear as they do. Technology is thus elevated to an ontological dimension.

> *Techné* is a mode of *alétheuein*. It reveals whatever does not bring itself forth and does not yet lie here before us, whatever can look and turn out now one way and now another. (QT 295)

> Thus what is decisive in *techné* does not lie at all in making and manipulating nor in the using of means, but rather in the revealing mentioned before. It is as revealing, and not as manufacturing, that *techné* is a bringing forth. . . Technology is therefore no mere means. Technology is a way of revealing. (QT 294)

Technology as a mode of truth assumes the overall shape of Heidegger's truth theory. "Technology is a mode of revealing. Technology comes to presence in the realm where revealing and unconcealment take place, where *aletheia*, truth, happens" (QT 295).

A mode of truth as a variant upon the revealing-concealing invariant carries with it certain characteristics. A few of these are important to note with respect to the specific characteristics of technological truth. I have called what Heidegger sometimes calls "epochs of Being" civilizational givens. These are something like deeply held, dynamic but enduring traditions, historical but no more easily thrown over than one's own deepest character or personality. Thus, for an individual it is possible to say that he stands in or stands over against that which precedes him. "The coming to presence of technology gives man entry into something which, of himself, he can neither invent nor in any way make. For there is no such thing as a man who exists singly and solely on his own" (QT 313). Second, these civilizational givens make a claim upon those who inhabit them such that some response is necessary (although variations might range form sheer rebellion to willing acceptance). And, third, they have a *telos* or inherent direction, which Heidegger terms a *destiny*. But, as will be noted, a destiny is not a strict determination; it is more like a direction of growth and decay. "We do not mean a generic type; rather we mean the ways in which house and state hold sway, administer themselves, develop and decay" (QT 312). Technology, ontologically, is what characterizes the variant of this epoch of Being; thus penetration of its essence or shape becomes a central philosophical concern if we are to understand our era and prepare a response to it. Again, technology is elevated to a seldom seen philosophical importance in Heidegger's sense.

Now every shape or truth as a variant upon the revealing-concealing ratio has a certain definiteness to it. It has an essence or structure that is

not merely its genus but is the particular form of its set of possibilities that found what we take as contemporary technics. The name for this shape of technological truth, Heidegger calls *Ge-stell. Ge-stell* means in ordinary German, frame, apparatus, or skeleton; in Heidegger's use, it means *enframing.*

With *Ge-stell* the essence of technology is named: "we now name that challenging claim which gathers man thither to order the self-revealing as standing-reserve: Ge-stell" (QT 301). This is Heidegger's ontological definition of technology. It has the features previously mentioned of being a civilizational variant into which humans have moved; of being a mode of revealing that serves as the set of possibilities by which technology ontically appears as it does; of making a call or claim upon humans for some necessary response; and it has a telos or destiny as a direction of development.

By introducing *Ge-stell* at this point, I leap over Heidegger's development in the lecture. I do so in order to display what may now be called his ontology of technology, the elements of which have been mentioned. What yet remains is to examine this notion in such a way that it can be seen to account for the major features of technology in its contemporary sense and to note more specifically Heidegger's claim that technology can be thought of as the *primary* mode of truth for the contemporary era. To accomplish this task I shall turn to some more specific aspects of each of the structural features of technology as Heidegger exhibits them.

Technology is a mode of revealing. Revealing is a coming to presence within a framework. Already at this level one can detect the emergent value given to *praxis* by Heidegger. In typical fashion, he reverts to etymological expositions upon Greek thought that stands at the origin of our epoch of Being. *Techné*, Heidegger points out, is originally thought of as broader than 'technique' in the contemporary thought. "*Techné* is the name not only for the activities and skills of the craftsman, but also for the arts of the mind and the fine arts. *Techné* belongs to bringing forth, to *poiésis*; it is something poetic" (QT 294). *Poiésis* is both making and bringing forth, but bringing forth is presencing and thus is a *praxical* truth. Here is already the seed for the primacy of the praxical that characterizes Heidegger's phenomenology, but at this point it is important to see only that *techné*, as with the ancients, is linked to *episteme* as a mode of truth as bringing to presence. *Techné* reveals or brings to presence something that is possible. "What has the essence of technology to do with revealing? The answer: everything. For every bringing-forth is grounded in revealing" (QT 294).

But what is revealed? Technological revealing takes its particular shape from its field of possibilities, its framework. And its framework is a particular form of the human taking up a relation to a world through some existential intentionality. There is thus some particular presumed shape to world and some particular activity that responds to that shape of the world.

The world in its technological shape is the set of conditions that Heidegger defines as world taken as *standing-reserve* (*Bestand*). This is to say that the world, revealed technologically, is taken in a certain way, as a field of energy or power that can be captured and stored. "The revealing that rules in modern technology is a challenging, which puts to nature the unreasonable demand that it supply energy which can be extracted and stored as such" (QT 296). This makes world a field as standing-reserve.

This view has certain consequences, for example, "The earth now reveals itself as a coal mining district, the soil as a mineral deposit" (QT 296), which is to say that nature appears as a certain potential for human use. This is a *variant* upon how nature may be viewed. It stands in contrast to those civilizational variants that, for instance, regard the earth as mother and to which one does not even put a plow. Thus one may say equivalently that the technologically viewed world is a variant upon civilizational possibilities or that it is a historical *transformation* upon how nature is taken.

Heidegger argues that such an understanding of the world is a condition of the possibility for our taking up the kinds of technologies that we actually develop now. He emphasizes the transformational features of this enterprise. Thus not only is it the case that the earth may be viewed as a resource, but what was previously taken as the dominance of nature over man becomes inverted so that man dominates nature through technology. "In the context of the interlocking processes pertaining to the orderly disposition of electrical energy, even the Rhine appears to be something at our command. . . . The river is dammed up into the power plant. What the river is now, namely, a waterpower supplier, derives from the essence of the power station" (QT 297). Technology, in this sense, is both the condition of the possibility of the shape of world in the contemporary sense, and the transformation of nature itself as it is taken into technology.

Phenomenologically, for every variant noematic condition there is a corresponding noetic condition. Thus, if the world is viewed as standing-reserve, the basic way in which the world is perceived, there must also be a correlated human response. That, too, takes particular shape in a technological epoch. The activities of humans in response to world as

standing-reserve are those of revealing that world's possibilities, characterized by Heidegger as "unlocking, transforming, storing, distributing, and switching about" (QT 298). Man is taken into the process of *ordering*: "Precisely because man is challenged more originally than are the energies of nature, i.e., into the process of ordering, he never is transformed into mere standing-reserve. Since man drives technology forward, he takes part in ordering as a way of revealing" (QT 299–300).

Here, once again as in *Being and Time*, there begins to emerge the primacy of praxis that characterizes Heidegger's version of phenomenology. And it is here that I shall begin to make the most specific connection with Heidegger's famous "tool analysis," which serves as the model for his philosophy of technology. The common view of technology, related to what Heidegger calls the instrumental and anthropological view, holds that modern technology is a child of modern science. Technology is a mere tool of science or, at best, an applied science. Heidegger inverts this view and claims that modern science is essentially the child of technology. The strategy by which he seeks to show this is a reflection of the same functional inversion employed in *Being and Time*. This inversion of science and technology calls for careful examination.

There are two correlated ideas that appear at the beginning of the strategy which bear initial note. First, Heidegger grants that the contemporary dominant view of technology seeks to strongly differentiate between scientific technology and the older handwork technology. Heidegger does not deny that there are differences, but he plays these down. For instance, in granting correctness (not truth) to the instrumental view of technology, he notes that this view can bring both handwork and scientific technology under the same rubric as "means" or as instrumental toward ends. Here the difference between technologies is merely a matter of relative complexity (QT 288–289). Second, the constant emphasis upon technology as *poiésis* and as *techné*, a making in the ancient broad sense, tends to play down a difference between ancient and modern technology. But third, and most profoundly, the difference is played down strategically because the essence of technology is not itself technological but is existential. What Heidegger does grant is that modern technology allows the secret grounds of technology as enframing to emerge more clearly, allows what was long latent and originary to be made more explicit.

Correlated with this downplay of an essential difference between ancient and modern technology is the necessary admission that modern technology is chronologically later than modern science.

> Chronologically speaking, modern physical science begins in the seventeenth century. In contrast, machine-power technology develops only in the second half of the eighteenth century. But modern

> technology, which for chronological reckoning is the later, is, from the point of view of the essence holding sway within it, historically earlier. (QT 304)

Here one must recall the difference between history as a destiny and historiology as a chronicle developed in *Being and Time*. The essence of technology is not chronologically prior, but it is historically, ontologically, prior to modern science itself. It is from this inversion that Heidegger makes his claim that the technological epoch is what characterizes the contemporary era. The claim is clearly reflective of his earlier explicit claims regarding the primacy of the praxical.

In the lecture, the inversion first takes explicit shape regarding science and its instruments.

> It is said that modern technology is something incomparably different from all earlier technologies because it is based on modern physics as an exact science. Meanwhile we have come to understand more clearly *that the reverse holds true as well*: modern physics, as experimental, is *dependent* upon technical apparatus and upon progress in the building of apparatus. (QT 295–296; italics mine)

This is to say that modern science is *embodied* technologically. One might very well say that one basic difference between modern science and its ancient counterpart is precisely its increasingly technological embodiment in instruments.

But if science is embodied in instruments as a necessary condition for its investigation, this is not yet to say that technology is its origin. Yet that is the claim Heidegger ultimately makes. The form the argument takes is essentially that it is first necessary to view nature as a storehouse or standing-reserve toward which man's ordering behavior can be directed. This provides the condition of the possibility for a calculative modern science.

> Modern science's way of representing pursues and entraps nature as a calculable coherence of forces. Modern physics is not experimental physics because it applies apparatus to the questioning of nature. The reverse is true. Because physics, indeed already as pure theory, sets nature up to exhibit itself as a coherence of forces calculable in advance, it orders its experiments precisely for the purpose of asking whether and how nature reports itself when set up in this way. (QT 303)

Thus, hidden behind modern physics is the spirit of technology, technology in its ontological sense as world-taken-as-standing-reserve. Its

firstness, however, only gradually becomes clear. Such conditions are not necessarily first known, they only gradually come clear. Historiologically, then, modern science does play a role. It begins to announce what lies behind science as technology comes to presence.

> The modern physical theory of nature prepares the way not simply for technology but for the essence of modern technology. For such gathering-together, which challenges man to reveal by way of ordering, already holds sway in physics. But in it that gathering does not yet come expressly to the fore. Modern physics is the herald of enframing, a herald whose origin is still unknown. (QT 303)

But the origin does gradually become clear, the origin that is technology as ontologically interpreted. "All coming to presence, not only modern technology, keeps itself everywhere concealed until the last. Nevertheless, it remains with respect to its holding sway, that which precedes all: the earliest" (QT 303).

Technology as enframing, *Ge-stell*, as originary, is the condition of the possibility of modern science. In Heidegger's terms this is the primacy of technology.

> Because the essence of modern technology lies in enframing, modern technology must employ exact physical science. Through its so doing the deceptive illusion arises that modern technology is applied physical science. This illusion can maintain itself only so long as neither the essential origin of modern science nor indeed the essence of modern technology is adequately found out through questioning. (QT 304)

Here the inversion is complete; technology is the source of science, technology as enframing is the origin of the scientific view of the world as standing-reserve.

Enframing is both the condition of the possibility of modern science and the field of possibilities within which it moves. Enframing is the *ontological horizon* of modern science such that what occurs within it appears as it does through its types of ordering. Such is the shape of the contemporary variant so far as world is concerned.

For limited purposes here, I shall consider that the exposition of technology as grounded in enframing, the world that appears as a standing-reserve, completes the *noematic* analysis of the phenomenological program. World is that which both stands before humans and into which they are "thrown," in Heidegger's earlier language. Thus they must necessarily enter into some kind of relationship with this world. In the context

of the contemporary era the dominant mode of revealing of world is technological, thus the *noetic* analysis would have as its task the unfolding of the range of possible responses to the essence of technology as enframing.

I have already noted that the normative response is what Heidegger calls the *ordering* of the world (unlocking, transforming, storing, and so on). On the surface it then appears that the human response to the world seen as enframed is the activity of calculatively ordering the disposition of resources. Thus, just as nature appears, within enframing, as standing-reserve, so the human task appears as a kind of command of nature through technological means.

What is normative, however, is merely symptomatic of the essence of technology as enframing. It is indicative of the core or central destiny (telos) of world under the guise of technology. It is with the notion of destiny that Heidegger undertakes what must be considered the noetic analysis of enframing: Here, again, the standard moves of a phenomenological program appear:

First, the noematic (world) correlate appears and is defined or described essentially. "The essence of modern technology shows itself in what we call enframing" (QT 305). "It is the way in which the real reveals itself as standing-reserve" (QT 305). Second, then, the question of a relationship to this essence is taken up, the noetic correlate. "We are questioning concerning technology in order to bring to light our relationship to its essence." (QT 305) Third, Heidegger characterizes this relationship as a mode of "being-in" as follows:

> Enframing is the gathering together which belongs to that setting-upon which challenges man and puts him in position to reveal the real, in the mode of ordering, as standing-reserve. As the one who is challenged forth in this way, man *stands within* the essential realm of enframing. (QT 305; italics mine)

In short, the response or relationship of man to the essence of technology will be in terms of the way enframing appears. And this selectivity of a way of seeing the world contains a direction or destiny. "We shall call the sending that gathers, that first starts man upon a way of revealing, *destining*." (QT 305–306)

Destining, in Heidegger's terms, is not described as a determination. It is rather a telos, a direction, which at best may be said to set a framework and provide a set of conditions as an inclination. "But that destining is never a fate that compels. For man becomes truly free only insofar as he belongs to the realm of destining and so becomes one who listens, though not one who simply obeys" (QT 306).

It is at this juncture that Heidegger makes a strategic phenomenological move. To recognize and identify the essence of technology, to comprehend it, is to have located it or to take note of it *as bounded*, as having a horizon. Thus by the same move that grasps technology in its essence, the possibility of becoming free occurs.

> But when we consider the essence of technology we experience enframing as a destining of revealing. In this way we are already sojourning within the open space of destining, a destining that in no way confines us to a stultifying compulsion to push on blindly with technology, or, what comes to the same, to rebel helplessly against it and curse it as a work of the devil. Quite to the contrary, when we once open ourselves expressly to the *essence* of technology, we find ourselves unexpectedly taken into a freeing claim. (QT 307)

What this amounts to, in the Heideggerian program, is to have recognized that the relationship to technology is not technological, but is an existential relationship and hence circumscribed by all the features that characterize existentiality. And to characterize the human response to technology, now located and limited, is to recognize that technology is, first, not neutral: "We are delivered over to it in the worst possible way when we regard it as something neutral; for this conception of it, to which today we are particularly likely to do homage, makes us utterly blind to the essence of technology," (QT 288); is, second, ambiguous: "the essence of technology is in a lofty sense ambiguous" (QT 314); and is, third, mysterious: "technology is not demonic, but its essence is mysterious" (QT 309). But all of these are characterizations of existential intentionality with respect to the truth structure of concealing-revealing.

I have indicated that Heidegger's theory of truth is a *complex* field theory. It is complex because the structure of revealing is inextricably bound to concealing—indeed, bounded by concealing which is its horizon. "All revealing belongs within a harboring and a concealing. But that which frees—the mystery—is concealed and always concealing itself. . . . Freedom is that which conceals in a way that opens to light. . . . Freedom is the realm of the destining that at any given time starts a revealing on its way" (QT 306). I shall not here go into the complexity of the ratio of concealing to revealing that marks Heidegger's theory of truth, but it is important to note its result for a human relationship to the essence of technology.

Heidegger characterizes a range of possible responses to technology. These range from blind obedience to equally blind rebellion. But he also allows for a free (authentic?) relationship that faces technology in its

essence. But because there is such a range, there is also danger: "Placed between these possibilities, man is endangered by destining. The destining of revealing is as such, in every one of its modes, and therefore necessarily, danger" (QT 307).

But what is the danger? The answer is essentially the same as the previously noted danger of taking correctness as truth, the danger of taking a part for the whole. "In whatever way the destining of revealing may hold sway, the unconcealment in which everything that is shows itself at any given time harbors the danger that man may *misconstrue the unconcealed and misinterpret it.*" (QT 307; italics mine).

A misinterpretation, for Heidegger, contains elements that reflect the errors possible in taking correctness for truth. They revolve around his version of mistaking the part for the founding whole. Thus, unless it is recognized that technological revealing is also a concealing (and it is from concealing that the origin of freedom arises), it can be mistaken for the totality. Technology, by its very status as a mode of revealing, may harbor this temptation.

> The coming to presence of technology threatens revealing, threatens it with the possibility that *all* revealing will be consumed in ordering and that everything will present itself *only* in the unconcealedness of standing-reserve. (QT 315, italics mine)

Noematically, this is the implicit claim of ultimate truth, world must appear *totally* or ultimately as standing-reserve. Noetically, the same index for danger can occur. By reflexively taking account of their place within world, humans face the danger that they can also be taken as standing-reserve.

> When destining reigns in the mode of enframing, it is the supreme danger. This danger attests itself to us in two ways. As soon as what is unconcealed no longer concerns man even as object, but exclusively as standing-reserve, then he comes to the very brink of a precipitous fall, that is, he comes to the point where he himself will have to be taken as standing-reserve. (QT 308)

If the world becomes totally perceived as standing-reserve, then reflexively, humanity itself may come to perceive itself as the same.

In one respect, this is to note that the technological mode of truth is "reductionistic." But it is reductionistic in a special Heideggerian sense because it is not that something can be "added to" this mode of revealing that will correct it—although it appears that Heidegger himself opts for

something like this alternative as a solution. Rather, one mode of revealing can be changed only by, in effect, being replaced. Its "reductionism" is a reductionism of disregarding the concealed, the horizon of all unconcealedness or revealing.

I am not particularly concerned here with Heidegger's response to the danger of technology, but rather concerned with its explanatory scope. Even so, it is perhaps well to note that his response was never well formed. In the technology essay, the response was, in fact, a form of remedy for "reductionism." It contained two primary steps. The first remains continuous with what may be called "phenomenological therapy." This therapy is to address the critical question to technology, as to any truth claim, and to seek to limit its hubris toward totality. Critical questioning, in Heidegger's sense, calls us back to noting the structure of the invariant *concealing-unconcealing* that limits every totality. This is the perennial philosophical task:

> Because the essence of technology is nothing technological, essential reflection upon technology and decisive confrontation with it must happen in a realm that is, on the one hand, akin to the essence of technology, and, on the other, fundamentally different from it . . . For questioning is the piety of thought. (QT 317)

The other dimension of Heidegger's response is or may be seen as an attempt to broaden and enrich technological revealing. And the enrichment, he sees, comes from a similar activity that is in its own right praxical and poetic; the enrichment is to come through a basic revival of *techné as art*. This move is familiar throughout the Heideggerian emphasis upon the primal thinking of the poet, but it is rarely appreciated as the similar-dissimilar counterpart of *techné* as technological. Art *is* technological as *techné*, but its mode of revealing opens new ways of "saying Being" as Heidegger puts it, this is fundamentally different from *techné* as technology.

> What was art—perhaps only for that brief but magnificent age? Why did art bear the modest name *techné*? Because it was a revealing that brought forth and made present, and therefore belonged within *poiésis*. It was finally that revealing which holds complete sway in all the fine arts, in poetry, and in everything poetical that obtained *poiésis* as its proper name . . . poetically dwells man upon this earth. (QT 316)

Technology and art belong to the danger and possible salvation of the same epoch of Being.

I now turn to a brief examination of the famous "tool analysis" of *Being and Time* as the full anticipation of the themes concerning technology in the lecture. It is first important to note the context and role that the tool analysis plays in the overall Heideggerian strategy. The analysis occurs as the vehicle by which the worldhood of the world is to be made phenomenologically apparent. World, Heidegger contends, does not just appear, and neither can it be accounted for by adding up and classifying the entities within it. Such a strategy always already contains a hidden interpretation and is thus ontologically naïve. Heidegger's counterstrategy is to attempt to locate what is ontological *through* a phenomenological analysis of what first appears as ontical. This counterstrategy appears clearly at the end of the tool analysis, where the ontological relationship with world appears *through* the ready-to-hand:

> As the Being of something ready-to-hand, an involvement is itself discovered only on the basis of the prior discovery of a totality of involvements. . . . In this totality of involvements which has been discovered beforehand, there lurks an ontological relationship with the world. (BT 118)

Here is already a glimpse of Heidegger's assertion of the way a whole or totality, although hidden and latent, *precedes* any individual or part as the condition of possibility for the part to appear as it does while the part, in turn, is the proximal means by which the totality itself is discovered. The ontological is discovered (literally, dis-covered) through the ontic.

Ultimately, what is ontological, however, must also be noted. Heidegger's ontology is thoroughly phenomenological, although phenomenological in the specific existential sense that Heidegger gives to the intentional arc. A phenomenological ontology is one that correlates in a unified concept three distinguishing notions.

Dasein: Being-in-the-World

These three notions are clear adaptations from the Husserlian notion of intentionality, in which "consciousness" is always *of* something to which the act of consciousness refers. The intentional arc in Husserl is thus: Ego-cognizing-World. It should be noted preliminarily that the interpretation in the Husserlian context is one that dominantly sticks to a more traditional perceptual and cognitional characterization of the arc as "mental."

Functionally, the intentional arc remains operative in *Being and Time* but it is no longer interpreted cognitionally; it is rather existentialized, such that what turns out to be basic or primary is the *praxical.* But it

remains important to recognize that the ultimate structure of Heidegger's ontology is the arc *Dasein: being-in-the-world.*

Heidegger's transformation of intentionality into a praxical base may be seen in two complementary ways. It is a deepening of the understanding of intentionality. It is to have noted that *all* so-called conscious activities are equally intentional, including such phenomena as moods and emotion and, what is more, bodily movement, such that the human being as a totality is "being-in" an environment or world. It is true that Husserl recognized this, but he continued to interpret intentionality as if it were "mental" instead of existential. Heidegger's tactic is one of simply cutting through the traditional mentalistic language and speaking of human existence as correlated with a world. But the second way in which Heidegger's transformation of Husserlian phenomenology may be seen is by way of seeing it as an *inversion* of Husserlian priorities. Again, Husserl already saw that the phenomenological aim undercut much theory and aimed at what became known in the literature as the "pre-theoretical" stratum of phenomena. Heidegger not only absorbs this notion, but he also inverts it in *Being and Time* such that a praxical engagement with entities becomes primary over the assumed theoretical-cognitive engagement, which actually characterizes all Husserl's descriptions.

The "anti-Husserl" theme in *Being and Time* is not unfamiliar, but in this context the inversion concerning praxis and theory may be seen as the anticipation of the later explicit theme that makes technology the origin of science. I shall put the exposition in the context of its proper phenomenological strategy.

Heidegger wishes to penetrate the stratum of latent, hidden, but familiar relations with the world that characterize what he calls *everydayness.* Such a stratum constitutes, according to Heidegger, the base and limits within which subsequent specifications may be made. "The theme of our analytic is to be Being-in-the-world, and accordingly the very world itself; and these are to be considered within the horizon of average everydayness—the kind of Being which is *closest* to Dasein" (BT 94).

As already noted, the analysis takes place first in its *noematic* or world-correlate step that seeks to uncover the "worldhood of the world." The everyday world is the experienced environment (world-as-environment). It is through the familiar, but hidden environment that clues to the World as such are to be found.

When Heidegger turns, then, to a phenomenological analysis of this everyday environment, he argues that what is first or primary is the *praxical.* We have dealings first with things that we put to use.

> The kind of dealing which is closest to us is . . . not a bare perceptual cognition, but rather that kind of concern which manipulates things and puts them to use; and this has its own kind of "knowledge." . . . Such entities are not thereby objects for knowing the 'world' theoretically they are simply what gets used, what gets produced, and so forth. (BT 95)

Heidegger argues that to take "things" interpreted as bare entities with properties is already to have presupposed an ontology prior to the actual investigation of human engagement with the environment. It is from this argument that Heidegger constructs two different ways of relating to entities with the environment. These two ways of relating are well known as the distinction between the "ready-to-hand" (*Zuhandenheit*) and the "present-at-hand" (*Vorhandenheit*). It must be noted that both are qualitatively different relations to entities within the environment.

Heidegger's inversion of Husserl is one that makes a strong contrast between the "present-at-hand" relation and the "ready-to-hand" relation. The first is one in which entities (beings) appear as "just there" and as having certain qualities or predicates. They are "theoretically determined." Contrarily, the "ready-to-hand" belongs to the stratum of productive use or other forms of active engagement that characterize *praxis*. And Heidegger's strategy in *Being and Time* is to show that these are not merely two alternate modes of relation, but that one is founded upon the other, in this case the "present-at-hand" upon the "ready-to-hand." This is, in effect, an action theory of ontology.

Interestingly, what prevents the contemporary era from seeing the primacy of praxis, Heidegger contends, may be laid to the door of Greek philosophy. "The Greeks had an appropriate term of 'Things': *pragmata*—that is to say, that which one has to do with one's concernful dealings (*praxis*). But ontologically, the specifically 'pragmatic' character of the *pragmata* is just what the Greeks left in obscurity; they thought of these 'proximally' as 'mere Things'" (BT 96–97).

I have already noted in the first section of this essay that for Heidegger whatever appears does so in terms of a whole. The same occurs with respect to "tools," which are what most interpreters of Heidegger on this point seem to think Heidegger is talking about. Phenomenologically, however, it should be noted that the analysis Heidegger undertakes is effectively a relational analysis in which the distinguishing features of the intentional arc are what are being described. Thus one will find that the tool analysis begins with the noematic correlate, the context and entity as it occurs phenomenologically. Later and reflexively referred back to its

noetic correlate, the mode of engagement is entered into by the human exister, Dasein. The totality, Dasein-relating in the mode of the ready-to-hand, with entities within the world determines what shows itself overall.

The noematic description of the analysis begins typically with the phenomenological observation that no entity (whether in the mode of ready-to-hand or present-at-hand, for that matter) occurs except in a context and against a background. Thus a "tool" shows itself *only* as already in a context, an equipmental context.

> Taken strictly, there "is" no such thing as *an* equipment. To the Being of any equipment there always belongs a totality of equipment, in which it can be this equipment that it is. Equipment is essentially "something-in-order-to." . . . A totality of equipment is constituted by various ways of the "in-order-to" such as serviceability, conduciveness, usability, manipulability. (BT 97)

This context in which equipment occurs has, moreover, a variable structure. "In the 'in-order-to' as a structure there lies an *assignment* or *reference* of something to something" (BT 97). This is to say that any given piece of equipment is what it is in an equipmental context and that it appears in such and such a way relative to that context. The homely illustrations Heidegger employs (ink pens belonging to the context of the desk, writing paper, and so on) show both the way in which an individual "tool" belongs to a context and how the context is variable. But it is noteworthy that even at this first level, the whole is what determines the part. "Out of this the 'arrangement' emerges, and it is in this that any 'individual' item of equipment shows itself. *Before* it does so, a totality of equipment has already been discovered" (BT 98). Here is the model of how world is "already discovered" in hidden and latent form through the use of a piece of equipment.

What emerges from this analysis is a description of equipmentally intentional structures, which Heidegger calls the ready-to-hand. It is the equipmental (noematic) context that is the condition for the manifestation of a "tool" as ready-to-hand.

> The kind of Being which equipment possesses—in which it manifests itself in its own right—we call "readiness-to-hand." Only because equipment has *this* "Being-in-itself" and does not merely occur, is it manipulable in the broadest sense and at our disposal. (BT 98)

What is more, it is from this structure that Heidegger contends one can detect a kind of *praxical knowledge* that is distinct from what we ordinarily

think of as theoretical knowledge. A simply predicative knowledge of things described by properties misses this stratum, "no matter how sharply we just look at the 'outward appearance' of Things in whatever form this takes, we cannot discover anything ready-to-hand" (BT 98).

Contrarily, it is only in use that the distinctive characteristics of the ready-to-hand emerge. "When we deal with them by using them and manipulating them, this activity is not a blind one; it has its own kind of sight, by which our manipulation is guided and from which it acquires its specific Thingly character" (BT 98). Here the turn is made to the noetic correlate. The sight that emerges in active use, noetically, is also a field characteristic of human engagement, *circumspection*. "The sight with which they thus accommodate themselves in *circumspection* . . . action has *its own* kind of sight" (BT 98–99).

Heidegger sets off in strongest terms the difference between this praxical sight and a theoretical observation. The latter would focus its gaze *upon* the "tool" and thus make of it an object having such and such properties—but this precisely hides the distinctive character of the entity in use. It is the peculiar manifestation of the tool in use that is the secret to praxical sight. The tool in use appears not as an object to be seen, but recedes or withdraws.

> The peculiarity of what is proximally ready-to-hand is that, in its readiness-to-hand, it must, as it were, withdraw in order to be ready-to-hand quite authentically. That with which our everyday dealings proximally dwell is not the tools themselves. On the contrary, that with which we concern ourselves primarily is the work. (BT 99)

Here is an essential insight concerning the ready-to-hand. The entity in praxical use "withdraws" or is taken into a manifestation that is partially "transparent." This is one reason why the ready-to-hand may be so easily overlooked and also a reason for the inappropriateness of a predicate analysis. It is a phenomenologically positive feature of the appearance. It is, moreover, thoroughly in keeping with the intentionality analysis being presupposed by Heidegger. The human user refers *through* the tool-equipment toward one in which the work or result appears. A Thing in the mode of ready-to-hand is radically different from a Thing in the mode of being "just there" or present-at-hand.

