

INTRODUCTION

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Max Plank's *The Philosophy of Physics* was published in 1936, eighteen years after he received a Nobel Prize in Physics. He was awarded that distinguished honor, of course, for his fundamental contributions to physics in the form of the development of quantum mechanics. Given the title of his 1936 book and Planck's absolutely central role in the development of quantum mechanics one might think it would focus heavily, or even perhaps exclusively, on the technicalities of quantum mechanics and its direct physical implications more than on traditional philosophical matters. But, this is not the case. To be sure, in *The Philosophy of Physics* Planck does address the profound difference between classical mechanics and quantum mechanics. But, he also aims to elucidate a wide-ranging of matters having to do with truth, ethics, the character traits and biases of scientists, the nature of philosophical and scientific systems, the metaphysics of causality, the theory of measurement, the nature of good societies and even the nature of faith. This may seem to us today to be a case of a scientist over-stepping disciplinary boundaries in order to appear to be profound, but this is also not the case. Planck's discussion of more philosophical matters is central to the goal of this book.

In *The Philosophy of Physics* Planck was attempting to show how science, philosophy and society co-exist in an often-shaky balance that is in need of deeper understanding. In particular, Planck pays very close attention to important matters related to truth and bias as they manifest themselves in both science and in society more broadly. This is, of course, not surprising in light of Planck's having remained in Germany at the University of Berlin for the entirety of his career. Importantly, he was present in Germany to witness the rise of Nazism in the 1930s and the subsequent domination of German culture by a populist fascism that lasted until the end of World War II. To be clear, Planck was a staunch critic of Nazism who publicly stood in opposition to this anti-intellectual

atrocious and this is evinced in what he has to say about the relationship between physics and philosophy. We shall return to this matter shortly, but first let us place Planck's book in its historical context more fully.

Planck's philosophical views importantly show the influence of the Berlin Circle headed by Hans Reichenbach and they reflect the move away from the prevailing Kantianism that antedated the rise of positivism in the early 20th century in Europe. His approach to philosophy and science is not a surprising one given that Planck himself directed Moritz Schlick's doctorate in Berlin and given that Planck, along with Einstein, also helped to secure a position for Reichenbach at the University of Berlin. Schlick founded the logical positivism that in turn affected Reichenbach's views and they could not avoid being influenced by Planck's own thinking given Planck's role in their academic lives.¹ So, there is little doubt that Planck's thinking was closely related to the work of the members of the Berlin Circle, especially Reichenbach's views. The Berlin Circle was greatly influential in the intellectual scene in Berlin at the time when Planck wrote *The Philosophy of Physics* and the view of science and philosophy that he espouses therein is very similar to the Reichenbach's views presented in his *The Theory of Relativity and A Priori Knowledge*, originally published in 1920. But, it also extends that view to a broader application.

In *The Philosophy of Physics* Planck sets the stage by noting that science and general philosophy cannot be entirely disentangled. This is simply because general philosophy concerns itself with everything and so must encompass physics and the rest of the sciences. Any reasonable philosophical system however must not conflict with what we have learned about nature via science, for otherwise it would go against our best knowledge of the nature of reality. So, the two domains are interdependent as Planck sees it. On this basis, Planck importantly sees that physics and the other sciences cannot be practiced in isolation from general philosophy. In other words, all physical theories presuppose some philosophical framework or principles of classification, but, *pace* Kant, there is no single a priori true framework or principle of classification that must be assumed as a matter of necessity. Such principles stand above the scientific theory and shape how we see and investigate the world, but there are many such frameworks that could be adopted. Moreover, Planck holds that the adoption of any philosophical framework requires making a value judgment concerning the appropriateness of that framework for the guidance of scientific research and as a set of presuppositions about both methodology and reality. This includes

¹Of course, Planck explicitly criticized aspects of positivism in Planck 1931 and later in Planck 1933. Schlick responded to Planck's 1931 criticisms in Schlick 1932.

adopting familiar methodological values like respect for truth and commitments to principles like that of causality and the basic concept of a physical object. But, this also includes adopting more broad values like freedom of thought and inclusiveness. It is in virtue of this fact that Planck sees that every physical theory presupposes some philosophical theory and that values infect all science. It is also in virtue of this fact that Planck sees that biases in the form of framework assumptions can take root. They can both distort our views of reality and be used to advance immoral aims.

