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Published in:
Journal of NeuroPhilosophy

DOI:
[10.5281/zenodo.7740219](https://doi.org/10.5281/zenodo.7740219)

Published: 16/03/2023

Document Version
Publisher's PDF, also known as Version of record

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Please cite the original version:
Kakkuri-Knuuttila, M.-L. (2023). Solving Mind-Body Issues Requires Combining Philosophical Reflection and Empirical Research. *Journal of NeuroPhilosophy*, 2(1), 157-181. <https://doi.org/10.5281/zenodo.7740219>

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Solving Mind-Body Issues Requires Combining Philosophical Reflection and Empirical Research

Marja-Liisa Kakkuri-Knuuttila

Abstract

This paper argues that to progress with philosophical issues concerning brain-mind relations one needs to combine philosophical reflection and empirical research with theoretical model building. Philosophy and abstract theorizing alone do not carry us far, as will be illustrated by analyzing the views about panpsychism by the quantum physicist David Bohm, who builds his reasoning on quantum mechanical analogies. His reflection around the notion of active information, adopted in his causal interpretation of quantum mechanics to replace the Newtonian notion of force, turns out to be a fallacy of equivocation. His other line of reasoning to specify matter-mind unity in terms of soma-significance and signa-somatic processes yields problems of its own. To illustrate empirical investigations on brain-mind relations, I shall present the tripartite model of the experiential selfhood and the related Self-Me-I index as proposed by the neuroscientists Fingelkurts and Fingelkurts, along with their background theory called operational architectonics (OA) of brain-mind functioning. The model states that the three components of selfhood, Self, Me, and I, correlate to three distinct operationally synchronized cortical areas, the frontal cortex, the right posterior cortex, and the left posterior cortex. The philosophical and practical benefits of their framework will be exemplified by presenting the results of a series of studies with the philosopher Tarja Kallio-Tamminen about the effects of meditation reflected in the Self-Me-I index.

Key Words: mind-body problem, David Bohm, panpsychism, causal interpretation of quantum physics, operational architectonics, electroencephalography (EEG), Self-Me-I index, meditation

DOI: 10.5281/zenodo.7740219

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Introduction

The physicist David Bohm (1917-1972) was not only interested in developing intelligible realist interpretations of quantum mechanics (Bohm 1952, 1984, 1985, 1988, 1990; Bohm and Hiley 1987, 1993; Pykkänen 2017) but saw philosophical

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Received: 13 February 2023; **Accepted:** 6 March 2023

interpretations of physis as having ‘profound effects on the individual, and on society as a whole, not only physically, but also psychologically and ethically’ (Bohm, 1985). Having adopted the stand of a responsible citizen at an early age (Pylkkänen, 2007), Bohm took as his task to promote a revolution in the worldview not only among scientists but also among lay people. To serve this purpose he developed a form of communication, known as the Bohm dialogue (Senge, 1990/2006, Isaacs, 1999). For him the Newtonian mechanistic theories resulted in fragmented knowledge and action, and finally to the global problems threatening human life. To overcome the fragmentation, Bohm saw it necessary to adopt the holistic metaphysics implied by quantum mechanics (Bohm and Hiley 1993, Deleted for purposes of review). Panpsychism was to be a component of this revolutionary project.

In Western philosophy panpsychism is often considered an odd position, as testified by Samuel Guttenplan’s description of our basic intuitions in his introductory essay to *A Companion to the Philosophy of Mind*:

Human beings definitely have minds. Other creatures on this planet or elsewhere may have minds. Inanimate objects such as rocks do not have minds. These claims will no doubt seem unexceptionable to all but the most perverse. (Guttenplan 1994, 3)

Bohm was not alone among physicists in his panpsychism, however. Being inspired by Eastern thinking, other early quantum physicists were also ready to adopt similar stands.² Adopting Guttenplan’s approach to philosophy as a discipline that questions its own basic conceptions, we then need to inquire after Bohm’s particular version of panpsychism, and how he defends it. I shall show that panpsychism for Bohm consists of two separate theses, to be called universality thesis and unity thesis (section 2). It will turn out that both his lines of reasoning for these theses fails.

One of Bohm’s arguments for panpsychism is based on his notion of active information, introduced in his causal interpretation of quantum mechanics to replace the Newtonian notion of force (Bohm 1952; 1984; 1985; 1988; 1989; 1990; Bohm and Hiley 1975; 1987; 1993) (section 3). Bohm argues as follows for the universality of mind by relying on active information, which is the force of the wave-field to influence the

² See Skrbina (2005) and Seager (2019).

movement of electrons (1952, Bohm and Hiley 1987, 1993, 78-83, 98-104):

[T]he whole notion of active information suggests a rudimentary mind-like behavior of matter,... (Bohm 1990, p. 281).

To an analytically minded philosopher this immediately raises the question about the particular notion of information in the causal interpretation. The same holds for the specific sense of meaning as the notion related to information (Bohm 1985). Because 'active information' is to be understood merely as a cause of the electron's movement and 'meaning' as the effect of its influence on the electron, no mind-like properties need to be involved here. The line of reasoning turns out a fallacy of equivocation.

The other line of reasoning for panpsychism to be studied here is connected to Bohm's specification of the matter-mind relationship in terms of two opposite processes, called soma-significance and signa-somatic (Bohm 1985, 1989) (section 4). This conceptualization implies a peculiar two-level causal theory, in which parallel material and mental processes form a unity. This theorization nevertheless implies problems of its own. It remains unexplained, for instance, how the mental features connected to the neural processes from eye to brain cause the conscious processes connected to the brain. A similar jump we find from the conscious processes to externally observable action.