Although a full characterization of the mode of the present-at-hand is not called for in this essay, its relationship with the mode of the ready-to-hand is. It might be thought that the two modes could merely be variants upon concern with the world, but this is not the use to which Heidegger puts his distinction. Rather, he argues that one is the condition for the

other, that readiness-to-hand *precedes* presence-at-hand, and it is this argument that is both the inversion of Husserlian phenomenology and the source of what later becomes the primacy of technology in relation to science.

The themes that arise in this argument are precisely those that arise concerning technology in the later lecture. First, readiness-to-hand is a mode of disclosure. It is through the ready-to-hand that the environment appears as a "world." Praxis discovers Nature through the ready-to-hand. Heidegger's analysis traces this discovery not merely from a subject, but also intersubjectively and on through wider and wider reaches until Nature is seen in a certain way:

> Any work with which one concerns oneself is ready-to-hand not only in the domestic world of the workshop but also in the *public* world. Along with the public world, the *environing Nature* is discovered and is accessible to everyone. In roads, streets, bridges, buildings, our concern discovers Nature as having some definite direction. A covered railway platform takes account of bad weather; an installation for public lighting takes account of the darkness. . . . In a clock account is taken of some definite constellation in the world-system. . . . When we make use of the clock-equipment, which is proximally and inconspicuously ready-to-hand, the environing Nature is ready-to-hand along with it. (BT 100–101)

Here one sees the anticipation in *Being and Time* of the way in which the founding totality is seen through a mode of disclosure. The ready-to-hand discovers the world, but only implicitly, because the world lies "behind" the partial withdrawal of the equipment in its use.

> Our concernful absorption in whatever work-world lies closest to us, has a function of discovering; and it is essential to this function that, depending upon the way in which we are absorbed, those entities within-the-world which are brought along in the work and with it . . . remain discoverable in varying degrees of explicitness and with a varying circumspective penetration. (BT 101)

Second, what is ultimately revealed is the world as a whole. "The context of equipment is lit up, not as something never seen before, but as a totality constantly sighted beforehand in circumspection. With this totality, however, the world announces itself" (BT 105).

Third, once disclosed, world is seen to be that in which Dasein already was, that in which Dasein has its relation of being-in:

> The world is therefore something "wherein" Dasein as an entity already *was*, and if in any manner it explicitly comes away from anything, it can never do more than come back to the world. Being-in-the-world, according to our interpretation hitherto, amounts to a non-thematic circumspection absorption in references or assignments constitutive for the readiness-to-hand of a totality of equipment. (BT 106–107)

Each of these themes is isomorphic with their later reiteration under the aegis of technology as the current world epoch. The connection with technology has been anticipated in the primacy of the ready-to-hand announced in *Being and Time*. Moreover, the connection between ready-to-hand and world occurs by use of Heidegger's inversion, which takes a specific, but peculiar turn in *Being and Time*.

What is peculiar about the mode of the ready-to-hand is precisely the way in which the entities, the equipment, manifest themselves by paradoxically withdrawing in use. This partial transparency in use functions to conceal the very context in which the equipment occurs. In noting this, Heidegger is considerably subtle in his phenomenological tactics, but, simultaneously, he begins to employ what I call the *negative turn* to isolate the structural characteristic he is interested in displaying.

Equipment in use appears as partially transparent, as hidden from *direct* observation. To show this, Heidegger inverts the situation and contends that the equipmental context (which is the first index for world) appears through *negativity* when the equipment somehow *fails* to function.

There are two reasons for this negative turn. The first is tactical with respect to presence-at-hand. Heidegger argues that the mode of relationship, which is theoretical, the present-at-hand, *cannot* discover either equipment or an equipmental context. One does not uncover the praxical at all by adding predicates to an object. A "tool" is not a bare physical entity to which one may add "values"; neither is its serviceability or usability seen by a bare perceptual cognition. Thus, the negative turn functions, in part, to short-circuit the temptation to give an account of the ready-to-hand in terms of a theoretical metaphysics. Regarding equipment, "we discover its unusability, however, not by looking at it and establishing its properties, but rather by the circumspection of the dealings in which we use it" (BT 102).

The second reason functions as a positive phenomenological tactic by making what must be described as the partial transparency of equipment in use appear *indirectly*. Thus, by this variation—no different in function

from a Husserlian fantasy variation—Heidegger displays this feature of the ready-to-hand by noting that piece of equipment which malfunctions, is unusable or even missing serves to indirectly light up its genuine function. But in the process, the negative appearance must be characterized in partial thinglike terms: conspicuousness, obtrusiveness, obstinacy. "When its unusability is thus discovered, equipment becomes conspicuous. This *conspicuousness* presents the ready-to-hand equipment as in a certain unreadiness-to-hand. . . . When we notice what is un-ready-to-hand, that which is ready-to-hand enters the mode of *obtrusiveness*" (BT 102–103).

This is to say that a malfunctioning piece of equipment emerges from its functional transparency and becomes a "thing" that just lies there. Indeed, it is from this *negative* characterization that Heidegger derives the origin of the present-at-hand!

> Anything which is un-ready-to-hand in this way is disturbing to us, and enables us to see the *obstinacy* of that with which we must concern ourselves in the first instance before we do anything else. With this obstinacy, the presence-at-hand of the ready-to-hand makes itself known in a way as the Being of that which still lies before us and calls for our attending to it. (BT 103–104)

Presence-at-hand is, in this way, dependent upon the primacy of the ready-to-hand. "The modes of conspicuousness, obtrusiveness, and obstinacy all have the function of bringing to the fore the characteristic of presence-at-hand in what is ready-to-hand" (BT 104).

Now, once emergent *from* the ready-to-hand, the mode of presence-at-hand can attain its own relative autonomy. It becomes possible to attend to things predicatively, theoretically. But at the same time, presence-at-hand has been derived from its praxical base. This derivative character of the present at-hand carries with it, at first, the interpretation that casts it negatively as a *deficient* mode of concern. "It [equipment] reveals itself as something just present-at-hand and no more, which cannot be budged without the thing that is missing. The helpless way in which we stand before it is a deficient mode of concern, and as such it uncovers the Being-just-present-at-hand-and-no-more of something ready-to-hand" (BT 103).

I take it that this inversion is strongly indicative of both the primacy of technology and of praxis in Heidegger's later phenomenology, but it is also penultimate with respect to the ultimate strategic use to which the negative turn is put. The purpose of the analysis is to get at the world that belongs to the ready-to-hand, and the inversion is but one step along the

way. What equipmental negativity ultimately reveals is the latent context to which it belongs, the "world" inhabited by concern.

> When an assignment has been disturbed—when something is unusable for some purpose—then the assignment becomes explicit. . . . When an assignment to some particular "towards this" has been thus circumspectly aroused, we catch sight of the "towards this" itself, and along with it everything connected with the work—the whole workshop—as that wherein concern always dwells. (BT 105)

It may now be seen that the basic strategic and functional elements that characterize the philosophy of technology found in "The Question Concerning Technology" were present in the much earlier opus *Being and Time*, although they are not specifically identified with technology as such there. Nevertheless, *praxis* in *Being and Time* functions as the basic existential stratum *through* which the world is revealed and as the basic realm of action *from* which sciences may arise (as processes of theoretically developing present-at-hand).

The emphasis upon praxis as existentially basic is what characterizes the Heideggerian inversion of Husserlian phenomenology. Thus it may be said with more than a touch of correct-parallelism that Heidegger is to Husserl what Marx was to Hegel.

Technology as Emergent Theme

In this retrospective reading of Heidegger on technology, I have admittedly stressed those elements that are isomorphic between *Being and Time* and the technology lecture. These isomorphisms are basic to his philosophy of technology, but there are two related anomalies concerning praxis and technology in the early as compared to the later Heidegger, and it is from these that I shall lay the groundwork for the concluding section of this essay.

Being and Time does not specifically raise the question of technology, although it may easily be seen that the praxical dimension of the ready-to-hand could become interpreted as the condition of the possibility for technology. What is missing in an explicit sense in *Being and Time* is the specific characterization of world taken as standing-reserve. There is a hint of this, to be sure, in that Nature becomes *available* to the ready-to-hand. "So in the environment certain entities become accessible which are always ready-to-hand, but which, in themselves, do not need to be produced. Hammer, tongs, and needle, refer in themselves to steel, iron, metal, mineral, wood, in that they consist of these. In equipment that is

used, 'Nature' is discovered along with it by that use—the 'Nature' we find in natural products" (BT 100). Here we have an anticipation of the idea of standing-reserve in a particular interpretation of Nature that is linked to readiness-to-hand.

Heidegger contrasts this concept of Nature with that which he finds in science, which in *Being and Time* is essentially an abstract nature derived from a theoretical interpretation of the present-at-hand. In *Being and Time* he makes the *contrast* between the Nature of the ready-to-hand and the Nature of the present-at-hand as strong as possible. The Nature of the ready-to-hand does anticipate the notion of standing-reserve, "the wood is a forest of timber, the mountain a quarry of rock; the river is water-power, the wind is wind 'in the sails.' As the 'environment' is discovered, the 'Nature' thus discovered is encountered too" (BT 100). But this ready-to-hand Nature contrasts with the "*just there*" Nature of the present-at-hand. "If its kind of Being as ready-to-hand is disregarded, this 'Nature' itself can be discovered and defined simply in its pure presence-at-hand. . . . When this happens, the Nature which 'stirs and strives,' which assails us and enthralls us as landscape, remains hidden. The botanist's plants are not the flowers of the hedgerow; the 'source' which the geographer establishes for a river is not the 'springhead in the dale'" (BT 100).

What Heidegger has not yet discovered in *Being and Time* is the profound link between contemporary science and technology. The 'science' of *Being and Time* is essentially a metaphysical and even contemplative science. It is a science derived from what may now be seen to be the ancient Greek ideal of speculation and deduction. It is not yet the science that is necessarily *embodied* in instrumentation; neither is it the science that is in the service of technology as calculative standing-reserve of the lecture.

Thus, the latent technics of *Being and Time* remain either innocuous or even positive. The tool analysis has often been noted to be highly selective in one respect. Heidegger chooses as examples equipment that is used "in hand," technologies that are directly employed in work projects, technologies that extend human capacities often in terms of *handiwork*. This selectivity colors the entire analysis and is one element of a certain Heideggerian inadequacy of interpretation regarding technics. But first, in this context, this selectivity gives a certain tone of positivity to the ready-to-hand that is lacking in the contrasting "abstractness" of the present-at-hand.

If the first contrast between the lecture and *Being and Time* revolves around the notion of standing-reserve as the essence of technology, a second anomaly revolves around what may be called the "disappearance of

the object," which functions differently in the early and later publications. In a sense, the *object* is what appears or is constituted *by* metaphysically based science in *Being and Time*. That which just stands there and which can be made the theme for presence-at-hand is the object. The object, which is characterized by predicates, is the noema of science in the view of *Being and Time*. Contrarily, equipment in use withdraws and is neither objectified nor appears as directly present at all.

The negative tone that permeates the Heideggerian analysis of presence-at-hand, however, is directed at its reductionism. The object is "abstract," reduced, not the full and rich thing (the springhead in the dale) which is experienced in daily life. The object is the reduced noema of scientific contemplation. It is derived from and set aside from the full existentiality of *praxis*.

By the time of the technology lecture, however, the object has also disappeared from science. Under the concept of the standing-reserve, "whatever stands by in the sense of standing-reserve no longer stands over against us as object" (QT 298). Here objects *and equipment* are, in effect, absorbed into the new totality. "Then in terms of the standing-reserve, the machine is completely unautonomous, for it has its standing only from the ordering of the orderable" (QT 298–299). Nature, already noted as taken into technology as standing-reserve, is now accompanied by "tools" as well. The technological world is one in which the noematic correlate is simply standing-reserve and the noetically normative response is that of ordering this reserve.

Now, many critics of Heidegger see in these moves simply a Heideggerian preference for the Romantic themes of much past German philosophy—and it must be admitted that Heidegger is not blameless for offering occasion for such criticism. The implicit problem of *Being and Time* is the reductionism of the sciences of the present-at-hand in that the object reduces and loses the full sense of existentiality. Symptomatically, nature as that which "stirs and strives," as the "springhead in the dale," is lost. In the technology lecture it would seem that what is reduced and lost is the "toolshop" itself, and with it the direct expressivity which characterized the ready-to-hand of *Being and Time*. I will not deny that Heidegger provides clues himself for such an interpretation—but it seems to me that this misses much of the thrust of the Heideggerian philosophy of technology.

There is another side to the interpretation of technology that does emerge from this surface negativity. This may be seen in the transpositions that occur between *Being and Time* and the lecture. The lecture does

not make anything of the distinction between the ready-to-hand and presence-at-hand, but it does elevate to the fore a strong and comprehensive concept of technology. It seems to me that this concept is one that *combines* certain features of both the present-at-hand and the ready-to-hand in such a way that we may speak of a unique *scientific technology*. Thus, in spite of his playing down of a distinction between traditional handiwork technology and contemporary technology, Heidegger in effect recognizes the uniqueness of the latter. Indeed, the clue to the combination is not far from the surface.

If one returns to the contrast between presence-at-hand and the ready-to-hand of *Being and Time*, not only does one note the essentially positive tone which permeates the discussion of the ready-to-hand, but sees in it certain base constants which re-emerge with a different evaluation in the technology lecture. Recall several of these key features: (1) The world is revealed *through* the equipmental context; (2) the equipmental context is the condition of the possibility of specific 'tools' being what they are; (3) noetically, engagement of the environment through readiness-to-hand reveals existential intentionality as *concern* (which is an index of Care in *Being and Time*), and (4) concern takes account of the context holistically as circumspection. This *praxical* dimension is where the *essence* of Dasein is shown and effected. Now each of these elements remains constant with the later technological interpretation of the contemporary world in Heidegger, but the earlier clearly positive tone coloring these elements is transformed into the ambiguous sense of *danger* that characterizes the technological world.

Contrarily, the brief characterizations of presence-at-hand in the tool analysis are often marked by partially negative characterizations. The present-at-hand originates by means of (1) deficient mode of concern (BT 103) and is characterized as a matter of entities appearing under the guise of (2) bare perceptual cognitions (BT 95), (3) just looking (BT 98), and (4) as abstract reductions interpreted as a world-stuff (BT 101). Positively, (1) presence-at-hand may be elevated into a kind of knowledge (science) that knows the world theoretically (BT 95), (2) and that can be thematically ascertained (BT 106), but that appears accordingly as the ultimately reduced *functions* of the theoretically constituted world. "By reason of their Being-just-present-at-hand-and-no-more, these latter entities can have their 'properties' defined mathematically in 'functional concepts.' Ontologically, such concepts are possible only in relation to entities whose Being has the character of pure substantiality. Functional concepts are never possible except as formalized substantial concepts" (BT 122).

Now the concept of *technology* that pervades the lecture clearly *combines* elements from both sides of the earlier contrasting modes of relation. It remains the case that only through concern with the world, through what remains the praxical, is humanity effected in its essence. And it is only because it is effected in its essence that technology can be considered dangerous. "The threat to man does not come in the first instance from the potentially lethal machines and apparatus of technology. The actual threat has already afflicted man in his essence" (QT 309). But what is now taken into the very way in which world is perceived are the previously negatively characterized "reductions" whereby the world becomes mere standing-reserve.

I have indicated that latently the "nature" of the ready-to-hand already anticipates the notion of standing-reserve. Taking account of nature in such a way that the "wood is a forest of timber" is already to be open to a world taken as standing-reserve, but this is a necessary and not sufficient condition. What makes it sufficient is the *addition* of thematically and systematically taking "nature" into a calculative and *universal* view of nature as standing-reserve. But this is the metaphysics of what may be characterized as a scientific or theoretically organized technology and not that of any simple handiwork technology. Thus in some sense, the illuminating distinctions of the ready-to-hand and the present-at-hand of *Being and Time* collapse in the later work and become unified.

One result of this collapse is the elimination of any purely contemplative science. There can be no "just looking" in what should more correctly now be called a technological science. The Greek ideal is what is lost—and if Heidegger is correct, then those who think they are remaining true to this ideal are merely naïve and open to being used by technological culture. As with the non-neutrality of technology, there can now be no neutrality to science.

Ironically, a compatible way of interpreting this collapse of readiness-to-hand and presence-at-hand in the later Heidegger is to see that the science latent within presence-at-hand, in contemporary technological science, has become an *existentialized* science. That is why it can be thought of as effecting humanity in its essence. I shall not speculate concerning how this might literally be the case in contemporary genetic engineering, however tempting such an excursus might be, but it is in such examples that one might see how humanity itself becomes standing-reserve in the Heideggerian sense.

Technology, then, becomes the combined powers of what was earlier both readiness-to-hand and presence-at-hand. Humanity is effected essentially because science itself is technological in its contemporary sense and

operates in the praxical dimension. But in these transpositions the earlier positive tone given to the praxical also disappears and is replaced with the characterizations of technological culture as "dangerous," "ambiguous," "mysterious," and as harboring even a certain "monstrousness." It is from such characterizations that Heidegger's critical attitude toward technology provides material for an interpretation that sees him as dominantly pessimistic regarding humanity's future.

While Heidegger is hardly alone in this attitude, such an interpretation misses what provides not only an opening to a different hope, but also the recasting of a different set of distinctions that were never fully developed in the Heideggerian corpus. I have already noted that Heidegger's hope against any totalizing closure concerning humanity lay in technics as *art*. There is a very good strategic reason for this choice.

First, art is a technics, akin thus to the concern which is exhibited in all praxical dealings with the world. It is thus already related to technology. "Confrontation with [technology] must happen in a realm that is, on the one hand, akin to the essence of technology" (QT 317). Art is also "theoretical" in that it does not simply take the world as that which is to be used. Its "contemplative" attitude is thus akin to science in the earlier sense of the present-at-hand of *Being and Time*. It is interesting to note that the observation "the botanist's plants are not the flowers of the hedgerow" (BT 100) contrasts with the reduced objects of a theoretically dominated presence-at-hand, but neither are these objects the use-sources for a sheerly praxical world. There is here a hint of a new contrast, a contrast between the now combined ready-to-hand-present-at-hand existential intentionality and the poetic being-towards-the-world of Heidegger's "poetic dwelling."

Strategically, however, if artful praxis is akin to technological science in its technics and its possibility of thematic distance, its difference may also be noted. "Confrontation with [technology] must happen in a realm that is . . . on the other [hand], fundamentally different from it." (QT 317) The difference lies in its *proliferation* of possibilities. Art is essentially antireductive in its imaginative fecundity. Its "worlds" are effectively endless.

I am thus suggesting that in terms of Heidegger's systematic concern with praxical, now technological humanity, artful praxis is not some simple addition to the current epoch of Being, but is the strategic counterbalance to what Heidegger fears is the threat of closure. There is thus an internal need for the turn to poetics, from Heidegger's point of view, as a response to the age of technology as the current epoch of Being.

2

The Historical-Ontological Priority of Technology Over Science

The thesis I wish to explore in this essay is that *there is a significant sense in which technology may be seen to be both ontologically and historically prior to science.* There is, of course, an obvious and trivial sense in which this claim may be regarded as true. If technologies in the broadest and most concrete sense involve humans and their uses of tools and artifacts, then at the least one can say that technology in this sense is both universal and probably used at the time of the rise of the human species. There are no instances of societies, cultures, or human groups that do not use tools and artifacts in their relations with the natural environment.

If science centrally involves a theorizing about things in a systematic and hypothetical sense, then it should be apparent that the practiced and skilled uses of technologies long precede the kind of self-awareness implied in science. In the most general sense then, *praxis* precedes explicit theory.

I wish, however, to suggest that there is a more specific sense in which technology, particularly in its more recent developments, is the *condition of the possibility of science.* I argue in my book *Technics and Praxis* that science, in its contemporary sense as an experimental science wedded to specific meanings of measurement, is *necessarily embodied* in its instrumentation. Indeed, one of the chief differences between modern science and Greek contemplative science lies in the development of instrumentation both for measurement and for actual investigative purposes. Instrumentation extends and embodies perception.

Historically, of course, even Greek science in actual practice engaged some measurement technologies. But the lack of a specific technological impetus also doomed Greek science to its primarily speculative attainments—witness the odd ideas about the shapes of atoms and causes of sweet, bitter, or sour tastes in Democritus. (Lacking any means of investigation of such micro-phenomena, the speculation had to remain just that.) This lack of appropriate technology determined the limits of a primarily contemplative science.

Here I wish to push the essential interlocking of science and technology further by arguing for the historical-ontological priority of technology as a condition of the possibility of science. I develop three unequal stages in this demonstration: First, I briefly describe what I take to be the standard and dominant theory of the relationship between technology and science. Second, I pay my debts to two important intellectual predecessors of my views. The philosophical debt is owed to Martin Heidegger, who may be said to have originated and solidified what has become the philosophy of technology for the twentieth century, and who argued most explicitly for the ontological priority of technology over science. The historical debt is owed to the large body of work done by Lynn White Jr., who made us aware that there was a virtual technological revolution in the Middle Ages that preceded and laid the groundwork for the rise of modern science in the Renaissance and through the Enlightenment. The third step will then be an examination of certain aspects of the historical technological lifeworld. I shall develop this account along phenomenological lines.

The Standard Theory

Various conceptual possibilities could account for the relationship of technology and science, but two extreme cases—I call them the "idealist" and "materialist" interpretations—have the advantage of posing the issues most starkly.

The idealist view is the interpretation that holds that science precedes and founds technology, that requisite for creating a (modern) technology, one must have insight into the laws of nature, a conceptual system at the formal and abstract level, and the ability to *apply* this knowledge to the material realm, thus creating a technology. In this interpretation, technology follows from science, both ontologically as an application of scientific knowledge and historically as the spread of this insight into ever-widening realms of material construction.

The standard view is accompanied by an interpretation of the history of modern science and technology that may be characterized as follows: After a long dark period in European history, a revival of the Greek scientific spirit emerges within and animates what we call the Renaissance. Europeans regain an interest in nature, speculate about nature, and evolve a method of understanding nature that we call modern science. Historically this movement becomes dramatic and fulfilled in such figures as Galileo, Kepler, and Copernicus and eventually becomes fully systematized with Newton.

The rise of modern science is a development that includes (1) the discoveries of more sophisticated mathematics; (2) a gradual move away from religious and theological notions and a move toward a more mechanistic and materialist metaphysics; (3) a method that diverges from the more speculative ancient roots towards a more experimental and verificationist direction; and (4) a movement that results in the rise of physics as the primary science, or at least the science that is first among equals.

Only after this historical development of science does there arise a technology (in the modern sense). The Industrial Revolution of the past century and a half and the explosion of the current "high technology" are plausibly dependent upon the precondition of scientific theory. Technology in the contemporary sense seems to spin forth almost directly from science itself.

In this essay I am not interested in a further exposition of the implicit metaphysics of this interpretation; neither am I going to undertake a direct attack upon its presuppositions. As an interpretation of the relationship between science and technology, it has both plausible and implausible aspects. I shall point out some of these, but I shall do so indirectly by elaborating a strategy that this view must entail.

What must technology be, how must it appear if this view is correct? First, what will pass for technology must in the paradigm case be a technology that is obviously dependent for its shape upon scientific-theoretical considerations. Thus, the best examples are what we call today high technologies. While I do not intend what follows to be exhaustive by way of definition, I suspect that a high technology must be characterized as a technology that must include: (1) a complex and interlocked system; (2) workings that are understood only by way of scientifically derived theories; (3) components that contain esoteric compounds and units, themselves the result of complex and scientifically determined processes; and (4) microscopic machine tolerances, internal organization, and mechanical or electronic motions developed from micro-levels of manufacture and

planned construction. A computer is an obvious case of such a high technology, but there are dozens of other examples that could do as well.

In contrast, "low" or, better, traditional technologies would be those that are simple, arrived at through a process of trial and error, that contain only rough interrelations of parts, and that are understandable by any mechanically inclined person. A waterwheel is an example of such a technology.

That there is an apparent and even dramatic difference between the computer and the waterwheel seems clear. But just what and how that difference is to be accounted for is precisely what needs note. However, at the level at which I am developing the case, we need to be aware that the idealist position, which holds that science is the condition of technology, must accentuate a sharp difference between a presumed prescientific and scientific technology. In short, contemporary technology is seen to be disjunctive with traditional technology.

This tactic is conceptually necessary because otherwise one would have no way of accounting for the previously noted historical situation in which all peoples and societies use and have technologies, whether or not they have a science in our sense. The historical dependence of technology upon science then becomes a special case of dependence; only *scientific* technology is historically dependent upon science.

The relationship of the Renaissance and Enlightenment periods to the medieval period may be seen to be an instance of the focus upon the assumed priority of science in the modern sense. Put most simply, because scientific knowledge as theoretical knowledge was assumed to be higher than so-called practical knowledge, the possibly unique attainment of the Middle Ages was overlooked.

A Materialist Theory: Heidegger and White

A contrary position is possible. I shall construct such a view by combining the insights of Martin Heidegger and Lynn White Jr.

Martin Heidegger is perhaps the philosopher who has most originally and profoundly rendered the question of technology a central concern of philosophy. The position he developed in "The Question Concerning Technology" argues for the ontological but not the historical priority of technology over science. The argument is complex, and I shall look at only a few elements of it.

Heidegger holds that Technology (capitalized to indicate the essence of technology) has always underlain what we have called science in the West, but it has been revealed as the origin of science only recently. Embedded

in this complex argument, however, is a deep ambiguity about what will count as technology. On the ontological level, Technology is a certain way of experiencing, relating to and organizing the way humans relate to the natural world. On the historical level, at least in the chronological sense, Heidegger seems to grant that technology in its modern sense is "later than" science. In short, Heidegger accepts in some degree the notion that modern or scientific technology is essentially and distinctly different from traditional technology. I hold that he is wrong in allowing himself to accept this notion, and as a result he weakens his own case in such a way to give credence to the usual accusation that he is somewhat "romantic" with respect to technology. In sum, the Heideggerian position is that Technology, while ontologically prior to science, is historically later.

At the core of the view Heidegger is espousing lies an inversion of the standard view of the relationship between science and technology. This inversion is most dramatically illustrated by his claim that rather than technology's being a tool of modern physics, it is exactly the opposite: physics is the necessary tool of Technology. In this first instance, Heidegger discerns that modern physics is necessarily interrelated with its instruments:

> It is said that modern technology is something incomparably different from all earlier technologies because it is based on modern physics as an exact science. Meanwhile we have come to understand more clearly that the reverse holds true as well: modern physics, as experimental, is dependent upon technical apparatus and upon progress in the building of apparatus. The establishing of this mutual relationship between technology and physics is correct. But it remains a merely historiographical establishing of facts and says nothing about that in which this mutual relationship is grounded.[1]

Then, in a much stronger statement, Heidegger argues that physics is the herald of Technology.

> Modern science's way of representing pursues and entraps nature as a calculable coherence of forces. Modern physics is not experimental physics because it applies apparatus to the questioning of nature. The reverse is true. Because physics, indeed already as pure theory, sets nature up to exhibit itself as a coherence of forces calculable in advance, it orders its experiments precisely for the purpose of asking whether and how nature reports itself when set up this way.[2]

This inversion, clearly evidenced in the way Heidegger views the relationship between science and technology, is one that nevertheless retains

at least one partial sense in which science precedes technology. (I am quite aware, with most Heidegger scholars, of the distinction between *Historie* and *Geschichte* in Heidegger's use. However, *Geschichte* serves a specifically ontological function.)

This residual sense in which science historically precedes technology also accounts for a distinction between scientific and traditional technology. The strongest statement concerning this residual sense states:

> Chronologically speaking, modern physical science begins in the seventeenth century. In contrast, machine-power technology develops only in the second half of the eighteenth century. But modern technology, which for chronological reckoning is the later, is, from the point of view of the essence holding sway within it, historically earlier.[3]

Similarly, the disjunctive sense that the standard view must maintain and that separates modern from traditional technology is allowed by Heidegger:

> The revealing that rules modern technology is a challenging, which puts to nature the unreasonable demand that it supply energy which can be extracted and stored as such. But does this not hold true for the old windmill as well? No. Its sails do indeed turn in the wind; they are left entirely to the wind's blowing. But the windmill does not unlock energy from the air currents in order to store it.[4]

And again, Heidegger, as he so frequently does, contrasts the peasant's sense of earth from that of the modern technologist's:

> In contrast, a tract of land is challenged in the hauling out of coal and ore. The earth now reveals itself as a coal mining district, the soil as a mineral deposit. The field that the peasant formerly cultivated and set in order appears different from how it did when to set in order still meant to take care of and maintain.[5]

Thus, while we have the assertion of the ontological priority of Technology over science as an inversion of the standard view, a secondary sense is retained in which technology chronologically follows the development of science and a sense in which there is a disjunctive difference between traditional technology and modern technology. Science, in Heidegger's view, stands as the event that finally shows to us what Technology is ontologically. Science is the herald of Technology in a (chronological) historical sense:

> The modern physical theory of nature prepares the way not simply for technology, but for the essence of modern technology. For such a gathering-together, which challenges man to reveal by way of ordering already holds sway in physics. But in it that gathering does not yet come expressly to the fore. Modern physics is the herald of enframing, a herald whose origin is still unknown.[6]

What holds this argument together lies in the several ways in which Heidegger uses the term technology.

