Instrumental Realism
The Interface between Philosophy of Science and Philosophy of Technology
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Preface

Nearing its sixth decade as a subdiscipline in philosophy, the philosophy of science clearly can be said to be established. Now at the end of its first decade as an organized subdiscipline, the philosophy of technology is still having birth pangs. This monograph, a primer really, enters an interstice between these two subspecializations with several purposes in mind:

First, not only is there a difference between middle age and youth in the two subdisciplines, but the two are only vaguely related. The philosophy of science, today becoming more diverse than it once was, nevertheless has had a strong lineage connection with the Anglo-American philosophies. Positivism—although of continental birth—became strong when it fled the continent and found itself in a favorable position in North American universities in the very beginnings of this subdiscipline. Later, other analytically inclined directions became revisionist but remained dominant. By contrast, the loose groupings of philosophers who were interested early in philosophy of technology in North America tended to come from Marxist, phenomenological, and theological backgrounds, as well as from the older versions of pragmatism. Thus, in addition to an age difference, there was also a parentage difference.

The split in parentage, of course, paralleled the much wider gap which for many years was seen to form at the English Channel and which covered topics much wider than either the philosophy of science or the philosophy of technology. Unfortunately, accompanying this division were also habits of reading. The earlier dominant traditions in the philosophy of science remained ignorant of—or worse, hostile to—the strands of philosophy of science in Euro-American philosophy. By contrast, much Euro-American philosophy often appeared either
uninterested in or hostile to science itself. This antipathy was, however, matched by strong interests in social concern for and critique of technological culture. Euro-American philosophy retained a strong interest in the ethical, social, and political implications of science and technology.

Underlying both these differences is the most profound difference of all. It is the difference of philosophical interpretation between what could be called the theory-prone and the praxis-prone approaches to both philosophy of science and philosophy of technology. But this difference is one which does not, at first, take the forefront.

One may thus speak of three gaps in the reading practices of those who should be interested in this interface between philosophy of science and philosophy of technology. The first gap is the one between philosophers who read primarily in one, and not the other specialization. The second gap crosses both fields in that some philosophers tend to read solely in either the Anglo- or Euro-American traditions without crossing style boundaries. And the third, even broader gap, lies between those who emphasize a theory-bias as opposed to a praxis-bias in the interpretation of the two specializations.

And while it certainly is true that in the last few years there have increasingly appeared both philosophers of science and philosophers of technology who might be called bi- or even multi-lingual with respect to the various tribal languages, there is not yet anything like a *lingua franca* (which, in science and technology probably would more likely be a *lingua inglesa*, anyway). Even as recently as the convergence of the “school” of instrumental realists whose books appeared from 1972 to 1987, there is little cross-citation between the first of the two reading-gap dimensions.

It is the third dimension of the reading gap which complicates the issue even further. This is the gap between what could roughly be called the theory-biased and the praxis-biased readings of both philosophy of science and philosophy of technology.

Philosophy of science, particularly pre-Kuhn, could have been characterized as dominantly located on one side of each of the three gap dimensions: it was interested almost solely in *science*—indeed, it remained largely blind to technology, even science’s technology; it was largely Anglo-American (at least, after the U.S. immigration of the positivists), and it was theory-oriented. By contrast, philosophy of technology, arising from Euro-American concerns, was more interested in technology as a social-political phenomenon. It often left (pure) science in the background, and it dealt with a practical, even applied focus.

This was so much the case that, in the early days of what was to become the Society for Philosophy and Technology, the leadership deliberately resisted any moves to form the loose-knitted group into

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anything like its counterpart, the Philosophy of Science Association. That tendency remains to a certain extent, and there is no organization which actually calls itself a philosophy of technology organization. There are, however, publications which claim that title, including several books published as introductions to the philosophy of technology, such as Frederick Ferré’s contribution to the Foundation Series—Foundations of the Philosophy of Technology (1988).

In 1979 I first entered this field with a book, *Technics and Praxis* (Reidel). It was the first volume in the Boston Philosophy of Science series dedicated explicitly to the philosophy of technology. The first half of that book focused upon what I called the *technological embodiment of science, its instrumentation*. Part of the thesis was that a crucial difference between modern and ancient science lay in its technology, its instrumentation. I still believe that is the case. I was, in effect, a philosopher of technology who, from the outset, was interested in the implications of technology for science. Moreover, coming from a tradition of praxis-interpretation I was also primarily concerned with epistemological and ontological issues. It was here that I saw the need to *interface* philosophy of science and philosophy of technology.