The result of my analyses is that neither line of reasoning offers support to Bohm's universality or unity thesis. Even though philosophy has an important role in his thinking, the arguments and analogies from quantum mechanics remain too abstract without evidence from relevant empirical studies. Based on recent brain research, it seems reasonable to accept the unity thesis, but this in no way presupposes the universality thesis.

To illustrate possible ways of combining empirical research on philosophical reflection, I shall present the tripartite model of the experiential selfhood and the related Self-Me-I index proposed by the neuroscientists Alexander Fingelkurts and Andrew Fingelkurts, and their background theory called operational architectonics (OA) of brain-mind functioning (Fingelkurts and Fingelkurts 2003, 2008, 2010, 2010a, 2022, Fingelkurts *et al.*, 2013, Fingelkurts *et al.*, 2019) (section 5). The three components of selfhood, Self, Me, and I, are shown to

correlate to three operationally synchronized cortical areas, the frontal cortex, the right posterior cortex, and the left posterior cortex. To demonstrate the philosophical and practical benefits of such an approach I shall present results of studies together with the philosopher Tarja Kallio-Tamminen about the effects of meditation on the Self-Me-I index (Fingelkurts *et al.*, 2015, 2016a, 2016b, 2020). In conclusion I shall point to some philosophical issues for further research (section 6).

Bohm's Version of Panpsychism

One of Bohm's most fascinating, but simultaneously most puzzling views is the universality of mind-body unity which constitutes his version of panpsychism. Because of its crucial position in Bohm's holistic world-view (Pylkkänen 1989), it is important to take a closer look at how he characterizes and justifies it. To explicate, panpsychism for Bohm consists of two distinct claims, the universality of mind or mental phenomena (universality thesis) and the unity of mind and body (unity thesis). We find the universality thesis in the following:

The electron, in so far as it responds to a meaning in its environment, is observing the environment. It is doing exactly what human beings are doing. The word 'observe' means to gather, to pay attention. (Bohm 1986, 120; see Pylkkänen 1989, 21; emphasis added)

The claim here is that there is no difference between the observational abilities of electrons and human beings. If the microlevel of reality already possesses mental properties, then why not the whole of reality!

The unity thesis means that soma and significance are distinguishable only in thought, not separable in reality (Bohm 1985, 1989, Smart 2017). Bohm writes further that 'each aspect reflects and implies the other, so that the other shows in it' (Bohm 1985, 73). As an illustration of such a whole he offers the magnet, in which the north and south poles do not exist separately, but presuppose each other (Bohm 1985, 73-74, 1986). This involves a holistic stand, according to which mind does not exist without matter and matter does not exist without mind. The unity thesis is meant to contrast with both Descartes's dualism, in which mind and body are two distinct substances, as well as the reductionist position, according to which mind is reducible to material processes (Bohm 1985, 1989, 1990). Together with its universal applicability, the unity

of mind and body form crucial components in Bohm's holistic conception of reality (Bohm 1985, 1989).

As the analogy to the opposite poles of a magnet indicates, Bohm hardly distinguishes between the universality and unity theses. In the following he glides from the universality thesis to the unity thesis:

[M]eaning and matter may not have the same sort of consciousness that we have, but there is still a mental pole at every level of matter [...] eventually, if you go to infinite depths of matter, we may reach something very close to what you reach in the depths of mind. So if you consider it, we no longer have this division between mind and matter. (Bohm 1985, 89-90)

This warrants the formulation Bohm's panpsychism as a combination of both the unity and the universality theses.

Bohm seems to contradict himself, however, by formulating the universality thesis in different ways. In contrast to the strict formulation cited above, according to which there is no difference between human perceptive capacities and those of the electrons, he also puts it in a weaker manner:

So I am not attributing consciousness as we know it to nature, but you might say that everything has a kind of mental side, rather like the magnetic poles. In inanimate matter the mental side is small, but as we go deeper into things the mental side becomes more and more significant. (Bohm 1985, 87; emphasis added)

Such a moderate formulation of the universality thesis involves a big move from the strict version and is likely to make the universality thesis more palatable. To what extent Bohm succeeds in supporting the two versions will be scrutinized next.

Arguments Relying on Information and Meaning

Arguments Relying on Information

In discussing the issues of mind and matter, Bohm explained that his views are deeply based on his understanding of quantum mechanics:

However, as will be explained in more detail later, the quantum theory, which is now basic, implies that the particles of physics have certain primitive mind-like qualities which are not possible in terms of Newtonian

concepts (though, of course, they do not have consciousness). (Bohm 1990, 272)³

In his causal interpretation, the notion of ‘active information’ plays a crucial role in his version of panpsychism (see Pylkkänen 2007, 2018):

[T]he whole notion of active information suggests a rudimentary mind-like behavior of matter [...] Active information can thus serve as a kind of link or 'bridge' between these two sides of reality (physical and mental, explanation added) as a whole. (Bohm 1990, 281-282)

Here again the two sides of Bohm’s panpsychism, the universality and the unity theses, are presented as closely related. The term ‘rudimentary’ makes this a moderate version of the universality thesis. Following his approach of illustrating quantum phenomena by analogies from common experience (Kakkuri-Knuuttila manuscript), Bohm argues for the relevance of information by relying on an analogy between human cognitive capacities and those of electrons:

