

E. Scheibe, *Between Rationalism and Empiricism. Selected Papers in the Philosophy of Physics*. New York - Berlin - Heidelberg: Springer Verlag, 2001, 627 pp. Edited by B. Falkenburg.

As the subtitle indicates, this volume contains part of the large output of the German philosopher of science Erhard Scheibe. The 38 selected essays cover a large period (1969 - 1998), the largest part originating in the 1980's and early 1990's. Some of them are presented here for the first time in English translation. Since Scheibe's latest books (*Die Reduktion physikalischer Theorien* – two parts, 1997, 1999) only appeared in German, and as the essays presented here are taken from very diverse sources, this volume offers a unique introduction to the work of this philosopher. Scheibe started his career in 1957 as an assistant of Carl Friedrich von Weizsäcker (himself a pupil of Werner Heisenberg), and retired in 1992 after having taught philosophy in Göttingen, Irvine (California) and Heidelberg.

Even more telling than the subtitle is the very aptly chosen title (taken from one of the essays). It neatly sums up the one theme that recurs in almost all of the essays, and pervades Scheibe's philosophical thinking. In his view one can only understand scientific activity (restricted to physics) if one tries to steer a middle course in between the classic philosophical positions of rationalism and empiricism. His middle course merits attention because it deviates in some important respects from nowadays more common views in Anglo-Saxon philosophy of science. His starting point is not too uncommon, as he repeatedly stresses the importance of looking at the practice of physicists, and even more importantly, at their own understanding of what they are doing. But he draws from this the conclusion that what is the most important about physics – and whence should be the main theme for philosophy of science – is the continuous *striving towards the unity of physics*. This is a theme he borrows from his teacher von Weizsäcker, and which makes the notion of *progress* occupy central stage for him.

The attempt to steer a middle course in between rationalism and empiricism, or if one likes, to find a synthesis between these positions, of course reminds one of Kant's grand system of philosophy. Scheibe himself also makes this comparison in one of the essays, but he stresses that whereas a transcendental philosophy can indeed make the striving for unity understandable (and laudable), the apriori element that is present in

Kant's philosophy should be discarded. Instead one should take a more historical approach, in which Kant's conditions of knowledge are the *end-product* of a search towards a basic system of physics (in a way more or less reminiscent of C.S. Peirce's views on the nature of truth). So, if physics progresses, one can understand this progress as a striving towards a final theory which will tell us nothing but the conditions of the possibility of experience, and thus *constitutes* the unity of all physics. In this way Scheibe distances himself quite sharply from the logical-positivists who placed the supposed unity of physics primarily in its methods. Not surprisingly, Scheibe nowhere gives a hint about what such a final theory could look like. However, in some of the essays he attempts to sketch what this progress would look like, thus making plausible (or so he claims) its hypothesized end point. Progress in physics is closely tied to *local reductions*, in Scheibe's views. When a successor theory for some physical theory is established, this new theory will unveil some *contingent presuppositions*, which were responsible for the limited validity of the old theory's laws. The new theory's laws will hence have a greater universality, and the content of the old laws will be reduced to, on the one hand a contingent part, and on the other hand a lawful part. As a result, in the course of progress, new laws will be subject to less contingent limitations than their predecessors. And "[i]t is thus an idea to be taken seriously that the entire empirical content will have eventually migrated to contingent additional assumptions and that the ultimate fundamental laws formulate nothing but the conditions of possible experience." (p. 68). The final laws are the ones that cannot be anymore meaningfully conditionalized. But of course, as the reader will no doubt notice, this is in itself a highly conditional statement, because as yet there is not the least indication that such a final theory is possible at all.

What is clear, however, is that this process indeed makes room for a road in between rationalism and empiricism. The first of the eight parts of which the volume consists, bears the same title as the entire book and contains four essays that deal with these general themes. (A very interesting fifth essay, on the concept of cause, is also contained in this part, apparently because it seems to fit with none of the other essays in the volume.) In the other parts of the volume, there are no explicit references to the nature of the supposed final theory, corroborating the impression that also Scheibe considers this a very speculative point of view. Still one cannot avoid the impression that somehow it always remains in the back-

ground of his thinking, since all the other essays can be considered attempts at filling in different aspects of the notion of progress, which is always assumed to be towards better, more complete theories – taken in a rather absolute sense.