What I have set out to do responds to each of these facets of the philosophy of science/philosophy of technology interface. First, by underlining the roles of technology and its philosophy, I am seeking to elicit from neglected areas of the newer forms of philosophy of science a need to consider science’s technology. But I am also seeking to do this by introducing from neglected Euro-American sources those important themes which are relevant to the philosophies of science and technology. As a tactic, I have gone back into fairly recent history and have done a brief re-reading of Thomas Kuhn as the progenitor of a “revolution” in the philosophy of science. Such recognition of Kuhn as a revolutionary is not new—but I have added several aspects to this re-reading. First, I parallel Kuhn with a European contemporary, Michel Foucault, who did for the social or human sciences something which turns out to be strikingly similar to what Kuhn did for natural science.

But in this identification of a proximity, I will begin to make thematic a certain perspective upon both Kuhn and phenomenology. The theme in question is that of a praxis-perception model of interpretation. The tactic I am about to take eventually pairs two strict contemporaries, Michel Foucault and Thomas Kuhn, both of whom published their first revolutionary works in the early sixties (Foucault in 1961, Kuhn in 1962). In situating this particular “take” on both Kuhn and Foucault, I am quite aware that the praxis-perception model I am trying to elicit varies from some interpretations of both phenomenology and Kuhn.

Second, I background both Kuhn and Foucault with the emergence of a view of science centering around praxis and perception, in the
persons of Edmund Husserl and Maurice Merleau-Ponty. Lastly, I look at
the rise of philosophy of technology alongside these figures in the
thought of Martin Heidegger. It was the latter who raised the question
of technology with respect to science and thus opened the way to an
interface between the two subdisciplines.

I have focused the interstice between the two subdisciplines on the
need to make technology—instrumentation in particular—focal as the
point where science in its technological incarnation takes unique
temporary shape. I thus read the philosophy of science through its
need for and neglect of a concern for technology.

Finally and most thematically, I outline what can be called an
implicit praxis-perception model for both philosophy of science and
technology. This model is explicitly derived from certain directions
within phenomenology, but in a postfoundationalist guise. Here it
serves as an interpretive guide for re-reading the role of
instrumentation and technology in science.

To see more fully how praxis and perception play a crucial role in
the way a technologically embodied science discovers knowledge, I
have added to the recent histories of the philosophy of science and
technology a brief look at five North American philosophers who have
explicitly recognized this interstitial role: Hubert Dreyfus, as the
background pioneer; Patrick Heelan, representing the Euro-American
side; Robert Ackermann and Ian Hacking for the Anglo-American side;
and myself. Although the traditions from which the two sides draw
yield different results, it is clear that the roles of embodiment and
instrumentation become crucial for both the philosophy of science and
of technology.

As a tactic, I focused upon five authors whose books could be read
in parallel, noting how they converge and form areas of consensus
around the themes of what I call instrumental realism. However, this
emergence of a consensus regarding the role of the technological
embodiment of science’s mode of knowledge gathering has, in recent
times, taken a more complex turn. Today’s instrumentation is rarely
simple tools or measuring devices, and science as an institution is a
corporately large enterprise. Both of these conditions complicate the
result of a scientific process.

In the ’80s, this complexity began to draw attention, particularly
from sociologists and even anthropologists of science. By 1987, several
books of importance focused specifically upon the way experiment
relates to the “construction” of scientific realities and experiment as
a socio-historical form of science. Here, too, is a genre of new approaches
to the philosophy of science which merits independent treatment. But
there are two points at which the praxis-perception approach taken
here crosses over the social construction of scientific reality approach.

Our instrumental realists all began to realize that there were areas
of ambiguity between instrumental “artifacts” (effects produced by
instruments) and the related ambiguities in the complex technologically
produced entities which constitute so much of science’s interest today.
Thus, a brief look at experiment was also called for, and following the
simplified tactic of instrumental realism, I have looked at only the two
most relevant books, by Peter Galison and Bruno Latour, concerning
this issue. I conclude with broad observations on the effects of
technology upon our wider existential world and on the interface which
continues to be necessary between the philosophies of science and of
technology.

