

Regular Article

Harald Atmanspacher*

The Pauli–Jung Conjecture and Its Relatives: A Formally Augmented Outline

<https://doi.org/10.1515/opphil-2020-0138>

received June 21, 2020; accepted August 18, 2020

Abstract: The dual-aspect monist conjecture launched by Pauli and Jung in the mid-20th century will be couched in somewhat formal terms to characterize it more concisely than by verbal description alone. After some background material situating the Pauli–Jung conjecture among other conceptual approaches to the mind–matter problem, the main body of this paper outlines its general framework of a basic psychophysically neutral reality with its derivative mental and physical aspects and the nature of the correlations that connect these aspects. Some related approaches are discussed to identify key similarities to and deviations from the Pauli–Jung framework that may be useful for cross-fertilization.

Keywords: dual-aspect monism, exceptional experience, implicate order, meaning, mind, matter correlations, neutral monism, nonlocality, objective idealism, panentheism, panpsychism, product state, reproducibility

1 Background

The question of how the mental and the physical are related to one another is likely as old as humans are pondering the human condition. Its advent in modern Western philosophy is usually appointed to the work of Descartes, who coined the notions of *res cogitans* and *res extensa* to refer to two fundamental substances.¹ In contemporary terms, these substances are addressed as the mental and the physical. Of course, this dualistic stance does not characterize Descartes' thinking exhaustively – but a Cartesian dualist ontology has been eminently influential for the development that eventually led to science and engineering as we know it today.

A key point of difficulty in this framework is a direct interaction between the mental and the physical, which is problematic for a number of reasons. Interpreting the concept of interaction in these sense of a physical (causal, local) interaction, it is entirely unclear to which properties of the mental these physical interactions could couple. Also, mental states have no spatial location, and their temporal dynamics exceed the repertoire of physical time, so there is no common space-time basis for a consistent joint discussion. Considerations like this resonate with the doctrine of the causal closure (or completeness) of the physical, stating that every physical event has a physical cause by necessity.

There are two immediate reactions to Cartesian dualism, both trying to undercut the dualist ontology by emphasizing one of Descartes' substances at the expense of the other. One of them is known as

¹ For details, see Robinson, “Dualism.”

* **Corresponding author: Harald Atmanspacher**, Collegium Helveticum, ETH Zürich, Zürich, Switzerland, e-mail: atmanspacher@collegium.ethz.ch

idealism, where some form of the mental is granted ontological primacy, while the physical is considered as derivative. The other is known as materialism, or physicalism, where some form of the physical is granted ontological primacy, while the mental is considered as derivative. Both of them avoid the problem of interacting substances, because only one substance is left as fundamental. However, the problem that now arises is how to describe the (non-interactive) relation between the primary substance and its derivative.

In physicalism, the dominant view in current science and of large parts of the philosophy of mind, there are two main projects to address this. One is reductive physicalism, claiming that the mental can be reduced to the physical, so that ultimately (i.e., when the goal of this project is accomplished) all mental activity can be understood in terms of physical laws. Sloppily speaking, the idea is that consciousness is understood as soon as the brain is understood. The alternative is non-reductive physicalism, claiming that such a reduction fails and the mental emerges from the physical in the sense that novel properties, such as mentality or consciousness, arise, which cannot be understood from physical laws alone.²

The other response to Descartes, idealism, began with Leibniz and Berkeley and culminated in German idealism (Fichte, Schelling, and Hegel) and British idealism (Bradley and McTaggart). Somewhat simplifying a more involved landscape, it also comes in two variants: subjective and objective idealism. Subjective idealism claims that there are no mind-independent entities (as in physicalism), but rather everything depends on cognitive and perceptive capacities of individual subjects (Berkeley's *esse est percipi*). Objective idealism maintains that there is a universal, absolute, cosmic mind of which individual (human) minds are fragmented and impure offspring.³

A third alternative to Cartesian dualism was pioneered by Spinoza and gave rise to a number of so-called dual-aspect approaches over the centuries. Dual-aspect approaches consider the mental and physical domains of reality as aspects, or manifestations, of an underlying undivided reality in which the mental and the physical do not exist as separate domains. In such a framework, the distinction between mind and matter results from an epistemic split that separates the aspects of the underlying reality. Consequently, the status of the psychophysically neutral domain is considered as ontic relative to the mind-matter distinction.⁴

Two basically different classes of dual-aspect thinking can be distinguished by the way in which the psychophysically neutral domain gives rise to the mental and the physical. For Mach, James, Russell, and the neo-Russellians, often subsumed as neutral monists, the compositional arrangements of psychophysically neutral elements decide about their mental or physical properties. In this picture of wholes constituted by parts, following classical systems theory, the mental and the physical are reducible to the neutral domain.

The other class of dual-aspect thinking is decompositional rather than compositional. Here, the psychophysically neutral domain is holistic, and the mental and the physical (neither reducible to one another nor to the neutral) emerge by making distinctions. This decompositional move was recently characterized as priority monism.⁵ Two quantum-inspired versions of this picture have been proposed by Pauli and Jung and by Bohm and Hiley.⁶

² See Primas, *Chemistry, Quantum Mechanics, and Reductionism*; Beckermann et al., *Emergence or Reduction*; Butterfield, "Emergence, Reduction and Supervenience;" Chibbaro et al., *Reductionism, Emergence and Levels of Reality*; and Bishop, *Physics of Emergence*, for more discussion.

³ See Guyer and Horstmann, "Idealism," for more details. Eastern philosophical systems (such as Zen Buddhism, Advaita Vedanta and several variants of Yoga) escape the characterization of idealism as a reaction to Descartes, but they appear to correlate with objective (or cosmic) idealism in several respects, which Chalmers, "Idealism and the Mind-Body Problem," discussed in his systematic account of idealist frameworks. This issue will be picked up again in Section 4.3.

⁴ An overview of 20th century versions of dual-aspect thinking has been presented by Atmanspacher, "20th Century Variants."

⁵ Schaffer, "Monism: The Priority of the Whole."

⁶ Jung and Pauli, *Interpretation of Nature*; Atmanspacher, "Dual-Aspect Monism;" Bohm, "A new theory;" and Bohm and Hiley, *Undivided Universe*.

The following is an attempt to augment the proposal by Pauli and Jung, the Pauli–Jung conjecture, by using somewhat formal terms.⁷ In this way, it will become clear how it is motivated by key concepts of quantum theory – both Pauli and Bohm played significant roles in the development of quantum mechanics. The general framework is sketched in terms of the decomposition of psychophysically neutral states Φ_{PPN} into separate mental states Φ_M and physical states Φ_P , together with correlations ($\Phi_M \sim \Phi_P$) between them.

The formalization, which is kept to a minimum,⁸ will serve to describe (and hopefully apprehend) the empirical material in Section 3 and the comparative material in Section 4 more easily. Section 3 takes a closer look at the correlations, their relation to their psychophysically neutral origin, the way they are substantiated, and how they lead to a taxonomy of phenomena expressing mind–matter relations. It will be shown that a considerable amount of empirical material supports this taxonomy. Section 4 addresses mind–matter accounts that are close, near, and distant relatives of the Pauli–Jung conjecture: Bohm’s implicate and explicate orders, neutral monism à la Mach, James, and Russell, and variants of objective idealism. As a particular point of comparison, their different outlook on cosmic consciousness, panpsychism, and the psychophysically neutral will be analyzed.

2 General framework of the Pauli–Jung conjecture

This section resorts to a terminology that readers knowledgeable in quantum physics are familiar with and generalizes it – speculatively – to frame the mind–matter problem as seen in decompositional dual-aspect monism à la Pauli and Jung. The basic reality in their conjecture is psychophysically neutral (PPN) and lacks the distinction between the mental (M) and the physical (P). Any psychophysically neutral state Φ_{PPN} can manifest itself in separate states Φ_M and Φ_P in state spaces \mathcal{M} and \mathcal{P} , respectively, representing the derivative realities (aspects of PPN) M and P . The state Φ_{PPN} is itself not a product state, $\Phi_{PPN} \neq \Phi_M \otimes \Phi_P$, so that Φ_M and Φ_P are not states of separate subdomains M and P and their corresponding state spaces \mathcal{M} and \mathcal{P} .⁹ It is the manifestation of Φ_{PPN} in the subdomains M and P that can be regarded as the decomposition of separate states $\Phi_M \in \mathcal{M}$ and $\Phi_P \in \mathcal{P}$.

