Review of Steen Brock: *Niels Bohr's Philosophy of Quantum Physics in the Light of the Helmholtzian Tradition of Theoretical Physics*, Berlin: Logos Verlag, 2003, 303 pp.

This book originated from the revised version of a doctoral thesis at the Faculty of Arts of the University of Aarhus, Denmark. Its author is assoc. professor at the Aarhus Department of Philosophy, who specializes in Kierkegaard, Neo-Wittgensteinian philosophy and German idealism.

Given the plethora of books on Niels Bohr's philosophy of physics,[1] the reader will immediately ask him- (or her-self) whether we really need yet another such study. But we must remember that so far no agreement has been reached on how to interpret Bohr's position and where to place him among the various philosophical schools. He has been claimed by realists and antirealists, pragmatists and idealists alike, by ordinary language philosophy and transcendental philosophy, and so on, with each party being able to show some fitting quotes seemingly in support of their appropriation. The influences of some thinkers, especially Poul Martin Møller, Søren Kierkegaard and William James has already been pointed out by Max Jammer as early

[1] For a survey of the literature cf., e.g., my summaries of books on Bohr in *Reader's Guide to History of Science*, ed. Arne Hessenbruch (London: Fitzroy Dearborn, 2000), pp. 92–94, many of which (such as Honner and Folse) have also been summarized by Steen Brock in various sections of the book under review.

as 1966, later supplanted by further candidates such as Harald Høffding (most strongly argued by Jan Faye, and equally bitterly disputed by David Favrholt). The book under review adds some more names to this very mixed bag, including Immanuel Kant, Johann Wolfgang Goethe, Ernst Cassirer, the Romantic tradition, Wittgenstein, and last but not least, Michael Dummett's recent linguistic philosophy (discussed in chapter 4). If this wild assortment sounds implausible, here is what Brock himself claims: "I will present Bohr as a philosopher that insisted, perhaps unsuccessfully, on associating a post-Kantian, neo-Romantic position with a full-blooded version of scientific realism." (p. 10)

To be more precise, Brock tries to situate Bohr's mature philosophy of quantum physics in what he calls the Helmholtzian tradition of theoretical physics which, in turn, harks back to Kantian roots. In following this program, Brock starts chapter 1 with a review of "the semantics of Kant's transcendental analysis and its implications for Natural Philosophy." Whether this was a good move in terms of the book's readability is questionable though I did appreciate the effort to illustrate Kant's table of judgement by means of Euler-diagrams which might also be the way to clarify the still often-discussed issue of the completeness of this table. Next follows his summary of the Helmholtzian tradition into which Brock rightly includes Max Planck, who indeed remained a (neo)Kantian throughout his active career. I would also go along with the claim that the label 'classical physics' is in fact a relatively late construct, formed not before 1870 and thus actually more or less parallels the emergence of the 'modern' physics against which it contrasts itself. It is slightly more strange to see the principle of least action (over?)interpreted as one of Kant's transcendental principles of human understanding (pp. 58ff.). Helmholtz's and Planck's ideal of unifying the sciences (pp. 85ff.) is much more a case in point. I am also much less prepared than Brock to continue this train of thought to thinkers such as Heisenberg and Bohr which, after all, is the very point this books tries to make in chapter 3.

The way I read Heisenberg's treatise on the uncertainty relations or his Chicago lectures is much closer to instrumentalism and phenomenalism, inspired by Heisenberg's reading of Mach and his creative misreading of Einstein (about which he speaks in *Der Teil und das Ganze*, for instance). If anything, it was Plato and not Kant who instilled some idealism into Heisenberg's philosophy of science, whereas with Bohr I see neither Plato nor Kant. I am glad it was not a German philosopher who made this claim about Kant's impact on Bohr, as this would easily have been ridiculed as yet another late attempt to restore the kind of intellectual hegemony that Kantianism had among German school-

philosophers in the late 19th century. If there are any German roots in Bohr's thought, they might rather be the Romantic *Naturphilosophen* and Høffding's twisted version of Kantianism. Strangely enough, none of these really get much attention in the book: the first group's influence is more or less taken for granted (Brock only refers back to a study by Don Howard allegedly proving this point which however is still very contentious). The second issue is more or less dismissed (not a single book by Høffding is listed in the bibliography, for instance). Nor is it true that "Einstein was always a kind of neo-Kantian" as Brock claims on p. 140. To the contrary, Einstein refuted the Kantian move at its core in one of his unknown book reviews, which I rediscovered in 1987.[2] Of course, one can always call virtually everything dealing with the conditions of knowing a Kantian *Gedankenfigur*, but this would inflationarily subsume practically all forms of epistemology as a branch of Kantianism and – in my opinion – is not helpful in a history of philosophical thought.

Unfortunately, the author does exactly this when he writes, for instance: "As was the case with Heisenberg, Bohr certainly subscribes to this Kantian principle of causality as 'a statement about measurements, laws and principles that says that all these can be so related that from this combination follows a system of knowledge and not a mere aggregate of observations'." (p. 172, similarly on p. 200). This is no water-proof argument for Heisenberg and Bohr being Kantians of some sort, but a catch-all reading that makes practically all scientists of the turn of the century into Kantians, i.e., it simply broadens the category far too much. I also miss a lot more reflection on what it means to trace the 'influence' of person A on to person B and under which conditions such a claim becomes feasible, testable and, *horribile dictu*, ultimately also falsifiable.

One of the more interesting claims of the book is, I think, Brock's comparison of Bohr's thought with some of Wittgenstein's points. Indeed, Bohr's obsession with language as the medium in which you have to express your thought in order to be comprehensible to others parallels Wittgenstein's thoughts about language (cf., p. 203). Perhaps the switch from 'classical' to modern physics can be seen as a change of the language-game, with radically new rules for how to use expressions such as length, time, and measurement. But then the switch already sets in with Einstein, and Bohr just marks another step in this deep transformation of physical thought.

[2] Klaus Hentschel, 'Einstein, Neokantianismus und Theorienholismus'. *Kantstudien*, 78 (1987): 459–470.

Bohr's philosophy also parallels Wittgenstein's in so far as both thinkers are strangely unsystematic and hard – if not impossible – to systematize: hence both have created this avalanche of interpreters, all convinced that they have got it right and yet, each only capturing a small part of what Bohr, or Wittgenstein, had in mind. But I find far too little to substantiate this claim in the book under review whose main focus is on Kantianism and the Helmholtzian tradition. This would have been fine if the idea was to explore, say, Planck's philosophy of quantum theory or von Laue's, but I simply don't think it works for Bohr's (or Heisenberg's or Schrödinger's). In private conversation, the author explained to me that his real intention was not to rephrase Bohr's thought, but to show "how Bohr helped to transform an agenda" and thus initiated a drift away from 'Kantianism', but I don't think this aim becomes clear in the book itself which is all too easily read as another attempt at relocating Bohr.

Altogether, I must say that I found the book very hard to read, as it is often not clear where the author is heading, and the sentence structure is often heavy, even though almost everything is grammatically correct.

The absence of a name index does not help to retrace passages on some of the less frequently named figures. Since this book will be indigestible for beginners and since I disagree with so many of the claims made by the author, I can only recommend this book for the occasional specialist in the intellectual history of modern physics who is interested in some of the specific claims mentioned above and wants to see the argument in greater detail. The others might do better to read Bohr himself and see whether they can make sense of it in terms of one coherent philosophy of quantum physics, or rather as an amalgam of some deep *philosophische Brosamen.*

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