

Mind, Matter and the Implicate Order

by Paavo T.I. Pylkkänen

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David Bohm (1917-1992) was a major figure in 20th century physics and one of its most original thinkers. From the time of his classic textbook *Quantum theory* (1951), through *Causality and chance in modern physics* (1957), *The special theory of relativity* (1965), to *Wholeness and the implicate order* (1980), Bohm was concerned with deep philosophical issues, even more than Niels Bohr. (For a biography of Bohm, see Peat, 1996.) Bohm's ontological emphasis was "holonomic," that is, ontology under the law of the whole. The Bohmian program continues to be carried forward today in physics by Basil Hiley and in philosophy by Paavo Pylkkänen (e.g. Hiley and Pylkkänen 2005).

In *Mind, Matter and the Implicate Order* (MMIO) Prof. Pylkkänen provides a superb and readable account of Bohmian theory within a lucid and comprehensive philosophical framework. Bohm's *oeuvre* is liberally quoted in this work. (All quotations from Bohm below can be found in MMIO.) Pylkkänen is Professor of Philosophy at the University of Skövde in Sweden and heads the Consciousness Studies Programme there. As a former student of Bohm's and

collaborator, Pylkkänen is well positioned to present Bohm's views. Pylkkänen's book is part of the Springer "Frontiers in Science" series.

Chapter One of MMIO provides a survey of Bohm's thought, in preparation for more detailed considerations in later chapters. Chapter Two focuses on the architecture of matter according to Bohm, and Chapter Three is on the architecture of consciousness. Chapter Four deals with Bohm's concept of "active information" and Chapter Five with the temporal organization of experience. Chapter Six discusses Bohmian metaphysics, causality and the "hard problem" of consciousness. Pylkkänen mentions connections throughout the text between Bohmian thought and the philosophies of Heraclitus, Aristotle, Spinoza, Leibniz and Whitehead. Whereas Bohm's writing style is somewhat dull, Pylkkänen's is lively. Pylkkänen excels not only in the exposition of Bohm's thought but in pointing out weaknesses and lacunae in Bohm's program.

Pylkkänen observes that the deeply problematic relationship between mind and

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matter has not been advanced by classical physics. He calls for a “postclassical physics.” It is Bohm’s postclassical emphasis on *wholeness*—which places him closer to Bohr than to Einstein—which opens the way to a new interpretation of the mind/matter relationship. Bohmian wholeness is dynamical: a continuous *holomovement*. The holomovement has two simultaneous processes: *implication* and *explication*. In implication the ordinary Cartesian order is *enfolded* to the whole where it “exists” *in potentia*, while in explication the Cartesian order is *unfolded* from the whole.

To illustrate, consider the trajectory of a particle beginning at time t . We usually think the particle moves along its trajectory between t and $t+1$. But for Bohm, the particle at t is re-implicated at $t+1$ and a particle is explicated at $t+1$. Thus the continuous trajectory of the particle is an illusion, succeeded according to Bohm’s theory by the continual movement of implication and explication.

But the holomovement is even more profound. Each explicate part of the universe enfolds information about the entire universe and each explicate part is at the same time enfolded to the entire universe. (This is highly reminiscent of Leibniz’s monadology.) ... each thing—say, an electron, but also a human being—could not be what it is without standing in the enfoldment relationship to the whole universe. ... the way the thing enfolds the whole is essential to what the thing is and to how it acts, moves, and behaves quite generally (MMIO, 22).

The explicate order of ordinary experience has only a relative autonomy; it is in fact grounded as potentialities of the more fundamental implicate order of the holomovement. Thus Bohm writes that explicate things emerge from the holomovement in which they are enfolded as *potentialities*, and ultimately they fall back to it. They endure only for some time, and while they last, their existence is sustained in a constant process of unfoldment and re-enfoldment, which gives rise to their relatively stable and independent forms in the explicate order (Bohm, 1990; 273).

The most fundamental reality, then, is the holomovement. Bohm’s ontology here is a “double aspect” theory, reminiscent of Spinoza, with mind and matter as aspects of a neutral reality. The *tertium quid* for Bohm is the holomovement.