The notions of product and non-product states indicate concepts that are inspired by analogies to quantum theory.¹⁰ This entails that the separability of states with respect to

⁷ Pauli and Jung developed their thinking mainly in their correspondence and in scattered remarks in publications in the mid-20th century, but they never presented it in a coherent and comprehensive way. Their ideas were systematically reconstructed by Atmanspacher and Primas (“Hidden Side of Pauli,” “Pauli’s Ideas on Mind and Matter,” *Recasting Reality*) after most of the so far unpublished material Pauli and Jung had left behind was released. The notion of the Pauli–Jung conjecture was coined by Atmanspacher and Fuchs, *Pauli–Jung Conjecture*.

⁸ Why to a minimum? As Halmos (*I Want To Be a Mathematician*, 4) stated in his autobiography, “the invention of subtle symbolism is often a great step forward, but its use can obscure almost as much as it can abbreviate.” Words often help to create the insight necessary to develop pertinent formal concepts for a problem (e.g., that of decomposition). However, symbolism is not only for abbreviation. According to Pauli (“Letter to Goldschmidt,” 39): “A symbol can only partially be expressed by conscious ideas, another part of it acts upon the human ‘unconscious’ or ‘preconscious’. The same holds for mathematical notation, for only those have a talent for mathematics who are capable of appreciating its symbolic power.”

⁹ In analogy to ordinary quantum physics, \mathcal{M} and \mathcal{P} would be the Hilbert spaces of subsystems M and P whose states Φ_M and Φ_P are pure in \mathcal{M} and \mathcal{P} , respectively, although Φ_{PPN} is not pure in the tensor product space $\mathcal{M} \otimes \mathcal{P}$. Since there is no canonical state space \mathcal{M} for mental states available so far, and since we will be looking for a formal structure of which we only know that Hilbert space quantum physics is one of its representations, we leave the state spaces for Φ_M , Φ_P , and Φ_{PPN} unspecified at this point. The work of Bohm and, in particular, Hiley proposes a possible way to be more specific (see Section 4.1).

¹⁰ The Wikipedia entry at en.wikipedia.org/wiki/Interpretations_of_quantum_mechanics lists 17+ different ways to interpret the formalism of quantum theory, each of which has different things to say about key conceptual aspects of entanglement. This article cannot possibly live up to their substance in detail and is restricted to some common denominator. See, e.g., Myrvold, “Philosophical Issues,” for more details.

particular observables is non-trivial and that observables in general do not commute. That this is not only the case in quantum physics but also for mental operations such as cognition and perception has been demonstrated in numerous applications in recent decades.¹¹ The corresponding progress in understanding mental processes has been encouraging for using the mathematics of quantum theory beyond quantum physics. As a consequence, not only \mathcal{P} but also \mathcal{M} is conceived as a non-classical state space, and it would be implausible to conceive their underlying state space containing states Φ_{PPN} as classical.

Moreover, it should be noted that only physical states Φ_P can be embedded in three-dimensional position space and evolve as a function of physical, tenseless time. Mental states Φ_M generically are outside anything like position space, and mental time is tensed, that is, it distinguishes past, present, and future.¹² The psychophysically neutral domain is assumed to be void of both position space and mental or physical time. Therefore, states Φ_{PPN} cannot be characterized in terms of spatial or temporal locations or distances.

Since Φ_M and Φ_P derive from the same state Φ_{PPN} , their manifestation co-creates correlations between them, denoted as $(\Phi_M \sim \Phi_P)$. These correlations are acausal, meaning that they are not due to a causal influence between Φ_M and Φ_P , and they are not chance events either. Since they are co-created in the manifestation process, they depend on the state Φ_{PPN} from which they derive. They are detected by the subject that experiences them in its state Φ_M .¹³

$$\begin{array}{ccc} \Phi_M & \text{--- acausal correlation ---} & \Phi_P \\ & \swarrow \quad \quad \quad \searrow & \\ & \Phi_{PPN} \neq \Phi_M \otimes \Phi_P & \end{array}$$

This scheme, sketched in analogy to quantum entanglement, is a gross simplification though. More realistically, one has to imagine a layered structure in the psychophysically neutral reality. Descending into it from the physical side leads to entangled quantum states, and descending into it from the mental side leads to the domain of the personal unconscious – distinct from Jung’s collective unconscious populated by archetypes blurring the mental–physical boundary. Moving to lower layers, the distinction between M and P dissolves until finally a universally holistic domain, an *unus mundus*,¹⁴ arises that represents the limiting case of a fundamental archetype with no distinctions whatsoever.

Formally speaking, an *unus mundus* would be a completely symmetric situation where nothing “stands out” and everything is invariant.¹⁵ By contrast, the Pauli–Jung conjecture offers archetypal patterns A_i in the psychophysically neutral reality which are not identical, yet their differences do not permit an assignment to M or P . (Archetypal patterns in Jung’s sense are holistically conceived like “gestalts” and not composed of elements, like patterns in a network.) Although states Φ_{PPN} may differ with

¹¹ See, e.g., Wang et al., “The Potential of Using Quantum Theory.”

¹² A stimulating comprehensive study of the relations between physical and mental time due to Primas, *Knowledge and Time*, sketches ideas to flesh these relations out in a dual-aspect spirit.

¹³ Section 3 discusses these experiences, which Jung and Pauli (*Interpretation of Nature*) called synchronistic events or meaningful coincidences, in more detail.

¹⁴ Jung, “Mysterium Coniunctionis.”

¹⁵ A property F is called invariant under the transformation μ if $F = F^{(\mu)}$. In this sense, symmetries are invariances under transformations, but a transformation already presupposes some parameter whose variation is discernible, which led to the slogan of “change without change” (Wilczek, *A Beautiful Question*). Therefore, a “complete” symmetry cannot be expressed this way, and one might prefer to work with idempotent operations I , which leave a state unchanged by successive application, $I = I^2$. Eddington (*Philosophy of Physical Science*) and later Frescura and Hiley (“The Implicate Order”) proposed idempotents of Clifford algebras in their discussion of an implicate order akin to a psychophysically neutral reality. See Section 4.1.

respect to archetypal patterns A_i and A_j , they are not product states with respect to \mathcal{M} and \mathcal{P} , such that $\Phi_{PPN_A} \neq \Phi_{M_A} \otimes \Phi_{P_A}$. Only their manifestations yield decomposed states, $\Phi_{PPN_A} \rightarrow \Phi_{M_A} \otimes \Phi_{P_A}$.

The manifestation process $PPN \rightarrow (M, P)$ does not only transform Φ_{PPN_A} into the decomposed states Φ_{M_A} and Φ_{P_A} , it also generates a backreaction. On the physical side, this is well known as the uncontrollable effect of an observation on the observed system. On the mental side, a conscious insight changes the unconscious state from which it arose, also uncontrollably. This structural analogy is striking and means that the upward arrows in the figure above have to be complemented by downward arrows indicating that both Φ_{M_A} and Φ_{P_A} may change the state Φ_{PPN_A} .

$$\begin{array}{ccc} \Phi_{M_A} & \text{— acausal correlation —} & \Phi_{P_A} \\ & \swarrow \quad \searrow & \\ & \Phi_{PPN_A} \neq \Phi_{M_A} \otimes \Phi_{P_A} & \end{array}$$

Once M and P are manifest as separate yet correlated domains, the question arises how the correlations ($\Phi_M \sim \Phi_P$) can be fleshed out. One possible way to do so, proposed earlier, uses a non-reductive physicalist methodology, dubbed contextual emergence.¹⁶ In this framework, mental states Φ_M can be constructed from physical states Φ_P under contextual constraints that are available within M . (That they are not available within P blocks reduction to P .)

A given contextual constraint yields a partition of \mathcal{P} that allows us to map the fine-grained microstate dynamics p of Φ_P onto a coarse-grained (symbolic) macrostate dynamics m of Φ_M by using a so-called intertwiner $\pi : \mathcal{P} \rightarrow \mathcal{M}$ such that $\pi \circ m = p \circ \pi$ or $m = \pi^{-1} \circ p \circ \pi$. This can be represented diagrammatically as:

$$\begin{array}{ccc} \Phi_M(0) & \xrightarrow{m} & \Phi_M(t) \\ \uparrow \pi & & \uparrow \pi \\ \Phi_P(0) & \xrightarrow{p} & \Phi_P(t) \end{array}$$

The intertwiner π maps many physical microstates in each partition cell onto one mental macrostate per cell, for which the microstates form an equivalence class.¹⁷ Thus, the micro–macro mapping actually appears as a many-to-one mapping under a given context, defining an appropriate Markov partition of microstates into macrostates.¹⁸

Likewise, a comprehensive meta-analysis of localized neural (fMRI) correlates of various mental tasks¹⁹ showed that indeed different brain locations are activated during the same mental task. However, these studies also showed the converse: that the same neural activation is correlated with more than one

¹⁶ Atmanspacher and Beim Graben, “Contextual Emergence.”

