

Zygon: Journal of Religion and Science: 22(1987):383-386

Beyond Mechanism: The Universe in Recent Physics and Catholic Thought. Edited by DAVID L. SCHINDLER. Lanham, Md.: University Press of America, 1986. 156 pages. \$22.75, \$10.75 (paper).

The title of this small, worthy volume is more comprehensive than the contents: it contains four Catholic responses to the philosophical views of the physicist David Bohm, as well as the response of one non-Catholic, John B. Cobb, Jr. While Bohm is a seminal figure, he cannot be taken as mainstream in recent physics. Further, some developments of cosmological interest—for instance, the anthropic principle—are not mentioned here at all. Finally, most recent Catholic cosmological thought, which is not surveyed in this work, proceeds independently of Bohm's thinking.

Still, this collection focuses on and aspires to comprehend a significant part of the whole designated in the title. Bohm presents a model of the universe as an unbroken and seamless whole, with responses by five critics. These papers are the result of a conference held at the University of Notre Dame in 1984. Prefacing the collection, David Schindler contrasts Cartesian mechanism with

[*Zygon*, vol. 22, no. 3 (September 1987).]

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other (involving thousands of light years of signal time), and some parts of the universe are out of causal contact entirely. There is no universal simultaneity. Bohm and his disciples prefer to give heavy weight to somewhat anomalous events that suggest instantaneous contact. "The evidence now is that this enfolding is not limited to events in its light cone. It seems that information can be transmitted instantaneously" (Cobb, p. 45). However, that is no settled conviction in recent physics; it is a minority report. We certainly do not have much (any?) evidence that historical events on Earth are currently influenced by worlds outside our light cone—worlds with which we have never exchanged light signals—or even by worlds within our light cone that are light years away.

Leaving the cosmological scene and restricting our view globally to events on Earth, one can wonder whether Bohm's holism leaves enough room for the pluralism, novelty, and diversity displayed around the continents and across the centuries of history. "In the implicate order, everything is enfolded into everything. . . . The whole universe is in principle enfolded into each part . . . in different ways and in different degrees . . . but the basic principle of enfolding of the whole is not thereby denied" (p. 26). Any particular thing—an atom in my hamburger, a tree in Brooklyn, the Ozark Mountains ecosystem—is explicated from this order. "Explicate orders emerge as sets of relatively autonomous, distinct and independent objects, entities and forms, which unfold from implicate orders" (p. 31). In each explicate part the implicate whole is (fully?) present; in the implicate whole each explicate part is (fully?) present.

Yet is this so? Snow leopards in Tibet live on the same planet with black-footed ferrets in Wyoming. They share some biochemistries historically and genetically inherited from the paleontological past; they both depend on photosynthesis; they breathe air that flows around the globe; a water molecule might somehow get transported from Tibet to Wyoming. But they also live in considerable isolation from each other. Each is a limited part of the story. It is hard to see how every earthen part can contain "in principle" all the cosmic implicate whole, as though snow leopards are in principle implicate in black-footed ferrets, or vice versa (though both no doubt obey some of the same laws). It is hard to see how there is an implicate whole that has all these parts forever determinate within it.

Relativity theory became explicate with Albert Einstein; was it somehow implicate when the Druids built Stonehenge? Moreover, is Stonehenge somehow implicate in Einstein? If not, what does "everything is enfolded into everything" mean? What "basic principle of enfolding" is the key to understanding all these events?

Perhaps an organismic view is not the final word, left uncorrected by, for example, narrative, or historical, or communitarian models. Cobb begins to sense this when he worries that "Bohm goes too far in giving the primacy to the internal relation to the whole over the internal relation to other parts" (p. 48). The world of historical experience is a place of larger and smaller communities or societies, not always of organic wholes, with various stronger and weaker connections, and many disconnections—mixed dependence, interdependence, and independence. The scene is one of plural and unfolding story fragments, substories more or less valuable in themselves and more or less taking place integrated into longer story lines. The world is full of relationships and continuing stories, but it is also full of extinctions, chance events, statistical patterns, mutations, and the intersections of unrelated causal lines. Whether such a world is best comprehensively embraced as an explication of an impli-

Aristotelian organicism, convinced that Bohm is recovering a "forming and finalizing activity" in nature (p. 4) long eclipsed by science.