An important distinction not made clear

in Pylkkänen’s presentation is that although Bohm considers the implicate order to be the fundamental order and the explicate order to be derivative; the *processes* of implication and explication are at parity. The explication *process* is as much integral to the holomovement as is the implication process. However, the explicate *order* is “a special and determinate sub-order” (Bohm 1987, p. 44) that is contained within the implicate order.

Pylkkänen presents Bohm’s theory of the mind-matter relationship, which is called “soma-significance.” Although strictly speaking reality is an undivided totality, it can “for convenience, be thought of as being constituted out of relatively autonomous levels, which are organized into a hierarchy” (29). The hierarchical dimension ranges from the more manifest (material) to the more subtle (meaning) and each level of the hierarchy has a somatic side and a significant (meaningful) side. But “significance” segues to the “mental,” that is, “if one assumes that meaning and the mental are overlapping concepts” (MMIO 29).

So there is a “convenient” hierarchy and each level has both mind and matter as aspects. Furthermore there is an upward process, called “soma-significant,” and a downward process, called “signa-somatic.” Pylkkänen describes the dynamics of soma-significance.

In the soma-significant direction of the process, information is gathered from the world and enfolded, as it were, and such enfolded information is carried over to higher levels where its meaning can be apprehended. When apprehended, the meaning of the information is unfolded, and as it unfolds, it can have an effect upon lower levels, which is the signa-somatic direction of the process. (MMIO 30)

In the theory of soma-significance, *all matter has a mental aspect*, which is a Bohmian version of panpsychism. And all mind has a material aspect. But mind and matter are basically abstractions.

. . . we may for the sake of thinking about the subject abstract any given level of subtlety out of the unbroken whole of the reality and focus our attention on it. . . . But the deeper reality is something beyond either mind or matter, both of which are only aspects that serve as terms of analysis. These can contribute to our understanding of what is happening but are in no sense separate substances in interaction (Bohm 1990, p.285).

Since nothing is purely mental or purely physical, Bohm thinks the problem of mind/matter interaction is elided.

A problem with this theory is that Bohm also thinks there is “a two-way traffic between manifest and subtle levels” (MMIO 32), an influence between levels that criss-crosses the aspects. On the one hand mind and matter are aspects of the *same* level, “correlated projections of an underlying ground” (MMIO 237). This implies no causal relationship between them at the same level. On the other hand, there are causal relationships *between* levels. Mind affects matter at a less subtle level and matter affects mind at a more subtle level. Bohm’s notion of mind/matter *at* a given level not having causal interaction, while mind/matter interaction taking place *between* levels is causal, smacks of “having one’s cake and eating it too.”

Another complication can be pointed out. It is tempting to think that mind is implicate and matter is explicate, but this is not Bohm’s view. Mind is both implicate and explicate. Matter is implicate and explicate, too. So now the doubling at a level are each doubled. This reviewer’s mind boggles at trying to work through interlevel causality between more subtle implicate/explicate and less subtle implicate/explicate! I think the underlying problem is that Bohm’s theory is burdened with rather traditional notions of mind, thought and consciousness, which are unlikely to connect easily with the revolutionary physical theories he proposes, and lead to what I find an overly complicated theory.

Bohm is not unaware of the difficulties of soma-significance and Pylkkänen is adept at bringing out the deficiencies. The theory of “active information” is a further attempt to explain consciousness, mind and matter. Bohm derives a potential directly from the Schrödinger equation, which he calls the “quantum potential,” Q. In the quantum field theoretical model this potential, which does not fall off with distance, is called the “super-quantum potential.” These potentials play a kind of cybernetic role, determining where a particle will be found in the case of Q or determining the configuration of world in the case of super-Q.

What we have here is a kind of universal process of constant creation and annihilation, determined through the super-quantum potential so as to give rise to a world of form and structure, in which all manifest features are only

relatively constant, recurrent and stable aspects of this whole (Bohm 1987, p.43).

The super-quantum potential is “active information” that expresses the activity of a new kind of implicate order. This implicate order is immensely more subtle than that of the original field, as well as more inclusive, in the sense that not only is the actual activity of the whole field enfolded in it, but also all its potentialities, along with the principles determining which of these shall become actual (Bohm 1987, p. 43).

The mental and the physical are inseparable aspects of active information. So it turns out that active information is the Spinozan *tertium quid*. The more subtle mental levels and the less subtle physical levels are able to influence each other at any level because “there is active information that connects the mental and the physical sides to each other” (MMIO 190). I think it doubtful that active information as super-Q can rescue Bohm’s theory from the complexities described above.