¹⁷ An equivalence class with respect to an element a of a set X is the subset $[a] = \{x \in X | a \equiv x\}$. A macrostate Φ_M defines an equivalence class of microstates Φ_{P_i} if and only if $\Phi_M(\Phi_{P_i}) = \Phi_M(\Phi_{P_j})$ for $i, j = 1, \dots, n$, so that $\Phi_{P_i} \equiv \Phi_{P_j}$ with respect to Φ_M . In this case, Φ_M is an invariant of the equivalence class of microstates Φ_{P_i} .

¹⁸ For a concrete construction of such a partition correlating neural (EEG) microstates Φ_{P_i} with mental macrostates Φ_M from empirical data, see Allefeld et al., “Mental States as Macrostates,” and for key differences from Kim’s supervenience argument, see Harbecke and Atmanspacher, “Horizontal and Vertical Determination.”

¹⁹ Anderson, “Neural Reuse.”

mental task, such that many mental states Φ_{M_i} are correlated with one neural state Φ_P ! This suggests another intertwiner $\mu : \mathcal{M} \rightarrow \mathcal{P}$ with $\mu \circ p = m \circ \mu$ or $p = \mu^{-1} \circ m \circ \mu$. The corresponding diagram is the upside-down version of the one shown before:

$$\begin{array}{ccc} \Phi_P(0) & \xrightarrow{p} & \Phi_P(t) \\ \uparrow \mu & & \uparrow \mu \\ \Phi_M(0) & \xrightarrow{m} & \Phi_M(t) \end{array}$$

Taking both π and μ into account, mental-to-physical correlations are both one-to-many and many-to-one, hence many-to-many. This restores the symmetric relationship between M and P for the nature of the correlations between them: the micro–macro connection can go both ways, so it is neither reductive nor physicalist after all. Although physical (or, in this case, neural) correlates of conscious mental states are never one-to-one, their dynamics can be intertwined to be topologically conjugate with one another.

3 Meaningful correlations

3.1 Neither causal nor random

In quantum physics, measuring an entangled non-product state yields separate states that are non-locally correlated in a precise way, depending on the entangled state from which they derive. An entangled singlet pair state, for instance the state Φ_{pair} of a particle pair, is not the same as the product of the states Φ_1 and Φ_2 of two separate particles. The decomposed states of the two separate particles arise from the pair state as soon as a property of the system, like spin, is measured. Together with a spin measurement at particle 1, the opposite spin becomes realized at particle 2, so that there are strict anticorrelations between the measured spins of the two separate particle states.

An ingenious inequality set up by Bell in 1964 expresses the classical assumption of a local reality where the entangled pair state would in fact be the same as the product state of the two separate particles. In a somewhat modified formulation, this inequality reads as follows:²⁰

$$|E(a, b) - E(a, b') + E(a', b) + E(a', b')| \leq 2,$$

where a and a' are measurement settings for particle 1, b and b' are measurement settings for particle 2, and $E(.,.)$ expresses the expectation value of the measured spin pairs $(+1, +1)$, $(+1, -1)$, $(-1, +1)$, and $(-1, -1)$ at particles 1 and 2 ($+1/-1$ stand for spin up/down). Calculating the values of E for measurements with different settings yields that their sum violates the limit posed by classical correlations, the value 2, exactly in the way quantum mechanics predicts, namely up to the value $2\sqrt{2}$.²¹ Many corresponding experiments

²⁰ Bell, “On the Einstein-Podolsky-Rosen Paradox;” and Clauser et al., “Proposed Experiment to Test Hidden-Variable Theories.”

²¹ This is known as the so-called Tsirelson bound, according to Tsirelson (“Quantum Generalizations”). It is of interest to note that the range in which Bell’s inequalities can be violated in principle exceeds the Tsirelson bound for quantum systems up to the value of 4. Examples of this effect have been constructed, but it is unclear at present what nature wants to tell us with these super-quantum

so far have provided overwhelming evidence that local realism is violated by entangled quantum systems.²²

There is a stunning analogy of this line of argument with the Pauli–Jung conjecture sketched in Section 2, which matches exactly what is sometimes referred to as a “pullback metaphor”:²³ structural relations in a new domain to be explored are pulled back to structural relations in a familiar domain. Just replace Φ_{pair} with psychophysically neutral states Φ_{PPN} , and Φ_1 and Φ_2 with mental states Φ_M and physical states Φ_P , and the basic scheme is the same. Neither in quantum entanglement nor in dual-aspect monism are the correlations due to causal interactions, and yet in neither of the two they are random. So it seems that quantum entanglement teaches us a lesson we might be able to apply to the bigger picture of mind–matter correlations as well.

However, there is a crucial difference between quantum correlations and mind–matter correlations, which calls for emphasis because of its significant consequences. While acausal quantum correlations between two particles Φ_1 and Φ_2 are purely statistical and perfectly reproducible across experiments, correlations ($\Phi_M \sim \Phi_P$) between the mental and the physical are not. Since these correlations transgress the boundary of the physical toward the mental, they inevitably necessitate a subjective element that challenges reproducibility. Subjective experience is clearly something that physics, or any other science describing and explaining “objective” (physical) facts, cannot cover within its limits. To address this, Jung and Pauli offered the radical and brilliant idea that the currency of these correlations is not (quantitative) statistics, as in quantum physics, but (qualitative) meaning.²⁴

They expressed this idea with their proposal of synchronistic events consisting of acausally connected states Φ_M and Φ_P , whose correlations ($\Phi_M \sim \Phi_P$) are not (or sufficiently unlikely) random. In addition, they are not only notable and striking but also exhibited as meaningful coincidences.²⁵ The meaning that substantiates the correlations is attributed by the experiencing subject in its state Φ_M . As an intrinsically relational concept, meaning correlates subjective states Φ_M of mental representations with states Φ_P of what they represent in the physical domain. In a way, the experience of meaning can thus be understood as a (“sixth”) sense modality for “perceiving” psychophysical correlations.²⁶

However, the subjective and generally irreproducible attribution of meaning does not entail that it is arbitrary: it is an (often symbolic) expression of the non-subjective, psychophysically neutral, archetypal state Φ_{PPN_A} from which it originates. If an archetypal pattern is activated, the correlation between a subject’s mental state Φ_{M_A} and its correlated physical state Φ_{P_A} is restricted to a range of experiences prescribed by the theme of the activated archetypal state Φ_{PPN_A} .²⁷

As a two-place relation between a mental representation and what it represents, the concept of meaning has been widely discussed as intentionality, or intentional content, in the philosophy of mind.²⁸ Two differences to this standard discussion should be stressed. First, mental representations in the

correlations. Their study has become a vivid field of contemporary research, as the review by Popescu, “Nonlocality beyond Quantum Mechanics,” demonstrates.

²² The logic of such tests is indirect: assume A and B as mutually exclusive metaphysical alternatives, reject B by its experimental consequences, so you get A as the remaining alternative. This is exactly what the study of entanglement did: if A is nonlocal realism and B is local realism, then the violation of Bell’s inequality refutes B, such that A survives.

²³ Devlin, “A Mathematician Reflects.”

²⁴ Jung and Pauli, *Interpretation of Nature*.

²⁵ Obviously, this is not a rigorous definition. For a detailed discussion of the concept of synchronicity and several problems with its precise characterization, see Main (*Revelations of Chance*, 11–23). Particularly critical are the notions of simultaneity, causation, and meaning. In the present outline, synchronistic events are not restricted to be simultaneous in time, causation is essentially regarded as efficient causation, and meaning is mainly addressed in the sense of the philosophy of mind, where it is referred to as intentionality (Jacob, “Intentionality”), i.e., as the intentional content of a mental representation.

²⁶ This resembles the way Gabriel, *Meaning of Thought*, discusses the faculty of understanding.

²⁷ More details are discussed in Section 3.2, see also Main, *Revelations of Chance*.

