Worldviews: An Introduction to the History and Philosophy of Science by Richard DeWitt

Chichester, UK: Wiley-Blackwell, 2010. 2nd edn. Pp. xii+376. ISBN 978–1–4051–9563–8. Cloth $34.95

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Richard DeWitt intends his book *Worldviews* for beginners in history and philosophy of science. His ambitious aim is to provide an accessible and enjoyable introduction to fundamental issues in history, philosophy, and science, as well as to draw out the connections between these fields. The time frame is broad, the three parts of the book spanning the period from around 300 BC until today. The focus is on physics and, more specifically, astronomy. Part 1 introduces in a non-technical way some key philosophical concepts and problems, which include: the notions of worldview, truth, and underdetermination; facts and evidence; the problem of induction; and the attitudes of instrumentalism and realism. Part 2 offers a survey of the main views on the physical structure of the universe. It begins with the Aristotelian conception and outlines the transition from the Ptolemaic to the Newtonian system (*via* Copernicus, Tycho, Kepler, and Galileo). Part 3 covers important recent developments in the sciences, namely, relativity theory, quantum theory, and evolutionary theory. The book ends with useful bibliographical notes and suggestions for further readings on each chapter.

As the title of the book indicates, DeWitt's organizing concept is that of a worldview, a notion loosely based on Thomas Kuhn's 'paradigm' and Willard v. O. Quine's 'web of belief'. According to DeWitt, a worldview comprises a number of interlocking beliefs such as those of the Aristotelian worldview:

- the Earth is located at the center of the universe
- the Earth is stationary
- in the sublunar region there are four basic elements

ISSN 1549–4497 (online) ISSN 1549–4470 (print) ISSN 1549–4489 (CD-ROM)
Aestimatio 8 (2011) 188–191

- each of the elements has an essential nature
- this nature is reflected in the way in which that element tends to move.

Another such set, the Newtonian worldview, includes:

- the Earth revolves on its axis
- the Earth and planets move in elliptical orbits around the Sun
- objects behave as they do largely because of the influence of external forces.

In part 2, DeWitt makes a careful comparison of the main theories of the universe with a focus on their degree of complexity and on how well these systems predicted and explained relevant data. To account for the transition from the Aristotelian to the Newtonian worldview, he considers the astronomers' 'motivations' such as Copernicus' commitment to uniform, circular motion and Kepler's religious beliefs. The presentation of the Newtonian worldview is comparatively brief; a few pages cover the three laws of motion, the law of universal gravity, and the difference between teleological and mechanistic conceptions of the universe. Part 2 ends with a short account of two issues that physicists around 1900 could not quite understand in terms of Newtonian physics and that would soon become major challenges to the Newtonian worldview: the Michelson-Morley experiment and black-body radiation.

Those puzzles are the starting point for part 3. This part concerns challenges to 'our own' worldview. The emphasis shifts from general theories of the universe to our everyday beliefs (religious and otherwise) and how they may be challenged by the insights of modern physics and biology. The first four chapters present lucid introductions to relativity theory and quantum mechanics. They are followed by an overview of the theory of evolution and its philosophical and religious implications. Much of this chapter deals with the question of whether it is possible to accept evolutionary theory and science more generally while continuing to believe in God. DeWitt presents arguments for both sides and, in line with his overall approach, interprets the issue as a disagreement about key elements of one's (individual) worldview.

The conclusion brings the discussion back to general considerations concerning the question of whether relativity theory, quantum mechanics, and evolutionary theory can be accommodated in the

Newtonian worldview or whether they force us to give it up. DeWitt suggests that we live in a period of transition. We will have to abandon the mechanistic model of the universe, and the new view of the universe will likely be complex and perhaps piecemeal.

I must say my reaction to this book is mixed. Like the reviewers of the first edition (2003), I am most impressed by the clarity and accessibility of DeWitt's rendering of quite difficult and complex scientific ideas. But I am also a bit disappointed that DeWitt's overall approach to the history and philosophy of science is rather traditional. In the last decade or so, the relation between history and philosophy of science has become a topic of lively debate. New organizations (such as &HPS, aka Integrated HPS) have emerged, several conferences and workshops on history and philosophy of science have taken place, and special issues on the nature and merits of HPS have been published. None of these developments are reflected in the new edition of DeWitt's book.

For instance, while the author traces changes of scientific ideas (and grants that religious and political ideas are subject to change as well), he implies that philosophical concepts such as 'evidence', 'fact', and 'instrumentalism' are transhistorical. There is only one very brief hint that these concepts may be historically variable, namely, at the beginning of chapter 21 where DeWitt states that since the 1600s, the notion of scientific law has played an 'increasingly prominent role' in science. I would expect from an introduction to history and philosophy of science a detailed treatment of this issue. But instead, DeWitt only discusses the—fascinating and complex, no doubt—philosophical question of what a scientific law is.

Moreover, his account reinforces to some extent the traditional notion that before Darwin, the history of science was really the history of physics. In part 2, a mere three pages are devoted to chemistry and biology. But recent historical research especially on early modern science has shown that the medical sciences have played a key role in bringing about the changes that DeWitt's book covers. He does note at one point that the history of scientific ideas is intertwined with political, conceptual, and religious changes, but the chapter that is devoted to this issue [ch. 19] is just about four pages long.

The book has great merits and is very readable, and beginners in history of science and philosophy of science will appreciate the wealth

of information that it offers. I will definitely use it as a resource when I design units on such key scientific ideas as the Aristotelian notion of God or on the mathematics and interpretations of quantum theory, for my undergraduate courses in history and philosophy of science. I may also use it as a resource for introducing such key philosophical issues as the problem of induction or the debate about realism and instrumentalism. I may assign selected chapters as course readings.

But an introduction to the History and Philosophy of Science it is not. Neither is it a compelling illustration of the successful integration of historical and philosophical analysis, nor does it discuss possible ways of bringing history and philosophy of science together. It really is an introduction—an excellent introduction—to a number of fundamental scientific ideas that should be familiar to students in history of science and philosophy of science.