What may be called the surface definition of technology is what Heidegger calls the anthropological-instrumental understanding of technology, technology is a mere tool of science.[7] This definition, not false, is only merely correct. It does not reveal the *essence* of technology.

A second definition derives from the Greek *techné*, and begins to more nearly approximate the Heideggerian sense of Technology in that *techné* is both a name for the activities and skills of a craftsman and for the arts of both mind and hand, but also is linked to creative making, *poiésis*.[8] For the Greeks *techné* was a production that was a kind of knowledge.

The third and ultimate Heideggerian definition of Technology, however, makes of Technology a mode of truth or revealing (*alétheia*). Technology, in essence, reveals a world in a certain way. "Every bringing-forth is grounded in revealing."[9] "Technology is a mode of revealing, Technology comes to presence in the realm where revealing and unconcealment take place, where *alétheia*, truth, happens."[10] The essence of technology allows us to see, to order, to relate to the world in a particular way. Nature becomes standing-reserve, a source of energy for human use, and this mode of relating to the world becomes, in a technological era, the dominant and primary way in which we understand world.

I shall not further explore the Heideggerian view, except to note that only after Technology is discovered to be this way of relating to the world may one begin to understand how science, under this mode, is seen to be the necessary "tool" of Technology. Science becomes a means of knowledge that gives power; science becomes Baconian. And with this move the inversion is completed: Technology as the revelation of the world as standing-reserve is the ontological presupposition and ground of modern science.

Philosophically, things would have been neater and clearer were it the case that Technology could be shown to be not only ontologically, but historically prior to science. And this would especially be so if the historical priority were of such a nature as to be understood as an experiential condition of the possibility of modern science. Such a view would also

have the advantage that it would be continuous with the ordinary observation that some form of technology is universal and occurs wherever there are human societies.

I think this is the implicit import of the work of Lynn White Jr., who has clearly caused a revision of the way in which we understand the medieval period with respect to technology. White's publications concerning medieval technology span two decades. His landmark book *Medieval Technology and Social Change* (1962) shows how technological development was deeply implicated in systems of warfare (the stirrup led to mounted shock warfare, thence to changes in social structure in feudalism), agriculture (one plough combined with horsepower and the development of three-field rotation led to a shift of food production to Northern Europe), and in that increasing hunger for mechanical power that underlay other forms of increased productivity.

By looking at the burgeoning technology of the medieval period, White paints a historical picture of a Europe rapidly changing, avidly searching for inventions, and particularly hungry for power. This is the case with the newly invented mechanical devices for extracting power from water and wind. By 983, waterpower was being used for fulling mills, but within a century the *Domesday* census revealed that there were already 5,624 watermills in operation in England (a harbinger of the Industrial Revolution centuries later).[11] The windmill was referred to as early as 1180 and was common in much of Europe by 1240. The search for power in the Middle Ages utilized every source. Inventions from foreign lands were rapidly experimented with in new ways, often in practical, but rarely overlooked. This medieval search for power laid the groundwork for later industrial technology, but it was also intricately tied to a search for knowledge. Giovanni da Fontana, for example, in 1420, designed the forerunners of our robot measurers in the form of swimming fish, flying birds, and running rabbits, all linked to a plan to measure surfaces and distances in water, the air and out-of-the-way places.[12]

One dramatic technological development during this period, a development that transformed the human perception of time, was the clock. In White's words, "Suddenly, toward the middle of the fourteenth century . . . clocks seized the imagination of our ancestors. . . . No European community felt able to hold up its head unless in its midst the planets wheeled in cycles and epicycles, while angels trumpeted, cocks crew, and apostles, kings, and prophets marched and countermarched at the booming of the hours."[13] Time and the movement of the spheres were tied to a mechanical device. And thus by 1382 the universe itself began to be conceived of according to a mechanical metaphor:

> It is the works of the great ecclesiastic and mathematician Nicholas Oresmus, who died in 1382 as Bishop of Lisieux, that we first find the metaphor of the universe as a vast mechanical clock created and set running by God so that "all the wheels move as harmoniously as possible." It was a notion with a future: eventually the metaphor became a metaphysics.[14]

White's more recent works have taken account of the unique intellectual climate that encouraged technological development in Europe. By the time of his publication, "Cultural Climates and Technological Advance in the Middle Ages," White can claim, "The technological creativity of medieval Europe is one of the resonant facts of history."[15] What he finds is that medieval Europe was highly receptive to the use and development of technology and that several factors encouraged this: The organization and climate for order, stemming from the earlier monastic reforms, readily adapted technology. The clock, used first to establish the order of time, agricultural techniques, and machines to lighten labor were all affirmatively valued. Indeed, his survey of the literature of the time finds that detractors from the praise of technology are rare. Contrarily, praise of invention, machines and their use is the rule.

Prior to our Bishop Oresmus, who declared the heavens to be clockwork, one finds praise and prediction concerning a glorious technological future common: "Roger Bacon, 1260, pondering transportation, confidently prophesied an age of automobiles, submarines, and airplanes."[16] This attitude of fascination and obsession with the technological stands in stark contrast to other areas of Christian civilization. Whereas the Latin West from the monasteries on accepted technology into the precincts of the holy—every cathedral must have a clock—the Eastern regions forbade such inventions in sacred space. Clocks must remain outside the realm of eternity, thus outside the church in the Orthodox lands.[17]

The positive evaluation of inventiveness, linked to a desire for machine power, was also accompanied by the willingness to adapt ideas and artifacts from any culture. What became the bow for our string instruments came from Southeast Asia. A Tibetan prayer wheel may have inspired the windmill, and so the list goes. In short, the medieval period was suffused with interest in, desire for, and the development of technologies.

By the late Middle Ages, at the dawn of the time for the rise of modern science, White points out:

> About 1450 European intellectuals began to become aware of technological progress not as a project (. . . this came in the late thirteenth century) but as an historic and happy fact, when Giovanno

> Tortelli, a humanist at the papal court, composed an essay listing, and rejoicing over, new inventions unknown to the ancients. . . . It was axiomatic that man was serving God by serving himself in the technological mastery of nature. Because medieval men believed this, they devoted themselves in great numbers and with enthusiasm to the process of invention.[18]

In short, White established that by 1500, a period whose image is consolidated by the technological genius of Leonardo da Vinci, there is a self-awareness of technology, the process of invention, and the desire to master Nature through human artifacts.

By the year 1500, Europe had already developed some of the instrumentation so fundamental to the very investigative possibility of science in the modern experimental sense. Lenses were invented by 1050, compound lenses by 1270, spectacles by 1285, and, by 1600, Galileo's period, the microscope and telescope. Clocks, essential to measurement, began to be developed in the ninth and tenth centuries and by the 1500s were widespread from cathedral to town hall to individual watches.

On the industrial side, one can note that Europe is by this time covered with wind and water mills; the lowlands were being drained by wind power; there were railways in mines; and the massive, sophisticated architecture of cathedrals, suspension bridges and other large projects were part of daily life. Yet, in spite of the now reflective obviousness of this pervasive technological achievement of the Middle Ages, White is probably right in still claiming that "the scholarly discovery of the significance of technological advance in medieval life is so recent that it has not yet been assimilated to our normal image of the period."[19]

The Historical-Ontological Priority of Technology

If one combines the claims of Heidegger concerning the ontological priority of technology with those of White concerning the immediately preceding historical technological revolution, one arrives at this essay's thesis. However, to consolidate this thesis I shall speculatively develop something of a phenomenology of daily life, first as it appeared in the European lifeworld, then as a variation, as it appeared in a different culture, that of the Polynesians. In so doing, I shall focus upon spatial and temporal orientations.

A "Reconstruction" of an Aspect of the Medieval Lifeworld

My strategy in this reconstruction of a medieval lifeworld will be to focus upon selected experiential components as they are embodied in praxis. It

should be obvious by now that in the late medieval period, mechanical contrivances were very common and indeed pervasive in many ordinary activities. The world was already implicitly thought of in terms of mechanical metaphors. But in my focus upon space and time, I am concerned with the way these dimensions are *perceived.*

I begin with the familiar example of clocks, which were common in daily life in the late medieval world. Lewis Mumford, in his 1936 book *Technics and Civilization*, has already noted how the clock was crucial to the development and reorganization of medieval life. According to Mumford, clocks were first commonly used in conjunction with monastic life and the development of disciplined and common order. The keeping of hours for religious exercises and the ordering of work set the pace for public or intersubjective life. Heidegger, too, in *Being and Time* pointed out the way in which clocks are not mere artifacts, but "take account" of human surroundings and nature. One can say that once clocks are developed, we begin to perceive time through technology.

Take careful note of the specific perceptual representation of time via the clock. First, until recently, all clocks represent time through a use of moving pointers. This is the case whether one regards the moving shadow of the sundial, the linear scale of the early water clocks, or the eventual round cyclical face of the cathedral clock. I would point out here that this representation of time is one which has both a focus—the instant of time within which the instant finds its place. The field or span of time that is the precise "now" as that point where the pointer "stands"—and a duration or span of time is the spread of the clock face, whether linear or circular. Thus "now" takes its place within a duration of time.

If one begins to reflect upon the evolution of the clock, one can note the following distinct developments: at first the movement of the pointer is crude and relates primarily to fairly large "units" of time. The earliest circular faces of clocks were marked only into hours and had only one hand. But as clockwork became more mechanically refined, time was divided into smaller and smaller units; a second pointer was added to mark the minutes, and then a third to mark the seconds. Time was more and more quantified. This quantification was gradually more finely divided, and the perception of time became even more open to finer discriminations, to what may be called the micro-features of time. Moreover, these micro-features could be considered atomistically as units that were discrete from each other. In short, the clock allows us to perceive time latently as a series of atomized, discrete instants, a representation of what was to become a "scientific" mode of analyzing time. Time is perceived

via or through the clock and this perception is a technologically mediated perception.

Historically, what eventually became more and more important was the focal point of technologically mediated time. The instant of its micro-features stands out. It becomes the means for further investigating things and is now essential for contemporary scientific measurement. Simultaneously, but almost unnoticeably, the field of time, which is the background but grounding feature of clock time, recedes and becomes less important. This development reaches a qualitatively different result in the contemporary invention of the digital clock. The digital clock represents only the focal instant of time; the field of time is no longer perceptually represented, and in the process the perception of time also changes. The person who awaits the train, who once could glance at his watch and *see* that it was yet ten minutes until arrival time by *seeing* the relation between the pointers and the span, now sees only the number and must infer or calculate the span. This is to say that the mental operation for telling the time changes, even if unnoticeably, with the digital clock. What this portends for us I shall not now predict, other than to observe that if part of the essence of technology is "calculative thought" in Heidegger's sense, then the digital clock is an enhancement of this process.

Clocks were, prior to the rise of science proper, part of the daily experience of medieval humanity. They were an ordinary part of the lifeworld, the technological mediators of the sense and perception of time. And in a sense, they made possible the very calculations that lay at the much later basis of measurement undertaken by the Galileos and Keplers of the early scientific era.

Turn now to a spatially mediated experience and note that the same invariants occur again. One of the most important technologies that allowed the science of the modern era to become truly experimental was optics. Lenses were developed in the tenth century and were already compounded by the thirteenth century, and simultaneously with the first explicit scientific observations, the microscope and telescope were invented.

Vision is embodied and mediated through lenses. What changes is what might be called a shift of focus from ordinary perception to the technologically mediated micro-dimension. Distance is reduced, what is far is brought near, but this is equivalent to saying that what was for ordinary vision a micro-feature is now made present. The microscope brings into view for the first time the small and unexpected creatures found in drinking water; the telescope reveals that the shaded areas of the moon are seas and mountains and craters. The span of space is changed, reduced, and

the object is "brought closer." What was previously so distant as to be unperceived, is now perceived in a near-distance of optically mediated space. Again, both what is focal and what was the field of space change under the transformations of technologically mediated perception.

This is to say that through the use of technologies, experience had already become prepared for the scientific experience of the world. A world whose features could be considered as discrete units, a world whose micro-features would fascinate, a world conceived of under the sign of mechanical relations, was a world that was prepared for by the taken-for-granted technologically mediated experience of the medieval period.

Late medieval experience of both time and space could be considered to be thoroughly embedded in and often mediated through technologies. One could expand upon these examples in many areas of life. One could also contrast these examples of technologically mediated perceptions of space and time with cultures that did not have clocks or lenses and note that time and space are differently perceived by the latter. But I now turn to a more dramatic example of the way experience and praxis are organized and examine a crucial case of long-distance spatial orientation, the variant development of a perceptual and technologically mediated perceptual navigational system.

Variant Long-Distance Spatial Orientation: Atlantic and Pacific Navigation

One of the features that stimulated the European development of technology was the availability of ideas and devices from many areas of the world, an availability made possible through the early exploratory trips of Europeans. We are familiar with some of the historical events which were associated with this cross-cultural interchange: the Crusades, the travels of Marco Polo, the centuries of coastal voyages; and only much later, the full spice trade and voyages of conquest for gold and riches that fed the end of the medieval period. I focus here upon the development of cross-oceanic navigation by Europeans as it contrasts with the Pacific variant.

Coastal navigation, essentially navigation within sight of land or never far from it, is distinctly different from transoceanic navigation. The principles or practice of coastal navigation and the body of knowledge that goes with it were known from ancient times. Such navigation was largely perceptual and traditional, since observations of currents, animal life, noise and sight of breakers over shoal waters, wind patterns, and so forth, were necessary for safe coastal piloting. Fears of out-of-sight navigation were not merely those clothed with superstitions about the unknown

(monsters, the end of the world, and the like) but were related to a lack of knowledge about how to return to a known area. In short, what was needed was a means of dependable spatial orientation across the expanse of uncharted ocean.

Early Western transoceanic navigation was successfully undertaken by the Vikings who traveled from Scandinavia throughout not only Europe and the Near East in coastal raids, but also to Iceland, Greenland, and Nova Scotia in the New World. How these voyages were undertaken is obscured by a sparse historical record, except that we know that two features of navigation unique to Northern Europe were already known: a fixed star, the North Star (Polaris), was known, and navigational calculations could be based upon this fixed point. And the primitive use of the lodestone, which also points to a fixed area, was already common with the Vikings. Thus, although very simple, one can say that the very origin of transatlantic navigation was technological in a most primitive sense. Orientation was secured through a device.

If, however, one takes the voyages of Columbus as more typical, then the technological determination of orientation is abundantly clear. By 1492, the transition period for our purposes, not only is there a magnetic compass, but measured and careful cartography was also known, and a larger array of instrumentation was also available. The compass, the astrolabe for calculating angles to the sun and other heavenly bodies, clocks (although not yet fully useful for ocean voyages), and various measuring devices were used for navigation. Columbus's daring voyage was a voyage undertaken through a technologically mediated orientation to possible space. (Columbus knew very well that the earth was round; that it was of approximately a certain size—although vastly underestimated by his era—and that it could be plotted through calculations via instruments.) His navigation already conceived of the world as a grid upon whose surface one moved, and his perceptions were instrumentally mediated. Thus, our earliest voyages through the period of world exploration were voyages that were undertaken through technologies.

Turning to the Pacific, we find that the Polynesians and related peoples had, already a thousand years before the Vikings, explored and populated virtually every inhabitable island chain of a much larger ocean. Western explorers were amazed by the two-hundred-foot-long catamaran war canoes that speedily navigated the Pacific, yet they did not pick up the secrets of Polynesian navigation at the time. One must conclude, on the basis of praxis, that both Atlantic and Pacific navigation were successful, but on examination, each was a distinct and different system.

Polynesian navigation was instrumentless; it operated without fixed points such as Polaris, which is not visible in the Southern hemisphere; neither did the Polynesians have the technological fixed point of the compass. It was a rather complex system of perceptual observations carried on through a secret tradition by a school of navigators.[20] I shall not outline all of the features of this perceptual system, but shall point to enough features to illustrate its subtlety:

1. One key feature of the perceptual system was a highly developed sense of wave patterns. Waves march with regularity across the Pacific, and the Polynesian navigators learned to use them for precise directional purposes. By judging the angle of swells in relation to the direction their canoes took, Polynesian navigators could maintain direction. They became so keenly aware of this wave harmonic that even when local storms confused the seas, they could detect the swell pattern engendered by the storm. (Often they would sit in the bottom of the canoe to feel this pattern; their claim was that only men could navigate so because they felt the pattern in their testicles.) They also were aware of what we would call refraction waves: swell patterns bend when they approach a land mass such as an island, and the change in direction was detected and understood as an indication of a distant landmass.
2. Cloud and light patterns were also learned. Far over the horizon a column of cloud, slightly green tinted skies, and other more dense moisture indications would be read as the presence of an island. Again the indications were perceptual readings of the phenomena.
3. Although bird behavior and patterns were not unknown to European coastal navigators, the precision of observation that knew exactly how far each species strayed from land, the knowledge that a direction toward land could be obtained at dusk by returning birds, and even knowledge of which fish inhabited nearby island waters enabled the Polynesian navigators to regard the ocean stretches as a familiar, readable world.
4. Star paths were learned and conveyed from generation to generation of navigators. Lacking an immovable pole star, the Polynesians developed a highly temporal, dynamic mode of reading star tracks over the horizon with changes of direction times to moving locations. Indeed, all constants were in effect dynamic and temporally changing constants in this system.

Here was a navigational system that historically was at least equally successful in conquering transoceanic distances, a system that had more difficult tasks to perform, since small island systems are harder to locate than

continental masses, and a system that was thoroughly perceptual and historical. It was a system whose "map" of the earth was based upon perceptually acute readings of the ocean, without either a mathematics except for short time counts (but no clocks or any instrumentation.) It was a variant orientational praxis.

One might very well expect that a variant praxis would be sedimented in a variant understanding of the world; and that certainly is the case. The Polynesian view was—if interpreted by Western standards—"animistic." The ocean was not perceived as either alien or strange, although its dangers and threats were clearly appreciated. It was a deity whose many natures could nevertheless be understood. It was the source of nurture and support, and thus a voyage upon its face, while it may pose dangers, was not a voyage into the wild or something over which humans could expect mastery.

Do not misunderstand the point I am making here: I am not claiming that this lifeworld is better than that of the technologically oriented modern. But it is different. Its praxis, focused perceptually, achieves similar goals although it implicates a different understanding of the world. It is a world that does not become standing-reserve because the earth's bounties are conceived of differently.

One might also point out that the Polynesian world is one that is disappearing. Its navigational arts, though still extant among a small number of persons, have been replaced by the now highly micro-determined instrumented navigation of the West. Long voyages by islanders are now undertaken on trading schooners or ships. (Although their ability to sense land before the Westerner remains, trading schooner captains indicate that they have lapsed into only rough navigation because they know that their passengers will begin to sing when approaching their island, long before the Western captain knows that it is near.) My point is that two differently patterned praxes implicate two different ways of understanding the world, and ours is and has been historically Technological for centuries, indeed virtually for at least a millennium.

If Heidegger is right, that the essence of Technology shows itself only recently, it is because we have failed to look at what was under our very noses for a long time. But Technology is like a set of spectacles: those who see through them and who have become accustomed to them, do not notice them. Thus that which is closest and most familiar to us, we have failed to notice. Yet what we have failed to notice turns out to be basic, perhaps the most basic thing about the very way in which we see the world.

Conclusion

I have suggested that there is a significant sense in which Technology is both historically and ontologically prior to science. This priority, I believe, is one that is not contrary to the more trivial sense in which the human use of technologies is both universal and archaic, common to all cultures whether or not they have developed science.

I have also suggested that the way in which this priority operates is at the level of a basic praxis within a lifeworld, a praxis that inclines or predisposes us toward what becomes a scientific worldview. I have developed only some of its features—those that include a technologically mediated basic perceptual experience. This is an experience that harbors invariant characteristics such as transformed foci regarding ordinary and microdimensions of experience, a tendency toward discreteness and the atomization of things, and the enhancement of calculative activities. In this sense, Technology at the level of familiar praxis precedes and sets the conditions for a science.

Science, in turn, becomes the coming to self-consciousness of these activities, a self-consciousness that both projects the form of life implicit in the praxis upon the universe and becomes increasingly purified of diverse elements. Such a purification, however, is also a purification of the essence of Technology.

Even the Renaissance, enamored of inventions, and its desire to measure and use the world, created its artifacts in the form of animal and human life. Da Fortana's measuring robots were conceived of in the form of fish, rabbits, and birds. The predecessor of the steam boiler was the *sufflator*, literally "blower," whose shape was always that of a human head whose mouth blew forth the steam that powered various devices. Only gradually did the *abstraction* needed for contemporary Technology emerge, thus freeing technologies to be "scientific" as embodiments of a purely technological metaphysics.

The gradual movement to deanimate our technologies, to move toward purer *functionalism*, is both latent within technology and a preparation for a scientific worldview. It is a long step from the symbolism of the clock, whose movements represented the heavenly bodies, to the bare, instantaneous numbers of the digital, but the movement is one toward a more totally technological and scientific representation.

There is one question still left unanswered in this chapter, the issue that separates idealist from materialist interpretations of science and technology. But it may begin to be understood in a different way too. That issue is whether and in what sense *scientific* technology may be distinctly

different from traditional technology. My answer is that in one sense it is different, in another not.

The sense in which it is not different is the sense in which technologies have and continue to have the same existential dimensions with respect to the humans who use them. Technologies may embody and mediate experience so that our lifeworld undergoes changes; technologies may be "other" than we as that to which we relate; and technologies may increasingly be surrounding features of our lifeworld. In each case, these appearances of technology may be seen to be continuous with even the most archaic technology.[21]

The sense in which scientific technology differs from traditional technologies depends upon the synergistic interaction of a technology made abstract or purified through the self-consciousness connected with science. Thus the break from "natural" materials to the manipulation and creation of materials, the gestalts that occur between scientific fields, and the extrapolations made possible by revolutions in science could happen only when the essence of Technology has become manifest. But precisely because it has become so, we can now notice more distinctly and clearly that we are wearing eyeglasses, and we can begin to reflect upon the implications of that wearing.

3

Deromanticizing Heidegger

A century after his birth, two very contrary statements can be made concerning Martin Heidegger: First, in a significant sense, he is surely one of the most important founders of the philosophy of technology. His insights into the structures and functions of technology remain deep and suggestive. Second, we all also know that he joined the National Socialist German Workers' Party and remained with it through the war. His associations with the movement, seen today as one of the most destructive applications of modern technology, are equally deeply disturbing.

My question is this: Is there something at the very heart of Heidegger's thought that makes both of these contraries possible? I begin my reflection with two vivid images, both related to that ancient Greek ancestry to which Heidegger turned again and again as a source of thinking, consonant with self-proclaimed origins for Euro-American civilization.

The first image is Heidegger's, that of the famous Greek temple in "The Origin of the Work of Art." Heidegger's temple is taken as a paradigm of artful *techné*, both "thingly" and signifying.

> Standing there, the [temple] rests on the rocky ground. This resting of the work draws up out of the rock the mystery of the rock's clumsy yet spontaneous support. Standing there, the building holds its ground against the storm raging above it and so first makes the storm itself manifest in its violence. The luster and gleam of the stone, though itself apparently glowing only by the grace of the sun,

> yet first brings to light the light of the day, the breadth of the sky, the darkness of the night. The temple's firm towering makes visible the invisible space of the air. The steadfastness of the work contrasts with the surge of the surf, and its own repose brings out the raging of the sea. Tree and grass, eagle and bull, snake and cricket first enter into their distinctive shapes and thus come to appear as what they are.[1]

This "Wagnerian," this "Nietzschean" deployment of signification in the focal point of the Greek temple against the ground of its earth is typical Heidegger. It is heavy: it is *romantic*; it is what gathers the mortals, gods, earth, and sky. "The temple-work, standing there, opens up a world and at the same time sets this world back again on earth, which itself only thus emerges as native ground. . . . The temple in its standing there, first gives to things their look and to men their outlook on themselves."[2]

Heidegger's imagery is striking, captivating, and, above all, weighty. Now contrast what could be another look at the same image, done this time by a historian, J. Donald Hughes, in his book *Ecology in Ancient Civilizations*.

> Those who look at the Parthenon, that incomparable symbol of the achievements of an ancient civilization, often do not see its wider setting. Behind the Acropolis, the bare dry mountains of Attica show their rocky bones against the blue Mediterranean sky, and the ruin of the finest temple built by the ancient Greeks is surrounded by the far vaster ruins of an environment which they desolated at the same time.[3]

Here, the same "thing," the Greek temple, reveals a very different "world" from that of Heidegger. Hughes goes on to point out:

> In the centuries before the Golden Age of Athens, those same mountains were covered by forests and watered by springs and streams. The philosopher Plato saw evidence of the changes that had occurred not long before; there were buildings in Athens with beams fashioned from trees that had grown on hillsides which by his day were eroded and covered only with herbs, and he visited shrines once dedicated to the guardian spirits of flowing springs which had since dried up.[4]

What accounts for the dramatic difference in what is seen in the image of the Greek temple? Or, phrased even more starkly, is there, in the Heideggerian way of seeing, a deeper and even necessary way of *concealing* that allows only a romanticized perspective?

I opened this reflection with a well-known example from one of Heidegger's analyses of art objects. But his analyses of technological objects follow a close and similar pattern. Indeed, one could easily conclude that an art object is, for Heidegger, the primary example of a "good" technology. Both art objects and technological objects—equipment—are "thingly," "produced," have ways of "revealing" a world, and belong in some way to the process called *techné*, which Heidegger defines in the following passage:

> There was a time when it was not technology alone that bore the name *techné*. Once that revealing which brings forth truth into the splendor of radiant appearance was also called *techné*. Once there was time when the bringing-forth of the true into the beautiful was called *techné*. The *poiésis* of the fine arts was also called *techné*.[5]

One cannot but detect, again, the heavy romantic overtones of this nostalgic merging of art and technology. Nor should we ignore from the outset that Heidegger's primary suggestion of a solution to the dilemmas of the Age of Technology often revolves around a kind of saving power found in art. But if this is where the revealing power that could save us from the reductions of modern technology is, it is because art and technology are closely related in precisely the thingly, produced, but revealing roles which both art objects and equipment or technological objects contain when they are seen as focal elements against a context or field that is "lighted up" as a "world."

Yet, in the Heideggerian corpus, there is often a great difference of evaluation and connotation between art objects and technological objects. On the surface, it might appear that the two most frequently patterned such differences relate to a certain suspicion concerning *modern* technology versus traditional technologies, and the older, smaller and simpler technologies versus the newer, larger, and more complex technologies.

There is much in the Heideggerian choice of "good" and "bad" connotations that commentators have noticed. Heidegger "likes" the tools of the workshop, the peasant shoes of the Van Gogh painting, the watermill on the stream, the windmill, and the old stone bridge with its arches. He does not like hydroelectric dams on the Rhine River, the atomic bomb, even the modern steel bridge that routes traffic to the same city square as does the old stone bridge. Such a pattern would seem to evidence a simple and old-fashioned romanticism of a nostalgic sort—and I would not deny that such a strain may be a found in Heidegger. But the issue is more complex than that.

There are, for example, inconsistencies: it is not always the small and relatively simple that escapes the Heideggerian disapprobation. Clearly, by today's standards the typewriter would be an example of a good, simply mechanical writing device, not much different in kind or principle than the Bavarian clocks beloved by the folk of Todtnauberg. Yet the typewriter receives a particularly scornful disapproving note:

> It is not by chance that modern man writes "with" the typewriter and "dictates"—the same word as "to invent creatively"—"into" the machine. This "history" of the kinds of writing is at the same time one of the major reasons for the increasing destruction of the word. The word no longer passes through the hand as it writes and acts authentically but through the mechanized pressure of the hand. The typewriter snatches script from the essential realm of the hand—and this means the hand is removed from the essential realm of the word.[6]

I virtually feel the scorn that would have been poured upon my composition of this paper with a word processor! But the point is that here is a relatively simple, mechanical device that does not escape the romantic thesis. I shall return to this example.

There are also much deeper inconsistencies in this pattern of choices of "good" and "bad" technologies. In the "Question Concerning Technology," a deep danger of modern technology is laid to the way the world is revealed in the ensemble of modern technology as "standing-reserve," the extant translation of *Bestand.* (I translate this term as "resource well.") It is the whole of nature that is revealed as a resource well in modern technology, as illustrated through the disliked hydroelectric plant on the Rhine:

> The hydroelectric plant is set into the current of the Rhine. It sets the Rhine to supplying its hydraulic pressure, which then sets the turbines turning. This turning sets those machines in motion whose thrust sets going the electric current for which the long-distance power status and its network of cables are set up to dispatch electricity. In the context of the interlocking processes pertaining to the orderly disposition of electrical energy, even the Rhine itself appears to be something at our command.[7]

That is, nature, including the Rhine, is revealed as resource well, standing-reserve, for man's use. And while this production of energy does contrast with the old windmill—which can turn only when the wind blows and thus seemingly lets the wind "be"—it does not, in principle, differ from

the smaller dam on the stream that allows the waterwheel in turn to grind the peasant's wheat. To allow this example as a "good" technology does not, to my mind, prevent seeing nature as resource well except in its lack of a larger interconnectedness with the electrical grid.