²⁸ An alternative, non-representational concept of meaning due to the interaction of an organism with its environment, an action–perception loop, pervades phenomenology (Merleau-Ponty, *Phenomenology of Perception*), ecological psychology (Gibson, *Ecological Approach to Perception*), as well as dynamical system approaches to cognitive neuroscience (Skarda and

Pauli–Jung conjecture do not relate to what they represent in the outside physical world, but that “world” is itself regarded as an aspect of an underlying reality.²⁹

The second point is that the unfolded meaningful correlations ($\Phi_M \sim \Phi_P$) derive from their origin in the psychophysically neutral domain, i.e., from archetypal pattern states Φ_{PPN_A} . This suggests that the experienced meaning is somehow implicitly preformed in those patterns irrespective of its manifestation through Φ_M and Φ_P and their correlation ($\Phi_M \sim \Phi_P$). Since at the psychophysically neutral archetypal level there is no subject–object distinction, it is a challenging question of whether and, if yes, how this implicit, dispositional core of meaning can itself be open to experience.³⁰

3.2 Structural and induced correlations

For a more systematic account of the correlations between the mental and physical aspects of an underlying psychophysically neutral reality, Atmanspacher and Fach suggested distinguishing structural and induced correlations.³¹ These two types of correlations in the framework of the Pauli–Jung conjecture will now be explained in more detail.

Structural correlations are considered as the consequence of a unidirectional manifestation of Φ_{PPN} in both the mental and the physical, without the backreaction indicated in Section 2. Typical examples are psychosomatic correlations such as those between mental stress and physical blood pressure or the widely discussed neural correlates of conscious mental states. The “symmetric” intertwining relations π and μ discussed at the end of Section 2 belong to this class of structural correlations, which are pretty much established (even though they are usually not one-to-one), and they are stable and reproducible. Typically, they are never explicitly experienced as particularly meaningful, let alone numinous (as Jung occasionally demanded for synchronistic events). In this sense, they define a persistent correlation baseline that does not call for particular attention by the subject.

Nevertheless, they are manifestations of archetypal patterns. Since the correlations are robust, it makes sense to assume that the archetype from which they originate is always and ubiquitously constellated across time and irrespective of individual or societal differences. This is the case for those archetypes Jung identified as most fundamental, such as the principles of unity and duality, integration and differentiation. Splitting one (unity) into two (duality) is a basic principle in all Western epistemology (though less so in Eastern philosophies, hence culture may indeed make a difference), and it seems plausible to see such basic archetypes as responsible for structural, stable, and reproducible baseline correlations. Such correlations ($\Phi_M \sim \Phi_P$) can be heuristically characterized by their vanishing difference from the baseline, $\Delta(M \sim P) = 0$, omitting the index A for archetype because of its virtually context-independent significance in this case.³²

Freeman, “How Brains Make Chaos”). At variance with mental intentionality, this notion of meaning invites an expansion of the Pauli–Jung conjecture toward biological evolution without mental representations. See Wang (“Mind and Meaning”) for more discussion.

²⁹ This is consistent with the way Metzinger (“Precis of Being No One”) conceives intentionality, compare Atmanspacher and Fach, “Exceptional Experiences.”

³⁰ Main, *Revelations of Chance*, 31–7, and Atmanspacher, “Status of Exceptional Experiences;” see also Section 4.3.

³¹ Atmanspacher and Fach, “Structural-Phenomenological Typology.”

³² Note that the baseline may be subject to long-term changes in the same way archetypes may not be strictly invariant. Depending on cultural background, novel archetypes may form and old ones may become inefficacious. For instance, large-scale traumatic events such as world wars, genocides, climate changes, and ever accelerating globalized predator capitalism with its disastrous consequences created and create archetypal patterns that were arguably less pronounced or totally absent before the 20th century. Note also that archetypes exhibit a tight resemblance with affordances à la Gibson (*Ecological Approach to Perception*) that provide dispositions for behavior in action–perception cycles under particular space–time contexts.

$$\begin{array}{ccc}
 \Phi_M & \text{— structural correlations —} & \Phi_P \\
 & \Delta(M \sim P) = 0 & \\
 & \swarrow \quad \searrow & \\
 & \Phi_{PPN} \neq \Phi_M \otimes \Phi_P &
 \end{array}$$

Induced correlations are correlations ($\Phi_M \sim \Phi_P$) with a non-vanishing distance from the baseline and come in two variants: coincidence phenomena and dissociation phenomena. In coincidence phenomena, there are excess correlations between Φ_M and Φ_P above the baseline of structural (ordinary) correlations, while dissociation phenomena express deficit correlations between Φ_M and Φ_P below the baseline (see more details in Section 3.3). Both types of induced correlations can be heuristically characterized by $|\Delta(M \sim P)| > 0$. Reason #1 for induced correlations is that they arise from archetypal patterns less fundamental than structural correlations. They are activated only under special circumstances rather than pervading entire cultural contexts. Reason #2 is the backreaction that makes it possible to induce changes of Φ_{PPN_A} from both Φ_{M_A} and Φ_{P_A} . These changes can in turn manifest themselves in M and P , creating further correlative experiences ($\Phi_M \sim \Phi_P$).

$$\begin{array}{ccc}
 \Phi_{M_A} & \text{— induced correlations —} & \Phi_{P_A} \\
 & |\Delta(M \sim P)| > 0 & \\
 & \swarrow \quad \searrow & \\
 & \Phi_{PPN_A} \neq \Phi_{M_A} \otimes \Phi_{P_A} &
 \end{array}$$

As an example, consider some subject in the imagined situation of grave personal loss in their immediate (emotional) environment. In Jungian terms, this situation may activate an archetypal pattern of grief. The corresponding state $\Phi_{PPN_{\text{grief}}}$ will manifest itself in states $\Phi_{M_{\text{grief}}}$ and $\Phi_{P_{\text{grief}}}$ and correlations ($\Phi_{M_{\text{grief}}} \sim \Phi_{P_{\text{grief}}}$) between them (representing a synchronistic event). These correlations are experienced as meaningful by the subject insofar as it attributes grief-related content to them in its state $\Phi_{M_{\text{grief}}}$. Likewise, any other archetypal pattern would manifest other kinds of synchronistic events related to its content and, thus, limit the range of possible subjective experiences. In this way, the attribution of meaning is always subjective – but it is never arbitrary.

This is not the end of the story though. As soon as the grief state $\Phi_{M_{\text{grief}}}$ appears consciously, it has a backreaction onto $\Phi_{PPN_{\text{grief}}}$, which induces a perturbation of the archetypal grief pattern and its environment in the psychophysically neutral domain. This perturbation of $\Phi_{PPN_{\text{grief}}}$ can lead to a new equilibrium situation, a new unconscious homeostasis as it were, so that a slightly changed state $\Phi_{PPN_{\text{grief}}}^*$ may create a novel state $\Phi_{P_{\text{grief}}}^*$ and, thus, a novel correlation ($\Phi_{M_{\text{grief}}} \sim \Phi_{PPN_{\text{grief}}}^*$) – another synchronistic event.

In Jungian psychoanalysis, a dynamic like this can be therapeutically useful to overcome a difficult situation (here connected to grief) and even constructively exploit it to turn to an attitude more conducive for the process of self-realization, which Jung called individuation. Ultimately, it is the transformative impact of a meaningful coincidence that decides how significant it has been for the experiencing subject.³³

³³ Main, *Revelations of Chance*, collected and discussed impressive narrative material along these lines.

3.3 Exceptional experiences

The Pauli–Jung conjecture is not only conceptually appealing, but it also has wide-ranging empirical consequences – a promising feature that makes it particularly outstanding among several related approaches to mind–matter research, to be discussed in Section 4.

As indicated above, induced correlations can appear as coincidence phenomena and dissociation phenomena, above and below ordinary baseline correlations. Coincidence phenomena exhibit excess correlations above ordinary baseline correlations. They include meaningful coincidences (synchronicities in Jung’s parlance) that connect *M* and *P* more than ordinarily. Conversely, dissociation phenomena exhibit deficit correlations where ordinary baseline correlations are disconnected, e.g., in out-of-body experiences, sleep paralysis etc. Based on the Pauli–Jung conjecture, Atmanspacher and Fach proposed a taxonomy in which coincidence and dissociation phenomena form two of four fundamental types of exceptional experiences based on induced correlations.³⁴

As of today, about 3,000 cases of spontaneously occurring exceptional experiences have been systematically collected and evaluated at the Institute for Frontier Areas of Psychology (Freiburg).³⁵ As a result of various factor analyses, cluster analyses, item analyses, and scale analyses, the taxonomy predicted by the Pauli–Jung conjecture turned out to be the most robust and best generalizable model for all analyzed samples. The fact that all patterns occur not only in subjects seeking help but also, although less often, in the general population shows that exceptional experiences are widespread and continuously distributed in their intensity and frequency.