I should like to give a few hints for the reader: At one level, this is
a selective report on a few issues which arise in the state of the art in
both subdisciplines. The earlier chapters are thus more historical and
retrospective, in contrast to the strictly contemporary exposition in
chapters 4, 5, and 6. Thus, chapters 2 and 3 belong together as a
background in the interface, while chapters 4, 5, and 6 are more
narrowly issue-related at the interface concern with science’s
instrumentation. I did debate about how to deal with my own works in
that context, so I simply have shamelessly included myself as one of the
five instrumental realist authors (I hope this slight break with some
writing traditions will be forgiven). Obviously, one of the hopes of this
sort of book is that the reader will use the occasion to go on to read the
suite of books discussed. I did stick to one book each from my five
selected authors, to make the matter simpler.

Similarly, in the chapter on experiment, I have focused upon only
two authors whose books are most relevant to the themes discussed
here. Such a tactic is obviously restrictive and yet suggestive. In the last
decade both philosophy of technology and philosophy of science as
fields have canonically exploded. Instrumental Realism is but one way of
cutting across that exploded field and does not pretend to be either a
survey or encyclopedic. It does claim to isolate themes which continue
to be of serious issue within both philosophy of science and philosophy
of technology.

Serious work on this book began during a sabbatical in the fall of
1984, although my interest in the topic and its focus upon a science/
technology interface goes back another decade. There was a hiatus
between that beginning and the completion of the manuscript in the
fall of 1988 while I was on a research leave from my first term as dean
of Humanities and Fine Arts at Stony Brook. That second time off
mended the rent of the previous delay, so I am grateful to the
university and its administration for supporting the writing.

I shall not draw up the usual long list of appreciated critics and
readers, except for thanking both John Compton and Frederick Ferré
for reading the first half of this book and making suggestions. Were it
not for their agreement, I might not have proceeded to the conclusions
I illustrate here. I also thank Robert Ackermann and Joseph Rouse for their reading of the manuscript after its revision. Both gave insightful criticisms which I have tried to incorporate in the final draft. And I want especially to thank Steve Goldman and his colleagues at Lehigh University where, as a Selfridge Visiting Professor in the fall of 1989, I was able to enjoy their critique of the manuscript prior to publication. I must also add that Jean Kelley did her usual efficient work on manuscript preparation to which she always adds her initial editing.

Finally, while the "school" of instrumental realists I have pointed out arose largely independent of the first published books, there now has been some initial and fruitful interchange among some of its members and those who today work with experiment. I hope that one result of this book will be a furtherance of those initial exchanges.

Part One

Philosophy of Science Read through
Philosophy of Technology
I. Introduction: Philosophers and Technology

Although there is a vast literature concerning technology, rarely has it been the primary theme of philosophers. But even with the plethora of books concerning the human impact of technology, few are concerned with the nature of technology per se. Either the literature tends to focus upon effects of technology or it may itself be technical literature. Rachel Laudan, one of the new group of historians concerned with the history of technology, has observed, “For all the diatribes about the disastrous effects of technology on modern life, for all the equally uncritical paean to technology as the panacea for human ills, the vociferous pro-and anti-technology movements have failed to illuminate the nature of technology.”

Such a lack of focus also occurs within the disciplines, which again tend to focus either upon social effects or upon techniques of decision or management within the technological context. Again Laudan:

On a more scholarly level, in the midst of claims by Marxists and non-Marxists alike about the technological underpinnings of the major social and economic changes of the last couple of centuries, and despite advice given to government and industry about managing science and technology by a small army of consultants and policy analysts, technology itself remains locked inside an impenetrable black box, a deus ex machina to be invoked when all other explanations of puzzling social and economic phenomena fail.

What Laudan misses to a degree is that there has been some careful attention to technology by European philosophers, although that literature is not well known in the dominant North American circles.

The first book to coin the term “philosophy of technology” was written in 1877 by the neo-Hegelian Ernst Kapp. Of course, the later Marxist traditions also recognize the role of technology within human history and economics; but even more broadly, almost every major European philosopher in the dominant traditions of the mid-century also devoted attention to technology. Here the list would have to include Ortega y Gasset, Karl Jaspers, Nicolas Berbyae, and Gabriel Marcel. But the name of Martin Heidegger would take the central
position. Yet until recently, even Heidegger's clearly focused thematic concern with technology has gone largely without notice or comment from even the continentally oriented American philosophers within the scholarly traditions which follow this tradition here.

