

DUGALD MURDOCH: *Niels Bohr's Philosophy of Physics*. Cambridge: Cambridge Univ. Press, 1989 (paperback). x, 294 pp., 7 figs, index.

Since the first edition of this book (1987, cloth-bound) has already been reviewed in this journal<sup>1</sup>, and since no major changes appear in the paperback edition, apart from minor corrections, I will confine myself here to some supplementary (if not 'complementary') remarks. According to the present reviewer, the best aspect of this book is the method employed in presenting the development of Bohr's philosophy of quantum mechanics in contrast to competing interpretations. Indeed, Bohr's position is neither purely 'positivistic' (as e.g. Pauli's) nor 'operationalistic' (à la Bridgman); it is neither crudely 'instrumentalistic' nor unqualifiedly 'realistic', although there are hints of all of these ingredients in Bohr's writings. Emphasis is put on Bohr's discussions, most prominently with Einstein (chap. 8), but also with Born (p. 64), Schrödinger (43, 101, 143), Heisenberg (p. 49), and others. Murdoch carefully examines Bohr's (often obscure) statements, introducing helpful distinctions (i.e. between two often confused concepts of complementarity in section 4.1., or between a strong versus weak meaning condition: 148 f., 237) and employs them to draw a sketch of Bohr's opinions that is far more refined than the philosophical labels usually attached to his ideas. Murdoch attempts to link all the existing textual and historical evidence by rooting Bohr in a continental variant of pragmatism, transmitted to him by the philosopher Harald Høffding<sup>2</sup>. Indeed, Bohr's insistence on continuity as the basis of classical descriptions of nature, and its absence in quantum mechanics as the ultimate explanation for its often counter-intuitive results, is a direct outgrowth of Høffding's philosophy.

But Murdoch's efforts to characterize Bohr's philosophical outlook as "a weak form of realism" (sect. 10.4) or as "instrumentalistic realism" (sect. 10.6) remain unconvincing. While a realist would insist on objects having observer-independent properties, Bohr warned us not to forget the "non-independence of the object as regards both its properties and its behaviour"<sup>3</sup>. Because of these strong non-realist components of Bohr's thought (of which Murdoch is very well aware of, p. 216), his reclassification of Bohr's philosophy in realist terms is more misleading than helpful<sup>4</sup>.

Murdoch's detailed discussions of central problems in quantum mechanics often proceed in the style of modern 'analytic philosophy', sometimes helpful, but occasionally missing the mark as e.g. his misplaced digression into imputed analogies between Bohr and Dummett (238-240). Concerning complementarity, many readers might be surprised by Murdoch's debatable claim that Bohr attached reality only to the particle model of matter and to the wave model of radiation because these are consistent with the directly perceivable macroscopic observations, while he regarded particle aspects of radiation and matter waves as "purely

<sup>1</sup> By Kris Szymborski, *AIHS*, 39 (1989), 162-163.

<sup>2</sup> See sect. 10.7-10; compare e.g. D. Favrhøld: "N. Bohr and Danish Philosophy", *Danish Yearbook of Philosophy*, 13 (1976), 206-220; *id.*, "The Cultural Background of the Young N. Bohr", *Rivista di storia della scienza*, 2 (1985), 445-461; J. Faye, "The Bohr-Høffding Relationship Reconsidered", *Stud. Hist. Phil. Sci.*, 19 (1988), 321-346, all not mentioned by Murdoch.

<sup>3</sup> E. Scheibe, *The Logical Analysis of Quantum Mechanics* (Oxford, 1973), p. 28 with several Bohr-quotations corroborating this view.

<sup>4</sup> It would have been better to distinguish several variants of positivism as e.g. P.K. Feyerabend, "Complementarity", *Proceedings of the Aristotelian Society*, Suppl., 32 (1958), 82: "Bohr's point of view a positivism of higher order".

symbolic" pictures despite the 'wave-particle-complementarity' (see sect. 4.4.). Concerning the (highly controversial) quantum theory of measurement, Murdoch not only gives a clear account of Bohr's approach emphasizing the need for a consideration of the whole experimental arrangement of microphysical object and macrophysical instruments, but also explains the more recent solutions to the "Bohrian measurement puzzle" <sup>5</sup>.

Why CUP decided against footnotes and opted for old-fashioned endnotes, forcing the reader to jump back and forth in the book, is incomprehensible. But more serious than this is Murdoch's insistence on closing his clear and commendable discussions of Bohr's opinions with his own "assessments". Since Murdoch openly confessed that his "own philosophical leanings are in the direction of realism" (p. 236), it is not surprising that the idealistic (neo-kantian) and instrumentalistic strains in Bohr's philosophy do not get fair treatment in Murdoch's evaluations. (These preferences of the realist historian also explain his overemphasis on realist's tenets mentioned before.) The last chapter bearing the title 'An appraisal of Bohr's philosophy of physics' is completely superfluous, since (pace, Murdoch) a reader buying a book on Niels Bohr is not necessarily interested in Dugald Murdoch's private (to say the least: highly controversial) opinions, e.g. about postulating "some sort of action at a distance in order to explain the double-slit experiment" (p. 248). For the reviewer it appears to be a serious relapse into the old bad habits of the dogmatic *Schulphilosophie* to resume the Einstein-Bohr-debate in purely philosophical terms (p. 241) and to ignore the results of delayed choice experiments (Aspect *et al.*), that strongly favor Bohr's position, once and for all falsifying the Einsteinian reliance on an observer-independent reality, a causal description *and* separability (locality). That Murdoch dares to comment on this issue with the precocious maxim: "we ought not to abandon an entrenched metaphysical assumption simply because the interpretation of our latest, and best confirmed scientific theory seems to require it; for scientific theories, as history shows, come and go [...]; we should not be too quick to let physics overhaul our metaphysics" (p. 242), places him among the many deplorable scientific reactionaries, who clung to their beloved metaphysics in spite of contradicting experimental findings. On the contrary, "history shows" that scientific theories do not simply "come and go", but rather that the metaphysical background of their predecessors is never restored.

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<sup>5</sup> Due to Daneri, Loinger and Prosperi, *Nucl. Phys.*, 33 (1962), 297-319; *Nuov. Cim.*, 44B (1966), 119-128, and others (see sect. 6.3. and ref. pp. 274-275).