Since Pylkkänen explicitly sets his task as a presentation of Bohmian theory, he should not be criticized for the limits of his discussion. However the lucidity of his presentation facilitates application of Bohmian thought in other contexts. I want to mention two potential applications which are distanced from Bohm’s somewhat convoluted theory of mind and consciousness, while making use of his physical insights.

Bohm was well aware of the connection between his thought and that of Leibniz (1646-1716), who is arguably the first thinker of holonomy in the west. (Of course, holonomy is strongly present in ancient traditions of the east. See Capra’s (1975) *The Tao of physics*.) For Leibniz each part of the world is an expression of the whole. I want to focus instead on the British empiricist philosopher, George Berkeley (1685-1753), viewed from a Bohmian perspective.

Berkeley is famous for his absolute idealism, captured in the phrase, *Esse est percipi*, to be is to be perceived. The physical world consists essentially of ideas in our minds and has no independent existence. Reality is mental. (Hume famously observed that Berkeley’s philosophy did not admit the slightest refutation nor did it cause the slightest conviction!).

Of course Bohm, the scientist, is inclined toward naturalism, believing in the explicate reality of the external world that we are

conscious of, even if its autonomy is only relative. However, if we think with Berkeley, then the explicate order we are conscious of is purely mental.

Now, Berkeley faced a severe problem in consistently maintaining an absolute idealism. How can the systematic nature of conscious experience be explained, if it is not based on an interaction between the subject and a mind-independent external world? Berkeley's explanation turns to God. God did not create in seven days the mind-independent world which we then have conscious experience of, but God directly orders our experiences, which we mistakenly believe are of a transcendent world.

For a Bohmian Berkeley, God becomes the super-quantum potential of the holomovement. God's orders are Bohm's active information. God explicates world-thrownness in parallel across conscious observers. There is no world-in-common. Instead there are world-thrownnesses explicated in parallel by God as holomovement. Hopefully Pylkkänen in some future publication will provide a more detailed account of Bohm's ontology and epistemology in relation to Berkeley, Leibniz, James and Whitehead.

My second application of Bohm, which again steps outside the framework of Pylkkänen's presentation, is related to the work of Umezawa (1993), Vitiello (2001, 2003) and Globus (2003, 2005). Bohm's collaborator, Basil Hiley (2001), has shown a mathematical convergence between Umezawa's dual mode thermofield dynamics and Bohm's physics. It was noted above that although Bohm's implicate order is primary and the explicate order is derivative, the processes of implication and explication are at parity. This leaves a residual duality in Bohm.

Now suppose along Umezawa's lines that the implicate order is dual mode, that is, a *thermofield implicate order*. Recall that the dual quantum modes of the thermofield (designated '~' and 'non~') are entangled in the quantum vacuum state and that in case of "~conjugate match" between the two modes, the vacuum state is described in terms of real numbers. That is, when the dual modes of the implicate order match ~conjugately, then order is explicated. Here the process of explication is not ontologically at parity with the process of implication but is just a *special case of implication*, which has a considerable advantage

of parsimony over Bohm's model. As in the discussion of Berkeley, however, there is no naturalistic world-in-common, only world - thrownnesses explicated in parallel. The "rest" is implicate as potentialities of the holomovement.

Pylkkänen concludes his book in characteristically open-minded fashion.

In the traditional materialistic scheme, consciousness is an anomaly, a mystery in a mechanical universe. In Bohm's new scheme, which is based on quantum and relativity physics, consciousness exhibits the same implicate order which prevails in both inanimate and animate matter. The Bohmian universe is thus more "consciousness-friendly" than the universe of classical physics and contemporary neuroscience, which are typically mechanistic. However, Bohm's scheme in its current state does not answer all the puzzling questions about consciousness that have been raised in the contemporary debate, such as the hard problem of consciousness. But perhaps it provides one framework in which we may hope to develop better theories in the future (MMIO 247-8).

This reviewer, who had previously studied Bohm's work, came away from Pylkkänen's book with a far deeper appreciation of Bohmian thought. I think that readers of *NeuroQuantology* will find much physics and philosophy to ponder in *Mind, matter and the implicate order*.

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