To this point, it should be clear that the romantic thesis, as I shall call it, pervades Heidegger's choices of "good" and "bad" technologies. But in what does it consist?

The first element, I claim, is a preference for what I call *embodiment relations*. Heidegger prefers, likes, those technologies that express straightforward bodily, perceptual relations with the environment. This is part of what underlies his dislike of the typewriter. Expressivity, the connection with "word," is primitively found in a handy gesture:

> Human beings "act" through the hand; for the hand is, like the word, a distinguishing characteristic of humans. Only a being, such as the human, that "has" the word (*mythos, logos*) can and must "have hands." . . . The hand becomes present as hand only where there is disclosure and concealment. . . . The hand has only emerged from and with the word.[8]

As we saw with the typewriter, for Heidegger somehow there is less "hand" in writing with a typewriter than presumably that which is "handwritten" with a pen.

This same preference for simple, embodiment relations is exemplified in his very earliest analysis of human-technology relations, the famous "hammer example" in *Being and Time*. That example is simultaneously one of the most pointed in showing not only Heidegger's radical insights into technology but also a certain blindness and prejudice concerning technologies that do not express embodiment relations.

I shall not here go into great detail into this often-analyzed example, but shall instead note only a few salient features that are relevant to the way in which the romantic thesis also conceals important aspects of technology.

Positively, Heidegger shows in the hammer example that technologies in use are not objects as such; they "withdraw" in use and become partially transparent means by which humans relate to an environment. Here is a good critique of any simplistic and objectivistic account of technologies as simple objects. Rather, technologies are contextual, or field involved; the hammer "is" what it is in reference to the context of nails, project, and so on. It belongs to a reference system that always includes more than a mere hammer. Thus, while the hammer is always "thingly," it is never a *mere* thing and is, in use, transformed into a world-related

and world-revealing way in which humans are involved with their environments. All of this—and more—is the source of the Heideggerian suggestivity for philosophy of technology.

But there is also a negative side to the analysis. In *Being and Time*, the context is "lit up" through technological *breakdown*. It is when the hammer is broken or missing that its involvements are shown. The fullness of the project—and the objectness of the hammer—gets shown when it is *not* functioning. I claim that here lies an early clue to a certain negativity that pervades the Heideggerian corpus and that blinds the analysis both to a possible appreciation of human-technology relations other than embodiment ones and to the features that, in fact, unite modern technologies to traditional ones. In *Being and Time*, it is hard to conceive of a positive relation *to* a piece of equipment, a technology, other than as that *through which* Dasein experiences its environment either in embodiment or with transparent referentiality. (The old turn-signal example from the German automobiles, which had flip-up arrows, manually operated, is what I call a *hermeneutic relation*, since actions are "read" *through* the technology. These are recognized in *Being and Time* but are on a close continuum with embodiment relations and are directly expressible in the technologically mediated action of the driver.)

In short, to relate *to* a technology in a positive way and in a situation in which the artifact takes on what I call an *alterity* relation seems to me inconceivable in the Heideggerian scheme. And although I cannot long belabor this here, an example from technology-as-toy may illustrate what I have in mind.

The child's top is just such a technology-as-toy that may become an *alterity relation*. Set in motion, the technology itself becomes an object of fascination. It has a quasi-life of its own, even apparent self-movement that is unpredictable. It becomes a quasi-other to which the child can happily relate. Such playful technological moments do not seem to belong to the heavy romanticism of the Heideggerian context. But just for that reason one could also miss the kind of appreciation and fascination that characterize much of the experience of modern technologies.

The preference for embodiment relations over other human-technology relations is what could be called a nostalgic element in the romantic thesis. It is hardly unique to Heidegger. It is also to be found in Karl Marx. Insofar as alienation theory is bound to any nostalgic element relating to the handwork of the worker prior to machine tools in a factory context, there may be found the same taste preference in that older mode of analysis.

A second element of the romantic thesis is one that has made Heidegger so appealing to those close to the environmental movement, particularly those now associated with "deep ecology." Here, too, a certain closeness between "good" technologies and the art object emerges more clearly.

A "good" technology is one that "gathers" a world in a certain way and "lets be" the nature and community that is so gathered. The old stone bridge in the essay "Building, Dwelling, Thinking," is an excellent example of this subthesis. Like the temple, the bridge reveals a certain world:

> The bridge swings over the stream "with ease and power." It does not just connect banks that are already there. The banks emerge as banks only as the bridge crosses the stream. The bridge designedly causes them to lie across from each other. . . . It brings stream and bank and land into each other's neighborhood. The bridge *gathers* the earth as landscape around the stream. [And in a direct echo of the temple, the] . . . waters may wander on quiet and gay, the sky's floods from storm or that may shoot past the piers in torrential waves—the bridge is ready for the sky's weather and its fickle nature. . . . The bridge lets the stream run its course and at the same time grants their way to mortals so that they may come and go from shore to shore. . . . The bridge *gathers* to itself in *its own way* earth and sky, divinities and mortals.[9]

Here art object and use object merge positively. The bridge is clearly a "good" technology when it gathers the Heideggerian fourfold in its focal/field relation. Yet, not all bridges do this, according to Heidegger:

> The highway bridge is tied into the network of long-distance traffic, paced as calculated for maximum yield. [This stands in contrast to the] . . . old stone bridge's humble brook crossing [that] gives to the harvest wagon its passage from the fields into the village and carries the lumber cart from the field path to the road.[10]

The steel highway bridge is to the old stone bridge precisely what the typewriter is to the pen. Yet even in the midst of this clearly romanticized difference, Heidegger must admit that both bridges have something in common: "Always and ever differently the bridge escorts the lingering and hastening ways of men to and fro, so that they may get to other banks and in the end, as mortals, to the other side."[11] This means more than that a bridge functionally connects the two sides of the river. It means that a bridge, ancient stone or modern steel, *gathers* in its way. Authentically or "good" sounds in the term "lingering," whereas unauthentic or "bad" in

the "hastening," which belongs to the highway network. So, gods and mortals, sky and earth are gathered—although differently—by both bridges: "The bridge *gathers* as a passage that crosses, before the divinities—whether we explicitly think of, and visibly *give thanks for*, their presence, as in the figure of the saint of the bridge, or whether that divine presence is obstructed or even pushed wholly aside."[12]

Gathering, the deep signifying surplus of meaning in the figure/ground of bridge and landscape, thus belongs to any such artifact. The difference lies in Heidegger's late variant upon how this may happen authentically or unauthentically. And while the romantic thesis clearly belongs intimately to this distinction, it does so in a complicated way.

The authentic mode of gathering is one that states, "To preserve the fourfold, to save the earth, to receive the sky, to await the divinities, and to escort mortals—this fourfold preserving is the simple nature, the presencing, or dwelling."[13] It is at least implicitly clear that the conservative view of Heidegger's notion of Germanic life is what best fulfills this preservation. That, too, is part of the romantic thesis. The authentic mode of gathering contrasts with its unauthentic counterpart, the world as revealed through the "gathering"—which inauthentically becomes *enframing* in the worldview of modern technology.

I am quite aware that Heidegger does not simply outright condemn modern technology—its essence, enframing, is simultaneously a revealing of the world and an openness:

> When we consider the essence of technology we experience enframing as a destining of revealing. In this way we are already sojourning within the open space of destining . . . [and] when we once open ourselves expressly to the *essence* of technology we find ourselves unexpectedly taken into a freeing claim.[14]

But there is danger here of the inauthentic closure and reduction that arise from this form of gathering: "The coming to presence of technology threatens revealing, threatens it with the possibility that all revealing will be consumed in ordering and that everything will present itself only in the unconcealedness of standing-reserve."[15] In short, all of nature, including human being, will be seen as reduced to a vast resource well—but the question then is: for whom, or for what end?

So, the stone bridge or the steel one, the temple or—and here I shall introduce a counterexample bound to be outrageous to Heideggerians—the nuclear plant gather the fourfold, albeit in different ways. Here, then, is my post-Heideggerian example:

> Seen while sailing in Long Island Sound, on the horizon stands the stark super-silo, light green topped, of the Shoreham nuclear plant. Standing there, it brings to presence the very contrast between the seemingly featureless sandhill earth with the sky. It stands at and defines the contrast, too, between the sea and the shore, which without its focal presence would also be featureless lines along the horizon.

I could, of course, go on in this crypto-Heideggerian mode, but the point is made. But if the nuclear plant substitution for the temple is somehow outrageous, what makes it so? I contend that the difference is not simply the difference between the nostalgic romanticism of the Greek temple and the urgent and fearful presence of the nuclear plant. Rather, it lies in what is left out, concealed, or unsaid in the Heideggerian account.

What is left out of both the Heideggerian account of the temple—and of the crypto-Heideggerian paraphrase concerning the nuclear plant—is what Langdon Winner has called the "politics of the artifact." For us, that dimension of the thingly is more vividly present in the nuclear plant than in the lost civilization of the Greeks only because it is nearer to us.

We know that the Shoreham nuclear plant was sold to New York State for one dollar (its cost had been five billion dollars). We know that the reasons had to do with the recognition that Long Island, the most populous nonurban area in the United States, could not be evacuated in a Three Mile Island or Chernobyl-type accident, and with the political opposition of over 75 percent of the populace to its going online.

Yet, ironically, precisely because the nuclear plant *revealed* its artifactual politics in a somewhat Heideggerian fashion, this first stoppage of a plant before opening could occur. It was because the Shoreham plant revealed—negatively—its form of gathering that it could be closed. So, as at the beginning of this reflection where I juxtaposed J. Donald Hughes's reading of the Greek temple with Heidegger's, the same can be done here. In its gathering, the nuclear plant makes the fishy life of the Sound to appear—as drawn to the warmer exhaust waters of the plant, but to be placed in danger of a leak, as in the case of the Irish Sea, which today is the world's most radioactive sea because of the irreparable leak at Sellafield. It channels the community into its pathways, now recognized to be more cloggable than the Long Island Expressway at high traffic time. It reveals the hastening which would be needed to evacuate its wastes (by sea, or by land?), and so on. And I add as a postscript to this Hughesian variant upon Heidegger that I could not borrow the even more poignant image of Langdon Winner in his description of the Diablo Canyon plant,

beyond which he sighted a gray whale in the Pacific. This is because Long Island Sound has ceased to entertain whales or porpoises for the entirety of the twentieth century and, as of 1987, has its first forty miles of bottom so hypoxic (absent of oxygen) because of excessive phosphate and nitrogen runoff from modern sewerage that even the lobsters are dead in that area.

By adding this politics of our artifacts to the analysis—absent from the Heideggerian account, concealed and unsaid—the account becomes even more powerful. What needs to be noted, however, is that the romantic thesis in its unsaying concealment has all along hidden this politics of the thingly. It hid the Greek politics of the thingly just as well as it hides ours.

Hughes, whose image of a temple surrounded by a decimated environment, points out that every ancient civilization of the Mediterranean Basin brought about the same result: the Greeks deforested Attica; the Phoenicians, Lebanon (whose cedars went to Israel to build temples not unlike the Athenians); the Latins, the Italian peninsula—and all with low-technology bronze axes.

We, of course, recognize some difference between this ancient rise of civilizations and their impact upon the earth and the modern equivalent. Brazil's rapid decimation of the rainforests is speedier because of chain saws and tree-cutting megamachines, hypocritically echoed in our own free cutting of the redwood forests of the Pacific Coast. High technologies amplify and magnify what a culture can do; and today we are aware of the threat of the greenhouse effect, whose gases, according to a very recent account in *Science*, are probably 20 to 25 percent homogenic in origin.

But now I have gone too far. My illustrative excesses may make it sound as if Heidegger was not one of the most important "fathers" of contemporary philosophy of technology and, worse, that those of us who are post-Heideggerian are even more negative on modern technology. Neither of these conclusions is my intent. Thus I must make two closing apologies.

To make my apologia to the more reverent Heideggerians among us, I recognize that one of the deep significances of his account of technology is to have shown it not to be simply some collection of objects, but long pre-Kuhnian, a way of seeing, of revealing a world. And Heidegger is right, at least about the dominant way of Western seeing of nature as a resource well for human purposes. What is uniquely Western about this view lies mostly in its connection to the systematic mathematization of nature and the emptying of nature of any but inanimate and deanthropomorphized qualities. Unfortunately, many—indeed, most—prior cultures have also included components that frequently negatively affect environments.

A survey of so-called primitive cultures would reveal a startling ability—with very low technologies—to devastate environments. Slash-and-burn agriculture could subsist only in a rich, renewable forest so long as the human population remained low. The Pacific Islanders, who swept eastward centuries before Leif Eriksson got to the New World, extirpated species after species of wingless and winged birds in the easy search for food and fashion. And one could go on gloomily for some time. The exceptions of finely balanced minimalist societies such as the Inuit in the Arctic or the inland Aboriginals (for forty thousand years) in Central Australia, who left environments little affected, are also rare in previous times.

So, now my second apologia: it is not simply modern technology that threatens the environment. It is only the extent and the amplification of power that make it global rather than regional. My negativity, rather, is addressed at cultures that embed technologies but heretofore have too often not been sensitive to the contextual and long-range effects of technologically enhanced human action.

Here, in conclusion, begins to emerge my reason for so thoroughly demythologizing romanticisms: there is no previous time to which we can return where the gathering of the fourfold was "right." The Greeks, the Romans, the Hebrews, our forefathers were not sufficiently concerned with our earth in any of their forms; neither were the peasants, who for all their preservation and building up of soils in Europe, were still the world's most populous per square mile on the earth. They had the politics that allowed the same peasants who preserved the soil to harbor the most virulent anti-Semitism and nostalgic call for a purified homeland, which nurtured the Nazism of Heidegger's time. This ambiguity of preservation of the earth with destruction of a whole group of peoples is matched by another unnoted ambiguity in the Heideggerian corpus.

The networks—highways for the steel bridge, the electric grid for the hydroelectric plant—are also ambiguous. Because in the modern—and now I would say postmodern—world the network is what is beginning to make us aware of the displacement of our chauvinistic Eurocentrism, which, to my mind, is linked with the romantic thesis not only in Heidegger but also in our dominant views of technology, nature, and each other's cultures.

What is needed is not a rejection of the deep and essentially phenomenological insights into technology as a culturally embedded phenomenon with its different gestalt features, but a deepening and more complex appreciation of all of the facets of our technologically textured mode of life. That includes and must include the explicit recognition of both the

politics of our artifacts, and the demythologization of nostalgic and romantic views of previous times.

Instead, we need to develop a postmodern critique that, at this early juncture, is still in a bricolage stage. But out of our growing experience of cross-culturality, we have begun to recognize that there is a plurality of cultures out there that threaten to decenter our past assumptions, and alongside which—but only alongside—we must reevaluate our past assumptions.

So, my demythologization of romanticism is also a critique. It is aimed at noting the freeing side of postmodern technological civilization and the opportunities that lie in its very networked ambiguity. Global pollution, the threat to the earth posed by our amplified powers, has also the promise of now seeing ourselves globally within a plurality of cultures. None of these should, or ought to be, romanticized. Rather, our emerging but still primitive awareness of pluriculture should be taken only as a threshold for simultaneously freeing ourselves of a past fraught with too frequently had ambiguities and opening ourselves to the uniqueness of a new world, equally ambiguous, but for the first time genuinely global.

The dramatic space shots of Earth from the moon or a satellite are very un-Heideggerian precisely because they place Earth at a distance from Earth-as-ground. But they are also irreversibly part of the postmodern view of Earth-as-globe, with a very different sense of what constitutes our "home."

Interlude: The Earth Inherited

We are now back to the beginning, the earth as we find it, heavily technologically textured, inherited from the previous generations of humans, all of whom left the Garden. I shall once again revert to a contemporary story. In this case the incident is an actual one, deliberately cast, for purposes relevant to the narrative, on one side in a "late Heideggerian" form and on the other with a postmodern commentary. The story is set in the late twentieth century in the foothills of Monte Albano, Tuscany, four centuries after the first birth pangs of the modern.

There is a fire of olive and oak burning in the ancient farmhouse hearth, its smoke curling up the open hood as it would have in the Middle Ages.

(The bricks and stones of the house were gathered from the remains of monasteries and other ruins of the past, not unlike the bricolage dealing in the stones of Rome in the medieval period, carted off throughout Europe.)

A man and woman and their young child have just pulled their chairs up to the white marble table upon which is placed a simple Tuscan dinner prepared for the cool October night.

(He, third-generation American, secular Christian, Germano-Scandinavian. She, third-generation secular Jewish, Polish, Russian, Austrian. The child, fourth-generation postmodern bricolage background. Marble, common here, an ordinary building material, also occurs in the statue of David in Florence.)

First, there is a pasta, freshly prepared with a tomato and mushroom sauce, a sprinkling of parmesan, followed by a homey dish of fried potatoes, all with a local Chianti and mineral water from the local spring in the dale.	(Pasta, earlier from China; tomatoes, from the New World; mushrooms, truly postmodern international, found in all great cuisines. Potato, again New World, the chicken, non–factory produced, is genuinely better than its U.S. counterpart. Chianti now harvested by grape combine and fermented in stainless steel vats in local cantina nearby. Water quality controlled for health purposes.)
Dessert is fruit: kiwi and pineapple, not unlike what might have pleased the tenant farmers who once occupied the stone dwelling.	(Obvious modern imports, South America and China originally, later kiwis grown in Italy. Tenant farmers and the *padrone* system have replaced earlier serfs.)
Outside, under the now full moon, the olive trees are ripe, and the grapes have already been picked. Fresh figs and almonds remain, along with the incense of the rosemary, oregano, thyme, and sage.	(Olive orchards and vineyards, now several centuries old, replaced the forests of previous aristocrats, whose land was deforested deliberately to remove their power by emergent merchant and guild classes. Olives and grapes are among the few products able to grow in the subtropical climate. The herbs mentioned are typical of a semiarid region. Disc tilling is done by tractor. The world is gathered globally, interconnected by trade, history, and even the pluricultural cuisine that graces the table. In the living room may be found the television and the stereo; upstairs, a word processor for composition)

This scene was, of course, highly enjoyable, entered in family intimacy and an actual event. But the commentary is deliberately cast to deromanticize the narrative that mimics the settings of Greek temples, peasant cabins and workshops, and the notion of a gathered world in which the ambiguity and complexity of the wider situation is left occluded.

The view adapts the wider angle of the vision of the denuded landscape beyond the Parthenon noted previously, from which the residual romanticism of the here-mimicked Heidegger is seen the necessity of adding the unsaid ambiguities relating to the anti-Semitism of many of the peasants

and the menacing of fascism. It is important that when gathering is recognized, it be fully and multidimensionally recognized.

The "world" described here is not so insulated as its preceding worlds. Were the narrative resumed, one would note that after the fire and dinner, the evening is structured by another set of postmodern choices. After young Mark is put to bed (with stories from his books from Italy, New Zealand, and the United States), his parents have the options of listening to the stereo (Japanese), perhaps to a digitally reconstituted Callas opera (Italian); watching Italian television (which, in the morning, brings CBC news); or retiring to bed to resume their reading: she of Mary McCarthy's *The Stones of Florence*, he of Iris Origo's *Merchant of Prato*. (Lest the tale be taken as in any way exceptional, note that nearby Florence is filled with dozens of other professors on sabbatical and leave, along with hundreds of students in Italy for their third year abroad, in patterns typical of the high-travel, cross-cultural contemporary world.) The couple chooses to read.

The reading is revealing: The merchant, one Francesco Datini, who bequeathed to posterity 503 files containing his letters, papers, and ledgers, brings the late medieval period to us through detail and person. In the late 1300s, at the time a pope inhabited Avignon and was constantly in conflict with the northern Italians, at the very eve of the Renaissance, one could see the glimmers of the coming modern era. This entrepreneur, all too willing to trade in anything, selling armor and religious articles to all parties (even warring mercenaries on all sides), traveling across most of the civilized world of importance at the time or having business outposts as a harbinger of the supernational conglomerates of our own and in an age already noted as having established its own technological revolution, reveals to us his fears in his lifeworld.

There is the plague, from which he barely escaped and to which he lost most of his family twice. There are the religious wars, the last of which finally disenfranchised him from Avignon, allowing him to return just in time to see his guardian foster-mother before her death. There are the robbers, and dangers of travel. And there is famine, which occurs with surprising regularity, even in the Italy of the fourteenth century.

Less than a hundred years later is to be born, illegitimately, as was so frequent at the time, one Leonardo, born in 1452 in Vinci, a village just around the shoulder of Monte Albano, only four decades before the New World was to be discovered. He was to become the very symbol of Renaissance polymathism. He was clearly a herald of the technologically embodied science that was to emerge from the Renaissance. Opportunistic in the extreme—not unlike his Tuscan predecessor, Datini—da Vinci offered

himself to a series of wealthy aristocrats and warring lords. He wrote to Ludovico il Moro an offer to build innovative battle machines:

1. I know how to build very light, strong bridges, made to be easily transported so as to follow and at times escape from the enemy. . . .
2. I know techniques useful in invading a territory, like how to drain water out of moats and how to make an infinite number of bridges and covered walkways useful . . . for such expeditions.
3. Item, if in the course of an offensive, the height of an embankment or the strength of a site should preclude shelling, I know techniques for destroying any fortress or other stronghold not built on solid rock. . . .
4. Whenever the shelling fails, I will invent catapults, mangonels, traps, and other unusual and marvelous instruments . . . .[1]

This engineering science is as wedded to the "military-industrial complex" as any Eisenhower ever dreamed of! (We have already noted that Galileo, yet another century later, followed the same path.)

In the twentieth century, the same thing happened. Very shortly after the discovery of fission, Werner Heisenberg, seeking to recoup his reputation, wrote secret letters to the War Ministry of the Third Reich and later organized a conference, the proceedings of which were titled *Probleme der Kernphysik*, in which he proposed nuclear-powered submarines, battleships, and a super-explosive that was to launch the Nazi attempt to build an atomic bomb. The difference with da Vinci lay mainly in the now corporate and multiauthored structure of twentieth century science and technology.[2]

The birth of Renaissance science is a birth within technological garb and institutionally wed to the same sources of finance as today's Big Science. It is only the nineteenth-century successful myth that has convinced us that it was ever otherwise. Here, too, is the doubled relation to technology that occurs at the birth of *modern* science. It is embodied in instrumental technologies, but embedded in a matrix of engineering and linked to the largest-scale patronage available.

In a last look outside at the lights of the valley in which Florence lies, the contemporary man of the tale reflects upon his worries: There remains part of the haze over the valley, which can be seen in some degree every day. The plague is gone, replaced by a much slower process in atmospheric pollution. The Germans to the north have begun to realize that their two intense loves—for forests and for automobiles—have now

reached contradictory straits. They have initiated actions concerning pollution controls and unleaded gasolines, even against the delicacies of Common Market politics. Farther north still, the Swedes have decided that one cannot always have both the whale and the reactor and have chosen to phase out their reactors (although, until recently, their westerly neighbor, Norway, was one of the countries still killing whales).

Famine is unheard of in these parts now, and Italy has surpassed England in production and gross national product. But the man knows that in the South, in the former colony of Italy—Ethiopia—there is still famine, abetted by the very indigenous government that replaced the colonizers, by desertifying farming practices, and by the lack of sufficient aid due to world political tensions.

The moral of the tale is clear enough: Although nostalgias and romanticisms may—in small doses—soften our harshest views, they can also obscure and sometimes *dangerously* obscure issues. What is more strongly needed than either of these medications is a deeper sense of the ambiguity of technological civilization in both its negative and positive vectors, that is, its heightened sense of contingency.

This sense of heightened contingency is itself a legacy of our current immersion in technological texture. It is part of our inheritance of the earth, a dimension of the non-neutral way in which we have received and taken up that inheritance. So the harder question is how we will care for and handle that inheritance. It could be squandered; it could be conserved; and it might even be increased.

4

Was Heidegger Prescient Concerning Technoscience?

Time Warps

I had remembered the movie *Being There*, with Peter Sellers playing Jerzy Kosinski's man of authenticity, as a deeply ironic and funny Heideggerian spoof in which the main character, an intellectually challenged gardener thrown out of his insular life into a world of high politics, became a sort of prophet-advisor to the president of the United States himself. The gardener would utter simple literalisms, such as "the soil must be tended if there is to be a good harvest," which were taken as metaphorically profound by the political interlocutors. Here was Heideggerian authenticity caught in the world of political deception and intrigue. Thinking my adolescent son might like this, we got the video—but to our surprise, all of us found the movie slow, boring, and repetitive, not at all like the guffaw-producing first time some decades ago.

This same experience occurred again as I worked on a recent paper about spectroscopy. I was using the figures of Moses and Aaron to illustrate the "image and logic" traditions in science instrumentation. I used Schoenberg's opera *Moses und Aron*. In the opera, the dialectic is between a totally iconoclastic Moses, who believes God cannot and must not be imaged, and Aaron, who holds that unless imaged, God cannot be experienced at all. The opera reenacts the "Golden Calf" incident, but with a twist in that Aaron argues that Moses is a hypocrite since he has used "images" all along—burning bushes, and even the "graven" letters on the

tablets. The time warp occurred when I reread Exodus, where I found that God appears quite often, anthropomorphically and directly, with a feast, face-to-face conversations, hands, feet, and backsides, a sort of postmodern multiperspectival set of epiphanies quite far from the purified, cannot-see-God prescriptions of "textbook theology" of the later traditions.

The third warp occurred in working on *this* chapter. I returned to Heidegger, this time with a particular interest in his philosophy of science in contrast to most of my earlier work on his philosophy of technology (upon which I have rather extensively published). Heidegger returned warped, different now with respect to *both* science and technology—he had changed through time.

A phenomenological reason for these time warps relates to the ways in which figures change in relation to their fields or contexts. In each case, significant temporal and historical changes have occurred: movies are faster paced; biblical archeology has shown us a more archaic Hebrew culture than before; and Heidegger now has to be repositioned in relation to both the radical and revolutionary changes within the sciences, many of which have occurred only since the mid-twentieth century, and in relation to the new types of science—better, technoscience studies that have also emerged since the mid-twentieth century.

So, the rereading of Heidegger I shall attempt here must recontextualize Heidegger with respect to these very large historic changes, first with respect to philosophy of science and science itself, then with respect to the science-technology relation, or technoscience. Was Heidegger prescient concerning technoscience?

Heidegger on Science

Trish Glazebrook opens her book on Heidegger's philosophy of science, by attacking Richardson's earlier claim that, "On the longest day he ever lived, Heidegger could never be called a philosopher of science."[1] She then valiantly attempts to take Heidegger's discussions about science in a direction toward a philosophy of science, clearly not succeeding in quite making him into a Quine, for whom "philosophy of science is philosophy enough,"[2] but nevertheless she makes the science theme much more central to Heidegger's confrontation with modernity than most previous commentators. My own reading will be more modest and more critical. I shall restrict myself to what could be called Heidegger's *explicit writings* about science (and technology) and refrain from reading his views across Aristotle, the Greeks, and so forth, although I agree with both Glazebrook

and Zimmerman that the science question plays an important role in Heidegger's negative confrontation with modernity.

Heidegger's explicit writings on what will emerge for me as technoscience are grouped largely in three different periods. First, there is the period around *Being and Time* (1927), which includes the *Basic Problems of Phenomenology,* and stretches to the Kant work of 1929. Second, there is the richer period in the mid-1930s with the *Beiträge*, the famous "World as Picture" texts, and *What Is a Thing?* And third, there is the period of the mid-1950s, after the war and denazification with "The Question Concerning Technology," "Science and Reflection," and related texts. All this is followed by a gap in which the "later Heidegger" has little to say on science, but then returns with his last letter, to the Heidegger Conference, in which the science-technology question is raised anew.

Although references to science do not account for much of the overall Heidegger opus, they do play a significant background role, and clearly the questions of both science and technology are highly important in relation to Heidegger on modernity. The relative paucity of explicit texts is one problem for this theme, but Heidegger's writing habits also pose another problem. His writings rarely engage and seldom cite contemporaries; rather, his explicit interlocutors are what today we call "dead white males." Heidegger is a deep reader of the philosophical traditions: the Presocratics, Plato and Aristotle (not Democritus), medieval ontotheology, and also deeply, the early moderns, Descartes and Kant, with side glances at Galileo and Newton; and then into the nineteenth century with Nietzsche and Dilthey. But he is a shallow and thin reader of both the histories of science and technology. He does cite, but mostly in passing and not extensively, Max Planck, Werner Heisenberg, and a few other contemporary scientists, but if he were interested in philosophy of science, one does not find extensive discussion with even his senior colleague, Edmund Husserl, or his acquaintance, Rudolph Carnap, on actual philosophy of science issues. Recent scholarship has helped supplement the paucity of texts with studies of conferences and correspondence, as with Ronald Giere and Alan Richardson's edited volume *Origins of Logical Empiricism* (1996). I shall be taking note especially of the Carnap-Heidegger exchanges herein. A rich bibliography of correspondence and conference events are also depicted in Cathryn Carson's "Science as Instrumental Reason."[3] Her special interest relates to the Heidegger-Werner Heisenberg encounters that I will also discuss here. This leaves us with inferences and with having to trace something of an historical context, which I shall do, but with reticence, since it leaves too much to speculation for my

taste. I shall take what follows in roughly chronological order, but skipping from then contemporary philosophy of science, science itself, and Heidegger's relations to both.