[W]hen we read a printed page [...] it is these forms [of the letters] which give rise to an information content in the reader [...] A similar mind-like quality of matter reveals itself strongly at the quantum level [...] (Bohm 1990, 281, see Pylkkänen 2018, 226-227)

Here we have quite a strict formulation of the universality thesis, in particular, as ‘information’ appears to refer to interpretive processes in the reader. The claim is that similar mental capacities exist also in quantum reality. Bohm does not explain this further, so let us analyze the situation for the reader. When the reader observes marks on the page and interprets them as letters with a specific meaning, she/he has in mind the relation between signs and their signification. Evidently, the sign – signified relation is not arbitrary, but is based on objective social conventions and exist outside the mind and action of a particular individual, though she/he may give the signs a personal interpretational twist (Kusch 2002). Here meaning of the signs is the information of the text to the person. Thus these notions are used here in a different sense than ‘information’ as cause and ‘meaning’ as effect as in Bohm’s causal interpretation. The meaning of the text may further give rise to thoughts in the reader’s mind and a desire to act in some manner, and the

³ Some neuroscientists argue that consciousness belongs only to human beings (Fingelkurts et al. (2013). For a discussion of consciousness in Bohm, see Fingelkurts et al. (2019).

impulse may lead to an observable action. The action may also be called the meaning of the text, but now in the causal sense.

Taken literally, Bohm's above claim implies that the electron has a similar mind-like capacity as the reader, which means that the electron has in its 'mind' a relation between an observed sign and what the sign signifies. Such relations can be recognized, for instance, in the bee's waggle dance as mediating information about flowers or a suitable new place for the nest (von Frisch 1967). Analogously to a reading person, the bees have objective social rules in their community concerning the dance and individual bees have the capacity to 'read' the messages of the dance. It seems far-fetched to assume corresponding social rules and capacities of electrons to hold in their 'minds' sign-signified relations. To understand how Bohm was led to these ideas, we need to look at the role of information in his causal interpretation. This allows us to clarify his particular use of meaning as a related notion, as well.

Information in the Causal Interpretation

Bohm explains his choice of the term 'active information' as a replacement of the traditional term 'force' to emphasize the differences between forces in quantum and classical mechanics. As he argues on the basis of his own formulations of the quantum equations, the quantum forces have three peculiar properties: self-activity, non-locality, and wholeness (Bohm and Hiley 1993). I shall first elucidate how 'information' is no bad choice for the quantum forces, and that Bohm uses 'meaning' for the causal consequence. Both can be built on our everyday uses of 'information' and 'meaning' (Kakkuri-Knuuttila manuscript).

Bohm takes it as evident that the causal use of 'information' poses no problems, since changes in information make a difference, i.e., have causal influence.

Information is a difference of form that makes a difference of content, i.e., meaning. (For example, a difference in the form of letters on a printed page generally makes a difference in what they mean.) (Bohm 1989, 44)

As indicated here, 'meaning' is Bohm's choice for causal effect, and the illustration of letters here does not undermine the fact that the claim is made generally. This accords also with everyday language use, as 'meaning' is often used for causal

consequences in connection with historical events. For instance, the meaning of the shots of Sarajevo are said to include the death of the Archduke Franz Ferdinand of Austria and his wife, and even less immediate consequences like the beginning of World War I.

Information can also be said to suit contexts of self-activity, which means that the correlation between the intensity of cause and effect, typical of Newtonian mechanics, does not hold at the quantum level. The qualification 'active' to information is meant to express exactly this that a small input can have a great output:⁴

The basic idea of active information is that a form having very little energy enters into and directs a much greater energy. The activity of the latter is in this way given a form similar to that of the smaller energy. (Bohm and Hiley 1987, 327)

The property of self-activity follows from Bohm's equations, according to which the quantum potential as the energy determining the quantum force influencing the movement of electrons is not changed by multiplying the wave-function ψ by an arbitrary constant (Bohm and Hiley 1993, Pylkkänen 2018).

This means that the effect of the quantum potential is independent of the strength (i.e., the intensity) of the quantum field but depends only on its form. (Bohm and Hiley 1993, 31)

Bohm points out that in-form is an apt title for the force of the wave-field, since it does not give its intensity to the electron, but 'only its form' (Bohm and Hiley 1993, 35).⁵

To argue that self-activity is, in fact, a familiar phenomenon in common experience, Bohm refers to the radio which has its own source of energy, in virtue of which the loudness of the sound is independent of the intensity of the radio waves. Another example is a ship on automatic pilot guided by radar waves; from biology he offers the case of the DNA molecule acting on RNA; and from human activity the reading of a map (Bohm 1989, 1990; Bohm and Hiley 1987, 1993, Kakkuri-Knuuttila manuscript).

⁴ Passive information is exemplified by Shannon's notion of information in information theory and classical forces and is said to be 'merely reflecting something outside itself' (Bohm and Hiley 1993, 37).

⁵ At this point my interpretation differs from that of Paavo Pylkkänen (2018, 2022), to whom active information is not merely a causal force but an information carrier in a particular sense.

