

Philosophy of Science: A New Introduction*

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Excerpts from *Philosophy of Science: A New Introduction*, (2014), Oxford: Oxford University Press.

Preface

This book is about the philosophy of science. We know from experience that this expression sounds, to many people, almost like a contradiction in terms. What could philosophy and science have to do with one another? Philosophy seems preoccupied with profound problems that can never be resolved: the “eternal questions” of the meaning of life and the nature of knowledge and the good. Science seems precisely the opposite: cut and dried, simply concerned with concrete matters of fact. Yet science and philosophy have vitally important things to say to one another. The sciences have transformed—and continue to transform—our understanding of the world we live in and of our place in it, our history and our future; the new understanding they have given us has implications that can be felt through every branch of philosophy. On the other hand, closer scrutiny reveals that the sciences raise deep and pressing philosophical questions of their own. Scientific claims have tremendous authority in today’s societies, and many of us believe that scientific inquiry is able to give us a special kind of knowledge: insight into the underlying workings of the natural world that is uniquely objective and reliable. Yet the sciences are also contested, subject to internal dispute among experts as well as to criticism from without. When public debates about any particular scientific issue become heated, the questions raised are philosophical ones about the nature, authority, and ownership of scientific knowledge. To make choices in our lives, we must each come to some conclusions about how to think about scientific controversies on issues as diverse as health risks and global climate change. At a political level, we face additional questions about how to shape public policy in response to the conflicting claims of scientists and of their critics, and about how to make choices about the direction of science itself. All of these questions require us to think philosophically about science. This book aims to show what such thinking looks like, and why it is both important and fascinating to do it. [...]

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Chapter 1: Science and Philosophy

Scientific Disputes and Philosophical Questions

For more than three decades now, researchers who investigate the Earth's climate have been telling the rest of the world that our planet is heating up, and that human activities are largely responsible. During the past two centuries people have released an increasing amount of carbon dioxide into the atmosphere, with the result that some of the heat that would normally dissipate is trapped. Many investigators believe that the long-term consequences for life on Earth are serious, and that the future well-being of our species is profoundly endangered. Yet although there have been periodic upsurges of interest in restricting the emission of green house gases, and despite the efforts of a few nations to reduce dependence on fossil fuels, there is no coherent global strategy for responding to the supposed threat.

Why has science failed to carry the day? Why has debate about the scientific case continued? In many nations there are vocal groups who deny that the alleged facts have been established. Journalists and politicians talk of the myth of global warming; large conglomerates fund "alternative" research; apparently moderate voices point out that the specific consequences of whatever warming trend has been established are matters of dispute and that policies designed to limit emissions might plunge the world into an economic crisis having even more adverse effects on our descendants. So, it is supposed, the question should remain open.

The problem is that science alone cannot tell us how to make reasonable judgments about what is happening to the world's climates, or about how we should respond to the threat of climate change. To do this, we need good science, but we also have to face some basic questions that science can't fully answer: How exactly have the climatologists arrived at their conclusions? What is the evidence and what does it entitle people to believe? How should we craft policies for the future when we recognize the uncertainty of our own situation? Whose interests should be taken into account and how should conflicting needs be weighted against one another? These are philosophical questions. They arise from an important problem that confronts humanity, and from the role science plays in our efforts to understand and address that problem.

Global warming is not an isolated case. Developments in the sciences often call for philosophical reflection. Consider another case, one in which scientific research is entangled with how we think about ourselves and other people. During much of recent human history people have categorized one another by race. Moreover, they have frequently operated with a view that some races are naturally—intrinsically—inferior

to others. Sometimes research in the sciences has supported these claims. So, for instance, it has been asserted that intelligence is measured by scores on a particular test, that there are differences in the averaged scores of members of different races, and that studies of twins have been reared apart reveal that intelligence is highly “heritable.” Other scientists have disputed both the data and the interpretation offered by those who would defend deep racial differences. Some have suggested that a systematic study of the world’s people reveals no basis for thinking that our species is divided into races, and that we should eliminate the concept of race entirely. Almost all would now agree that there is no evidence whatsoever for the existence of genes that have any noteworthy effect on cognitive abilities or traits of character and that are unequally distributed across the groups marked as “races.” Yet recent research in molecular genetics does show that DNA sequences with no known import (bits of what is sometimes thought of as “junk DNA”) are found with different frequencies in populations that have been isolated from one another for a significant period of time, so that there are “natural” divisions of *Homo sapiens* into smaller groups that share a closer kinship. Popular discussions of that research often view it as rehabilitating the notion of race.

Is that correct? What are we saying when we suppose that a particular division of the living world (or of the inorganic world) is “natural”? On what evidence are claims like this based? How should we explain the features of human psychology and behavior that fascinate us, and account for the differences across various populations?

Think about another pair of examples, not normally juxtaposed. Physicists have sometimes campaigned for public funds to build large facilities in which they hope to accelerate the weird microentities they view as the fundamental constituents of matter to speeds so high that their collisions would produce a type of particle that has been theoretically predicted but never detected. (American physicists lost in their attempt to secure government money, but their European counterparts won, and they appear now to have found their elusive target.) On a more modest scale, Freudian psychoanalysts advertise themselves as having a method, grounded in an understanding of the constituents and mechanisms of the mind, that enables them to bring relief to people with psychiatric troubles. Despite the increased popularity of drugs as remedies for psychiatric disorders, as well as the emergence of alternative forms of psychotherapy, some analysts continue to attract patients and to make a comfortable living.

In both instances, the entities that inspire various practical procedures—building huge tunnels, weekly sessions on the couch—are both strange and remote from everyday observation and detection. How can we fathom the mysteries of the Higgs boson or identify a repressed conflict between a patient and his father? Or should we think of particle physics and psychoanalysis simply as practical devices, insofar as they

lead people to the goals they want to achieve, but not as making any serious claims about nature? Is there a significant difference between the two instances, and, if so, in what does it consist?

We would continue the list, but these few examples are probably enough to make the point. All over the map of contemporary science, further questions—nonscientific questions—arise. As you ponder those questions, you are led to issues that seem to lie in the province of philosophy. What is evidence, and how do we obtain it? How should people act when they can recognize that their evidence is partial? Does the world come with natural divisions, and, if so, how can they be discovered? Is it right to think of the sciences as giving a deep picture of nature, even when the things it discusses are strikingly at odds with our previous ideas about reality? Who has the authority to make scientific judgments, and why?

Overarching these questions are even more general ones. Are the natural sciences the uniquely best sources of human knowledge, setting standards that ought to be achieved in all fields of inquiry? Do they constitute just one of many ways of thinking about ourselves and the world that are good in different ways or that serve different purposes? Do they threaten our understanding of ourselves, presenting a limited or distorting vision of the world and our place in it?

The philosophy of science, as we understand it, consists in an attempt to answer—or, at least, discuss—these questions, both the more specific ones and those that are most general. This book is an introduction to it.