Philosophy of Science in Heidegger's Time

We begin with only a superficial look at the state of European philosophy of science in Heidegger's time to set the context. Three strands bear examination. First are the emergent philosophies of science at the beginning of the twentieth century that forefronted *mathematization*, in particular, *mathematical physics.* The figures here are Pierre Duhem, Henri Poincaré, and above all, Ernst Mach. Second, there was the powerful contemporary movement of logical positivism and logical empiricism centered on the Vienna Circle, which organized in 1922. And, third, there was Edmund Husserl and the Göttingen group. Husserl's discussions about science are much more extensive than Heidegger's, but his major work, the *Crisis,* was not actually published until 1936, precisely in the middle of Heidegger's own 1930s period of science discussions. Finally, there is one more background figure whose effects are still felt, more strongly in Europe than in North America, and that is Wilhelm Dilthey. The definitive split between the "sciences" of explanation (physics here) and those of "understanding" (for Heidegger, mostly history) infects most of twentieth-century philosophy of science until very recently. I shall concisely situate Heidegger with respect to these groups and figures. But, in anticipation, we must equally be aware that what amounts to a *revolution* in the philosophy of science—here I refer to the "new philosophies of science" associated with Kuhn, Popper, Feyerabend, Lakatos, and others, simply do not get off the ground until *after* Heidegger has ceased to closely attend to science questions. Put simply, Heidegger is too early to have digested the "new" philosophies of science. Insofar as philosophies of science interpret science, there are quite different "pre-Kuhn" compared to "post-Kuhn" versions concerning what science is and does. However, there are some intriguing prescient hints that I shall underline between Heidegger and Kuhn and kin.

The Mathematizers

With respect to philosophy of science prior to Heidegger's first forays, the three figures of greatest prominence were Henri Poincaré (1854–1912), Pierre Duhem (1861–1912) and, particularly for Germany and the subsequent development of logical positivism, Ernst Mach (1838–1916). I will

not do more than mention the important consensus that might be noted concerning this early-twentieth-century development: First, all held to the basics of early modern epistemology, which has the subject-in-a-box (body), viewing its sensations, which can only infer to an external world through *representations*. Second, this in turn leads to the notion that science is a *theory instrument*, which can properly infer to an objective world. Science is *physical theory* and its scientific exemplar is *physics*. Third, theory takes its shape through *mathematization*, whether this process is considered as a formalism (Duhem) or as instrumental (Mach and Poincaré). Thus, science is the process of mathematizing the world through theory and is paradigmatically exemplified in *mathematical physics*.

Because my program here is fairly global regarding twentieth-century philosophy of science, I shall simply take a shortcut and assert that what we see of Heidegger's early "philosophy of science" largely *reflects and repeats* this dominant view: "A look at . . . science, which is at the same time the normative one in the modern age, namely, mathematical physics . . . [shows that] modern physics is called mathematical because, in a remarkable sway, it makes use of a quite specific mathematics. . . . It can proceed mathematically in this way only because, in a deeper sense, it is already itself mathematical. . . . *Science is the theory of the real.*"[4] I shall later trace this theory-physics-mathematization emphasis more specifically concerning some of the problems that the "new" or "Jewish" physics caused for Heidegger. But for the moment it is sufficient to see that Heidegger very much belongs to the common consensus of early-twentieth-century philosophy of science.

The Positivists

However, by the time Heidegger turns his attentions to science in his first two periods (1920s and late 1930s), two additional, relevant movements in the philosophy of science had become important. On one side there is the emergence of a more virulent philosophy of science that followed Mach, logical positivism within the Vienna Circle (1922). Heidegger opposed this version of the philosophy of science. This movement began to dominate philosophy of science in the 1920s and early 1930s, although it was contested by the phenomenological philosophy of science of Edmund Husserl to which Heidegger also found himself drawn.

In the case of early-twentieth-century positivism, there is ample indirect evidence that Heidegger found himself in deep opposition to it. Most concretely, there is the Carnap/Heidegger controversy, well documented by Michael Friedman in his essay "Overcoming Metaphysics: Carnap and

Heidegger," which I highly recommend to you. Carnap first met Heidegger at an *Arbeitsgemeinschaft* in Davos, Switzerland, in 1929. Heidegger was opposed to Cassirer's neo-Kantian positions, and since this was post–*Being and Time* (and later led to *Kant and the Problem of Metaphysics,* 1929), it was an important confrontation. Carnap was, in fact, deeply impressed and subsequently studied *SZ*, but he later began to attack the antilogical and, as perceived by Carnap, the antiscience stances implied by Heidegger. He chose Heidegger's meditations on nothingness for particular attack in his "Metaphysical Pseudo-Sentences," in *Erkenntnis* (1932). There followed by both Heidegger and Carnap a series of oppositions. Heidegger's position was one that made logic derivative: "Nothingness is the source of negation, not vice versa. . . . The idea of 'logic' itself dissolves in a vortex of more original questioning. . . . Therefore no rigor of a science can attain the seriousness of metaphysics. Philosophy can never be measured by the standard of the idea of science."[5] Carnap, in return says that Heidegger, "selects a few sentences from that metaphysical doctrine which at present exerts the strongest influence in Germany. . . . A metaphysician here arrives himself at the statement that his questions and answers are not consistent with logic and the scientific mode of thinking."[6] Carnap and Heidegger occupy contrary positions on the relationship between metaphysics and science. Friedman claims, "Carnap and Heidegger are therefore at opposite ends of the spectrum not only philosophically but also in cultural and political terms."[7] Carnap fled to America in 1935, with relief: "I was not only relieved to escape the stifling political and cultural atmosphere and the danger of war in Europe, but was also very gratified to see that in the United States there was considerable interest, especially among the younger philosophers, in the scientific method of philosophy."[8]

Carnap and Neurath were both neo-Marxists, saw science as affiliated with democratic tendencies, and were strong modernist proponents, for example, of the Bauhaus declarations. Heidegger reveals his opposition to this modernism at the time. He condemns scientific philosophy (positivism): "Here the traditional logic is to be for the first time grounded with scientific rigor through mathematics and the mathematical calculus in order to construct a 'logically correct' language in which the propositions of metaphysics—which are all pseudo propositions—are to become impossible in the future."[9] And, echoing the opposition culturally and politically as well: "It is no accident that this kind of 'philosophy' wishes to supply the foundations of modern physics, in which all relations to nature are in fact destroyed. It is also no accident that this kind of 'philosophy' stands in internal and external connection with Russian communism. And it is no accident, moreover, that this kind of thinking

celebrates its triumph in America."[10] This said on the eve of Carnap's emigration to America.

The positivist/metaphysics controversy between the Vienna Circle and Heidegger is a rich one that I cannot further explore here. I will note that Friedman makes a very good case that in the background lies a neo-Kantian controversy between the Marburg School (Cassirer et al.) and the Southwest School (Rickert and Windelband), which also echoes the logic/metaphysics relationship seen between Carnap and Heidegger. For our limited purposes here, it is more important merely to see that Heidegger persistently makes logic—and science—derivative in an often-negative sense from metaphysics.

Heideggerian Twists

What has emerged at this point with respect to Heidegger's implicit philosophy of science is largely reflective of the main trends of the time. I summarize here those themes which repeat the dominant views: First, physics, particularly *mathematical physics,* remains the paradigm science for Heidegger; second, physics is viewed as a measuring—and following Husserl—a reductive science; third, it is *theoretical* in form, and it is experimental only in a secondary sense because the theoretical cast calls for experiment to achieve exactness in measurement; fourth, its epistemology is "objectivist" in that it must make its objects stand before it as *representations.* This is typical early modern epistemology with a subject/object distinction within a representationalist framework. All of this remains within what might be taken as the early- to mid-twentieth-century "standard view" of science. The general view and Heidegger also accept the Diltheyan distinctions between *Erklärung* and *Verstehen* sciences.

Heidegger does place some twists upon this image of science—but, as I shall claim, the twists, if anything, make his philosophy of science even more conservative than that of many of his peers. The Heideggerian twists are to be found in his basically aprioristic view of science practice: Science, Heidegger thinks, makes a *projection* upon nature and only works from within the limits of this projection. This projective view goes back to his earliest works on science in the 1920s: "A scientific investigation constitutes itself in the objectification of what has somehow already been unveiled."[11] "Modern natural science constituted itself in the objectification of nature by way of a mathematical projection of nature."[12] It continues in the period of the 1930s: "[Science] is accomplished through the projection within some realm of what is—in nature for example—of a fixed ground plan of natural events. The projection sketches out in

advance the manner in which the knowing procedure must bind itself and adhere to the sphere opened up."[13]

This is part of what it means, for Heidegger, to be an *explanatory* science, "The basic character of proceeding in every explaining is to follow and lay out in advance individual series and sequences of consecutive cause-effect relations."[14] This conception of science as aprioristic (and reductive) projection, leads Heidegger to his negative evaluations: "Accordingly, 'science' itself is *not a knowing* in the sense of grounding and preserving an essential truth. Science is a derived *mechanism* of a knowing, i.e., it is the machinational opening of a sphere of accuracies within an otherwise hidden—and for science in no way question-worthy—zone of truth."[15]

Heidegger extends this projective-aprioristic characteristic of science to its process of *mathematization.* "Modern physics is called mathematical because, in a remarkable way, it makes use of a quite specific mathematics. . . . It can proceed mathematically in this way only because, in a deeper sense, it is already itself mathematical."[16] But, and here we see the closed projection returning in its Heideggerian twist, "*Te mathemata* means for the Greeks that which man knows in advance in his observation of whatever there is and in this intercourse with things."[17] In short, this antique version of mathematics reinforces the aprioristic notion of a projection by which Heidegger is characterizing science.

The same notion of apriori projection even belongs to Heidegger's sense of experiment. It is because of the essence of the projection that modern science must be *exact.* "Mathematical research into nature is not exact because it calculates with precision; rather it must calculate in this way because its adherence to its object-sphere has the character of exactitude. . . . Because modern 'science' (physics) is mathematical (not empirical) therefore it is necessarily *experimental* in the sense of a *measuring experiment.*"[18]

Ultimately, this aprioristic projection even accounts for the use of "technologies" or instruments. "What is experienced . . . is always already somehow *sought*, by applying certain instruments. The mere looking around and looking at becomes an observing that *pursues* what is encountered and indeed under changing conditions of its encountering and coming forth . . . magnifying glass, microscope: sharpening the seeing and changing the conditions of observability."[19]

Thus, from top to bottom, Heidegger's philosophy of science retains this projection, reduction, and aprioristic pre-given way of seeing nature. And, precisely because science as science cannot self-reflexively or from

within discern that it is such a projection, Heidegger ends by claiming that "science does not think."

It will not come as a surprise if I tell you that left in this state, there would not be any wonder why Heidegger might be perceived to be "anti-science" or, from the perspective of twenty-first century technoscience studies, be thought to have, simply, a very weird notion of science. But while I shall not leave Heidegger in this deplorable state, it might be good to ask what could a science, so conceived of, do?

Aprioristic, projective science, subsumed under an already "known" mathematization, and even subsuming experiment and instrument under its measuring foregaze, could probably find out that the orbits of the planets are elliptical rather than circular (Kepler). It probably could discover that the analemma traced along the meridian lines placed in cathedrals in the seventeenth and eighteenth centuries showed both Ptolemy's and Copernicus's measurements were wrong.[20] It probably could see the development of laws of motion along Galileo's and Newton's lines, since part of the projection is the reduction and abstraction of motion in which "motion means change of place. No motion or direction of motion is superior to any other. Every place is equal to every other. No point in time has preference to any other."[21]

But—I contend—this aprioristic projection most likely would have serious difficulties with the unexpected, the unpredicted, the anomalous, and the radically new—and above all, the challenges to precisely a projective aprioristic notion of science itself. In short, while early modern "normal" science might work under a Heideggerian rubric, "revolutionary" science might not do so well. Let us shift scenes, first to the physics of Heidegger's time, then to the emergence of the discontinuous philosophies of science exemplified by Kuhn and his kin.

Jewish Physics, or Science in Heidegger's Time

The leading science magazines, *Science, Nature*, and *Scientific American*, all carried millennial series in the year 2000. Clearly physics had to play a major role in this retrospective. There is now a hundred-year history to the "new" physics, relativistic and quantum. Let us look briefly at this history and relate it to Heidegger's periods of science texts. But, particularly in Germany, there is an added twist to this emergence of the new physics because it became known there as "Jewish physics." (This factor does not play a role in the scientific magazines' retrospectives or in the famous play *Copenhagen*, in which Bohr and Heisenberg play the central

roles. But in mid-twentieth-century history, precisely the "Jewish" identification of relativity and quantum physics did matter.) There was a very contested academic struggle in Germany between the classical physicists and the relativistic-quantum physicists that eventually led to Heisenberg's attempt to save the new physics within Germany by showing that it could lead to nuclear submarines and atomic bombs, both of which he proposed for the Third Reich in a conference on *Kernphysik.* It later led, through the emigration of the dominantly Jewish group of physicists (Einstein, Fermi, Szilard, Teller) to the United States and eventually to the "Manhattan Project." I cite this because both the challenge of the new physics and its identification as "Jewish physics" were obviously known to Heidegger.

Note how this played into Heidegger's insistence on his notion of projective physics:

> It is sheer nonsense to say that experimental research is Nordic-Germanic and that rational research on the other hand comes from foreigners. We would have then already to make up our mind to count Newton and Leibniz among the "Jews." It is precisely the projecting-open of nature in the *mathematical sense* that is the presupposition for the necessity and possibility of "experiment" as measuring.[22]

I read this in two ways: first, it shows that Heidegger was aware of the classical/new physics controversy cast in its racist context; and second, he uses it to maintain his continuist position firmly concerning the projective and aprioristic views of science. Yet, the new physics also posed a challenge to Heidegger, as we can see in his struggles with classical as compared to quantum physics.

I have selected here a progressive set of quotations showing how this struggle was reflected in Heidegger's thought. Whereas the works in the 1920s concerning science focus more broadly upon natural science, largely conceived of under the objectifying projection and its mathematizing dimensions, by the 1930s physics per se begins to be mentioned more frequently. At first Heidegger's tendency is to play down any strong difference between classical and quantum physics, or to subsume it under his initial notion of projection: "Inasmuch as modern atomic physics still remains physics, what is essential—and only the essential is aimed at here—will hold for it also."[23] Or, there is incremental continuity, "Within the complex of machinery that is necessary to physics in order to carry out the smashing of the atom lies hidden the whole of physics up to now."[24]

But, even in the later work of the 1950s, continuity under the projection plays a role: "In the latest works of Werner Heisenberg, the problem of the causal is the purely mathematical problem of the measuring of time."[25] And, under the objectifying dimension of the projection, "Were objectness to be surrendered, the essence of science would be denied. This is the meaning of the assertion that modern atomic physics by no means invalidates the classical physics of Galileo and Newton but only narrows its realm of validity." But, while this continuity thesis dominates, doubts build by the mid-1950s: "The objectness of material nature shows in modern atomic physics *fundamental characteristics completely different* from those that it shows in classical physics."[26] Only by rising to a higher level of abstraction now can the continuity be maintained, "And yet—modern nuclear and field physics *also* still remains physics, i.e., science, i.e., theory, which entraps objects belonging to the real in their objectness."[27] This eventually soaks in enough for Heidegger to begin to recognize that just as there are epochs of Being, there are epochs of physics: "This rough indication of a distinction between epochs within modern physics makes plain where the change from the one to the other takes place."[28] But I now, once again, break off my story concerning Heidegger vis-à-vis the science of his time and return again to the scene in philosophy of science.

New Philosophies of Science

At precisely the time period when Heidegger was beginning to discern the radicality of the new physics—and as we shall see, the time in which "Technology" (which I deliberately capitalize) occurs, that is, the 1950s, a new breed of philosophers of science began to emerge in the Euro-American context: what I call "Kuhn and kin." These philosophers might be called philosophers of *discontinuity.* They are also frequently identified as the antipositivists of the positivist-antipositivist controversy.

Their power in overturning the dominance of both the mathematizers and the positivist movement was belatedly evidenced by an interesting controversy covered by *Nature* magazine, beginning in 1987. This opinion piece, written by two physicists from the Royal College, London (in science, even opinion pieces are coauthored!), blamed the four philosophers in the "mug shots"—Thomas Kuhn, Paul Feyerabend, Karl Popper, and Imre Lakatos—for weakening faith in science and thus leading to the budget cutting suffered under the Thatcher regime. What they were pointing to were the results of a new consensus that had emerged from

"new" philosophy of science. This included an interpretation of the history of science that was no longer linear and accumulative; rather, it was discontinuous and often ruptured, or characterized by "revolutions" that, in effect *destroyed and replaced* previous paradigms. Furthermore, the new philosophies of science began to recognize that, in addition to objectification, there were also processes of *deobjectification.* Perfectly established scientific objects—phlogiston, aether, Democritean and Boschean atoms, epicycles, and hundreds of other "objects" simply no longer existed; they had been replaced entirely by new objects—but equally, by the scientific standards of the time, those objects had once existed! In addition, the notion of unified science, the ideal of positivism, disappeared and *sciences* in the plural replaced the hoped-for reduction to physics with other autonomies. This also implied the displacement of physics as unqualified paradigm science. Too, while mathematics and quantification remained important, different styles of mathematics, included geometries that were as drastically different from classical mathematics as quantum physics was from classical physics appeared. And, finally, new looks at the roles of experiment and instrumentation occurred such that disconfirmations of expected results played a stronger and stronger role in the concept of science.

In this shift within philosophy of science, one can easily see how the dominant Heideggerian notions of aprioristic projections must be called into question. For insofar as Heidegger's implicit philosophy of science repeated and echoed "classical" philosophy of science, it, too, must come under challenge. Here, however, is the opportunity to see another dimension of Heidegger's thinking about science, and here, for the first time, lies the opportunity to begin to test some notions of prescience. So my tactic will now change for the moment to one that reads backward to Heidegger to discern his possible relations to the new or revolutionary philosophies of science.

Heidegger's Prescient Moments

What I am going to outline now are some other dimensions of Heidegger's implicit philosophy of science that, while nestled within the overall trajectory of aprioristic projection, point to other possibilities. I call the first of these *the preinvention of framework relativity.* Dreyfus and others have sometimes pointed out that Kuhn was a "Heideggerian." This parallelism of texts is indicative:

> When we use the word "science" today, it means something essentially different from the *doctrina* and *scientia* of the Middle Ages,

> and also from the Greek *episteme*. Greek science was never exact because in keeping with its essence, it could not be exact and did not need to be exact. Hence it makes no sense whatever to suppose that modern science is more exact than that of antiquity. Neither can we say that the Galilean doctrine of freely falling bodies is true or that Aristotle's teaching that light bodies strive upward is false; for the Greek understanding of the essence of body and place and the relation between the two rests upon a different interpretation of beings and hence conditions a correspondingly different kind of *seeing* and *questioning* of natural events.[29]

And, then, Kuhn:

> Since remote antiquity most people have seen one or another heavy body swinging back and forth on a string or a chain until it finally comes to rest. To the Aristoteleans, who believed that a heavy body is moved by its own nature from a higher position to a site of natural rest at a lower one, the swinging body was simply falling with difficulty. . . . Galileo, on the other hand, looking at the swinging body, saw a pendulum, a body that almost succeeded in repeating the same motion over and over again ad infinitum. . . . I 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. . . . when paradigms change, the world changes with [them]. . . . Paradigm changes . . . cause scientists to see the world of their research engagement differently.[30]

This parallelism shows what I am calling framework relativity at work in both Kuhn and Heidegger. It entails features of Heideggerian epoches and Kuhnian paradigms: (1) A thing or object is what it is in relation to its context or field; (2) if fields or contexts change, so does the object; (3) but this means that if there is a replacement of one paradigm or epoch by another, the thing or object either may be said to disappear or to be "covered over." The difference between disappearing and being covered over is a difference between Kuhn and Heidegger—for Kuhn one can say that phlogiston, aether, and the like are displaced and disappear as objects; for Heidegger one would have to say that they are covered over or remain vestigially beneath or below their replacements. One view is "radical" in that it implies things that come into existence and then pass out of existence; the other "conservative" in that the older things remain under the newer things.

But framework relativity must be seen to be differently motivated in the Kuhn/Heidegger cases. Heidegger's motivation lies in his "history of

Being" (or history of metaphysics) quest, which has one big epoch, the history of metaphysics since the Greeks to its culmination in Nietzsche, but within this are progressive smaller "coverings" in the Roman period, then Middle Ages, then modernity—each of which covers more of the originating moment. Kuhn's motivation is to inject histories into science and what he calls "revolutionary science" is when one paradigm *replaces* another. For our purposes here, my point has to be restricted to noting the deep functional parallelism of framework relativities between Heidegger and the preeminent new philosophy of Kuhn. But I do want to remark that until late, and at a crucial moment, Heidegger himself did not seem to see the implication of framework relativity for science itself.

The second prescient moment I shall associate with Heidegger's fairly early recognition that science as it develops must be understood as a socially developed program. Science is a research program: "The essence of what we today call science is research."[31] Here, Kuhn—but also Popper, Lakatos and later, Latour—is anticipated. And, although just as with framework relativity, Heidegger's rationale for interpreting science as *research* is to embed it more deeply in his notion of a reductive projection or his conservative program: "In what does the essence of research consist? . . . [It is a] projection [that] sketches out in advance the manner in which the knowing procedure must bind itself and adhere to the sphere opened up. This binding adherence is the rigor of research."[32] The result is to begin to see something of the *social structure* of the scientific enterprise.

Science as research means that science becomes institutionalized: "[A research program is] ongoing activity. But this is to be understood first of all [as the] phenomenon that a science today . . . attains to the respect due a science only when it has become capable of being institutionalized."[33] Ultimately, science as research implies a different kind of vocation, or, more strongly, a different kind of human. And just as Heidegger does with stone, compared to steel bridges, water wheel dams compared to hydroelectric ones, he ends up making a nostalgic comparison between preresearch and research roles:

> The scholar disappears. He is succeeded by the research man who is engaged in research projects. These, rather than the cultivating of erudition, lend to his work its atmosphere of incisiveness. The research man no longer needs a library at home. Moreover, he is constantly on the move. He negotiates at meetings and collects information at congresses. He contracts for commissions with publishers. The latter now determine along with him which books must be written.[34]

This description matches that which is made much later by Latour in *Science in Action,* the role of the PI (principal investigator), which is well recognized in contemporary Big Science. Popper, Kuhn, Lakatos, and later, Latour, all extend this notion of science as a social institution engaged in research. For even though Heidegger's understanding of science-as-research is limited by his notion of projection, and cast in his usual negative tones concerning modernity, there is enough descriptive insight here to call his midcareer views prescient. There is much more to be said here, but I leave this as a prescient vignette only before now moving to the largest of Heidegger's prescient moments—the move to Technology and to *technoscience.*

Heidegger's Technological Turn

My tactics have been to place Heidegger's thinking about science—and now technology—either in his own historical context, or as above, in association with a more contemporary situation. I shall do the same here. I have noted that early-twentieth-century philosophy of science concentrated upon the theoretical and mathematizational moments of science, particularly as focused in physics as premier science; by the 1920s positivist philosophy of science amplified these tendencies to the extreme under the banner of "unified science," the two series, papers on the scientific world view (1928–1937), and the unified science series (1938–1962), which included Kuhn's *Structure,* marked a kind of end to this style of philosophy of science. The "new" philosophy of science then dominated the early 1960s through the 1970s, but by the late 1970s and early 1980s there were new challengers to science interpretation, not only from within philosophy of science, but even more powerfully from a range of social sciences—the "strong program" (Bloor, Barnes, and others), laboratory studies (Woolgar, Latour, Knorr-Cetina, Pickering), actor network theory (Callon, Latour) and social histories (Shapin and Schaffer). These movements threatened to *displace* philosophy of science, not only as the primary interpreter of science, but also as a flawed interpretation of science. Heidegger, of course, was not and for the most part could not have been aware of these developments, since he died in 1976. And, while it is these movements that can be said to have "invented" the terminology concerning science as *technoscience,* I cannot do more than mention them in passing.

However, I do want to also note that within the history and philosophy of science, now informed by philosophy of technology, there has emerged an informal consensus regarding the role of science's technologies (and

instruments) in what I have called the "school" of *instrumental realists,* among whom I would include Ian Hacking, Robert Ackermann, Peter Galison, and myself. I shall return to this development at the end. What I am implying is that we are now in an epoch in which the "new" or antipositivist philosophy of science itself is being displaced. We are two full moves beyond Heidegger's context.

That said, I now return for the last foray into Heidegger's prescient moments, his *turn to Technology.* His most prescient insight, regarding what today is called technoscience, has been with regard to technology in science. This appears with significance first with *Being and Time* (1927). The analysis of equipment, the ready-to-hand/present-at-hand distinction, and the understanding of a praxical "knowledge" in which tools "withdraw" and yet remain "assigned" to complex contexts, remains in my mind as one of the pioneer analyses of technologies in use. This phenomenology of the ready-to-hand in contrast to the presumably decontextualized objectification of entities in the present-at-hand has produced reams of commentary and explication. (It is my belief that this period of technology analysis remains the most significant positive contribution of Heidegger toward technoscience. It is the most detailed and the most insightful, for as we will see, the later work never seems to have again been so concrete.) But, in this context, I have been examining his thinking about science, and now I turn to his considerations about how technology relates to science.

Heidegger remained cognizant of an intimate role for technology within and alongside science. But, if *Being and Time* gives us an analysis of technology in use, it is not yet applied to science per se. Even in his meditations of the 1930s, he only loosely associates technologies with science. In "The Age of the World Picture," science and technology are separate phenomena: "One of the essential phenomena of the modern age is its science. A phenomenon of no less importance is machine technology."[35] But he also claims that science itself is "machinic": "Science is a derived *mechanism* of a knowing, i.e., it is the machinational opening of a sphere of accuracies within an otherwise hidden . . . zone of truth."[36] Which carry a trajectory: "The natural sciences become *machine* science."[37] And, in this period, because science is projective, machinic knowing, it must use machines or instruments. "What is experienced . . . is always already somehow *sought*, by applying certain instruments . . . magnifying glass, microscope [such as we have already noted]."[38] These mentions, without analysis, pepper many of his texts: the "complex of machinery that is necessary to physics in order to carry out the smashing of the atom"; "Compare the Wilson cloud chamber, the Geiger counter,

the free balloon flights to confirm and identify mesons."[39] But, in each of these cases, the use of instruments or technologies remains subsumed under and within the notion of scientific, now "machinic," projection.

I am now almost ready to make the penultimate move for this essay, the examination of the epochal turn to technology in "The Question concerning Technology." There remains only the single, enticing hint that Heidegger's belated recognition that quantum physics ultimately could not be subsumed by or remain within the direct trajectory of classical physics. In his 1950s period, the period in which the turn to technology occurs, Heidegger recognizes, "The objectness of material nature shows in modern atomic physics *fundamental characteristics completely different* from those that it shows in classical physics. The latter, classical physics, can indeed be incorporated within the former, atomic physics, but not vice versa. Nuclear physics does not permit itself to be traced back to classical physics and reduced to it."[40] We are close here to a paradigm shift. And, now, perhaps for the first time, there is an opening to the possibility of a non–early modern epistemology: "The way in which in the most recent phase of atomic physics even the *object vanishes also,* and the way in which . . . the subject-object relation as pure relation thus takes precedence *over* the object and the subject, to become secured as standing-reserve, cannot be more precisely discussed in this place."[41] Now the *turn to technology.*

Inverting Science and Technology, or "Inventing Technoscience"

Regarding the technological turn, "The Question Concerning Technology" is the most thorough and complex work on the science-technology relation. Here I shall work it through quickly and primarily with an eye to the way the essay transforms Heidegger's earlier notions about science. First, *the inversion*: Heidegger argues that the "standard view" that modern technology arises from and is an application of early modern science is wrong; it is, rather, the inverse: "Chronologically speaking, modern physical science begins the in the seventeenth century. In contrast, machine-power technology develops only in the second half of the eighteenth century. But modern technology, which for chronological reckoning is the later, is, from the point of view of the essence of holding sway within it, the historically earlier."[42] From this claim, which inverts the standard view, there are, in turn, two strong implications. The first is more concrete in that Heidegger sees that physics and its instruments might also be understood inversely:

> It is said that modern technology is something incomparably different from all early technologies because it is based on modern physics as an exact science. Meanwhile we have come to understand more fully that the reverse holds true as well: Modern physics, as experimental, is dependent upon technical apparatus and upon progress in building technological apparatus.[43]

For 1954 this was a prescient insight, particularly for philosophy of science, although not quite so dramatically for the history of science and technology, which by that time had begun to realize that even such theories as thermodynamics, because they arose from puzzles from the steam engine, led to the saying that "science owes more to the steam engine than the steam engine does to science."