Even though non-locality does not receive similar detailed treatment in Bohm's works, one may mention the interpretation of signs at varying distances as its familiar instance. For example, the meaning of a traffic sign is the same if read at a distance of 100 or 5 meters. Mathematically, non-locality follows from wholeness, which for two-particle systems means that the quantum potential

depends on the position of both particles in a way that does not necessarily fall off with the distance. We thus obtain the possibility of *non-local interaction* between the two particles. (Bohm and Hiley 1987, 330, original emphasis)

By wholeness Bohm means holism, similar to organic life (Pylkkänen *et al.*, 2017, 243):

Thus there is a kind of objective wholeness, reminiscent of the organic wholeness of a living being in which the very nature of each part depends on the whole. (Bohm and Hiley 1993, p. 177)

Perhaps an even clearer example of wholeness is a dance performance (Bohm and Hiley 1993). Here the term 'information' is well-suited to the case factor, since it is the information of the choreography which dictates the movements of each dancer (Deleted for purposes of review).

What we have now learnt from Bohm's use of 'information' and 'meaning' in his causal interpretation is that these terms have no further content than that 'information' refers to a cause of the electrons' movement and 'meaning' refers to the electron's movement as the effect of the cause. The fact that 'information' is appropriate for the peculiar properties of quantum causation follows nothing with respect to its connotation, since it also suits Newtonian contexts.

Fallacy of Equivocation

My approach here is to scrutinize the crucial notions Bohm uses to support panpsychism. Even though I highly appreciate his liking for metaphors and etymology, I believe that ontological analysis requires clearly distinguishing different uses of relevant homologous terms, such as, 'information' and 'meaning' in connection with the causal interpretation of quantum mechanics. As the analysis of the preceding subsection demonstrates, Bohm uses 'information' in two different senses. In speaking about 'active information', he is merely referring to

a cause of the electron's movement. But when speaking about the reading person, information is not a cause, it is the relational property of signification of the signs which the reader is capable of grasping when perceiving the signs on the page. Thus 'meaning' is also used in two different senses. In the causal interpretation, active information is the cause and the movement of the electron is the effect, which for Bohm is the 'meaning' of active information. For the reading person these terms refer to different things, as information and meaning coincide.

It is an obvious fallacy of equivocation to say, for instance that

[W]hen we read a printed page [...] it is these forms [of the letters] which give rise to an information content in the reader [...] A similar mind-like quality of matter reveals itself strongly at the quantum level [...] (Bohm 1990, 281)

Here 'information content in the reader' is the meaning of the letters, something in the reading person's mind.⁶ But Bohm has nothing to say about why 'A similar mind-like quality of matter reveals itself strongly at the quantum level'. When speaking about the quantum level, he presents active information merely as the cause of the electron's movement. Here information–meaning is the same as the cause–effect relation. The electron possesses in its 'mind' no two-place relation corresponding to sign–signified relation, which is here assumed as a necessary property of having a mind. Bohm thus appears to jump from one sense of information–meaning to another sense.

Does Power Metaphysics Support the Universalism Thesis?

I shall next test one possible way of saving the universalism thesis for Bohm. The preceding way of describing cause-effect relations is typical of the empiricist manner, in which causal relations are understood merely as regularities between two concomitant events (Hume 1975, Mackie 1980). To get a better grasp of Bohm's reasoning about panpsychism on the basis of active information, we need to see that the empiricist view of causation is not his. Looking at his way of speaking about active information reveals two metaphysical features of powers (*dunamis* in Greek singular, power, capacity, capability, potentiality in English) discussed by Aristotle in his *Metaphysics*

⁶ In Floridi's (2015) notion of semantic information, information is the sign rather than the referent (Pylkkänen 2020).

and *Physics* (Deleted for purposes of review). For our purposes here it suffices to show that Aristotle presupposes the potentiality–actuality distinction and the notion of full power as consisting of an active and a passive component. Since these give more sophistication to the cause–effect relation, it is worth investigating whether Bohm is, after all, entitled to the analogy between human mental activities and the capacities of electrons.

The following citation suffices to show that Bohm presupposes both features of power metaphysics just mentioned:

[T]his information is only *potentially* active in the radio wave, but it becomes *actually* active only when and where there is a *receiver* which can respond to it with its own energy. (Bohm 1989, 44, original emphasis)

Here the potentiality–actuality distinction is explicit, but we also have the other metaphysical distinction. Information (active information to be more exact) is the active power component which can be actualized only through a receiver which can respond to it. For information to be a causal factor presupposes that there is another causal factor, the radio apparatus. In the traditional terminology, the radio waves constitute an active power and the radio is the corresponding passive power which has the capacity to receive and respond to the radio waves. The active and passive power form together a full power (Aristotle *Metaphysics*, IX 3, 1046b29-1047a3, 1047a11-20, IX 6, 1048a25-b36, Knuuttila 1993, Witt 2003, see Harré and Madden 1995, Meincke 2020). Bohm’s way of speaking about a ‘receiver’ is a good choice for the passive power, since it need not be passive after all, as the self-activity property of electrons and human mental capacities indicate. In contrast to the empiricist view, this conceptualization offers a metaphysical analysis of cause in terms of the meeting of an active power and a receiver. Thus the two complementary powers, partner powers in recent terminology (Meincke 2020), form a full power which is needed for some change to take place.

Bohm also applies this same distinction to the quantum level:

[A]n electron is something that can significantly *respond to* information from distant features of its environment (Bohm 1989, 59, emphasis added).

Does this fact that the electron has the capacity to receive and respond to the active information of the wavefield somehow

support the electron having mental properties? As stated above, mental properties presuppose a capacity to possess sign-signified relations. In terms of the *dunamis* ontology, presuming mental properties in the electron means that active information is the active power and functions as a sign of something external to the sign, and the electron is the receiver which can read the sign as referring to that something. After that the electron moves according to its interpretation; this is what Bohm calls the meaning of the information.