Bohm gives a fine summary of what he calls the implicate order. "The universe is . . . an *unbroken whole in flowing movement*" (p. 18). That prior reality, the one, is unfolded into the many, the explicate order. "All matter, animate and inanimate, unfolds from a greater whole and folds back again into it" (p. 28). This world picture is available in more detail in Bohm's *Wholeness and the Implicate Order* (London: Routledge & Kegan Paul, 1980).

Cobb follows with a keen appreciation and criticism, especially of Bohm's determinism, in favor of openness in the implicate order (pp. 41-45). Cobb listens as carefully and criticizes Bohm as forcefully as anyone in the book. One begins to wonder whether, if the implicate order is significantly open, it can be fully characterized as an implicate order since much of what occurs does not simply unfold. Events of self-determination emerge along the way, within the options and constraints provided by the past. The world becomes more pluralistic and historical; the future is only partially implied by the past. There are surprises in the implicate order.

Continuing the effective criticism, Frederick J. Crosson analyzes diverse meanings that implication can have, meanings not always distinguished in Bohm's account. There are various senses in which parts are and are not implied in and from the whole (pp. 52-54). John H. Wright follows with an essay that owes more to Teilhard de Chardin than to Bohm; although Wright does not particularly criticize Bohm's account, he does offer an alternative and parallel.

William J. Hill examines "the implicate world" (p. 78) through a Thomist perspective that makes little contact with either Bohm or physics. Concluding a somewhat dense metaphysics, he realizes that Bohm's view needs to be enriched with a sense of history and narration (pp. 88-89). Kenneth L. Schmitz asks whether time itself embodies a sort of implicate order that is largely tacit, one that can be disclosed through metaphysical analysis. In a sophisticated analysis, congenial to but extending Bohm's thought with the irreversibility of time, he concludes that it can. Schmitz works from Edmund Husserl and Immanuel Kant, and there is, again, less contact with recent physics (for example, the relativity of time, or the lack of simultaneity at a distance) than one might expect in a volume with this title.

Bohm then replies to his critics, and there is, at the end, reprinted from *Zygon* 20 (1985):111-24, an autobiographical account of how he came to his views. Several authors find that mechanism did not remain in physics but infected philosophy and theology, fragmenting our modern world outlook. We make fragments of things and then find ourselves fragments in the world we inhabit (Bohm, p. 36). If physics has now moved beyond mechanism, as Bohm maintains, then, by parity of reasoning, philosophy can move to a more integrated world view, and this can be congenial with Catholic thought.

Bohm's holism is exciting, but it can get intense; the challenge is to keep it consistent not only with the evidence from physics but with our total world experience. Bohm claims, "All parts of the universe are connected by indivisible links, so that there is no way ultimately to divide the world into independent existent parts. . . . Since indivisible connection may extend even to distant regions of space, it follows that the very nature of each part may depend significantly on what is happening in places that are quite far from it" (p. 20).

Perhaps. Relativity and quantum theory do relate things, but they also disconnect things. Vast parts of the universe are in remote contact with each

cate order and how much authority physics has in this decision are still unsettled questions.

One wonders, reading Bohm's own story of discovering his views, his history, how much of his impetus for the implicate order is coming from outside physics. As he recounts his experience, Bohm was not satisfied with the picture he obtained in contemporary physics; rather he was dissatisfied with it because of its fragmentation, and he was driven to go beyond to posit an implicate order from which the fragments, parts, unfold (pp. 144-47). He was frustrated for a time, getting nowhere while working from the ideas that physics supplied. Later, from a study of order and human language he found ideas that he read back into physics (p. 151). Indeed, "the prime instance of the implicate order is consciousness itself" (Bohm, p. 129).

The picture of physics (if it is a picture) of particles as coming and going like vortices in a flow, or the analogies drawn with light waves where information about the whole scene is present at every point along the wavefront are all congenial to this model, but other evidence from physics was not so congenial. The model is really a metaphysical one, partially derived from physics but partially gained elsewhere and applied to it.

Minor blemishes mar the production of this book. An inexcusable typographical error occurs on page 56; book titles in references may or may not be italicized (cf. p. 64); there is prominent notice on the back cover of "other books of interest . . . by Nicholas Rescher," as if the one in hand were Rescher's.

In summary this collection is useful and stimulating, but not definitive.

HOLMES ROLSTON III
Professor of Philosophy
Colorado State University