The second implication, however, is more abstract—it is only by turning Technology (capitalized) into a "metaphysics" that it becomes possible for Heidegger to claim that science itself is subsumed into Technology: "Technology is therefore no mere means. Technology is a way of revealing. . . . Technology is a mode of revealing. Technology comes to presence in the realm where revealing and unconcealment take place, where *aletheia,* truth, happens."[44] But this end of metaphysics is simultaneously the transcendentalizing of Technology and its characterization as "Enframing," "Standing-Reserve," and the reduction of the whole of nature under its "challenge." Technology as hidden within modernity, is again contrasted with the "Greek": "And yet the revealing that holds sway throughout modern technology does not unfold into a bringing-forth in the sense of *poiésis.* The revealing that rules in modern technology is a challenging which puts nature to the unreasonable demand that it supply energy that can be extracted and stored as such."[45]

From this streams the *cascade* of contrasts between Heidegger's romantic and nostalgic premodern preferences and the negatively cast consequences of modernity, *technoscience.* Under the former, the "Question" includes the old windmill, the old wooden bridge, the Rhine, and old handwork technology; and under the latter, a hydroelectric plant, jets, radar, agriculture as mechanized food industry, mining—both uranium and coal, and power stations.

The revealing of Technology that challenges the earth itself "sees" the earth as standing-reserve, for mining, for mineral deposits, for yielding ore, nitrogen for agriculture, uranium for nuclear uses—all this is Technological "revealing," and it now sucks up and includes modern science itself under its sway:

> Because the essence of modern technology lies in Enframing, modern technology must employ exact physical science. Through its so

> doing, the deceptive illusion arises that modern technology is applied physical science. This illusion can maintain itself only so long as neither the essential origin of modern science nor indeed the essence of modern technology is adequately found out through questioning.[46]

The more intimate relations between science and its technologies, the inversion that sees science as more than merely technologically embodied, are prescient—but also deeply flawed.

Heidegger's thin understanding of the history of technology shows through even in this essay: mining, and whatever mode of revealing it belongs to, goes back to prehistoric times; by Roman times the lead levels had risen almost to modern heights; and while the old windmill may not take the wind for granted as power source, the old sawmill that dams the stream does. But there is a worse result from elevating Technology into a metaphysics as well: It dooms Heidegger's analyses of technology to being the same for every technology. Taking nature, the earth, as enframed standing-reserve leads—one can say logically—to his later claims in the interviews that the Holocaust and modern agriculture are equivalent (both treat their resources as standing-reserve). In short, the elevation to technology with a capital "T" emasculates Heidegger's philosophy of technology from making any nuanced conclusions about particular technologies (without capitals) because everything stands under the revealing power of enframed standing-reserve.

If such a move is philosophically disastrous, a second move that while belonging closely to this late insight, but that was not fully followed out, shows more promise. Heidegger begins to get a glimpse—but a glimpse only—that *late* modern science may, in fact, be different from early modern science. I have previously noted this in his belated recognition that quantum physics totally resituates the early modern subject-object distinction. In the "Question" he finally realizes that standing-reserve "designates nothing less than the way in which everything presences that is wrought upon by the challenging revealing. Whatever stands by in the sense of standing-reserve no longer stands over against us as object."[47] This 'dissolution' into pure relationality [noted earlier] implies something approaching a 'systems' approach to technology' . . . an airliner that stands on a runway is surely an object. . . . We can represent the machine so. But then it conceals itself as to what and how it is. Revealed, it stands on the taxi strip only as standing-reserve, inasmuch as it is ordered to ensure the possibility of transportation. For this it must be in its whole structure and in every one of its constituent parts, on call for duty . . . ready for take-off."[48] Much later, Bruno Latour was to say, "airplanes do not fly, Air

France flies." But the implication, undeveloped, is that late modern science may harbor a very nonmodern epistemology, no longer bound to the Cartesian subject-object, and representationalist context. Rephrasing, "physics, in all its retreating from the representation turned only toward objects . . . will never be able to renounce . . . that nature reports itself in some way or other that is identifiable through calculation . . . and remains orderable as a system of information."[49] This, however, hints at something very different from early modern physics and early modern epistemology. Heidegger never followed through on this insight.

I shall now leave Heidegger, ambiguously caught in his late recognition that within science itself, an epoche had emerged that no longer was commensurate with the early modern science that Heidegger deeply contested. And, although there were moments of prescience—which I have identified—in relation to late-twentieth- and early-twenty-first-century thinking about science, he still is left in the main as now as much "history" as were his contemporaries: Carnap, Feigl, Reichenbach, and others. Crippled by a paucity of systematic thinking about science, a shallowness of awareness of the histories of both science and technology, Heidegger now takes his own place as "history."

Epilogue: Lower Casing Technologies

I want to conclude this retrospective look at Heidegger on science and his prescience concerning *technoscience* by recasting a historical frame. My frame will forefront the *multicultural* origins of science and also look at a number of different sciences. For early twentieth century philosophy of science, science was paradigmatically *physics*. Indeed, that remains the case for even much of today's more standard analytic philosophies. But I think some fairly drastic changes have occurred whereby physics must now take its place among a diverse set of "new" sciences that are just as radically different from their predecessor scientific pasts as the new physics is from classical physics.

Heidegger, of course, continued to fit very much into the earlier view of the primacy of physics. And if only late did he begin to sense that the new physics was continuous neither with classical physics nor with his projective view of how science operates, he also—with regard to technology—did have prescience. As Cathryn Carson points out, however, part of this is because Heidegger early began to characterize physics itself *as technology*: "Physics must be technology, because theoretical physics is *the* real, pure technology."[50] Of course, this is technology as metaphysics, the very frame within which nature is revealed as *Bestand*.

Now, as I have claimed, Heidegger was a thin reader of histories, including those of the sciences, although as Carson has pointed out, he did read some popular accounts of the new physics. Rather, much of his impression of science came from actual conferences and encounters—for example, with Werner Heisenberg in particular. Carson recounts that they first met in person at Heidegger's hut in 1935, but, much more important, in Munich in 1953. Heidegger had earlier already characterized this era, and science in particular, as "The Age of the World Picture," and Heisenberg fell into this almost as a trap by giving a lecture, "The Picture of Nature of Modern Physics." Heidegger's responding lecture was "The Question Concerning Technology"!

What of other sciences? Post-Heidegger, it is clear that the most important "revolution" of the mid-twentieth century was biological. The discovery of the structure of DNA-RNA was in the mid-1950s, but biotechnological manipulations became practicable later. Dolly, the cloned sheep, for example, was born in 1996, two decades beyond Heidegger's death. Carson claims that Heidegger, in effect, did anticipate something of the biological scientific revolution that he expectably subsumed under his *Bestand, Gestell* framework. Biology lay within the framework of "domination and direction of what is made into objects in the service of use and breeding."[51] But as she realizes, this biological manipulation during the era in which Heidegger was speculating was precisely that of Nazi racial hygiene and "Aryan" physics. By today's standards, this "science" is crude indeed. If anything, genetic biology has radically undercut the very notion of "race." But doubtless Heidegger would subsume contemporary biotechnology in its later sense as more of the same, and this in spite of its promise to eliminate diseases, prevent heritable problems, and the like.

Interestingly, Heidegger, so strongly contesting modernism, remained in many deep convictions totally modernist. He clearly echoes the master narrative that locates both modern technology and modern science as a Eurocentric—and in his case a *metaphysical* trajectory of European culture. It is at this point that I wish to contest this both modernist and Eurocentric "history." The history of both science and technology does not follow the Heideggerian paradigm. I begin with the favored forefathers of Western metaphysics, for Heidegger one favorite being Aristotle. For practical purposes, post-Rome, Aristotle had been lost to Europe. He was reintroduced by Islamic scholars who had recovered the textual sources and elaborated upon them. And while this intellectual history is today well enough known, what has been less attended to are some of the postclassical scientific and technological feats also originating from Islam.

New sciences of mapmaking, and particularly the important instrumentation of navigation, including the invention of the astrolabe and armillaries essential for the style of navigation that opened the age of exploration, were Arabic. Similarly, gunpowder and its later development in the cannon were largely of Chinese origin. Both these "modern" technologies were already in high use by the fourteenth century. As Manuel de Landa has shown, cannons were utilized in the Hundred Years War with such effectiveness that castles in Normandy were being destroyed at the rate of one per month. Early in this multicultural adaptation of a technology, a siege could take place, with cannons brought close-up and with their firepower that destroyed defense walls. Soon, however, defenders developed firepower to shoot back, and this called for bigger artillery pieces to be placed farther away from the castle under attack. With this development, the early *science* of ballistics was born. Close up, one simply aims the cannon at the wall; farther out, one must raise the barrel. Trial and error gives way to ballistics. Note that this new need for geometrical "science" does follow, not the Heideggerian metaphysical priority of technology to science, but clearly a *practical* historical priority to the contextual needs of using a technology. De Landa gives this account:

> The theory of exterior ballistics . . . was worked out by the fathers of modern dynamics: Tartaglia and Galileo. Perhaps it would not be too much to assert that the foundations of modern physics were a by-product of solving the fundamental ballistic problem. . . . Tartaglia was led to his criticism of Aristotelean dynamics by experiments on the relation between the angle of fire and the range of a projectile. But to Galileo is due the fundamental discovery that the trajectory of a projectile . . . must be parabolic.[52]

Here the new philosophy of science can appeal to a paradigm shift à la Kuhn, in that Aristotle is replaced by Galileo with restrained fall replaced by the pendulum, but in response to the technological historical context. Technologies, even lowercased, precede the science.

Finally, the premodern origins of technoscience, an interrelated technology-science, were also multicultural. A telling example was the school of Henry the Navigator. Here, working together, were Jewish mathematicians, Islamic mapmakers and instrument makers, and Christian sailors, all creating the technosciences needed for the voyages of discovery that opened Europe to an even newer world. This ended in fact at just this historical junction. The expulsion of Moors and Jews, decreed in 1492, just as Columbus had reached the new world and began to capture "Indian" slaves to bring back as standing-reserve to Spain, did, indeed,

begin an era which enclosed and purified European ideology for its next phase.

My story has combined a pragmatist strand of science-technology history, avoided subject-object and representationalist epistemology (which arises later in any case), and replaced it with a phenomenological account of a lifeworld in the midst of myriad technologies. Here Galileo has his telescope, which reveals phenomena that his early form of mathematization must deal with, not unlike his ballistics, which could deal with cannonball trajectories. I hold that such a pragmato-phenomenological account leaves in shambles the metaphysical Heideggerian tale. The current tale, on the ground, is a lot messier, but also richer, with its interrelationality of humans, technologies, and science.

5

Heidegger's Technologies

One Size Fits All

> Agriculture is now a mechanized food industry, in *essence* it is no different than the production of corpses in the gas chambers and death camps, the embargoes and food reductions to starving countries, the making of hydrogen bombs.
>
> **Martin Heidegger**

> For Heidegger, technology is a gloomy drama in which every invention merely strips the mystery from the world and turns all things into a manipulable stockpile of present at hand slag. A mass-produced umbrella is no different from a cinder block or an aircraft carrier . . . the problem with his analyses is not their pessimism, but their monotony.
>
> **Graham Harman**

Philosophy and Technology

In this chapter, I first revisit Heidegger's reception and continuation of influence within the philosophy of technology, filling in several gaps left out in the introduction. Some three and a half decades since his death, while there is some evidence that Heidegger is virtually the only still strongly visible philosopher of technology of his generation, there is also evidence that this reputation is fading. Following my revisitation, I then turn to a *postphenomenological* analysis concerning Heidegger's blindness to distinctions and multistabilities that may be found in technologies. Indeed, I contend that while he claims that attending to the particularities

of technologies as anthropological-instrumental entities blinds one to the "essence" of technology, the inverse is also the case. To attend to the "essence" of technology, I argue, blinds Heidegger to the differing contexts and multidimensionalities of technologies that a pragmatic-phenomenological account can better bring forth. So, first I revisit Heidegger's reception and impact.

On the North American scene, I was, in fact, one of the earlier such interpreters of Heidegger on technology. My "Heidegger's Philosophy of Technology," in *Technics and Praxis: A Philosophy of Technology* (1979), here Chapter 1,was one of the first systematic expositions of Heidegger on technology in English. Originally *Technics and Praxis* was dedicated to Martin Heidegger, who had died in 1976, just a year before my manuscript was completed. Yet, only two years after *Technics and Praxis*, I had turned somewhat more critical. The first German-American philosophy of technology conference was held in Bad Homburg in 1981, and my paper was "The Historical-Ontological Priority of Technology Over Science," (Chapter 2 here), later published in German in *Technikphilosophie in der Diskussion* (1982) and then in English in my *Existential Technics* (1983). I am making these points not just to assert claims to early Heidegger interpretation and critique, but also to show that in this early period of philosophy of technology, Heidegger interpretation and critique was of high interest. His "tool analysis," one of the most commented upon sections of *Being and Time*, was published in 1927, simultaneously with Friedrich Dessauer's *Philosophie der Technik* but little known in Anglophone circles. His later works, particularly *Die Frage nach dem Technik*, were issued in the 1950s. Heidegger spawned, from among his students, another generation of technology-interested thinkers, including Hannah Arendt and Herbert Marcuse, whose *One Dimensional Man* was to become the cult favorite of undergraduates in the 1960s.

Not all respondents were happy with Heidegger. Many from the analytic traditions of philosophy—one could call them "externalist" critics—had little good to say about Heidegger. Richard Rorty pointed out that Hans Reichenbach would not even read Heidegger "for purposes of intellectual hygiene," and Mario Bunge, probably the earliest analytic philosopher of technology, noted, "I do not count the tiresome tirades on the way technology 'de-humanizes' man or robs him of his 'authenticity'; that is not philosophy, but bad literature."[1] Thirty years later, the most recent edition of the *Stanford Encyclopedia of Philosophy*, in its section on analytic philosophy of technology, concludes, "In the case of Heidegger in particular, the paramount position of technology in modern society is a symptom of something much more fundamental, namely a wrongheaded

attitude toward Being which has been in the making for almost 25 centuries. It is therefore questionable whether Heidegger should be considered as a philosopher of technology, although within the traditional view he is considered to be among the most important ones."[2] Of the externalists, however, the most important was probably Rudolph Carnap, whose work was much more familiar with Heidegger's writings, but whose disagreements were sharp and biting. This is not to say that all "analytic" philosophers were either so negative on, or so far from, their own positive contributions to the philosophy of technology. It is to say that most analytic philosophy of technology is a transformation from earlier interests in the philosophy of science. I, too, have addressed these issues in depth in *Instrumental Realism: The Interface Between Philosophy of Science and Philosophy of Technology* (1991). For example, although initially coming from philosophy of science, Ian Hacking had an early recognition that science (in practice) was tied to instruments and that philosophers should "go native" in looking at science—his *Representing and Intervening* (1983) was an early example of this change in approach. Similarly, Peter Galison, whose *How Experiments End* (1987) and *Image and Logic* (1997) also shifted to an emphasis upon laboratory and instrument roles—technology—in science. Joseph Pitt was even earlier in his shift to interests in philosophy of technology, although his primary book, *Thinking About Technology*, on this matter was published somewhat later, in 2000.

There were also more "internalist" early critics, perhaps foremost Adorno and his *Jargon of Inauthenticity* (1964; English trans. 1973). But here I want to make a somewhat more restrictive move. Heidegger criticism has gone through a number of historical phases, one related to his association with National Socialism (Nazism), led by Victor Farias and Hugo Ott in the 1980s and more recently current among younger critics. Here, however, I wish to distinguish between a more general critique of Heidegger as philosopher and a more specific critique of Heidegger on technology.

Most briefly, the more general critique, particularly the one that resulted after the revelation that Heidegger had continued his membership and paid his dues to the Nazi Party until the end of the war, unraveled the "official story" spread by Hans-Georg Gadamer and other intimates. Heidegger, they claimed, had simply been politically naïve and made an academic's mistake, which unraveled, led to dismay by his former defenders in Continental philosophy. But after this narrative unraveled, three camps emerged. The first holds that Heidegger's philosophy at its core remains pure and distinct, and thus Heidegger's sins appear no worse than those of Aristotle fleeing his city to avoid having the Greeks

be guilty for another Socrates. This group continues as Heidegger sycophants as if nothing had happened. The second holds that Heidegger is flawed, so now the task is to sort out what is salvable from what is not. (I consider myself to belong to this camp.) And the third finds Heidegger to be so deeply flawed that he should be expelled from the halls of the "mighty dead" and greeted only negatively, as argued by Tom Rockmore and Emmanuel Faye.

If, however, one looks at the more narrow interest in Heidegger on technology, then a somewhat different picture can emerge. I return to the epigraph by Graham Harman. The quotation is from the anthology *New Waves in the Philosophy of Technology* (2008), which collects essays from younger philosophers of technology, including Harman. Not surprisingly, a number of the chapters include or refer to Heidegger on technology—but, at least to my surprise, only one author could be called a "true believer." That is Iain Thomson, whose title tells all: "Understanding Technology Ontotheologically, or: The Danger and the Promise of Heidegger, an American Perspective." Others are clearly revisionists, some more radical than others, for example, Søren Riis, whose "The Question Concerning Thinking" basically shows that Heidegger's notion of thinking is itself a specific "technique" and thus a tool. I have chosen Harman, author of the 2002 *Tool Being: Heidegger and the Metaphysics of Objects.* Basically, I agree with him, Heidegger does remain a giant mighty dead twentieth-century philosopher—but *not* with respect to the philosophy of technology! And that, I admit, is a radical conclusion to which I came reluctantly.

So, here I return again to my first article critical of Heidegger on technology, "The Historical-Ontological Priority of Technology over Science." Put succinctly: Heidegger makes a distinction between what could be called "traditional" technology and *modern* technology. The latter, he claims, historically is antecedent to modern science; it is a technology that is invented by, determined by, and arising from modern science, and it is thus *historically* later. In short, Heidegger is buying what was then the standard modernist view of science's priority over technology as, noted earlier, Paul Forman holds: modern technology is "applied science." But at the same time, Heidegger claims, technology is *ontologically* prior to science because Technology (now I capitalize it to show its "metaphysical" status) is a "way of revealing" that lets the world be present in a certain way, as *Bestand*—I translate this as "resource well"—within a frame, *Gestell.*

My critique, back then, was that this belies the *history* of technology and, I try to show contrarily, that *both* historically and ontologically *technology precedes science.* I originally drew my arguments primarily from two

history of technology sources: Lynn White's work on what he argued was a technological revolution in late medieval times, and work that was being done widely among historians of technology, such as Rachel Lauden, in the late 1970s. White shows how very large mechanical technologies, many borrowed from other cultures, but flowing into a Europe that was power hungry and stemming from the inflow from fifteenth-century world exploration and trade, created all sorts of monumental works, including many of the great cathedrals, which needed sophisticated machinery, shipping, which needed vast cranes, and so forth, all of which precede the later industrial amplification through steam power. Thus, ironically, Heidegger's often valorized "new Middle Ages," actualized, would have been in the midst of its own technological revolution! But, as the historians have also pointed out, "science owes more to the steam engine, than the steam engine to science," since it was from the model of the steam engine that the theory of thermodynamics arose, not vice versa. To my mind, it is not at all accidental that many of the "laws" of physics and motion are derived from the observation and interaction with technologies: inclined planes, pendula, and steam engines—and not from "direct" observations of "nature." This argument was, of course, directly an implication of my claim in *Technics and Praxis* that science is necessarily *embodied* in its technologies, its instruments. But, now perhaps retrospectively and ironically, one could also say that this is in some way implied by the Heidegger of *Being and Time*! There, he showed that science, which creates a unique perspective by turning pragma, tools, into *objects* present-at-hand, is *derived*—he claims from a breakdown—of the actional ready-to-hand of tools in use. Yet, science in practice is immersed in instrumentally mediated readiness-to-hand! Heidegger's early-twentieth-century insight preceded the radical Forman thesis.

Now, while it may have taken time for this shift to sediment in academic-intellectual culture, it is clear that Heidegger provoked such a shift as early as 1927, *Being and Time,* and then subsumed science into technology as a metaphysic by the time of "The Question Concerning Technology." My 1981 article had also made these points as well. My third step took place at the famous conference organized by Hubert Dreyfus and Michael Zimmerman at Berkeley in 1989, "Applied Heidegger." (See Chapter 3.) My arguments concerning Heidegger's romanticism were also stimulated by the then widespread discussion concerning nonfoundational or neopragmatic philosophy.

Parallel to the romanticist criticism, I also began to apply what could be called a *pragmatist* criticism. Put most baldly, as Richard Rorty so

strongly noted in the early 1980s, pragmatism is both nonfoundational and anti-essentialist, themes he developed in *Philosophy and the Mirror of Nature* (1979) and again in *Consequences of Pragmatism* (1982). Here, the contrast with Heidegger could not be more dramatic: "The Question Concerning Technology" was an attempt to determine the *essence* of technology. As Heidegger also claimed, "The essence of technology is nothing technological." I claim, pragmatically, that there is no essence of technology, although there are many "technologies." The search for *the* essence of technology is necessarily a metaphysical—and *reductionist*—turn, one that determines from the beginning the reason all technologies are reduced to the same analysis, to the monotony that Harman claims. That essence, as readers of Heidegger know, is the way of seeing Nature as a pool of "standing-reserve" whereby nature is set up in advance in a restrictive frame, *Gestell,* to be calculatively challenged to produce usefulness for humans, *Dasein.* Here we are back to modern agriculture, the Holocaust, atomic bombs—and more manageably, as I will show, *typewriters and word processors.*

In order to make the pragmatic critique have more bite, let us look at the way Heidegger conceives of modern technology: I would claim, along with Jaron Lanier, that Heidegger's view of it is implicitly that of industrial or "rustbelt" megatechnology. As I argued in the introduction, this industrial or modern technology increasingly gets cast in dystopian modes.

At this juncture I will make an initial concession: Insofar as such gigantist industrial technologies obtain, Heidegger's critique of modern technology remains insightful and penetrating—and I agree with it! Now that we are almost a century later than that during which Heidegger was formulating his take on technology, we can see that many early forms of the worst of industrial technologies have changed, or are changing. The older, dirtier steel plants of the American Midwest have begun to disappear or have been cleaned up. Similarly, in Europe, the older German steel mills have been closed down or also scrubbed up with cleaner emissions—or, regretfully, they are today being dismantled, purchased by China, and reassembled there. Nor must one relax guard against the reemergence of such rustbelt megatechnologies: the recent demand for coal generated electricity to overcome oil or gas shortages—unless hi-tech scrubbed—will simply reintroduce dirty smoke. And precisely the industrial brand of modern agriculture with its "factory model": pigs, chickens, cattle, and now the aquaculture "factory model," with salmon, shrimp, and even tuna farms that continue to concentrate pollutants and parasites and such

to our detriment. With Donna Haraway, I deplore these Taylorist modeled methods, to which one can add sweep net and long line fishing techniques. All rightly fall under Heidegger's scathing critique. Factory farming remains old-fashioned industrialist.

But this is not the end of the story, or the whole of it. Do *all* technologies fall under this description? No. A postmodernist counter comes with the claim that we are increasingly living in a "postindustrial" technological landscape. Jaron Lanier, Peter Drucker, and many other commentators argue that we are in, or have moved into, a more *electronic* and *knowledge*-based technological world. Clearly the globalized, almost postindustrial world of computers, the Internet, all the media and image-oriented technologies of higher education, entertainment, and information, present a different texture from that of rustbelt technology. And while it is clear that in some sense "industrial" and "electronic" technologies remain more side-by-side than one evolutionarily replaced by the other, the dynamics are different. No one model fits our technological world; older technologies can often remain locked in for significantly long periods before disappearing. But, historically, technologies do get superseded and abandoned. Stone Age technologies, both stone and bone and crude fabric and net technology days—with the exception of a very few isolated backwaters of the present world—have disappeared entirely.

Now, however, it is time to make the "empirical turn" so much discussed in science-technology studies circles. And while I have suggested that Heidegger on technology is historically naïve and have now hinted that a pragmatic anti-essentialism would argue that there are many *varieties of technological experience* –one size does not fit all, and one analysis for all is next to useless—I now want to make a fourth, *postphenomenological* critique and show why even the most Heideggerian of Continental philosopher types will not be giving their laptops away. Such an empirical or concrete descriptivist turn both avoids the Heideggerian trap of remaining too high altitude and general, and with a microanalysis can show close up something else about technologies. Thus I begin a postphenomenological analysis.

The Pen and the Typewriter

I begin again with Heidegger on the pen and the typewriter. This repetition of example seems warranted because it focuses upon Heidegger's own technologies; it reveals the weaknesses in his "phenomenology" and shows his nostalgic taste for older technologies. In his *Parmenides*, he is talking

about the Greek sense of action, *pragma*, which leads to, in this case, the production of writing through the hand.

> Human beings "act" through the hand; for the hand is, like the word, a distinguishing characteristic of humans. Only a being, such as the human, that "has" the word can and must "have hands." . . . The hand becomes present as hand only where there is disclosure and concealment. The animal has no hands, nor are hands derived from paws, claws, or talons. . . . The hand has only merged from and with the word. The human being does not "have hands," but the hand contains the essence of the human being because the word, as the essential region of the hand, is the essential ground of being human. . . . As script, however, the word is handwriting.[3]

I am so tempted here to become satirical—is our Heidegger anti-evolutionary? Does he not know about primate hands, which form and grasp tools? Or, since speech seems to be associated only with either modern hominids or at most those immediately preceding modern hominids, were not hands "at hand" well before the word? And was not the essential ground of being human possibly tied up with tools first, which were fashioned at least 2.5 million years ago? But I will refrain and instead turn to take a now close-up look at Heidegger himself *acting through the hand.*

One of the most interesting books to be published recently, in my opinion, is Adam Sharr's *Heidegger's Hut* (2006). Sharr, a Welsh architect, gives us a glimpse of Heidegger's world as seen through his "dwellings," both the hut and his Freiburg city house. Let us take a close-up look, first the former. The photographs taken of the study in the hut, with bookcases in the background, show that the bookcases contain only manuscripts, presumably Heidegger's. The desk is empty except for a number of pens, a blotter and ink container, and papers. This site, Heidegger claims, is where he most often wrote his work by hand. Thus, like many an academic, perhaps most often in the summer, one can envision Heidegger at work with his writing.

Now turn to his city house. At this site, all the shelves near the desk and even on the desk are again filled with manuscripts, again presumably his own. But here, in the background, there are *books,* lots of books. And note, too, there is a plethora of pens—lots of them—and blotter and paper. I shall not speculate, but ask yourself what the absence of books in the country, compared to the presence of books in the city, may signify.

Now let us turn Heidegger onto Heidegger. Where there is revealing, there is concealing, and whatever is present has also its absence. Absent,

of course, is a different writing technology—the typewriter. So listen to what Heidegger has to say about the typewriter:

> It is not by chance that modern man writes "with" the typewriter and "dictates"—the same word as "to invent creatively"—into the machine. This "history" of the kinds of writing is at the same time one of the major reasons for the increasing destruction of the word. The word no longer passes through the hand as it writes and acts authentically but through the mechanized pressure of the hand. The typewriter snatches script from the essential realm of the hand—and this means the hand is removed from the essential realm of the word. The word becomes something "typed." Nevertheless, mechanical script does have its own, limited importance where mechanized script serves as a mere transcription for preserving handwriting, or where typewritten script substitutes for "paring." When typewriters first became prevalent, a personal letter typed on a machine was regarded as a lapse of manners or as an insult. Today, handwritten letters slow down rapid reading and are therefore regarded as old-fashioned and undesirable. Mechanized writing deprives the hand of dignity in the realm of the written word and degrades the word to a mere means for the traffic of communication. Besides, mechanized writing offers the advantage of covering up one's handwriting and therewith one's character. In mechanized writing all human beings look the same.[4]

Again, my temptation is to turn satirical, but I will only comment that it is quite obvious to me that Heidegger never learned to type, else he would have eventually understood that the word "flows" through the keyboard onto the scripted page and even better with an electronic rather than mechanical keyboard. We do know that in correspondence, in spite of his critical comments about typewritten letters, that he sent such letters to some inquirers—John Caputo has one, as does my colleague, Peter Manchester. Elizabieta Ettinger hints that Elfride probably did this correspondence.[5] And others have pointed out that the typed manuscript of *Being and Time* was produced by his brother.[6] But I will return to this after a detour into a different but related technology.

In my attempts to try to show that one size cannot fit all, I often revert to *musical* instruments (technologies), which I believe do not fit well into the *Bestand/Gestell* essential reductions of Heidegger's view of technologies. Indeed, woodwinds could be said to be somewhat like windmills, for they play only when the performer provides skilled and controlled "wind" or *breath.* So, here as my example, I draw from the work of Trevor Pinch

and Karin Bijsterveld on the history and sociology of music, "Breaches and Boundaries in the Reception of New Technology in Music."[7] The history of the development of musical instruments is fascinating. In Europe this history pretty much parallels the development of instrumentation in both science and art, particularly music. Prior to the Renaissance, with its fascination with all sorts of technologies—optics, musical instruments, mechanical devices—much music remained vocal and often highly restricted particularly in sacred music, to preferred tonal systems. But all of the classes of instruments—strings, percussion, winds, and keyboards—had emerged during the Renaissance. I shall use two examples: the invention of *keyed* wind instruments and the invention of "mechanical" keyboards that lead to the pianoforte, both considerably later than the Renaissance.