Now we can see that, even though the power metaphysics offers a relational analysis of cause, this brings us no closer to the supposed mental properties of the electron than the empiricist view of causation. In the metaphysical analysis, a cause consists of the meeting of two complementary powers. This is, however, a completely different matter than the relationality of sign-signified relation. Thus, instead, claiming the opposite involves a fallacy of equivocation. ‘Information’ and ‘meaning’ are used in two different senses as already stated. In the causal interpretation, active information is the active power which is partly responsible for the electron’s movement, for Bohm the meaning of the active information. If material reality had mind-like properties, the active information of the wavefield would inform the electron of a sign-signified relation, existing independently of the electron, and the electron would receive the active information as a clue. Moreover, it would have the capacity to interpret the clue as a sign referring to what it signifies. But we find nothing like this in Bohm; active information is merely an active causal power, and the meaning of the information is the causal effect. He offers nothing to support the claim that the electron can possess a kind of sign-signified relation as a kind of mental property.

It follows that Bohm’s use of ‘information’ and ‘meaning’ in the causal sense is neutral with respect to mental properties, and drawing an opposite conclusion involves mixing two different senses of ‘information’. He appears to confuse information as cause and meaning as effect as they are in his causal interpretation and the more familiar notion of information as the significance in the sign-signified relation. Information for the electron is no more than the active power as a component of the cause of the electron’s movement. The electron is the receptive power, and the locus of the effect (meaning) of these two powers meeting. It has nothing corresponding to the capacity of interpreting a sign as referring to some entity external

to the sign. The universality of the power ontology in no way guarantees the universality of the more complex sign relation.

I would like to emphasize that I do not protest against using words in new ways as long as their intended meaning is made sufficiently clear. Merely giving new names to an object without any empirical or theoretical argument, the object gains no new properties. One reason for Bohm's enthusiasm about ambiguous terminology could be the benefit of pointing to analogies between different levels of reality in a concise manner when developing an extensive philosophical world view to cover both the natural and the social reality.⁷ As we now have seen, the notion of information and meaning as such in no way supports the universality thesis, or that the electrons have mental properties of any kind.

Soma-Significance and Signa-Somatic Arguments for Panpsychism

While Bohm's reasoning about panpsychism based on the notion of active information focuses on the universality aspect, the emphasis in his other conceptualization of processes in terms of soma-significance and signa-somatic is on mind-body unity. The idea here is that reality, including its tiniest components (universality thesis), has a double nature: 'soma' referring to the material and 'significance' to the mental constituent (unity thesis). Here 'soma' is extended from its traditional meaning of organic body to refer generally to the physical aspect of an object, including a perceived object, the neural workings of the perception process, as well as external action (Bohm 1985, 1989). As in connection with the notion of information, Bohm claims that the soma-significance and signa-somatic processes involve both the universality and the unity theses:

The notion of soma-significance implies that soma (or the physical) and its significance (which is mental) are not in any sense separately existent, but rather that they are two aspects of one over-all reality. (Bohm 1985, 73, also Bohm 1989, 51, see Pyllkänen 1989, 26-27)

Soma-significance and signa-somatic are two opposite processes, human perception giving rise to external action offered as their paradigmatic case. 'Soma-significance' is the process of perceiving an external object (event or whatever)

⁷ In addition to causal effect, Bohm uses 'meaning' to signify signified, definition, theoretical interpretation, intention, value, or purpose of life depending on the context (Bohm 1985, 1989).

leading to visual experience of the perceived object through neurological processes, and further to thoughts, evaluations, wishes, desires, intentions, etc. ‘Signa-somatic’ is the opposite process from mental occurrences to bodily events, such as excitement arising from emotionally stirring experiences, including externally observable action (Bohm 1985, 1989).

The unity and universality theses imply here that all objects and causal relations have a double structure, one at the somatic and the other at the mental level of significance. This is not meant to replace the causal interpretation, as Bohm notes that active information has two sides, mental and physical (Bohm 1990). To describe the process of visual perception, for instance, complex conceptualizations would be needed. Applying the power metaphysics, we could say that the soma and significance components of the light ray meet the soma and significance components of the receptive power of the eye, and this actualization of these two pairs of complementary powers triggers a two-level impulse in the optic nerve. Each stage of the process of carrying the two-level signals to the cortical visual center has the same metaphysical structure of a two-level active power meeting a corresponding two-level receptive power. The finally arising mental representation of the object as a phenomenological experience is one aspect of the brain–mind unity, the other aspect being the material processes of the brain. The double process then continues whatever direction it then might take. No description like this is provided by Bohm, however (see Bohm 1989, Pyllkkänen 1989).

Bohm offers, in fact, no proper argument for the double nature of reality in terms of soma-significance or signa-somatic. The two components of Bohm’s panpsychism, the universality and the unity theses, appear to be already presupposed as in the above citation (Bohm 1985). This view brings further problems, as new conceptualizations would be needed for each step in causal processes. For instance, the moves from light rays touching the eye to the visual experience should be depicted by naming both the physical and the mental aspects. In general, the expectation to find detailed illustrations of the acclaimed double nature of soma-significance and signa-somatic is disappointed.