Given this understanding of science, Planck asserts that many bitter scientific controversies are actually disputes about the selection of principles of classification or frameworks rather than about purely empirical matters. This is especially important because Planck believes that judgments concerning which philosophical framework to adopt are matters of convention guided by purely pragmatic implications. They are then effectively subjective biases that are not subject to empirical resolution. Different scientists or scientific communities can approach empirical inquiry differently in terms of different assumed frameworks grounded in value judgments even if they are not aware of this. Thus it is of the utmost importance *both* that scientists concern themselves with the search for truth and that scientists concern themselves with the search for correct values. There simply is no science practiced independently of philosophy, and specifically independently of both conventional principles of classification and values. In other words, scientists should not pretend that empirical science is value free and scientists should not pretend that science does not require philosophical support.

Planck's way of looking at science and its philosophical presuppositions then suggests that there can be importantly different kinds of conflicts between belief systems involving empirical theories. There can be disputes about the non-empirical philosophical frameworks associated with empirical theories and there can be disputes about empirical theories framed in terms of the same non-empirical philosophical framework. Importantly, as Planck sees it, the first kind of dispute can be resolved only by appeal to the pragmatic implications associated with the conflicting frameworks, whereas conflicts of the second sort can be resolved by appeal to the empirical basis of science (i.e. measurements). Where we have conflicts of the first sort we can then only look at the conventional frameworks adopted and then consider the consequences they entail and how we pragmatically value them. So, as we have already noted, this view involves the rejection of Kant's idea of the fixed and *a priori* warranted categories of thought and the forms of sense and replaces it with the idea that all science is conducted in terms of some

contingently adopted philosophical framework or other. But, the selection of any such framework is a non-empirical matter (i.e. a convention). So, Planck's view is very nearly identical to Reichenbach's view of what has come to be called the relativized a priori and its supposed role in the conduct of science. Michael Friedman (2001) has recently revived this sort of view. He understands Reichenbach's view of science from *The Theory of Relativity and A Priori Knowledge* usefully as follows:

Reichenbach distinguishes two meanings of the Kantian a priori: necessary and unrevisable, fixed for all time, on the one hand, and “constitutive of the concept of the object of [scientific] knowledge,” on the other. Reichenbach argues, on this basis, that the great lesson of the theory of relativity is that the former meaning must be dropped while the latter must be retained. Relativity theory involves a priori constitutive principles as necessary presuppositions of its properly empirical claims, just as much as did Newtonian physics, but these principles have essentially changed in the transition from the latter theory to the former... What we end up with, in this tradition, is thus a relativized and dynamic concept of a priori mathematical-physical principles, which change and develop along with the development of the mathematical and physical sciences themselves, but which nevertheless retain the characteristically Kantian constitutive function of making the empirical natural knowledge thereby structured and framed by such principles first possible (2001, 30-31).

So, Reichenbach also held that all scientific theories are presented in conjunction with a philosophical framework that makes the empirical application of that theory possible and that such philosophical frameworks are not selected on the basis of empirical considerations.² In virtue of this methodological point, Planck demonstrates that at least some of the opposition between classical physics and quantum mechanics appears to be of this sort and has to do with the assumption of the principle of causality. This means that the opposition between these theories is, at least in part, non-empirical and resolving such a problem unavoidably involves attending to the philosophy behind the science. Planck then uses this model of the methodology of philosophically framed physics as a model for the conduct of all science and he warns us against attempts to ignore the infection of value-based assumptions in our thinking in all domains. As he sees it, we do so at our potential peril and we do so

² See Shaffer 2011 for critical discussion of this view.

in such a way that we misrepresent the methodology of the sciences. *The Philosophy of Physics* is then an important and cautionary book and we would do well to learn its lessons. Science needs philosophy and science should be based on good values that neither pervert the truth nor diminish our fellow men. As Planck explicitly warns us,

Justice is inseparable from truthfulness: justice, after all, simply means the consistent application in practice of the ethical judgments which we pass on opinions and actions. The laws of nature remain fixed and unchanged whether applied to great or to small phenomena, and similarly the communal life of men requires equal right for all, for great and small, for rich and poor. All is not well with the State if doubts arise about the certainty of the law, if rank and family are respected in the courts, if defenseless persons feel that they are no longer protected from the rapacity of powerful neighbors, and if the law is openly wrenches on the grounds of so-called expediency (p. 37 in the book ?????? to give the right page).

This is surely a sentiment that we would do well to take to heart.

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