The second part is entitled *The Philosophy of the Physicists* and is an attempt to trace many of the topics and insights back to some of the most important physicists of the twentieth century, including names as Boltzmann, Planck, Heisenberg, Schrödinger and the unavoidable Einstein. The central essay of this part is a very interesting one, entitled *The Physicists' Conception of Progress* (first published in 1988). In this essay Scheibe ascribes to Boltzmann and Heisenberg views anticipating the role that the notion of paradigm would later play with philosophers like Kuhn. In particular, Heisenberg's notion of a *closed theory* is one that is often referred to by Scheibe (not surprisingly, given his link with Heisenberg via von Weizsäcker). One of the formulations of this notion is the following: "To the extent to which one can describe any given appearances with the concepts [of a closed theory], the laws [of this theory] also hold with strict validity" (p. 136). The link with paradigms (and the associated incommensurability) is clear: the conceptual apparatus of a theory restricts the possible judgements on the validity of the theory. Still Scheibe holds that this possibility need not have a devastating effect on the idea of progress in physics. It is true that the only possible corrections of a closed theory imply dramatic changes in concepts, but if one does not hold on to the idea that the results of the earlier theory have to be *derivable* from a successor theory, one can come up with another notion of theory-reduction, in which there is also room for continuity and progress in the presence of closed theories. As he makes clear in the essays in the fifth part of the book, while he believes that the critiques of Kuhn and Feyerabend (to name but the most famous ones) rightly demolished the logical-positivist views on theory-reduction, there is still room to do better. It may be remarked here that quite recently also Mara Beller traced back Kuhn's notion of paradigm to Heisenberg's closed theories (in her *Quantum Dialogue*, University of Chicago Press, 1999). But, and this is highly relevant, she has a completely different appreciation of Heisenberg's motivation in the introduction of such a notion. In her view this was mainly meant to be a rhetorical weapon in the consolidation of the Copenhagen hegemony in the interpretation of quantum theory (a theme for which she has some highly convincing evidence) –

and indeed, readers familiar with this interpretation will not fail to see the relevance of the quoted characterisation of a closed theory. Bracketing all appreciations of this particular thesis, Beller's approach should remind us of the fact that we cannot stay blind to the many ideological underpinnings behind physicists' proclamations about their own practice. Whereas Scheibe is certainly right in paying much attention to what physicists have to tell, from time to time he may fall in the trap of elevating their views to the *nec plus ultra*.

The third part of the volume (*Reconstructions*) is about the virtues of what Scheibe calls reconstructionism. If one wants to come to grips with the notion of progress, it is crucial to develop tools to study inter-theoretic relations. It is to this end that he introduces a structural view on the nature of physical theories, much in the vein of what has become to be known as the semantic view. Some of the essays in this part are on a high technical level, which is unavoidable in Scheibe's continued attempt to do philosophy of science in a conceptually rigorous way. The main questions he struggles with are the related "how can physical theories be distinguished among each other?" and "how can physical theories be distinguished from other structures (i.e. what do they have in common)?" – questions that should interest any philosopher of science (regardless of her opinion on the possibility or general form of an answer).

Part four, takes up the perennial philosophical question about *Laws of Nature*. As should already be clear, they occupy central stage in Scheibe's view on physics' progress. In the essays in this part he takes up some of the associated problems, especially the tension that exists between on the one hand their *content*, which supposedly exclusively concerns individual systems, and on the other hand their *form*, which (in)famously is to be universal (being about all systems). This is one of the many forms in which the basic opposition between empiricism and rationalism rears its ugly head: the particular vs. the general, the independent vs. the universal. But Scheibe stresses continuously that what really is important, is the interplay between these different aspects. We cannot do without contingencies, if we still want to talk about *our* world. But at the same time, if we do not attempt to bring coherence to our theories, we will be lost in an endless babbling that will no longer be comprehensible to anyone. And it is in this continuous interplay that the progress of physics gets established.

Part five (*Reduction*) was already touched upon, and deals with the

reduction of theories. The essays here mainly serve as preliminaries for Scheibe's most recent monographs, which were already mentioned in the introduction, where he develops a full-blown theory of reductions. He also presents two case-studies: the 'approximative explanation' of Kepler's theory by Newton's, and a case taken from quantum mechanics. The expression '*approximative* explanation' already makes clear in which sense theory-reductions cannot be understood by means of e.g. the deductive-nomological model of explanations, where there is no room for the explanation of (strictly speaking) falsehoods. This also indicates how Scheibe tries to circumvent the problem posed by incommensurable theories: the empirical results of the reduced theories will not be strictly speaking derived from the successor theory, but only approximately, whereas the inverse relation will not hold. This points to an important point already referred to: the reducing theory will explain the limited validity of the laws (and concepts) of the reduced theory, thus establishing an asymmetry that is crucial for the idea of progress. It is however a pity that Scheibe only considers a limited number of actual cases, and for example does not confront his thesis (A_2), which reads: "For all empirical successes of T [the reduced theory] in [empirical domain] B there are corresponding ones of T_1 [the reducing theory]" (p. 330), with the extensive historical critique that such an idea received from the hands of Larry Laudan.

The three final parts of the volume, respectively entitled *Foundations of Quantum Mechanics*; *Spacetime, Invariance, Covariance*; and *Mathematics and Physics*, contain some more specialized essays in the philosophy of physics. All of them merit attention from the specialists in the field, but in themselves do not add much to the general outlook of Scheibe's philosophical position – apart from underlining his erudition in questions of physics and its philosophical problems, of course.

As is clear from this limited overview, this volume contains a wealth of insights and technical results, while at the same time maintaining a coherent standpoint in a search towards a rational understanding of physical activity. This coherence, however, makes the volume rather tiresome to read, as a lot of points are extensively repeated; besides, there is a rather big overlap between some of the essays. But this is a small price to pay

for the availability of all these essays in one volume, which can after all be approached in a piecemeal fashion.

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