One could now inquire as to whether the soma-significance and signa-somatic conceptualization offers at least a tentative solution to the problems of Descartes’s dualist theory of mind and body and monist theories, as Bohm claims (Bohm 1985, see

Pylkkänen 2017a). The unity position could be taken as an acceptable alternative to both dualism and monism, but why should one accept the universality thesis underlying the soma-significance and signa-somatic theory? Bohm appears to use the universalist stand either to solve or simply avoid the hard problem of consciousness (Chalmers 1995), for together with the unity thesis he hopes to be entitled to reject that there is a jump from brain to mind, as all matter already has a mental side. Some matter, such as the electron, has only a minor mental aspect (moderate version of the universality thesis), and more complex material structures have a more developed mental side.

However, the soma-significance and signa-somatic theory offers no sufficient ground for the universality thesis. The soma-significance and signa-somatic processes involve problematic jumps at other points. It remains unexplained how the significance elements of optic nerve can cause conscious visual experiences. The same holds for the question of how conscious visual experiences can bring about thoughts, desires, and decisions, and how can these cause further significance components of nerves relevant to bodily action?⁸ Since the soma-significance and signa-somatic conceptualization offers no response to these questions, we have to conclude that Bohm's two-level conception of reality yields no sound alternative to Descartes's dualist model of mind and body or to monist theories. He offers no proper theoretical or empirical support to this conception, which creates challenging new problems. In addition, the theory implies great challenges to various fields of science by suggesting that causal processes be described as two level-processes with matter-mental unity.

Combining Philosophical and Empirical Research

The two preceding sections have shown that Bohm's two philosophical approaches to panpsychism remain without support and fail to offer satisfactory solutions to the matter-mind question. The conception based on the notion of information turns out to be a fallacy of equivocation. In spite of its holistic approach, the soma-significance and signa-somatic view involves a strange two-level view of causation. Instead of solving questions about the matter-mind relation, it implies new problems of its own. Now I want to draw attention to a limitation of both these conceptions, namely, that the mental processes are

⁸ See Pylkkänen (2017a) for this issue.

merely a chain in already existing material objects. This implies excluding the possibility of evolutionary development, for instance, the generation of human beings with complex mental capacities from lower level creatures. Emergence is a metaphysical notion, meaning that new structures are generated with new properties and new capacities in comparison to those of their parts (O'Connor 2021, Fingelkurts *et al.*, 2010a). This presupposes extending the ancient Aristotelian understanding of potentiality and actuality which is tied to the already existing subject. For the possibility of emergent new structures involves potentialities to build new subjects. Mental phenomena could thus be naturally included among emergent properties of nature, including awareness and consciousness, and human beings as part of nature (comp. Dossey 1989). These kinds of ontological considerations fall outside Bohm's mind-body reasoning discussed here.

Adopting the metaphysics of emergent structures, it seems natural to connect philosophical reflection about matter and mind to empirical research. Thus, one may investigate what material structures correlate with what mental capacities. What biological properties of the bee make it possible to communicate with the other members of its species? Based on present knowledge, the question for us humans obviously concerns brain-mind unity. Investigating communication among trees, one is faced with the philosophical question of whether this interaction can be taken to involve mental properties (Simard 2021). But how are mental properties to be defined? All these questions are consistent with the unity thesis: it seems natural to presuppose that particular mental properties are connected to particular material structures which make these possible (Fingelkurts *et al.*, 2013, Fingelkurts *et al.*, 2015, Fingelkurts *et al.*, 2019, Revonsuo 2006). It seems also reasonable to give up the universality thesis, for who would start exploring the mental capacities of stones, for instance, based on present research paradigms!

The crucial point is that the philosophical unity thesis can be concretized as a scientific hypothesis to be tested empirically. As a philosophical thesis, the brain-mind unity is a metaphysical holistic claim stating that if there is one of the two, there is the other as well: brain activity is connected to mental activity and vice versa. Purely philosophical analysis obviously cannot make claims about what brain activity is connected to what mental activity, but the philosophical thesis may function as an ontological paradigm for empirical investigations. Because

extremely complex empirical phenomena are concerned and, in particular, the question involves the relation between two quite different kinds of phenomena, the physical and the mental, generating testable empirical hypotheses requires theoretical insights achieved by combining previous empirical-theoretical studies.

To illustrate the possibility of empirically investigating the brain-mind unity, I shall briefly present neurophenomenological research on experiential selfhood by the neuroscientists Alexander Fingelkurts and Andrew Fingelkurts. In their view, the relationship between the mental and the physical (neurophysiological) is hierarchical and metastable in nature (Fingelkurts and Fingelkurts, 2004, 2017). More specifically, this view states that emergent qualities (conscious mind) necessarily manifest themselves when, and only when, appropriate conditions are obtained at the more basic level (brain electromagnetic fields) (Fingelkurts *et al.*, 2013, 2019, 2020a, 2020b).⁹

The title 'neurophenomenological' already indicates a close connection between the brain and conscious mind, which is concretized in their operational architectonics (OA) theory of brain-mind functioning (Fingelkurts and Fingelkurts 2003, 2008, 2010, 2010a, 2022, Fingelkurts *et al.*, 2013, Fingelkurts *et al.*, 2019). The Fingelkurts (OA) has developed since the early 2000 to explore the mechanisms through which the brain integrates attention, perception, cognition, and consciousness to meaningful experiences. The aim of the research program is as follows:

It is well established that the brain's capacity to integrate information from numerous sources forms the basis for cognitive abilities. However, the core unresolved question is how information about the 'objective' physical entities of the external world can be integrated, and how unified and coherent mental states (or Gestalts) can be established in the internal entities of distributed neuronal systems. (Fingelkurts and Fingelkurts 2001, 261)