A second source of philosophical interest, one would think, should arise in the closest-related special interest among philosophers—the philosophy of science. This has not been the case until very recently, and then only after reaction, in effect, to challenges by minority groups within the profession of philosophy.

In a discussion of the state of the art, I shall turn to that often non-benign neglect for two purposes: First, I wish to locate the sources for a potential reevaluation of technology with respect to the philosophy of science; and second, I wish to use, by way of introduction, some of the more important European sources which show the greatest promise of development vis-à-vis an emergent philosophy of technology.

There has been for many years a thriving North American establishment in the philosophy of science. Indeed, the Philosophy of Science Association (founded in 1934) is the largest special-interest society within the profession of philosophy in America. The counterpart organization for technology, the Society for Philosophy and Technology, was not formally organized until 1983 (although it had met in a series of conferences for at least a decade before), and its membership is still less than a fifth of that of the PSA. This disproportion in organizational size is at least indicative of the degree and relative lateness with which philosophers in North America have come to a serious concern with technology.

There have been some beginnings: The major journal for the history and philosophy of technology, Technology and Culture, presented an issue as early as 1966 on "Toward a Philosophy of Technology." Among those who contributed were: James Feibelman, Mario Bunge, and Joseph Aggasi, who are still active in the field; and the organ of the Society for Philosophy and Technology, Research in Philosophy and Technology, which owed its primary existence to the work of Paul Durbin. Its reappearance is now under the hand of Frederick Ferré. However, Research collects articles which are usually quite diverse and interdisciplinary, and has not published either monographs or thematic books. But in contrast to the large European literature on the subject, there has been little serious work on the subject. As late as 1979, Mario Bunge could say:

... Technophihosophy is still immature and uncertain of its very object, and does not exploit the entire scope of its own possibilities. That it is an underdeveloped branch of scholarship is suggested by the fact that so far no major philosopher has made it his central concern or written an important monograph on it.5

Bunge himself outlines, then, what he hopes will be the fields of "technophilosophy," his term for philosophy of technology. And although he was certainly aware that there were European strains, his attitude toward them reflects the negative attitude that most mainstream old philosophy of science has taken:

Characteristicly, such writers as Berdyev, Ellul, Heidegger, Marcuse, and Habermas fail to distinguish technology from its applications, and endow it with an autonomous existence and, moreover, power over man. [and, presumably referring to these same authors] . . . I do not count the tiresome tirades on the way technology "dehumanizes" man or robs him of his "authenticity"; this is not philosophy, but bad literature.5

But Bunge himself, along with the others mentioned (and to which one might add Edward Ballard, Peter Caws, Joe Margolis, and Marx Wartofsky as widely known philosophers who have written early articles on the subject), stands out from the more prevalent philosophical indifference to technology as a theme.

I cite this brief and recent state-of-the-art observation because it points to much deeper roots. There are persistent reasons to be found in the dominant traditions of the philosophy of science, which themselves form the context of vision which overlooks technology. In Technics and Praxis—written in 1979, Bunge's crucial year—I claimed:

Part of the silence concerning technology comes from within philosophy itself. Philosophy usually conceives of itself more as a type of "conceptual" engineering than as a "material" engineering. Here there is a deeper set of relationships between science and technology as they emerge both in ancient and contemporary thought in philosophy.

This symptomatology points to the dominance of a long "Platonistic" tradition with respect to science and technology, a tradition which, with respect to science and technology, turns out to be "idealistic." This conclusion turns upon the variable which I have called the primacy of praxis and is related only partly to the long-held distinction between theory and practice.

The theory-practice distinction, however, may also be associated with a much deeper distinction, the mind-body distinction. Theory, as a set of concepts in some system of relations, is usually thought of as the product of mind, while practice often is associated with a product of body. And in the "Platonistic" tradition, mind takes precedence over body. Praxis philosophies return to this tradition in a new way because the primacy of a theory of action is one which positively evaluates what I shall call the phenomena of perception and embodiment.

Contrarily, a "Platonistic" tradition is one which negatively judges, or at least evaluates, perception and embodiment as lower on the scale of human activity than what is presumed to be a "pure" conceptuality.5
The long tradition of Platonism noted here continues into the later concerns of the philosophy of science. It also determines the dominant view concerning the relationship between science and technology, which is that technology is applied science, or a merely neutral development from science.