One of the general population samples was compiled in cooperation with the Psychiatric University Clinic Zurich.³⁶ After the standard, questionnaire-based procedure of identifying individuals according to the taxonomy, their behavior in psychophysical settings known as Mooney tasks was analyzed. With such tasks, the disposition of subjects to project meaningful objects into a random distribution of pixels can be studied. Wyss found that among the four basic types of exceptional experiences only subjects inclined toward coincidence phenomena showed a significant rate of false positives in the task.³⁷ These subjects perceive meaningful excess correlations (patterns) in situations that are random by construction – impressive support for the taxonomy of phenomena not only for spontaneous occurrences but even in controlled experiments.

Moreover, applying the framework of the Pauli–Jung conjecture to the psychodynamics of situations in which subjects report exceptional experiences yields new and fascinating insights. Fach showed this for the interplay of bonding and autonomy for adolescents exhibiting exceptional experiences in their family contexts.³⁸ In addition to a better understanding of the nature of mind–matter correlations in general, such psychodynamics studies offer specific intervention strategies with distinct therapeutic potential for subjects suffering from exceptional experiences.

However, far from all subjects reporting exceptional experiences suffer from them or even receive psychotic diagnoses. To avoid a premature and unjustified identification of exceptional experiences exclusively as mental disorders, the constructed questionnaires assess their phenomenology only, disregarding issues of veridicality or even psychopathology. The question of veridicality (or “truthfulness”) is delicate because it bears critically on assumptions about ontology. From a physicalist perspective, the veridicality of an experience requires that it must not contradict the laws of physics. If it

³⁴ See Atmanspacher and Fach, “Structural-Phenomenological Typology.” These experiences are not exceptional in the sense that their frequency of occurrence is low among a given population and that, as a result, not much empirical material is available. The opposite is the case. Several studies estimated frequencies of about 50% for populations in Western countries, and higher than that within other cultural contexts. The reason why exceptional experiences are denoted as exceptional is that their intraindividual frequency is small compared to ordinary, non-deviant mental experiences.

³⁵ For details, see Atmanspacher and Fach, “Exceptional Experiences;” and Fach, “Spektrum des Aussergewöhnlichen.”

³⁶ Fach et al., “A Comparative Study.”

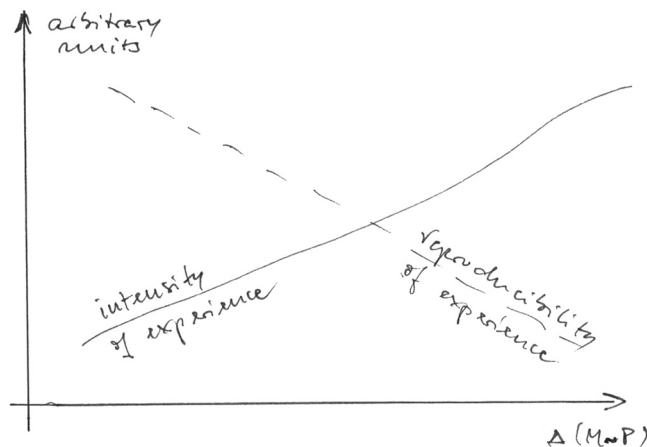
³⁷ Wyss, “Behavioral, Physiological and Subjective Aspects.”

³⁸ Fach, “Complementary Aspects.”

does, the experience will likely be ditched as a psychopathological impairment or a hallucination, which, however, is still veridical from a phenomenological standpoint.³⁹ From a dual-aspect perspective, correlational experiences ($\Phi_M \sim \Phi_P$) are subject to neither physics alone nor psychology alone. To dismiss them as hallucinations because they do not follow the laws of physics would be an obvious category mistake.

The existing empirical material shows – plausibly – that the (self-rated) perceived intensity of induced exceptional experiences decreases as a function of increasing frequency. Subjects may report low-intensity, hardly meaningful experiences fairly often, while “once-in-a-lifetime-experiences” of almost existential, numinous quality are rare. Low-level intensity experiences exhibit a small difference from the baseline of no experienced meaning at all. This suggests the heuristic picture of a monotonic increase of the intensity of meaningful experiences with increasing $|\Delta(M \sim P)|$. Rather than treating singular events of high intensity as statistical outliers, they are here seen as part of a lawful regularity.

In a similar vein, the empirical material also shows that structural baseline correlations with $\Delta(M \sim P) = 0$ (such as psychosomatic or psychoneural correlations) are stable and reproducible as standard scientific methodology demands. Induced correlations, however, are less stable up to completely evasive, and they are difficult to reproduce up to completely irreproducible. Hence, we may imagine a continuum of stability and reproducibility as a function of $|\Delta(M \sim P)|$ that looks heuristically like the diagram below. The higher the intensity of an experience (solid line) and its associated meaning is, the less stable and, as a consequence, the less reproducible (dashed line) it is to be expected. Or, somewhat sloppily speaking, the scientific aspiration to increase reproducibility inevitably entails that experienced meaning has no place in science.



There are immediately evident important lessons to be learned from these observations. The Pauli–Jung conjecture predicts a spectrum of reproducibility related to a continuum of the intensity of induced correlations, both depending on their distance $|\Delta(M \sim P)|$ from the baseline of structural correlations. The higher the intensity of experienced meaning, the lower the reproducibility of the experience. However, reduced or lacking reproducibility as such should not be seen as a knee-jerk indicator for reduced or lacking scientific soundness. There are innumerable events that have not been and will never be reproduced, and no one doubts their factuality. The world of controlled laboratory experiments is certainly small compared to the world around us.⁴⁰

³⁹ See also Prakash et al., “Fact, Fiction, Fitness.”

⁴⁰ Eddington, *Philosophy of Physical Science*, called the associated strategy guaranteeing reproducible outcomes a Procrustes strategy.

This is not a credo for some kind of hocus-pocus pseudoscience. Rather, it would be interesting to look at the spectrum of reproducibility as a scientific topic in its own right. We do already know that there are variations of reproducibility in established science, such as the deterministic reproducibility for individual events, statistical reproducibility for ensembles, problems with ensemble reproducibility in non-ergodic systems, long-time transients, and other situations eluding the straightforward application of limit theorems.⁴¹ It could be a valuable enrichment to science to study how reproducibility changes depending on circumstances rather than uncritically rejecting research based on reproducibility criteria not properly adapted to the context of the situation.

4 Related approaches

4.1 Implicate and explicate orders

Arguably the closest relative of the Pauli–Jung conjecture is Bohm’s proposal to consider the mental M and the physical P as decomposed explications (explicate orders) of holistic implicate orders whose most fundamental form he calls holomovement, resembling the *unus mundus* of Pauli–Jung.⁴² In between M and P and the holomovement, Bohm suggests a multilayered structure of implicate orders each of which generates explications that in turn may be implicate with respect to further explications.⁴³ In this way, he refers to structures that resemble a hierarchy of archetypal patterns in the Pauli–Jung framework.

Pauli and Jung did not address anything akin to the relativity of the distinction between implicate and explicate orders. However, such a distinction is important to understand the interplay of ontic and epistemic domains in the nested hierarchy of levels of reality in their conjecture. As an implicate order can be explicate with respect to a more implicate order, an ontic level of reality can be epistemic with respect to a more ontic level. A more detailed discussion of such a relative onticity, adopted from Quine’s ontological relativity, would exceed the scope of this paper.⁴⁴

Manifestations of implicate orders into separate states Φ_M and Φ_P are called unfolding in Bohm’s framework, and backreactions from Φ_M and Φ_P to their underlying implicate order are called enfolding. While in the Pauli–Jung conjecture archetypal activity is always psychophysically neutral, i.e., archetypes are neither mental nor physical, Bohm refers to implicate orders that are both mental and physical,⁴⁵ suggesting a distinction between M and P within such implicate orders. This “both-and” figure, as innocent as it may look, marks a grave deviation from the “neither-nor” of the Pauli–Jung conjecture. Taking it at face value, it points to a representation of implicate order states as product states in $\mathcal{M} \otimes \mathcal{P}$.