Methodologically their work relies on quantitative electroencephalography (qEEG), which allows directly measuring the electric current of masses of dendrites, while

⁹ Bohm's claim that electrons have a kind of mind could thus be formulated that the electron has the potentiality to form structures with other microparticles which are components of mind-body unity.

hemodynamically based methods (PET, fMRI, Optical Imaging) determine functional connectivity of neuronal assemblies only indirectly.¹⁰ Direct information is crucial, as it is widely agreed that the brain's capacity to integrate information from numerous transient neuronal assemblies forms the basis for cognitive abilities. (Fingelkurts and Fingelkurts 2001, 2011, 2022, Revonsuo 2006) The (OA) offers a hierarchical conception of the brain operations, beginning from local neuronal assemblies and their joint activity, which form unified and metastable operational modules (OM). Higher levels of the nested and dynamic hierarchical structures form the material basis of cognition and phenomenal consciousness. The underlying holistic approach to brain and mind relation is explicitly stated:

physical brain processes and psychological processes are considered as two basic aspects of a single whole informational brain state (Fingelkurts and Fingelkurts 2001, 261).

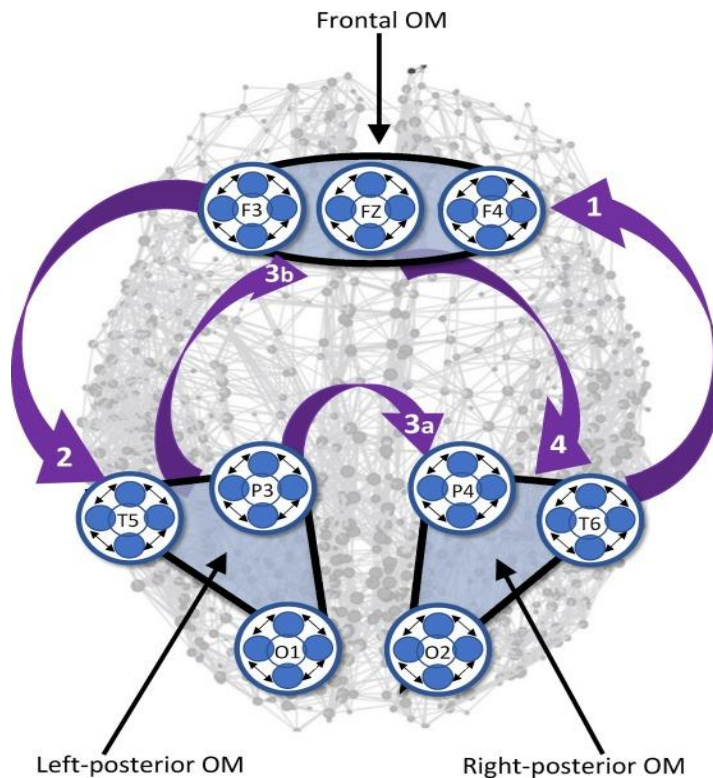


Figure. Operational modules (subnets) of the self-referential brain network with putative connections (explanations in Fingelkurts *et al.*, 2020).

¹⁰ For an extensive review of the practical relevance of qEEG, see Fingelkurts and Fingelkurts (2022).

The (OA) model forms a theoretical basis of the Fingelkurts' tripartite construct model of the complex experiential selfhood (Self-Me-I).¹¹ The other relevant line of research is the extensive empirical-theoretical work on the self-referential network (SRN), also called the default model network (DMN), including their own studies about normal and pathological conditions (Fingelkurts and Fingelkurts 2011, 2012, 2022).¹² The chief idea of the model is that the three components of selfhood, Self, Me, and I, correlate to three distinct operationally synchronized cortical areas, the frontal cortex, the right posterior cortex, and the left posterior cortex as shown in Figure 1. (Fingelkurts and Fingelkurts 2003, 2011, 2012 ... 2022, Fingelkurts *et al.*, 2016a, 2016b).¹³

The 'Self' refers to the highest dimension of selfhood and is characterized by experience of agency from first-person perspective (the witnessing observer). It is responsible for top-down attentional control, metacognition, loving-kindness and compassion, empathy and joy. The 'Me' refers to the experience of one's body, perceptions, emotions, and memories as one's own, and localization in space (representational-emotional agency). The 'I' refers to the experience of thinking about oneself (reflective agency), and the capacity to meaningful and logical processing. It is responsible for visuospatial and mental imagery, episodic memory retrieval, semantic and logical processing, language comprehension, and narrative thoughts, as well as reinterpretation of events related to self. (Fingelkurts and Fingelkurts 2022, Kallio-Tamminen 2022)

On the basis of the Self-Me-I model the Fingelkurts have developed a quantitative measure, Self-Me-I index, for assessing the relative strengths of these three components and for comparison with a population baseline comprising of a representative sample of ordinary healthy persons, with no specific training of self-consciousness. The index consists of seven steps, slight, moderate, strong increase/decrease with respect to the baseline. The Self-Me-I model opens significant avenues for research, and the index offers practical advice for personal development among healthy individuals and for health interventions for persons in pathological states. The hypothesis that the index functions as a well-being measure has received

¹¹ This approach accords neatly with the remark of William James (1890, 221) that 'the self is the fundamental unit of analysis for a science of mental life, the problem about which everything else revolves.'

¹² To avoid numerous references in this brief presentation, please, see the references in the cited articles.