Today, such a view is increasingly being called into question, perhaps more often by social scientists and historians, but also by philosophers, including many who are now working in the philosophy of technology. Again I cite my earlier Technics and Praxis:

If one assumes that technology is an extension of science, a mere application and its instrument, then to address the effects of technology is at most to address a tertiary phenomenon. A series of relations may be formalized thusly:

Science — technology — social effect

Here the original cause is science as concept; technology is its effect or application; and the ethical or social effect is the tertiary phenomenon resultant from the series. Given this schematism, the only radical way of treating any problems which arise at the end of the series as other than symptoms would call for revision or change in the cause—in this case, the conceptual foundations of science itself.

Of course, some philosophers do precisely this. The current debates about 'value free' science, even among neo-positivist philosophers, and the attacks upon various forms of scientific reductionism are, at least within the limitations of the idealist interpretation, working at the right level. The intuition that negative results from technology lead back to possible flaws in conceptual science is at least a consistent position with respect to Platonism.6

Since this now decade plus beginning, there has been an accelerated interest in the philosophy of technology. Here the principals have been thinkers like Langdon Winner with The Whale and the Reactor (1986), Albert Borgmann with Technology and the Character of Contemporary Life (1984), and even my own more recent Technology and the Lifeworld (1990). But in these cases the breadth of concerns is such that a focus upon the interface with the philosophy of science is often only sporadic within the books as a whole.

However, in comparison to the centuries-old traditions of Modern Science, philosophy of science is something of a relative newcomer. Prior to the nineteenth century, for example, it was often difficult to distinguish philosophy from science. What we would roughly call natural science today was, in early modern times (seventeenth to eighteenth centuries), natural philosophy. And even earlier it was, in fact, hard to distinguish science from its applications and embodiments, a fact which will have some bearing upon precisely the issue of the relation of science to technology. But with the gradual separation of science and philosophy until its much more extreme distinctions in professional form today, there was a more highly contrasted science-technology distinction, which eventually led to the disappearance of concerns with technology from philosophy.

To the informed, it would be unnecessary to note that the dominant philosophy of science in North America was first positivistic and then modified into what today is broadly called analytic philosophy. Both versions of philosophy of science were highly Platonistic in the sense sketched above; they conceived of science as a body of propositions, a conceptual, rational system, essentially disembodied from both social and material connections. This perspective views science as essentially a system of concepts and logical connections motivated by both explicit and implicit rational processes. This view has had a deep and profound effect even beyond the work of what I shall now call the old philosophy of science. For example, the sciences' own interpretations of themselves and their earlier history largely remained sympathetic to the positivist strain which continued to dominate early twentieth-century philosophy of science.

The father of the North American revolution in history and philosophy of science observed in the very opening chapter of The Structure of Scientific Revolutions:

Even from history ... [a] new concept will not be forthcoming if historical data continue to be sought and scrutinized mainly to answer questions posed by the unhistorical stereotype drawn from science texts. Those texts have, for example, often seemed to imply that the content of science is uniquely exemplified by the observations, laws, and theories described in their pages. Almost as regularly, the same books have been read as saying that scientific methods are simply the ones illustrated by the manipulative techniques used in gathering textbook data, together with the logical operations employed when relating those data to the textbook's theoretical generalizations.7

This is the attitude which accepts the notion of the older philosophy of science, an ideal and abstract science which apart from being ahistorical, is disembodied. It is a science without perception and a science without technology.

The same view, in the older historical disciplines, continued this implicit Platonism, which had as its implication the dominant view that technology must be the stepchild of science. Edwin Layton noted that historians, "while correctly repudiating the Marxist thesis that the Scientific Revolution was no more than the systematization of the knowledge of the craftsman, overreacted when they came to the converse conclusion, namely, that science was prior to and generative of technology."8

Given the usual conservatism of philosophical change, particularly
within the mainstream of recent North American thought, it is hardly surprising that the few philosophers who have begun to develop interest in the philosophy of technology continue to carry over to it the same interests and assumptions which motivated their primary interest in science. Bunge’s approach is symptomatic. In his article “The Five Buds of Technophilia,” one can easily see this focus. He asks:

- Is there a technological method parallel to the scientific method and, if so, what are its rules and what is the efficiency of the latter?
- Some philosophers have claimed that, unlike science, technology has no laws and theories of its own. True or false? And, if true, what distinguishes technological law statements and theories from scientific ones?
- What are the peculiarities of the rules of advanced technology vis-à-vis mathematical and scientific rules?