States of an implicate order in which both mental and physical properties are already separable would characterize a version of panpsychism – the view that mentality is fundamental and ubiquitous in the natural world.⁴⁶ In this view, the index *PPN* (psychophysically neutral) would be illegitimate for such states. Rather, one might want to speak of product states $\Phi_{PP} = \Phi_M \otimes \Phi_P$ with *PP* for panpsychism. It is not

⁴¹ Atmanspacher and Demmel, “Methodological Issues.”

⁴² See Bohm, “A New Theory.” It is sometimes argued that the processual nature of the holomovement is at variance with a basically static *unus mundus*. I don’t think this difference is as cogent as it might seem at first glance (see also Main, “Ethical Ambivalence”). After all, both holomovement and the *unus mundus* are the ultimate sources of all dynamic activity that results from implicate orders or archetypal patterns.

⁴³ Bohm, *Wholeness and the Implicate Order*.

⁴⁴ Quine’s “Ontological Relativity” has been concretely applied to scientific examples by Atmanspacher and Kronz, “Relative Onticity.”

⁴⁵ Bohm, *Wholeness and the Implicate Order*, 283.

⁴⁶ See Seager, *Panpsychism*. Panpsychism does not claim that elements of the physical world exhibit the same kind of consciousness as humans and other primates. This is reflected in notions such as panexperientialism or panprotopsychism. The considerable variety of graded panpsychisms is also discussed in detail by Goff et al., “Panpsychism.”

clear whether Bohm wants to stretch his panpsychism eventually to the holomovement as the ultimate implicate order – if not, the holomovement state would be a non-product state $\Phi_{PPN} \neq \Phi_M \otimes \Phi_P$ as all archetypal patterns in the Pauli–Jung conjecture are assumed to be.

An important point common to Bohm and Pauli–Jung is their emphasis on the significance of meaning, which no other approach to the mind–matter problem highlights so crucially (though Bohm, naturally, does not stress the subjective experience of meaning as much as Jung does). In Bohm’s wording, this is addressed by the notion of active information, which brings implicate structures into explicate forms. By doing so, not only separate states Φ_M and Φ_P are generated as explicate orders from an underlying implicate order, but in addition, active information deriving from the implicate order substantiates mind–matter correlations ($\Phi_M \sim \Phi_P$) as meaningful. These correlations arise as a consequence of the fact that both Φ_M and Φ_P unfold together from the same state of the same implicate order.

Hiley, a close collaborator of Bohm for decades, developed the idea of implicate and explicate orders further using the formal apparatus of representations of algebraic structures. Picking up on earlier proposals by Eddington,⁴⁷ he identified idempotents I of Clifford algebras as operators that leave the structural existence of a system invariant, though its concrete properties may well be subject to change. Irrespective of how much the appearance of a system may vary, the structural existence of its state remains preserved. Formally, this preservation is expressed by the relation $I = I^2$ (in the Hilbert space representation of ordinary quantum physics, idempotents become projection operators leading to the propositional lattices of standard quantum logic).⁴⁸

While these basic algebraic structures refer to implicate orders, their representation describes their manifestations as explicate orders of the mental and the physical domain. Specifying the general ideas laid out by Bohm and Hiley,⁴⁹ Hiley successfully used (generally non-commutative) Clifford algebras to reproduce basic principles of known physics using representations of these algebras. In this reconstruction, the states of quantum systems are representations of elements of so-called ideals of the algebra, which are generated by idempotents.⁵⁰

That idempotents have eigenvalues 0 or 1 can now be interpreted in terms of logical propositions with truth values about the existence of states. If idempotents commute, existence is always well-defined: either a state exists or it does not exist. However, if idempotents do not commute, existence as such becomes difficult to define – a well-known matter of debate about ontic versus epistemic interpretations in the foundations of quantum physics. The process of measurement is a way of forcing unambiguous Boolean substructures to arise as explications of the implicate non-Boolean structure implied by non-commuting idempotents.⁵¹

Other representations of the algebra, yet to be found, are hoped to be relevant for mental processes. As the basic algebraic structure is atemporal and aspatial, it is a promising candidate to characterize a pre-space and pre-time reality, implying that the holomovement must not be mistaken as a movement in time or in position space. Eventually, both the mental and the physical should be describable as

⁴⁷ Eddington, *Philosophy of Physical Science*.

⁴⁸ A Clifford algebra is an algebra generated by a vector space with an associative quadratic form. A hierarchy of Clifford algebras is suitable to represent Pauli and Dirac spinors as well as Penrose twistors. As outlined by Hiley (“Algebraic Quantum Mechanics”), they can be formulated as algebras of process. They are tightly related to C^* - and W^* -algebras of observables (von Neumann algebras), which have become the formal core of algebraic quantum theory (cf. Primas, *Chemistry, Quantum Mechanics, and Reductionism*). In the algebraic approach, Hilbert space quantum physics is just a representation (technically performed by the so-called GNS-construction) of the underlying (generally non-commutative) algebra. In this way, a hierarchy of implicate and explicate orders can be formulated (cf. Primas, “Hierarchic Quantum Descriptions”), which resembles the hierarchy of Jung’s levels of archetypes.

⁴⁹ Bohm and Hiley, *Undivided Universe*.

⁵⁰ Frescura and Hiley, “The Implicate Order;” Bohm et al., “Algebraic Quantum Mechanics;” and Hiley, “Process, Distinction, Groupoids.”

⁵¹ Hiley, “Quantum Mechanics.”

manifestations, or representations, of that algebra.⁵² Since both representations derive from the same algebra, they are supposed to exhibit the mind–matter correlations ($\Phi_M \sim \Phi_P$) that are at the core of the mind–body problem. Pylkkänen related Bohm’s and Hiley’s work to modern approaches in the philosophy of science, the philosophy of mind, and cognitive science.⁵³

4.2 Neutral monism

Another set of relatives to the Pauli–Jung conjecture can be found in the class of compositional dual-aspect thinking. The notion of neutral monism has been coined for this class, as exposed by its main historical protagonists Mach, James, and Russell. Stubenberg discusses its relations to other frameworks of thinking. Highlighting the influence of Russell, (a subclass of) it is also sometimes dubbed Russellian monism.⁵⁴

In compositional dual-aspect approaches, there are psychophysically neutral elements, neither mental nor physical, which can be composed into configurations producing larger entities. Depending on the configuration of the composed entity, its state acquires mental or physical properties. In this sense, Φ_{PPN} denotes the states of psychophysically neutral elements rather than of a psychophysically neutral whole. States Φ_M and Φ_P would figure as macrostates emerging from the neutral microstates.

This is the conception that one reads in Russell’s *Analysis of Mind* where he sees the “neutral stuff” as neither mental nor physical: “both mind and matter are composite, the stuff of which they are compounded lies [...] above them both, like a common ancestor.”⁵⁵ A few pages down he refers to neutral monism in terms of some raw material of which “some arrangements may be called mental, while others may be called physical.”⁵⁶ Here, Russell’s compositional (atomistic) move is obvious – in contrast to the decompositional (holistic) structure in Bohm and Pauli–Jung.

How are the neutral elements themselves to be characterized? Here, Russell refers to the notions of sensations and perceptions⁵⁷ – which has caused some confusion among his interpreters. Although he makes efforts to clarify that he does not think of both in terms of subjective experience, these notions sound much like phenomenological or even subjective idealist. In his *Analysis of Matter*, Russell changes the terminology by moving to the more neutral notion of events and sticks to that later on.⁵⁸ And in a late article of 1956, Russell clearly rejects panpsychism, as lifeless objects “move and undergo various transformations, but they do not ‘experience’ these occurrences.”⁵⁹

The two other protagonists of neutral monism in the late 19th century were Mach, originally a physicist, and James, originally a psychologist. Both share with Russell the compositional structure of mental states Φ_M and physical states Φ_P out of neutral elements in states Φ_{PPN} that are neither mental nor physical. Interestingly, similar kinds of misunderstandings as for Russell have been prompted by Mach’s usage of sensations and James’s usage of pure experience when referring to the psychophysically neutral. But, as for Russell, neither of them subscribes to subjective idealism.

James does even categorically disavow any ontological significance for consciousness and explains his notion of pure experience as a “plain, unqualified actuality, or existence, a simple that.”⁶⁰ If one still wants to understand this as non-neutral, one should prefer to resort to objective rather than subjective

⁵² Hiley, “Non-commutative Geometry.”

⁵³ Pylkkänen, *Mind, Matter, and the Implicate Order*, “Quantum Theory, Active Information, and the Mind-Matter Problem.”