¹³ For further references, please, see Fingelkurts and Fingelkurts 2022.

positive support in several studies on the effects of meditation together with Tarja Kallio-Tamminen. (Fingelkurts and Fingelkurts, 2022, Fingelkurts *et al.*, 2015, 2016, 2016a, 2020, 2022, Kallio-Tamminen 2022).

Meditation is a good starting point for exploring the relevance of the Self-Me-I index as a well-being measure, since clinical studies have already proved positive effects of meditation to general health, decreasing stress and depression, while increasing internal harmony and ability to concentrate. This indicates that regular meditation exercises not only improve one's momentary state of mind, but induces stable traits. Because of the possibility of adverse effects, there is a need for a personalized approach in the meditation practice adjusted for a concrete individual (Fingelkurts *et al.*, 2015).¹⁴ The chief contribution is that, as a result of meditation practice, the whole DMN is suppressed, and the strength of EEG operational synchrony in the right and left posterior modules decrease, whereas there is an increase in the frontal DMN module. This was testified by comparing the Self-Me-I index before and after 4 months of meditation training (Fingelkurts *et al.*, 2016). Corresponding observations were made with persons with long-term meditation experience (Fingelkurts *et al.*, 2016a).

Perhaps the most interesting of this series of work is the experimental setting which allowed testing the hypothesis of mental causation (Fingelkurts *et al.*, 2020). In this study experienced meditators (average 24 years of meditation practice) were requested to mentally induce states corresponding to either an increased or decreased sense of (a) Self (witnessing agency), (b) Me (body representational-emotional agency), or (c) I (reflective/narrative agency). The qEEG-data was compared with first-person phenomenological reports and questionnaires with the focus on subjective contents of the three dimensions of Selfhood. The study supports the causal hypothesis that deliberately generated phenomenological states of Selfhood have an influence on the corresponding three modules of Selfhood in the brain (see also Fingelkurts *et al.*, 2022).

Conclusion

The paper has argued that to contribute to the tricky issues concerning the relations of matter and mind, one has to combine

¹⁴ The Brain-Mind Audit, developed by the Fingelkurts and not discussed here, has proved to be a useful tool for the personalized approach to meditation (Fingelkurts *et al.* 2015).

philosophical and empirical work in a proper manner. As a less successful attempt for such theorizing, I have applied critical conceptual analysis to the quantum physicist David Bohm's treatment of panpsychism as a component of his holistic worldview. I have shown that his panpsychism consists of two distinct theses, the universality and the unity theses. One of his lines of reasoning for his stand is based on the notion of active information, a chief concept in his causal interpretation of quantum mechanics. This approach fails by implying a fallacy of equivocation. The other line of reasoning is based on specifying the unity thesis in terms of soma-significance and signa-somatic processes. This approach succeeds no better but leads to problems of its own. We are thus left without proper argument for either the unity or the universality theses. One could say that Bohm's approach remains too strictly tied to his interpretation of quantum mechanics and he draws too direct analogies between human and quantum phenomena. Rejecting Bohm's panpsychism in no way necessitates rejecting both these theses, however. A qualified version of the unity thesis is quite plausible and is supported by contemporary brain research.

To illustrate a successful manner of combining philosophical and empirical-theoretical research in exploring the brain-mind relations, the paper has discussed work by the neuroscientists Andrew and Alexander Fingelkurts. Their operational architectonics (OA) theory relies explicitly on the unity thesis, and functions as theoretical background for their tripartite self-hood model and Self-Me-I index. The paper has presented results with theoretical and practical relevance of their recent work on meditation within this theoretical framework together with Tarja Kallio-Tamminen (Fingelkurts and Fingelkurts 2001, 2003, 2004, 2008, 2017, 2022, Fingelkurts et al. 2010, b, 2013, Fingelkurts *et al.*, 2015, 2016, 2016a, 2019, 2020, 2022, Fingelkurts *et al.*, 2019).

In addition to yielding evidence to the philosophical brain-mind unity thesis, the described empirical-theoretical work has other philosophical implications. As their research offers empirical evidence to the hypothesis that deliberately generated phenomenal states have causal influence on brain states, this has implications to a widely discussed philosophical issues concerning explanation and understanding of actions. The question is whether one's intentions and beliefs are to be taken as causes of action or as reasons which yield understanding without causal explanation. The brain research offers support to the philosopher Donald Davidson's (1963) stand that reasons

are causes. Yet, one could save the opposite stand by von Wright (1971), according to which the reasons are premises of practical reasoning, i.e., the desire-belief model of action, and yield merely understanding without being causes. To save both stands, one could suggest that in addition to being causal factors, the reasons of action define what action is in question and thus generate understanding. The brain-mind unity conception seems to raise new philosophical problems as well. Since the causal direction from brain to mind is taken as common knowledge, the two-directional brain-mind causation seems to pose new philosophical questions about the nature of causation (see Hiley and Pylkkänen 2005). It seems to me, however, that even though new detailed understanding about the brain-mind relations will be gathered and the nature of causation might be clarified along the way, the hard problem of mental properties may still remain open.

Acknowledgements

The author wants to thank Andrew and Alexander Fingelkurts, Tarja Kallio -Tamminen, and Paavo Pylkkänen for useful comments on the manuscript, and Kai Alhanen for inspiring me to work on the philosophy of David Bohm. Warm thanks also to Donna Roberts for text-editing.

Funding

No funding.

Conflict of Interests

No conflict of interests.

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