The turn to keyed mechanisms—for flutes, clarinets, and later horns—took place largely in the nineteenth century. Prior to this development, holes for fingering were premechanical. Mechanical keys were easy to operate, produced more uniform and cleaner tones, and allowed for different and faster virtuosity. But not everyone was happy with this development—and here a century before Heidegger there was a Heideggerian moment. One critic, Heinrich Grenser, objected that the fingers (read hands) were losing their possibilities for making a "vibrato by simply moving the fingers over the sound holes" thus losing control over finger positions "to correct out of tune sounds." Grenser went on to complain that the use of keys (read typewriter) is "neither complex nor art" and that the "the real art" of flute construction should be to build flutes which would enable flutists to play whatever they wanted without the use of keys.[8]

Even earlier, a similar set of objections arose with respect to the move from the strictly hand- and finger-played harp compared to the mechanically keyed instruments, beginning with the harpsichord through the clavier and then pianoforte. Again, the loss of fingered strings was bemoaned—but, I have to say, by a minority of critics, compared to the majority who recognized the superior expressive potential of keyed instruments. The gradual development from plucked strings of the harpsichord to the hammered strings of the pianoforte, once mastered by skilled practitioners, becomes obvious. The soft/loud of the pianoforte, played today by someone like Ashkenazy or Boulez, should be clearly recognized as more expressive than the limited range of the classical harp. But neither does the mere mediation of keyed or "mechanical" musical instrumentation make "all humans look alike." I would claim that anyone can tell the

difference between a beginner's "twinkle, twinkle little star" and a master player like Boulez, even if the notes were the same.

What happens in these parallel "Heideggerian resistances" to typewriters and keyboards? Part of the answer, I believe, lies in the *phenomenological* notion of *embodiment.* Before a technology can become transparent or withdraw from being more objectlike or resistant, the human who interacts and learns to "play" the instrument or technology, there has to be a learning and accommodation/resistance process. This is to say that if "present at hand slag" can occur with breakdown or absence, that there is also a sense in which at the beginning something new also presents a kind of resistance or object-likeness that also must be surpassed. Heidegger's description of the typewriter as "mechanized pressure of the hand" precisely applies to the beginner, the novice, who has not yet experienced the "flow" of composition *through* the keyboard. The typewriter, for Heidegger, had not yet become transparent; neither had it withdrawn to become an embodied means of expression. For that matter, Heidegger does not recall that this same process had to acquire withdrawal and transparency with the pen. Had he looked at the acquisition process, he might have noted that when he first learned to write he had to master two standardizations. The first was the standardization of the alphabet itself. The English version has twenty-six letters, with other variants having from twenty-two to twenty-eight letters. To have readable text, he had to learn to comply with his cultural version of the alphabet. The second standardization he learned, along with all others in elementary school, was the practice of "penmanship." He learned to make standard sizes and standard shapes, else, again, his script would not be readable. (The typewriter makes this task easy; its letters are already sized and shaped, not needing a hand. Each writing technology makes certain actions harder and others easier, depending upon the human-technology interface.) These now-forgotten attainments make withdrawal and transparency possible. Then, second, once a skill has been acquired and the instrument has become transparent, a shift to a new instrument or technology calls again for the same process in a new set of acquisitions—and while the highly skilled musician, or word processor user, can perhaps easily shift from one technology to another, that is not always the case. A striking example known in science circles is Stephen Hawking. His very badly restricted motility has reduced him to pecking with a mouth-held pointer onto a keyboard, a process he has mastered. Although computer programmers have pointed out that there are now better and more flexible programs for him, he simply does not want to learn a new and differently patterned set of movements. Is he "Heideggerian"? What I am suggesting here is that any new

technology in relation to human praxis, before it can become transparent and thus fully accommodated, must be "embodied" if it is to be "known" at all. In short, something like presence-at-hand, although in phenomenologically different ways, lies at both beginnings and breakages.

I return to Heidegger once again: He is sitting at his desk, writing by hand, this time in the rented room prior to his move to Freiburg, producing the text, *Being and Time*. He is rushing to complete it so that he can receive his promotion (as Tom Sheehan has so brilliantly described in an article presented many years ago to the Heidegger Conference, which I sometimes circulate). It works, and the publisher accepts the manuscript for publication. But what then? Here we enter a context of ambiguity and eventually irony: before printing, the manuscript must be *typed,* reduced, as it were, to the uniformity of print and standardization. Does this make Heidegger a human being just the same as every other human being? I think not—*Being and Time,* in print as a book, also makes Heidegger into Heidegger. The book, once read and evaluated, perhaps analogously to Ashkenazy, who has been heard playing, shows a result that eventually gets praised as one of the most important philosophical works of the twentieth century. In short, Heidegger could not have become Heidegger without the infrastructure of the Gutenberg Revolution of printing, publication, and circulation.

So, now, I turn to my final irony. As we know, Heidegger in his lifetime had already become famous as "the thinker," largely by virtue of his published works. But after the war and after the investigation by the postwar powers, Heidegger was found to have been involved with the Nazi Party, was forcibly retired, pensioned, and forbidden to teach or publish from 1946 under the terms of the denazification program. He experienced a "nervous breakdown" and retired to his hut and city house away from university life.

In the 1950s, however, his former student and mistress, Hannah Arendt, reappeared in Germany, herself now famous in her own right with lectures in Frankfurt and elsewhere. She again communicated with Heidegger, who now in a rather unfavorable financial position, persuaded her, in later life (1969), to help him sell his handwritten manuscript of *Being and Time.* Arendt did his bidding and managed to get a sum sufficient for him to build a retirement house behind his city house—an income larger than sums he had earlier received as royalties for previous publications. There are multiple ironies here: the handwritten manuscript, now transformed into a commercial work—or perhaps an "artwork," but in either case commodified—brings more money than the

printed editions into Heidegger's hands. Arendt, concerned that Heidegger's manuscripts ought to remain in Germany—particularly with respect to his claims about the philosophical nature of the German language—thus advised that he place the manuscript with the Schiller Literatur Archiv in Marburg. This did become the ultimate location, eventually for all his manuscripts, but Arendt's initial suggestion was turned down by the Heideggers! They argued that the Americans would pay more money and for a while considered the University of Texas as most likely to have the most. Apart from the hypocrisy implied, the commodification of *Being and Time* also becomes the means for making it into a modern art object placed in a literary museum.

Before leaving writing by hand, valorized by Heidegger as the one-handed writing by pen, I want to point to a delicious contemporary example that relates to the typewriter. As noted, by even the early twentieth century most literary producers had shifted to the typewriter, and later most of these had shifted to the word processor. One writer slow to make the second shift was Cormac McCarthy. McCarthy is a very prolific writer, with one of his recent works, *No Country for Old Men*, now a popular movie made by the brothers Joel and Ethan Coen. McCarthy purchased his typewriter in 1963—before word processors, to be sure—after finding a light portable Lettera 32 Olivetti in a pawnshop for $50. He ended up writing more than five million words of manuscript on this favorite machine, by which time it was worn out. One can imagine the loose clackety-clack left if one were to try writing. A friend working with him at the Santa Fe institute found and bought him a virtually unused but identical model, which cost $19.95, with shipping at $11.00. (I wonder if it was on eBay.) And so McCarthy may continue his archaic attachment to the mechanical typewriter even today. As for his old model: He put it up for auction, now as a commodified art object. It sold for $245,500, with proceeds donated to the Santa Fe Institute.[9] Heidegger was not the only person to become fixed upon a preferred but antiquated writing technology.

I do not want to dwell upon or get caught in a war of Heidegger-interpretation, but instead want to push a second, related anti-essentialist critique, this time more implied by postphenomenology. I claim that technologies are *multistable*, that is, they have structured ambiguities that allow what first appears as a "same" technology to be differently situated and have different trajectories. I return to Heidegger's printed *Being and Time*. I have previously suggested that without *Being and Time*'s having been "reduced" to standardized print and the printing press, Heidegger could not have become Heidegger. Imagine, for example, if he had to

make handwritten copies for distribution; how far would have been his reach? Instead, the now five-century-old technology of printing made it possible for *Being and Time* to be distributed all over Europe and beyond in a very short time. But, as historians of technology know, the moveable type process actually had been invented several times before—in China as early as AD 925 and in Korea about 150 years before Gutenberg's reinvention in about 1439. Yet, the fate of the dissemination of printed materials and the growth of literacy was very different. In Asia, printing remained largely restricted to religious and imperial uses; it was a technology differently embedded. Similarly, the mechanical clock had a parallel differing trajectory in Asia and Europe. Daniel Boorstin has pointed out that the great Sung mechanical clock in China preceded the later European invention of the clock by a century and a half. But in China timekeeping, with the calendar too, was restricted to the Imperial Court, and the purpose of the Sung clock was to keep track of the astrological records of the Emperor's offspring. Conversely, in Europe, while clocks were first used to set the hours of monastic life, very early on they also were added to cathedrals and then town halls, and time became public. Lynn White points out that this was not the case even in the Orthodox East, since churches were supposed to be dedicated to *eternity*, and thus clocks were not allowed.

European printing followed an almost identical trajectory. Gutenberg's first printings were of the Bible, a sacred use, but as the Reformation began a few decades after the invention of the press, the Bible began to appear in the vernacular as over against the more restrictive Latin of the Roman Catholic Church. As with the clock, secular uses of print spread rapidly. Nor was it long until the glimmerings of the Scientific Revolution began in print as well. Owen Gingerich's study *The Book Nobody Read* takes account of every first edition of Copernicus's *On the Revolutions of the Heavenly Spheres* (1543), in which he found that each book had itself a long history of annotation by many readers, thus a book many people read. On to Heidegger and the many readers of *Being and Time*. The point is that the same technology—printing—can be and is differently embedded and has multiple "histories."

We are, I hope, gaining distance on the single essenced notion of *Bestand* and *Gestell.* One size does not fit all and no young Heideggerians today need feel guilty about not giving up their laptops. Neither shall I ever require my own students to hand in only "authentic" writing, the word as expressed through the hand with a pen.

6

Concluding Postphenomenological Postscript

Writing Technologies

In the progression of chapters, the reader will have noted that I have taken several different critical perspectives upon Heidegger—antiromantic, pragmatically anti-essentialist, historical, and so on. But there remains a double task to conclude this assessment of Heidegger: on one side, I shall now suggest that Heidegger's philosophy of technology—already seen to be highly dated—has only regional or limited relevance, particularly with respect to contemporary technologies. On the other side, I want to suggest a more phenomenological, or *postphenomenological* counterstrategy for technology analysis. While I shall not repeat the exercise undertaken in the last chapter, which discusses Heidegger's valorization of writing with an ink pen and his denigration of writing with a typewriter, I have always found this example of his technology analysis highly amusing and phenomenologically *arbitrary.* Granted, composition with pen or typewriter keyboard in the early twentieth century does speak to the two then most dominant forms of writing practice. What was to become a much more powerful mode of composition, word processing, did not actually become prominent until the late twentieth century.

What I want to do here, in very abbreviated form, is to take a very *long* historical look at major moments in the history of writing, using these moments as *phenomenological variations* in writing practice. In my own postphenomenological style, I shall look at the *production* of writing in practice, noting its forms of embodied activity and its entailment of writing technologies or instruments. Underway, I shall also be hinting at a

much more postmodern framing of this long history; this will be a multicultural and no longer "Eurocentric" history, which Heidegger, in relation to philosophy, narrows to a "Greco-Germanic" narrative on virtually all his interpretations of Technology.[1]

Variations on the History of Writing

How is one to undertake a long history of writing? Until very recently, many historians of writing have remained within the framework of the modernist or Eurocentric master narrative. In large part, this narrative locates the beginnings of virtually all civilized practices as originating from Mesopotamia and Egypt on to Greece, Rome, and elsewhere in Europe. But, and particularly with a much more refined and better datable set of archeological techniques, it appears that many very early civilizational practices did not follow this implicitly linear and distributionist pattern. Before turning to writing, I turn to another civilizational trajectory—the beginnings of agriculture. The older standard view patterned on this master narrative held that the oldest domesticated grains—the oldest usually claimed to be einkorn wheat—began to be domesticated soon after the last Ice Age, around 10,000 to 8,000 BP. But the newer archeological methods, aided by new dating processes, began to find much older examples and in a much wider distribution. For example, earlier in the twentieth century, examples of domesticated rice were found datable to 12,000 BP in China—only more recently, to 15,000 BP in South Korea! Not to be outdone, even older collections of barley, to 23,000 BP, have been found in the lowered bed of the Sea of Galilee (although these were collections of wild barley, not domestically modified seeds).[2] It is premature to say that the new paradigm for agricultural beginnings is now complete, but it does appear that these beginnings were practiced *in many places on the globe within a very ancient historical time.* While einkorn wheat, one of the oldest domesticated grains used in Europe, was found in the gut of "Ötzi," the Iceman found in the Italian Alps in 1991, a wheat sample dated to 5300 BP,[3] domesticated grains such as rice in Asia, beans and squash in Mesoamerica, and corn in North America, all go back at least this far in time as well.

Writing is actually *older* than the claims concerning grain domestication. Of course, one has to construe writing somewhat broadly, as the practice of making signifying *inscriptions* that have some recognizable *meaning* to the reader of the inscriptions. (If writing is narrowed to inscribed *language,* then the dates must fall later.) As evidence for the early claim, note that inscriptions from Ice Age caves and markings on reindeer

antlers, and some stone inscriptions, can be successfully dated back at least 20,000 BP. Unfortunately, except for clearly recognizable calendrical markings—such as those indicating the twenty-eight-day lunar cycle—the key to the meanings remains unknown. Then, returning to both standard archeology, and aided by more contemporary methods of dating, there was an explosion of inscriptions from Egypt, Iraq, Pakistan, and even a Sumerian site in Romania from 6000 to 5000 BP. Add, recently, new dating of Chinese turtle shell inscriptions that may go back to 7000 BP, and once again one has a distributed set of practices, globally diverse, concerning the origins of writing.

Now, some historico-phenomenological variational analysis: While turtle shell, reindeer antler, cliff and stone etching, pottery (Pakistan), and tablet (Sumerian and Mesopotamian) inscriptions might seem very diverse, there is something much more common to this writing-praxis than might first appear to be the case. Readers may recognize here my human-technology-world version of interrelational analysis. Work backward from the "text" or inscribed result—I call this the *tablet.* In each case, with the end result the inscription is preserved onto something *hard* (hard copy, if you like!). Take cuneiform, or the protoscript from Pakistan: both were inscribed upon clay artifacts, but then baked into solidified results. In the other cases, cliff, stone, and bone "tablets," the material was itself already hard and had to be inscribed upon. Then ask, what kind of instrument is needed to accomplish the inscription? The answer has to be: something itself *hard,* and in most cases, *sharp* to make the inscription, something styluslike. Third, what about the human *bodily action* needed to achieve the result? To give it a sort of Heideggerian but ironic twist, it takes lots of practice and learned bodily skill to make inscriptions that can be read. Not everyone can pick up a hammer and hit the right (not the finger) nail! But, once the practice, clearly somewhat analogous to sculpting or pottery shaping, gets habituated, the result will be a good, readable "written" inscription. Again, if Heideggerian language is used, at first there is a resistance from the object, a sort of early present-at-hand obstruction, before a transparent "withdrawal" occurs. It is only after more and more acquired skill that the transparency of readiness-to-hand can finally take hold. Heidegger's tool analysis seems to presume an already attained bodily skill rather than recognize its existential history of acquisition. And, as in this example, this is "writing with the hand"—but with and through tool and produced upon a tablet.

Now take note of a different writing variant. Here, as with the *hard* technologies, there is a considerable ambiguity as to chronological origins, but at least by 4000–3000 BP, there is evidence for what I call *soft* writing

technologies, examples being early Chinese calligraphy and writing upon Egyptian papyrus, and a different writing practice and technology. The material variation upon the (hard) tablet now varies into the soft sheet of parchment, papyrus, paper, which is flexible, rollable into a scroll, and usually of a highly uniform light colored surface. The stylus, too, changes: while retaining a stiff handle, the tip becomes a brush, or a quill or pen-with-slot, each using some liquid ink or paint to make the "inscription." But perhaps this is now not so much an inscription as a figure or a letter? So, a "soft" tablet, with a flexible brush-pen, and a new set of bodily skills to be attained in order to again attain a ready-to-hand transparency. Here the analog bodily activity is more like "painting" or "penship" praxis than the former sculpting or pottery movements. It is still writing-by-hand, indeed writing with one hand.

However, now with two variations upon writing-by-hand, we can note something subtler in the change from "hard" to "soft" technologies of writing. The bodily activity in the first variation called for a more muscular action, more effort. Similarly, even the clay before baking poses some experienced resistance to the stylus, and if etched onto turtle shell or stone, even more. Here a bodily material-tablet material set of accommodations and resistances points to a human-artifact interrelationality. The scribe-tablet interactively allows the product to become what it ultimately becomes. And here emerges an interesting feature: while clay, stone, and shell *do not determine* what can be inscribed, they are relatively easier to make straighter, rather than curved inscriptions onto hard material. This is what I have previously called an "inclination," which is found in the human-artifact interaction. If one looks at cuneiform tablets and many of the hard tablet-analogs, there is evidence of a dominance of straight inscriptions over curved ones. This proceeds even into Roman times, particularly with respect to lettering on stone. Or, note the linearity of Roman numerals. Contrarily, with calligraphy and penship products, curves often predominate, and a sort of curvilinear playfulness becomes possible. These trajectories may be noted in many ancient styles of writing: Persian and Cyrillic scripts that emphasize this curvilinear form, in great contrast to cuneiform or the Pakistani protoscript. Before leaving this variational shift and example, allow another "Heideggerian" moment: imagine a cuneiform inscriber looking at a later calligrapher and decrying the lazy ease with which the calligrapher almost haphazardly and so quickly produces the calligraphic result. It is "too easy," it detracts from the hard-won bodily effort of the cuneiform inscription, and is "too fast," not allowing the tarrying of reflection before making the next mark. But, note too, that cuneiform has effectively disappeared but contemporary calligraphy survives!

Now, with the millennia-long leaps being made in my examples, turn to the next change in writing technologies: the keyboard. Of course, pens, which lie in the trajectory of "soft" writing technologies, change over time as well. The ink-dipped quill pen of Revolutionary War times gave way to the reservoir ink pens that Heidegger himself used in the early twentieth century (as evidenced photographically in Adam Sharr's book *Heidegger's Hut*, referred to in Chapter 5). But even reservoir pens cut down extraneous times spent dipping, and they allowed much longer and more quickly written results to occur. While Heidegger remained loyal to the pen, the typewriter had already become the writing technology of choice for many, indeed for most literary composers of the twentieth century.

In the ancient examples, whether hard or soft writing technologies, the history is spotty at best. I am unaware of any self-reflective writing about writing until modernity, when it becomes common. The typewriter, however, has a very detailed history, and one that carries with it many implications for both the history and philosophy of technology. Invented in the nineteenth century (the first American patent went to a Pennsylvanian, Christopher Sholes, in 1867), the intended design-use was to aid the writing of myopic or even blind people. Of two of the best-known early users of the typewriter, Samuel Clemens (Mark Twain) and Friedrich Nietzsche, the latter was, in fact, myopic. Both praised the typewriter, with Nietzsche particularly extolling it as an instrument good for composing poetry.[4] As with many examples in the history of technology, designer intent did not determine dominant use. Within a very short time, the dominant use of the typewriter became that of a business-centered writing practice—letters, records, copies, documents—and the "typewriters" were dominantly women who replaced the male secretariat, which felt that typewriters "deskilled" them from their pen*man*ship.[5] By the time Heidegger had proclaimed using the pen as the "authentic" mode of writing, most other well-known writers, particularly of the early twentieth century, had adopted the typewriter as the favored writing technology. Thus, in addition to Twain and Nietzsche, Ernest Hemingway, William Faulkner, Isaac Bashevis Singer, and Hermann Hesse, with scores of others, praised the typewriter. One commentator on Hemingway and the typewriter says, "At some point my obsession with Ernest Hemingway led to a love and appreciation of typewriters. Nothing is *more pure than a typed letter on a mechanical typewriter*" (emphasis added).[6]

It is now appropriate to return to the abbreviated phenomenology of writing technologies. In the case of the typewriter, the tablet variable remains "soft," a sheet of paper, but now not laid before the handwriter but rather rolling through the platen of the machine. The instrument,

however, is more drastically changed: it is a keyboard, at first mechanically, then later electrically or electronically connected to—at first mechanical keys, later the rollerball device, and later still electronic printing devices. The bodily skills still had to be acquired (in my case, from a required typing class in high school), and with clearly recognizably different skill-results. These could run from single finger "hunt and peck" styles, through normal speed typing, to superspeed typing. But, note, while this is still writing by hand, it is now two-handed!

The analog praxis is that of playing a musical keyboard—and this turns out to have been historically important as well. One reason for the successful and rapid gender shift in the secretariat was that proper young ladies were often *pre-skilled* for a typing embodiment, due to the at-home practices which called for them to play and practice, often at a piano. I have often reflected upon this shift in bodily action through the keyboard. My summers in Vermont include attending a regular faculty concert at the Kinhaven Music Camp, which sometimes has summer resident musicians from Stony Brook University's renowned performance faculty. To watch a live performance at the piano is to see the player, highly animated, using with amazing rapidity two hands to strike the keys, feet to play the pedals, and whole bodies in engaged motion. Moreover, the player reads a score with two sets of five-lined "text," bass and treble clefs. This virtuosity has always struck me as a choice example of a high level and skilled phenomenological embodiment. Clearly, sitting at the keyboard of a mechanical typewriter does not come very close, although the superspeed typist's fingers fly and the platen is returned rapidly as the letter or document is typed. Clearly, this process is much faster than any pen process such that "thinking-to-written" time is much less than with the pen. But, unlike the previous long and slow histories of writing technologies, the age of the typewriter was very short: even if one includes the mechanical to electrical shift, it was no more than a century.

Enter now the keyboard, reconfigured and embedded in computer programs, word processing to visualizations to the Internet. Once again, if we begin with the tablet analog, we now have the *visual display screen.* I shall claim that while one may find limited multistability to tablets, there is a much more drastic multistability to the visual display screen. In composition mode, the screen somewhat mimics the paper sheet—it appears opaque (but lighted), flat and two-dimensional, and what is typed appears in real time as per the electronic typewriter. But the screen in this case has multiple capacities—switch to computer game playing: now the screen takes on a quasi-transparency into virtual or "cyberspace," with the objects within the play field, appearing three-dimensional and in dynamic

motion. One sees "through" the screen rather than seeing "on" the screen. Add multiplayer capacity: in the case of the opaque mode, reading and writing (from the previous keyboard mode), now becomes alternating, with my messages going out, but the others' coming in as in chats, blogs, tweets, and the like, or real-time email. Reading/writing alternate; switch to DVDs on the screen, and the tablet becomes cinema. I could go on extensively, but here I am merely pointing to the high degree of multistability the visual display screen has, which is very different from any of the previous writing technologies. The same applies to *multitasking*, which is the productive version of multistability. The "station" where the user engages the now-computerized system can today reach around the world, engage in many different activities, and yet remain aware of his or her bodily locatedness as well. As for composing by word processing, by the time I left the dean's office in 1990, 85 percent of the large English faculty composed by word processing, according to a poll I undertook.

It remains the case that bodily skills, acquired, honed, perfected, are called for here as well. I am all too aware that my youngest son far exceeds me in such electronic and computer skills, and it is him that I call for help more often than he would like. But, I have now abandoned doing books in BC (before computers) mode entirely; I find that all my composition today is produced electronically. Indeed, I can no longer type easily at all on a mechanical typewriter—it is simply too frustrating and slow, let alone not allowing me to click a few keys and break off to Google something I need to know.

Back to Heidegger: I have clearly been trying to show that to valorize *one* preferred style or technology of writing is to be phenomenologically arbitrary. My suspicion is that as is common among musicians, a favorite type or even favorite particular instrument can be preferred by an individual—and this is understandable. It is rare for a musician to attain virtuosity on a large variety of different instruments, in part precisely because it takes so much time, practice, and skill acquisition to reach transparent virtuosity that within this narrow range it is certainly genuine to extol the favored skills-plus-instrument of the case. It is different, of course, to secondarily appreciate or admire exactly this human-instrument interrelation as an observer or auditor, as in my Kinhaven example. But, phenomenologically, it seems clear to me that there can be virtuosity—and authenticity—in each of the variations of human-writing technologies I have examined. Yet, these also display different patterns of selectivity, of amplification and reduction, such that not everything can be expressed as well or at all, in each variant. One size does not fit all.

Where does this leave Heidegger? In what follows, I briefly summarize my critique of his philosophy of technology. While I sometimes refer back to items from the previous chapters, I also focus upon certain contemporary technologies, technologies that have come into being since his time:

Is Heidegger's philosophy of technology dated? I have suggested that, in some respects, this is the case. The earlier chapters argue that the model of Technology often animating Heidegger's notion of *modern* technology is an "industrial" one. The taking of nature as a resource well, to be challenged and its energy extracted by technological means, reflects the notions of the late-nineteenth- and early-twentieth-century megatechnologies one usually characterizes as industrial. These were cast in terms of humans-over-nature, Promethean-style technofantasies. These are also embedded in the cultural notion that *control* is a major factor. Were technologies to be anthropological-instrumental, control might be thought to reside with the human practitioner. But, with the postwar shift, control was thought to be autonomous through the technology. Frankenstein technofantasies are simply inverted Promethean forms. Neither is the case: humans and technologies are, I argue, *interrelational* and mutually co-constitutive. Even with the pen, I "use" the pen, but the pen with its material selectivities "uses" me as well. And, while industrial technologies continue to be used—and sometimes are even extended in use—I have argued both that many technologies do not fit this pattern; neither do many new contemporary technologies fit this pattern, nor does a "modern divide" fit well into the analysis. Mining is surely an example that could fit well into the Heideggerian paradigm of the *Gestell*, yet the first now widely provable atmospheric impact of lead-atmosphere pollution originating from mining processes, only recently measurable, goes back to a very large spike in lead pollution associated with the peak of Roman development! This, then, was hardly a "modern" technology.

Earlier, I pointed to musical instruments as nonfitting technologies. Woodwinds play only when the "wind"—here breath—blows (as with Heidegger's old windmills, which he takes as "good"), and that whether or not the flute is a 40,000-year-old vulture-wing flute or a "modern" keyed metal flute, the practice remains largely continuous. It simply seems perverse to apply *Bestand*, *Gestell*, and so forth analysis to this class of "technologies." But one could also do the same with respect to many contemporary *medical* technologies. In 2006 I underwent an angioplasty procedure: first there were

imaging technologies that showed blockage to several of my heart arteries; then, using a microsurgical procedure with a multipurpose miniature tube (with lighting and imaging functions, manipulating tool functions, and more), two of my arteries were treated with a balloon procedure to clear plaque, and one was given a stent. This microprocedure was minimally uncomfortable; I was awake through its entirety, and I could see on the display screens what the surgeon was seeing, copies of which I now have in my collection of medical images. Imaging technologies aiding laparoscopic ones, at least in the developed world, have led to very significantly longer life spans even when compared to the middle of the twentieth century. I would argue that this set of practices no better falls under a Heideggerian analysis than do the musical instruments.

A look at a general *convergence phenomenon* beginning in the late twentieth century and continuing in the twenty-first contrasts with the trajectory toward the mega-machine industrial technologies of the early twentieth century. I refer to this period's focus upon microprocesses that include *nano-*, *info-*, *bio-*, and *genetic* technologies. In each case one is dealing with new entities, discovered and manipulated only in the last few decades. Obviously, these contemporary technologies pose both dangers and opportunities and call for careful philosophical reflection thereon. And while it will also doubtless be the case that some will continue to apply a dystopian, metaphysical outlook concerning these technologies (while others take highly utopian views as with transhumanists and some posthumanists), I would argue only a detailed concrete set of considerations will adequately be able to discern the impacts of these technologies.

Then, look at technologies and contemporary environmental issues. I refer here to global warming and sources of energy. Heidegger disliked hydroelectric dams, and doubtless he would have included coal-, oil-, and gas-powered hydrocarbon electric plants as well. But he liked old windmills. In the contemporary world, alternative energy sources constitute a major field of research and development. Among the increasing variety of such sources (solar, wave power, and so forth), wind has again emerged as a new technology. Only now the "wind farms" are powered by very large, computerized and interconnected windmills. These, in turn, need to be fed into "smart" grid systems to transmit electricity. I doubt Heidegger would have liked these and would instead argue that contemporary windmills are examples of standing-reserve machines by virtue of size, complexity, and systems interconnectedness. This, I argue, is

only part of the change involved from the old windmills. New windmills are actually *hybrids* with respect to Heideggerian categories. They are "premodern" with respect to turning only when the wind blows, but "modern" with respect to size, complexity, and interconnectedness. They are also "clean" and use the energies of nature "renewably." What also has changed with the old versus the new windmills is the *set of assignments* to which the windmills belong. The old windmills, whether used to grind grain, saw wood, or run a set of belt-driven tools, belonged to the users, who were farmers, peasants, and even urbanites who needed the flour, the boards, or the products produced. It is that craft-world that has largely disappeared, but the electricity that the new windmills produce ends up running the interconnections of a much more urban, Internet-connected, electric-appliance, and soon electric-car world. It is clear which world Heidegger preferred, and this is the basis for his technology evaluation. Interestingly, he did eventually have his own hut electrified, and in late life he was known to take time out to watch soccer matches on television!