⁵⁴ Stubenberg, “Neutral Monism,” see also Alter and Pereboom, “Russellian Monism.”

⁵⁵ Russell, *Analysis of Mind*, 4f.

⁵⁶ Ibid., 11.

⁵⁷ Ibid.

⁵⁸ Russell, *Analysis of Matter*, 258.

⁵⁹ Russell, “Mind and Matter,” 152.

⁶⁰ James, “Does Consciousness Exist?,” 23. Early in the same article, he refers to consciousness as “a name of a nonentity” (2).

idealism, a universal mode of presence underlying all mental and physical appearances. Other, selected versions of objective idealism are sketched in Section 4.3.

Alternative to the neither-nor figure of psychophysical neutrality in traditional neutral monism, the states of the base elements can be considered both mental and physical. A pertinent example is naturalistic dualism according to Chalmers,⁶¹ where the base states have both internal phenomenal properties (Φ_M) and external physical properties (Φ_P). Insofar as any base state has mentality as an internal property, mentality is fundamental and ubiquitous – as in panpsychism. Naturalistic dualism is a dual-aspect model in which the two aspects appear at the same level as the base states of which they are aspects. Such a panpsychist ontology suggests that the base states are product states $\Phi_{PP} = \Phi_M \otimes \Phi_P$. (A more radical panpsychist reading of Russellian monism holds that consciousness in some primitive form is the non-structural categorical ground that drives all structure, its intrinsic nature as it were.)

A special feature in naturalistic dualism, anticipated by Sayre,⁶² is that the base elements as such are conceived as states of pure information. Pure here indicates that this information is conceived as purely syntactic (in the sense of Shannon) and any reference to meaning is rejected. Such information states require distinctions in their state space (such as Weizsäcker's ur-alternatives), which are needed to define syntactic information. This in turn implies a context-independent primitive partition of that state space, perhaps with the one constraint that the mental and physical aspects of so defined information states mesh with each other in the right way.

4.3 Objective idealism

Another relative of the Pauli–Jung conjecture, sharing a number of features with it, is objective idealism.⁶³ This position fell largely out of fashion with the rise of physicalism, though there are research programs in its spirit even today, such as Hoffman's (compositional) approach using conscious agent networks.⁶⁴ Since it is impossible in this outline to sketch objective idealism anywhere close to its full comprehension, only a few exponents will be indicated, from both Western and Eastern background. These are Schelling's philosophy at the turn of the 19th century and the much more ancient Indian systems of Advaita Vedanta and the Yoga Sutra by Patanjali.⁶⁵

Schelling, starting off as a follower of Fichte, was decidedly more concerned about the results of the developing sciences than his teacher. He realized soon that Fichte's subjective idealism with its emphasis on the ego is too narrow and too one-sided. Turning back to Spinoza, he explored the idea that mind and matter (spirit and nature) are two sides of a primordial totality – a base reality conceived as a higher unity beyond the mind–matter distinction.⁶⁶ Schelling's famous quote "Nature should be made Mind visible,

⁶¹ Chalmers, *The Conscious Mind*.

⁶² Sayre, *Cybernetics and the Philosophy of Mind*.

⁶³ In fact, Jung – particularly in his earlier work – also leaves traces of objective idealism with his focus on spirit ("Geist") in addition to the subjective mental ("Psyche"), which Main (*Revelations of Chance*, 3–31) discussed in detail. Jung's vacillation between dual-aspect thinking and objective idealism created some confusion about his early notion of archetypes, mixing up mental images and their psychophysically neutral origin. Pauli played no minor role in convincing the mature Jung to be more concise about the "psychoid" nature of archetypes, of which mental images are manifestations, in their joint work in the mid-20th century (Pauli, "Letter to Fierz," Jung, "Nature of the Psyche," par. 439).

⁶⁴ Fields et al., "Conscious Agent Networks."

⁶⁵ It is notable that Eastern practices typically emphasize experience as the proper path toward liberation, which would imply a basically epistemic grounding. For the experientially uninitiated, this might look close (or be projected) to an idealist metaphysics in which cosmic consciousness resembles the objective mind and cosmopsychism becomes a kind of objective idealism. As indicated by Chalmers, "Idealism and the Mind-Body Problem" and numerous references therein, there are tight relations, deeper than superficial, between Eastern systems and Western idealism.

⁶⁶ Alexander, *Short History of Philosophy*.

Mind the invisible Nature” takes mind-nature dualism as a cognitive move for the sake of discursive thinking, but he rejects this as a metaphysical option.⁶⁷

His next step was to posit the primordial reality without space and time as a dynamic, undifferentiated unity of the absolute-ideal (subjectivity) and the absolute-real (objectivity) in an “eternal act of absolute reason” from which mind and nature are decomposed as separate forms. Reality as such is a dynamic self-organizing activity indifferent with respect to even the most fundamental opposition of subject and object. This indifference – later referred to as the “unground” in his freedom essay⁶⁸ – points to states $\Phi_{PPN} \neq \Phi_M \otimes \Phi_P$, which are neither mental nor physical. The highest law of absolute reason at this level is the law of absolute identity, an identity whose only predicate is that it has no predicates. This is the core of his objective idealism.⁶⁹

Schelling’s “system of identity” offers a delicate balance of the mental and the physical as forms of manifestation.⁷⁰ Its perfect symmetry is the same as in the Pauli–Jung conjecture, although Schelling’s system does not, at least not explicitly, include a backreaction from mind and matter to their basis. This backreaction is crucial for Pauli and Jung, as it enables induced mind–matter correlations. Schelling does not explicitly address such correlations, but he talks about a “transitive being” that links mind and matter as predicates emerging from the indifferent “unground.” And he is astonishingly clear about the necessarily noncausal nature of this link.⁷¹

Rejecting the mind-like structure of Fichte’s ego, Schelling downgrades the mental to a derivative aspect and insists on an ultimate reality as a *tertium quid* that is indifferent with respect to the mind–matter distinction. On the other hand, Schelling at times also seems to think about the base reality as both mental and physical, similar to a panpsychist attitude, $\Phi_{PP} = \Phi_M \otimes \Phi_P$.⁷² With both versions, he departs from basic tenets usually ascribed to German idealism. Other than for Pauli and Jung who mostly reject epistemic access to the *unus mundus*, Schelling’s ultimate and absolute reality can be apprehended by “intellectual intuition” (a Spinozist term) – not to be conflated with intellect as a rational cognitive capacity.

The late Schelling, in his struggle to achieve a better understanding of the absolute, resorted to Neoplatonic and mystic ideas, very much akin to what Jung did with his recourse to alchemy and the Hermetic tradition, which have their origin in the Near and Middle East. This makes it interesting to look into the objective idealism of Indian spiritual traditions and compare them with the Pauli–Jung conjecture. One of these traditions was recently investigated by Whitney in a thoughtful comparison with Jung’s analytical psychology:⁷³ Patanjali’s Yoga Sutra, dating back to the first centuries AC.

A key clarifying ingredient of Whitney’s presentation of the Yoga Sutra is the distinction between two orientations of consciousness: consciousness in its true nature as orientation A and consciousness assuming the modifications of mind as orientation B. Other notions for orientation A are “pure consciousness,” “pure subjectivity,” or “consciousness as such” (*purusa*): Φ_{CC} (CC for cosmic consciousness). Consciousness in orientation A is unchanging, immutable, eternal, self-knowing – and non-dual, which is to say that it is free from distinctions. By contrast, consciousness in orientation B refers to states Φ_M of our everyday consciousness: perception, cognition, emotion, and other more or less subtle contents of the discriminating mind – “consciousness for us” (*prakrti*).

This framework of thinking is a kind of cosmic objective idealism in which the cosmic mind, orientation A, is open to human experience, if appropriate practices are conducted successfully. The

⁶⁷ Schelling, *Ideas for a Philosophy of Nature*.

⁶⁸ Schelling, *Essence of Human Freedom*.

⁶⁹ See Guyer and Horstmann, “Idealism.” It is hard to miss the analogy with Bohm and Hiley’s dynamic pre-space-time holomovement and its idempotents as basic operations of identity, from which the mental and the physical are explicated as manifestations, and meaningful correlations between them arise through active information, as described in Section 4.1.

⁷⁰ Schelling, *System of Philosophy in General*.

⁷¹ Bowie, “Friedrich Wilhelm Joseph von Schelling.”

⁷² Schelling, *System of Philosophy in General*.