Here we have a virtually stipulative concept of technology, one which, by definition, illustrates the predisposition to interpret technology as applied science. In this case, vast areas of technological phenomena are effectively excluded—certainly traditional technologies and all variants other than those related to science. Moreover, as the historians have recognized, even many technologies which have been developed in the recent scientific milieu are not reducible to applications of science.

When philosophy does turn its attention to the insistent presence of technology, it inevitably casts the question in one or another of the dominant modes of philosophical interpretation and reconstruction. Thus the logic of technological thinking and practice . . . and the question of technology’s relation to science has been posed in the framework of the nomological model of explanation in the sciences—e.g., are there “laws” of technology or how does technology fit within the context of justification which defines the project of a logical-empiricist philosophy of science?10

But this is the old philosophy of science, regardless of its continued institutional power.11 And even if, as we shall note, some of the preferences for purely conceptual concerns remain intact even in the new philosophy of science, a crack has appeared through which other possibilities may be glimpsed. What I call the new philosophy of science not only has opened the way to a different perspective upon science and its development but, in that very perspective, makes way for a philosophic concern with technology.

It is interesting that the roots of the new philosophy of science, particularly in the Anglo-American sector, are those which relate in every instance to historians and philosophers who have been sensitive to the historical, perceptual, and community embodiments of science. And whereas I shall turn shortly to some of the major philosophic aspects of this change of perspective, it should be noted that a good deal of separately originated and motivated work has also been carried out in the history of technology.

For example, with respect to the dominant notion of the science-technology relation, Rachel Laudan observes that the younger generation of historians of technology has become increasingly revisionist and has called this concept into question: “No less than three special issues of ‘Technology and Culture’ in recent years, not to mention countless individual articles and books, have been devoted to revisionist examinations of the relationship of science and technology.”12 This attack comes from both philosophical and more concretely, historical examination:

Recent attacks on the concept of technology as applied science have employed two strategies, one empirical and one analytic. On the empirical front historian after historian has chronicled episodes in the development of technology where the major advances owed little or nothing to science. Whether one takes steam power, water power, machine tools, clock making or metallurgy, the conclusion is the same. The technology developed without the assistance of scientific theory, a position summed up by the slogan “science owes more to the steam engine than the steam engine owes to science.” [Italics mine]13

I am, of course, still characterizing the Anglo-American state of the art which has in its own way and by its own insights become revisionist. But in the wider world, it is not true that philosophers have failed to appreciate the insight of the historian’s slogan. The smaller community of North American philosophers of science who are aware of the European traditions would immediately recognize in this questioning of the relationship an echo of Martin Heidegger’s much earlier revolution in perspective. In the early fifties he not only had already made the question of technology a central one to his thought but had suggested a radical inversion of the science-technology relation:

Because the essence of modern technology lies in enframing, modern technology must employ exact physical science. Through 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 through questioning.14

In short, without returning to the presumed Marxian concept that the Industrial Revolution is a systematization of handcraft work, Heidegger asserts the reversal of Platonism. If anything, science becomes for
Heidegger a technology-science relation. I shall return to this theme later, noting only that the radicalness of this shift in perspectives has remained largely invisible to the old philosophy of science; and although not often explicitly noticed, it relates more closely to the perspective of some of the new philosophy of science. Had the Heideggerian counterpart to Platonism been a livelier part of the debate, perhaps it might not have taken so long for the new perspective to emerge.

What I call the old philosophy of science, however, remains largely unaware of and uninterested in even science’s necessary technology, its instrumentation. Often satisfied that there is a sharp, or at least identifiable, distinction between “theoretical” and “experimental” science, the old philosophy of science has addressed itself almost exclusively to the former. This is partly in keeping with its own internal traditions, which view philosophy as an almost exclusively logical and linguistic exercise. Only recently have these prejudices begun to be called into question and revised in any serious way.

Yet the challenges which form what I shall call the “new” philosophy of science are irreversible, and they have begun to bear fruit for the interface between the philosophy of science and the philosophy of technology.