I close with one more telling example. Heidegger, effectively, was prescient concerning some aspects of "cyberspace," albeit before the global Internet and the multiplication of screen spaces:

> All distances in space and time are shrinking. Man now reaches overnight, by plane, places which formerly took weeks and months of travel. He now reaches instant information, by radio, of events which he formerly learned about only years later, if at all. The germination and growth of plants, which remained hidden throughout the seasons, is now exhibited publicly in a minute, on film. Distant sites of the most ancient cultures are shown on film as if they stood this very moment amidst today's street traffic. Moreover, the film attests to what it shows by presenting also the camera and its operators at work. The peak of the abolition of every possibility of remoteness is reached by television, which will soon pervade and dominate the whole machinery of communication.[7]

Given that today radio, film, and television have been so thoroughly sedimented in our world—to which one now adds the pervasive additions of cell phones, iPods, and the Internet—one might be tempted to say: so what? What is wrong with *opening* the world to quickly mediated distance? To the wonders of the organic world? To other cultures? Is Heidegger nostalgic for remoteness, the hidden, the unknown? And the

monocultural? Here, once again, his tone is clearly dystopian, with no small indication of fear for a creeping autonomous technology—such as the domination of television—about to overwhelm us. To counter this worry, or gloom, I propose a deeper, phenomenological analysis of such media and audiovisual imaging.

Heidegger's description of shrinking distances, noted earlier, remains a "lite" phenomenology. There is, indeed, an immediacy to listening to the radio or watching film or TV. The medium presents an audiovisual presentation, and the recipient usually is in an "audience" bodily position: sitting listening, sitting watching, and if visual, attending to the screen or "station." Of course, the media Heidegger describes are not interactive, so the more contemporary interactivity is not yet a normal part of the situation. It is this often-inactional immediacy that focuses his description. However, there is also something of an "irreal" or "virtual" quality as well, which Heidegger does not note. The analog experience is that of a (reduced) theater experience—one suspends most bodily and active movement to be given over to the theater-position in these cases. Moreover, the audiovisual presentation is not a *whole body* or plenary sensory presentation; it is reduced to the audiovisual and lacks tactility, kinesthetic, and the other sensory dimensions presented in active ordinary life. What is immediate, space-time "shrunken," is only one facet of media experience. It is the near of *near-distance.* But there remains distance, albeit now a cyber-distance. If it is a film of one's lover, friend, or even dead parent, the very untouchability of the other is also distant-in-presence. This was a common experience at the beginning of photography, which was frequently described as "deathlike."[8]

Return now to historical variations: The nineteenth-century predecessor of the DVD or TV was probably the *stereoscope.* The most popular one was invented by Oliver Wendell Holmes and Joseph Bates in 1862. This was an early 3-D optical instrument that had a binocular viewing device (the analog today is 3-D glasses) that could slide for focus on a wooden runner, attached to a holder for a double photograph on a card. The viewer could thus see ancient abbeys, the pyramids, tombs, or the "Seven Wonders of the World" through the stereoscope. These sets and devices sold millions, with advertising that told the viewer that he or she could be present anywhere in the world, instantly, visually.

When Heidegger claimed, "The germination and growth of plants, which remained hidden throughout the seasons, is now exhibited publicly in a minute," it is almost as if he were accusing the viewer of voyeurism! But this capacity of imaging technologies has many other multistable possibilities, one of which is to produce knowledge of previously unknown

phenomena. Take time-lapse photography as an example. Eadweard Muybridge began his long series of motion studies with just such a high-speed photographic setup. One of his most famous and often reproduced series involved horses in several gaits—his was the first imaging of the four-feet-off-the-ground phenomenon that proved that horses galloped and trotted with feet off the ground.[9] Similarly, if one returned to the time-lapse photography of sunflowers, one can see the heliotropy of following-the-sun, a previously unknown phenomenon. One could add an indefinitely large set of examples here; in the case of contemporary science imaging, one can now image phenomena all along the electromagnetic spectrum, as dramatic astronomical and medical imaging show. From my perspective, such examples, which vary from ordinary, or from even beyond human sensory capacities, are instrumentally mediated phenomenological variations from which knowledge, especially scientific knowledge, is built.[10]

Heidegger as philosopher dealt with much more than the question of technology. I have not addressed that legacy here, but have focused upon his thought concerning technology. Many Heidegger interpreters claim that while, in his early period, he developed his own style of phenomenology, and he clearly claimed it as the way into a fundamental ontology. Later, interpreters argue that he more and more left phenomenology—and insofar as this seems to be the case concerning a phenomenology of technology, it is something of a pity that he did so. Similarly, many philosophers of technology—including several well-known Germans (including Walther Zimmerli and Bernhardt Irrgang, and I count myself among them in this opinion)—hold that his earlier thinking on technology, including its prelude in *Being and Time*, remains superior to his later thinking, which subsumes Technology under its metaphysical "essence." So, as those of us who reflect upon technologies, it is quite apparent that today's developments continue to be rapid, to be diverse, and to—in many ways—diversify from previous technologies. Philosophies of technology need to renew themselves constantly, just as the technologies themselves change.

Blank Page

Notes

Introduction: Situating Heidegger and the Philosophy of Technology

1. See Thomas Hughes, *Human Built World: How to Think About Technology and Culture* (Chicago: University of Chicago Press, 2004), and David Nye, *Technology Matters: Questions to Live With* (Cambridge, Mass.: MIT Press, 2006).
2. "Scientist," *Oxford English Dictionary*.
3. V. R. Berghahn, *Modern Germany: Society, Economy, and Politics in the Twentieth Century* (Cambridge: Cambridge University Press, 1982), 1.
4. Michael E. Zimmerman, *Heidegger's Confrontation with Modernity: Technology, Politics, Art* (Bloomington: Indiana University Press, 1990), 7.
5. http://en.wikipedia.org/wiki/Futurism.
6. Zimmerman, *Heidegger's Confrontation with Modernity*, 47.
7. Ibid., 52.
8. Ibid., 53.
9. Ibid., 8.
10. Ibid., 14.
11. Ibid., 28.
12. Ibid., 41.
13. Simon Taylor, *The Rise of Hitler* (New York: Universe Books, 1983), p.106.
14. Zimmerman, *Heidegger's Confrontation with Modernity*, 65.
15. Ibid., 41.
16. Ibid., 90.
17. See David Hounshell, *From the American System to Mass Production* (Baltimore: Johns Hopkins University Press, 1985).
18. *Heidegger's Confrontation with Modernity*, 17.

19. Hans Sluga's *Heidegger's Crisis: Philosophy and Politics in Nazi Germany* (Cambridge, Mass.: Harvard University Press, 1993) undertakes a thorough analysis of German academic philosophy during the Nazi era. Heidegger, as he points out, was the best-known "survivor" of this era, but most of the profession supported National Socialism (with the very notable exceptions of those who emigrated elsewhere—some of the most notable names in twentieth-century philosophy). As Sluga points out, the Nazis were in a hurry to have university rectors be party members, and three were then prominent philosophers: Alfred Baumler (Berlin), Ernst Kriek (Frankfurt), and Martin Heidegger (Freiburg). As Sluga notes, it was a very fast set of elections: "Two weeks after Baumler and four days after Kriek, it was Heidegger's turn to enact his political commitment in public. He did so . . . on the occasion of his own rectorial inauguration" (135).

20. Ibid., 239.

21. Ibid.

22. Cited by Elzbieta Ettinger, *Hannah Arendt Martin Heidegger* (New Haven: Yale University Press, 1995), 92.

23. Sluga, *Heidegger's Crisis*, 240.

24. Martin Heidegger, "The Question Concerning Technology," in *The Question Concerning Technology and Other Essays*, trans. W. Lovitt (New York: Harper & Row, 1969), 4.

25. Ibid.

26. Here I will cite a few examples of how contemporary philosophers of technology have derived *non-neutrality* from more concrete examples of technologies themselves. One of the best-known examples is Langdon Winner's "Do Artifacts Have Politics?" in which he discussed the Robert Moses designs of Long Island Parkway bridges so that buses and other public transportation could not use these (in *The Whale and the Reactor*, 1986). Albert Borgmann's version argues for a difference between "focal practice" or engaged technologies such as wood-burning stoves, and "device paradigm" objects, which do not directly engage humans, such as automatic central heating (in *Technology and the Character of Contemporary Life,* 1984). In my case, I have argued that all technologies have amplifying or enhancing as well as reducing or dampening aspects in use and are thus non-neutral (in *Technics and Praxis,* 1979).

27. "The Question Concerning Technology," 5.

28. Ibid., 12–14.

29. Martin Heidegger, *Vorträge und Aufsätze*, 3rd ed. (Pfullingen: Gunter Niske, 1967), 19. 117–134.

30. Sluga, *Heidegger's Crisis*, 243. Among those who emigrated to the United States and who continued to be exponents of German philosophy were Rudolph Carnap, Hans Reichenbach, and Karl Hempel—all exponents of an "analytic" and positivist style of philosophy of science (see Chapter 5).

31. Whereas Sluga concentrates upon philosophy during the Nazi era, Lewis Coser examined a much broader and interdisciplinary set of emigrations in *Refugee Scholars in America* (New Haven: Yale University Press, 1984.)

32. Cited by Wolfgang Schirmacher, *Technik und Gelassenheit: Zeitcritik nach Heidegger* (Freiburg: Karl Alber Verlag, 1983), 25.

33. The most extensive history of philosophy of technology is Carl Mitcham's *Thinking Through Technology* (Chicago: University of Chicago Press, 1994). Hans Achterhuis's *American Philosophy of Technology: The Empirical Turn* (Bloomington: Indiana University Press, 2001; see Chapter 6) is a more specific examination of American philosophers of technology.

34. See Larry Hickman, *John Dewey's Pragmatic Technology* (Bloomington: Indiana University Press, 1990).

35. Andrew Feenberg has recently added to the Heidegger–critical theory discussion in his *Heidegger and Marcuse* (London: Routledge, 2005).

36. My own genre reviews include "Philosophy of Technology: 1975–1995," *Techne*, 1995, and "Has the Philosophy of Technology Arrived? A State-of-the-art Review," *Philosophy of Science* 71 (2004): 117–134.

37. Paul Forman, "The Primacy of Science in Modernity, of Technology in Postmodernity, and of Ideology in the History of Technology," *History and Technology* 23, nos. 1–2 (March 2007).

38. Hans Achterhuis, *American Philosophy of Technology: The Empirical Turn,* trans. Robert Crease (Bloomington: Indiana University Press, 2001), 6–8.

39. Ibid.

1. Heidegger's Philosophy of Technology

1. Quotations from "The Question Concerning Technology" are from *Martin Heidegger: Basic Writings*, edited by David Krell (New York: Harper & Row, 1977), and will be listed in the text simply as QT, followed by page numbers. Similarly, those quotations from *Being and Time* are from the John Macquarrie and Edward Robinson translation (New York: Harper & Row, 1962) and are listed in the text here as BT, followed by page numbers.

2. The Historical-Ontological Priority of Technology Over Science

1. Martin Heidegger, "The Question Concerning Technology," in *Basic Writings*, trans. David Krell (New York: Harper & Row, 1977), 296.

2. Ibid., 302–303.

3. Ibid., 304.

4. Ibid., 296.

5. Ibid.

6. Ibid., 303.

7. Ibid., 288: "The current conception of technology, according to which it is a means and a human activity, can therefore be called the instrumental and anthropological definition of technology."

8. Ibid., 294.

9. Ibid.

10. Ibid.

11. Lynn White Jr., *Medieval Technology and Social Change* (New York: Oxford University Press, 1962), 84.

12. Ibid., 98.
13. Ibid., 124.
14. Ibid., 125.
15. Lynn White Jr., "Cultural Climates and Technological Advance in the Middle Ages," *Viator* 2 (1971): 171.
16. Ibid., 173.
17. Ibid., 198: "In a separate building outside Hagia Sophia, Justinian placed a clepsydra and sundials, but clocks were never permitted within or on Eastern churches; to place them there would have contaminated eternity with time. As soon, however, as the mechanical clock was invented in the West, it quickly spread not only to the towers of Latin churches but also to their interiors."
18. Ibid., 199.
19. Ibid., 180.
20. A popular discussion of these techniques may be found in *National Geographic* 14, no. 6 (December 1974): 732–781.
21. I call these existential relations. See Chapter 1 of my book *Technics and Praxis* (Dordrecht: Reidel, 1979).

3. Deromanticizing Heidegger

1. Martin Heidegger, *Poetry, Language, Thought*, trans. Albert Hofstadter (New York: Harper & Row, 1971), 42.
2. Ibid., 42–43.
3. J. Donald Hughes, *Ecology in Ancient Civilizations* (Albuquerque: University of New Mexico Press, 1975), 1.
4. Ibid.
5. Martin Heidegger, *Basic Writings*, ed. David Farrell Krell (New York: Harper & Row, 1977), 315.
6. Martin Heidegger, *Parmenides* (Frankfurt: Klostermann, 1982), 118–119. Translation by Michael Heim in *Electric Language* (New Haven: Yale University Press, 1987).
7. Heidegger, *Basic Writings*, 297.
8. Heidegger, *Parmenides*, 118–119.
9. Heidegger, *Poetry, Language, Thought*, 152–153.
10. Ibid., 152.
11. Ibid., 152–153.
12. Ibid., 153.
13. Ibid., 158–159.
14. Heidegger, *Basic Writings*, 307.
15. Ibid., 315.

Interlude: The Earth Inherited

1. Marco Cianchi, *Leonardo da Vinci's Machines* (Florence: Becocci Editore, 1988), 17–18.
2. David Cassiday, a historian, is now writing a definitive history of Heisenberg during the war years. He provided me with copies of previously classified

materials authored by Heisenberg, including correspondence and the *Probleme der Kernphysik* (Berlin: Schriften der Deutschen Akademie der Luftfahrforschung, 1943).

4. Was Heidegger Prescient Concerning Technoscience?

1. Trish Glazebrook, *Heidegger's Philosophy of Science* (New York: Fordham University Press, 1999), 1.
2. Obituary of Willard Van Orman Quine, *New York Times*, December 29, 2000.
3. Cathryn Carson, "Science as Instrumental Reason: Heidegger, Habermas, Heisenberg," *Continental Philosophy Review* 42, no. 4 (2010): 483–509.
4. Martin Heidegger, "Age of the World Picture," *Science and the Quest for Reality* (New York: New York University Press, 1997), 72 and 157.
5. Michael Friedman, "Overcoming Metaphysics: Carnap and Heidegger," in *Origins of Logical Empiricism*, ed. Ronald N. Giere and Alan W. Richardson (Minneapolis: University of Minnesota Press, 1996), 47.
6. Ibid., 46–47.
7. Ibid., 51.
8. Ibid., 49.
9. Ibid., 53.
10. Ibid.
11. Martin Heidegger, *The Basic Problems of Phenomenology* (Bloomington: Indiana University Press, 1982), 320.
12. Heidegger, "Age of the World Picture," 72.
13. Martin Heidegger, *Contributions to Philosophy* (Bloomington: Indiana University Press, 1999), 102.
14. Ibid., 101.
15. Ibid.
16. Heidegger, "Age of the World Picture," 72.
17. Ibid.
18. Heidegger, *Contributions to Philosophy*, 101.
19. Ibid., 113.
20. Robert Heilbron, *The Sun in the Church* (Cambridge, Mass.: Harvard University Press, 2001).
21. Heidegger, "Age of the World Picture," 73.
22. Heidegger, *Contributions to Philosophy*, 113.
23. Heidegger, "Age of the World Picture," 72.
24. Ibid., 77.
25. Martin Heidegger, "Science and Reflection," in *The Question Concerning Technology* (New York: Harper & Row, 1977), 161.
26. Ibid., 169.
27. Ibid., 172.
28. Ibid.
29. Heidegger, "Age of the World Picture," 72.

30. Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962), 119–121.
31. Heidegger, "Age of the World Picture," 72.
32. Ibid.
33. Ibid., 76.
34. Ibid., 77.
35. Heidegger, *Contributions to Philosophy*, 101.
36. Ibid., 108.
37. Ibid., 111.
38. Heidegger, "Science and Reflection," 173.
39. Ibid.
40. Heidegger, "Question Concerning Technology," 23.
41. Ibid.
42. Ibid., 14.
43. Ibid., 13.
44. Ibid.
45. Ibid., 14.
46. Ibid.,17.
47. Ibid.
48. Ibid.
49. Ibid., 23.
50. Carson, "Science as Instrumental Reason," 490.
51. Ibid., 492.
52. Manuel de Landa, *War in the Age of Intelligent Machines* (Cambridge, Mass.: Zone Books, 1992), 40.

5. Heidegger's Technologies: One Size Fits All

1. Mario Bunge, "Five Buds of Technophilosophy," *Technology in Society* 1 (1979): 67–74.
2. "Philosophy of Technology," *Stanford Encyclopedia of Philosophy* (2009).
3. Martin Heidegger, *Parmenides* (Frankfurt: Klostermann, 1982), 118–119.
4. Ibid.
5. Elzbieta Ettinger, *Hannah Arendt Martin Heidegger* (New Haven: Yale University Press, 1995), 89.
6. Raymond Geuss, *Politics and Imagination* (Princeton: Princeton University Press, 2010), 142–150. This chapter, originally a review of Hans Dieter Zimmerman, *Martin Heidegger und Fritz Heidegger: Philosophie und Fastnacht* (Munich: Beck, 2005), gives a full account of how Fritz Heidegger was the typist for virtually all of Martin Heidegger's published texts. Apparently Fritz also made suggestions to Martin concerning clarification, sentence structure, and other copyediting points.
7. Trevor Pinch and Karin Bijsterveld, "Breaches and Boundaries in the Reception of New Technology in Music," *Technology and Culture* 44, no. 3 (2003): 536–539.

8. Ibid., 538.

9. *New York Times*, December 3, 2009. I found this vignette personally irresistible because I wrote my first book, on Paul Ricoeur, on exactly the same model Olivetti during the "Events of May" in Paris in 1968.

6. Concluding Postphenomenological Postscript: Writing Technologies

1. Over the years, much of my frustration with Heidegger's analysis of technologies arose from *doing* phenomenologies of many types of technologies. While in the bulk of the text my own analyses are in the background or indirect, here I am drawing from some of my own analyses to contrast with Heidegger. A much more complete historico-phenomenology of writing technologies can be found in "IT Clouds and Cyberspace-time," forthcoming in my book *Embodied Technics*. Thus, the pattern in this last chapter also changes to one that draws from similar examples and relies in more contemporary e-referencing—beyond Heidegger's time.

2. Frank Hole, "Stone Age Bedding by the Sea of Galilee," *Proceedings of the National Academy of Sciences* 101 (May 2004): 7207–7208.

3. For a more complete description, see my essay "More Material Hermeneutics," *Yearbook for Advanced Study on Science, Technology and Society* (Munich: Profil Verlag, 2005), 341–350.

4. Friedrich Kittler, "The Mechanized Philosopher," in *Looking After Nietzsche*, ed. Laurence A. Rickels (Albany: SUNY Press, 1990), 195.

5. Friedrich Kittler, *Gramophone Film Typewriter* (Stanford: Stanford University Press, 1999). Kittler points out that the term "typewriter" first applied to the women who typed. Similarly, Peter Galison points out that the first use of "computers" came from physics and astronomy, referring to the women who did the data analysis in these disciplines. See Galison's *Image and Logic* (Chicago: University of Chicago Press, 1997).

6. www.acontinuouslean.com/2009/03/18/flickr-find-writing-machines.

7. Martin Heidegger, *Vorträge und Aufsätze, II*, 3rd ed. (Pfullingen: Gunter Neske, 1967, 37/165 (translation by M. Zimmerman),

8. See Don Ihde, *Bodies in Technology* (Minneapolis: University of Minnesota Press, 2002) Many of the essays are analyses of virtual reality technologies and the role of human embodiment therein.

9. Mongol archers learned how to time the firing of their arrows at a gallop at just the temporal point when the four-feet-off-the-ground moment occurred, a pause without vibration. Whether they knew from kinesthesia-tactility that the horse's feet were off the ground is unknown.

10. My *Expanding Hermeneutics: Visualism in Science* (Evanston, Ill.: Northwestern University Press, 1998) analyzes the ways in which the sciences have developed a visualist hermeneutics precisely for the construction of scientific knowledge.

Blank Page

Name Index

Blank Page

Subject Index

Blank Page

Perspectives in Continental Philosophy

John D. Caputo, series editor

John D. Caputo, ed., *Deconstruction in a Nutshell: A Conversation with Jacques Derrida.*

Michael Strawser, *Both/And: Reading Kierkegaard—From Irony to Edification.*

Michael D. Barber, *Ethical Hermeneutics: Rationality in Enrique Dussel's Philosophy of Liberation.*

James H. Olthuis, ed., *Knowing* Other-*wise: Philosophy at the Threshold of Spirituality.*

James Swindal, *Reflection Revisited: Jürgen Habermas's Discursive Theory of Truth.*

Richard Kearney, *Poetics of Imagining: Modern and Postmodern.* Second edition.

Thomas W. Busch, *Circulating Being: From Embodiment to Incorporation—Essays on Late Existentialism.*

Edith Wyschogrod, *Emmanuel Levinas: The Problem of Ethical Metaphysics.* Second edition.

Francis J. Ambrosio, ed., *The Question of Christian Philosophy Today.*

Jeffrey Bloechl, ed., *The Face of the Other and the Trace of God: Essays on the Philosophy of Emmanuel Levinas.*

Ilse N. Bulhof and Laurens ten Kate, eds., *Flight of the Gods: Philosophical Perspectives on Negative Theology.*

Trish Glazebrook, *Heidegger's Philosophy of Science.*

Kevin Hart, *The Trespass of the Sign: Deconstruction, Theology, and Philosophy.*

Mark C. Taylor, *Journeys to Selfhood: Hegel and Kierkegaard.* Second edition.

Dominique Janicaud, Jean-François Courtine, Jean-Louis Chrétien, Michel Henry, Jean-Luc Marion, and Paul Ricœur, *Phenomenology and the "Theological Turn": The French Debate.*

Karl Jaspers, *The Question of German Guilt.* Introduction by Joseph W. Koterski, S.J.

Jean-Luc Marion, *The Idol and Distance: Five Studies.* Translated with an introduction by Thomas A. Carlson.

Jeffrey Dudiak, *The Intrigue of Ethics: A Reading of the Idea of Discourse in the Thought of Emmanuel Levinas.*

Robyn Horner, *Rethinking God as Gift: Marion, Derrida, and the Limits of Phenomenology.*

Mark Dooley, *The Politics of Exodus: Søren Keirkegaard's Ethics of Responsibility.*

Merold Westphal, *Overcoming Onto-Theology: Toward a Postmodern Christian Faith.*

Edith Wyschogrod, Jean-Joseph Goux, and Eric Boynton, eds., *The Enigma of Gift and Sacrifice.*

Stanislas Breton, *The Word and the Cross.* Translated with an introduction by Jacquelyn Porter.

Jean-Luc Marion, *Prolegomena to Charity.* Translated by Stephen E. Lewis.

Peter H. Spader, *Scheler's Ethical Personalism: Its Logic, Development, and Promise.*

Jean-Louis Chrétien, *The Unforgettable and the Unhoped For.* Translated by Jeffrey Bloechl.

Don Cupitt, *Is Nothing Sacred? The Non-Realist Philosophy of Religion: Selected Essays.*

Jean-Luc Marion, *In Excess: Studies of Saturated Phenomena.* Translated by Robyn Horner and Vincent Berraud.

Phillip Goodchild, *Rethinking Philosophy of Religion: Approaches from Continental Philosophy.*

William J. Richardson, S.J., *Heidegger: Through Phenomenology to Thought.*

Jeffrey Andrew Barash, *Martin Heidegger and the Problem of Historical Meaning.*

Jean-Louis Chrétien, *Hand to Hand: Listening to the Work of Art.* Translated by Stephen E. Lewis.

Jean-Louis Chrétien, *The Call and the Response.* Translated with an introduction by Anne Davenport.

D. C. Schindler, *Han Urs von Balthasar and the Dramatic Structure of Truth: A Philosophical Investigation.*

Julian Wolfreys, ed., *Thinking Difference: Critics in Conversation.*

Allen Scult, *Being Jewish/Reading Heidegger: An Ontological Encounter.*

Richard Kearney, *Debates in Continental Philosophy: Conversations with Contemporary Thinkers.*

Jennifer Anna Gosetti-Ferencei, *Heidegger, Hölderlin, and the Subject of Poetic Language: Towards a New Poetics of Dasein.*

Jolita Pons, *Stealing a Gift: Kirkegaard's Pseudonyms and the Bible.*

Jean-Yves Lacoste, *Experience and the Absolute: Disputed Questions on the Humanity of Man.* Translated by Mark Raftery-Skehan.

Charles P. Bigger, *Between* Chora *and the Good: Metaphor's Metaphysical Neighborhood.*

Dominique Janicaud, *Phenomenology "Wide Open": After the French Debate.* Translated by Charles N. Cabral.

Ian Leask and Eoin Cassidy, eds., *Givenness and God: Questions of Jean-Luc Marion.*

Jacques Derrida, *Sovereignties in Question: The Poetics of Paul Celan.* Edited by Thomas Dutoit and Outi Pasanen.

William Desmond, *Is There a Sabbath for Thought? Between Religion and Philosophy.*

Bruce Ellis Benson and Norman Wirzba, eds., *The Phenomoenology of Prayer.*

S. Clark Buckner and Matthew Statler, eds., *Styles of Piety: Practicing Philosophy after the Death of God.*

Kevin Hart and Barbara Wall, eds., *The Experience of God: A Postmodern Response.*

John Panteleimon Manoussakis, *After God: Richard Kearney and the Religious Turn in Continental Philosophy.*

John Martis, *Philippe Lacoue-Labarthe: Representation and the Loss of the Subject.*

Jean-Luc Nancy, *The Ground of the Image.*

Edith Wyschogrod, *Crossover Queries: Dwelling with Negatives, Embodying Philosophy's Others.*

Gerald Bruns, *On the Anarchy of Poetry and Philosophy: A Guide for the Unruly.*

Brian Treanor, *Aspects of Alterity: Levinas, Marcel, and the Contemporary Debate.*

Simon Morgan Wortham, *Counter-Institutions: Jacques Derrida and the Question of the University.*

Leonard Lawlor, *The Implications of Immanence: Toward a New Concept of Life.*

Clayton Crockett, *Interstices of the Sublime: Theology and Psychoanalytic Theory.*

Bettina Bergo, Joseph Cohen, and Raphael Zagury-Orly, eds., *Judeities: Questions for Jacques Derrida.* Translated by Bettina Bergo and Michael B. Smith.

Jean-Luc Marion, *On the Ego and on God: Further Cartesian Questions.* Translated by Christina M. Gschwandtner.

Jean-Luc Nancy, *Philosophical Chronicles.* Translated by Franson Manjali.

Jean-Luc Nancy, *Dis-Enclosure: The Deconstruction of Christianity.* Translated by Bettina Bergo, Gabriel Malenfant, and Michael B. Smith.

Andrea Hurst, *Derrida Vis-à-vis Lacan: Interweaving Deconstruction and Psychoanalysis.*

Jean-Luc Nancy, *Noli me tangere: On the Raising of the Body.* Translated by Sarah Clift, Pascale-Anne Brault, and Michael Naas.

Jacques Derrida, *The Animal That Therefore I Am.* Edited by Marie-Louise Mallet, translated by David Wills.

Jean-Luc Marion, *The Visible and the Revealed.* Translated by Christina M. Gschwandtner and others.

Michel Henry, *Material Phenomenology.* Translated by Scott Davidson.

Jean-Luc Nancy, *Corpus.* Translated by Richard A. Rand.

Joshua Kates, *Fielding Derrida.*

Michael Naas, *Derrida From Now On.*

Shannon Sullivan and Dennis J. Schmidt, eds., *Difficulties of Ethical Life.*

Catherine Malabou, *What Should We Do with Our Brain?* Translated by Sebastian Rand, Introduction by Marc Jeannerod.

Claude Romano, *Event and World.* Translated by Shane Mackinlay.

Vanessa Lemm, *Nietzsche's Animal Philosophy: Culture, Politics, and the Animality of the Human Being.*

B. Keith Putt, ed., *Gazing Through a Prism Darkly: Reflections on Merold Westphal's Hermeneutical Epistemology.*

Eric Boynton and Martin Kavka, eds., *Saintly Influence: Edith Wyschogrod and the Possibilities of Philosophy of Religion.*

Shane Mackinlay, *Interpreting Excess: Jean-Luc Marion, Saturated Phenomena, and Hermeneutics.*

Kevin Hart and Michael A. Signer, eds., *The Exorbitant: Emmanuel Levinas Between Jews and Christians.*

Bruce Ellis Benson and Norman Wirzba, eds., *Words of Life: New Theological Turns in French Phenomenology.*

William Robert, *Trials: Of Antigone and Jesus.*

Brian Treanor and Henry Isaac Venema, eds., *A Passion for the Possible: Thinking with Paul Ricoeur.*

Kas Saghafi, *Apparitions—Of Derrida's Other.*