⁷³ Whitney, *Consciousness in Jung and Patanjali*.

difference between orientations A and B is created by *avidya*, ignorance, characterized by change, egoism, impurity, attraction, aversion, fear, suffering, and confusion. However, precisely since orientation B can change, it can in principle become aligned with the unchanging eternal orientation A.

A striking similarity between Patanjali and Jung is their distinction of ego and self. In Patanjali's account, the former is a construct of the mind and the latter a mode of pure consciousness, sometimes referred to as *atman*. Although the ego is considered as one of the great afflictions within orientation B, it may nevertheless change so as to get aligned with orientation A and, thus, accomplish liberation. Note, however, that masquerading A with the tools of B is not the same as experiencing A directly! Likewise, Jung's notion of the ego is the conscious manifestation⁷⁴ of an archetypal self, which is the goal of the process of individuation.

While for Patanjali it is *avidya* that blocks the road from *prakrti* to the pure consciousness of *purusa*, analytical psychology proposes an increasing “opacity” of the unconscious as the obstacle precluding access to the ultimate ground of the undivided *unus mundus*. How could an “opacity of the unconscious” be interpreted in detail? In Jung's account, it is the loss of distinctions as tools for differentiation that is required for *prakrti*. This loss of distinctions implies a loss of “speakability” or “effability,” a loss of discursive cognition. As soon as the ultimate distinction dissolves, the resulting undivided reality does not leave any discursive option – non-duality par excellence.

The neo-Kantian flavor of Jung's and Pauli's approach did not permit them for a long time to think about this non-dual reality as being epistemically accessible. Only on the last pages of his final opus *Mysterium Coniunctionis*, Jung took the possibility of such an access seriously – literally as an act of revelation.⁷⁵ However, immanent experiences like this (a notion adopted from Deleuze) cannot be subjective experiences in the ordinary, profane sense. Along the lines of the Pauli–Jung conjecture, one ought to think about them as experiences of a neutral reality (neutral psychophysically and neutral with respect to all other distinctions, including that of subject and object), thus avoiding the objective idealist notion of “pure consciousness.”

One advantage of this move is that the term “pure consciousness” makes it too easy to be mistaken as subjective, as in James's “pure experience” or Russell's and Mach's “sensations” (see Section 4.2). This is avoided by a less biased term such as “neutral reality.” Another, more important issue is that Patanjali analyzes the cosmic idealism of “pure consciousness” states Φ_{CC} in orientation A primarily in relation to its mental manifestations Φ_M in orientation B. Physical manifestations Φ_P remain largely unaddressed in his account, and the mental–physical connection ($\Phi_M \sim \Phi_P$) is even less explained. By contrast, the neutral reality in the Pauli–Jung conjecture has an explicit relation to both the mental and the physical: both are manifestations of the neutral Φ_{PPN} . This entails three benefits with remarkable potential for concrete research and further insight.

- (1) Starting from the psychophysically neutral offers the option to explore formal structures for the description of the mental that are already well established for the physical. Since both arise from the same neutral ground, one would expect that key features in the description of the two domains should be isomorphic. One of these features is non-commutative structures in physics and psychology, a novel research program that has been attracting ever more scientists worldwide for the past two decades.⁷⁶
- (2) The Pauli–Jung conjecture and its ramifications provide a most natural and straightforward characterization of correlations between the mental and the physical. Decomposing a holistic state into parts generically leads to correlations between the parts. This means that a decompositional dual-aspect framework implies such correlations in the first place; there is no need to look for post hoc rationalizations for them and also no need to declare them as mysterious. In fact, a taxonomy of

⁷⁴ This manifestation resembles a self-model in the parlance of Metzinger, “Precis of Being No One.”

⁷⁵ Jung, “Mysterium Coniunctionis.”

⁷⁶ See Wang et al., “The Potential of Using Quantum Theory,” for an introduction.

psychophysical correlations deriving from the Pauli–Jung conjecture is now largely supported by a comprehensive stock of empirical material.⁷⁷

- (3) More generally, cosmic idealism bears the risk of embodied life, both mental and physical, being devalued relative to pure consciousness. Jung lends a dignity and sense of meaning to creation and human life,⁷⁸ which becomes somewhat overshadowed by models conceiving human consciousness as mere ignorance or at best as something that can be aligned with pure consciousness and thereby be transcended. As cogently argued by Main, Jung’s emphasis can be understood by the panentheist thought that the divine creator needs feedback from his creation to become conscious himself.⁷⁹

Together with the Yoga Sutra, another widespread and influential Hindu-related spiritual tradition is Advaita Vedanta, mainly due to Shankara (a.k.a. Sankara or Samkara) around 800 AC. While the Yoga Sutra especially focuses on the psychological side of the path toward liberation, Advaita Vedanta talks about both mind and world more symmetrically. A particularly informative and compact introduction to its main philosophical ideas is due to Deutsch.⁸⁰

On the side of physical nature, the outside world, Advaita Vedanta suggests a procedure of “sublation” (*badha*) that can be applied to a hierarchy of levels of being. To sublimate some experience of an object (e.g., of a material thing) means, roughly, to replace the experience by another one due to fresh insight. Sublation is a tool to distinguish appearance from reality (understood as the ultimate reality): while appearances can be sublated by other experiences, reality cannot be sublated by any other experience.⁸¹ The unreal, a third category next to appearance and reality, is that which neither can nor cannot be sublated by other experiences – such as a circular square or other oxymorons.

Three types of appearances can be characterized by sublation: the “real existent,” the “existent,” and the “illusory existent.” The real existent comprises those experiences that can only be sublated by the ultimate reality itself. These are spiritual experiences that are only sublatale by transcending the subject–object distinction.⁸² The existent comprises experiences that can be sublated by the real existent and by ultimate reality. The vast majority of everyday perceptual, cognitive, and affective experiences belong to this type. The illusory existent comprises experiences that can be sublated by all other types of experiences: hallucinations, erroneous sense perceptions, and dreams. While the illusory existent is epistemically empty, the unreal is ontically empty.

The overarching idea of Advaita Vedanta is for its adherents to analyze all experiences and sublimate them until they cannot be sublated any further, i.e., until the ultimate reality is reached. In other words, this means to move through successive levels of appearance with the goal of arriving at the most fundamental level: the ultimate reality of the *brahman*. Its experience is non-dual and unveils the delusional, *avidya*-conditioned multiplicity of appearances in the physical world. Yet, this world can be made intelligible discursively by employing *avidya* and by reversing sublation: moving back from the one to the many.

⁷⁷ Atmanspacher and Fach, “Exceptional Experiences.”

⁷⁸ Jung, “Answer to Job,” “Psychological Commentary,” par. 798.

⁷⁹ See Main, “Panentheism.” Panentheism combines the idea that the divine is nature itself (pantheism) with the idea that the divine is ontologically different from nature (theism). In this way, a bidirectional relationship between the creator and his creation becomes possible, which connects our everyday lives with divine transcendence. This relationship entails that neither the divine nor our mundane world is statically given, but they rather influence one another continuously and dynamically.

⁸⁰ Deutsch, *Advaita Vedanta*.

⁸¹ This sounds superficially reminiscent of reductive interlevel relations in science where, however, descriptions at different levels may all remain scientifically valid in a domain-specific sense. By contrast, Advaita Vedanta holds that any sublated description becomes invalid and must be replaced by the description that sublates it.

⁸² Deutsch, *Advaita Vedanta*, 20f, refers to such experiences as relational, in the same sense that synchronistic events are relational qua meaning. In terms of the Pauli–Jung conjecture, they correspond to induced psychophysical correlations with considerable distance from the baseline of structural correlations. They are sublatale only by an experience of the psychophysically neutral archetype from which they arise.

On the side of the mind, Advaita Vedanta distinguishes four classes of states Φ_M of consciousness: the wake state of the ordinary conscious mind, the dream state, the state of deep sleep, and transcendental consciousness. While wake and dream states are already targets of contemporary consciousness studies, deep sleep only slowly becomes lifted from unconscious activity to a state of consciousness.⁸³ In Advaita Vedanta, experiences of deep sleep still retain a knowing subject but all objects of consciousness are gone, and distinctions are experienced as pure potentialities (thus revealing the nature of *avidya*).

As far as transcendental consciousness is concerned, there are two distinct modes of it:⁸⁴ a borderline experience (*savikalpa samadhi*) at the transition from deep sleep and a pure experience of reality (*nirvikalpa samadhi*). Different from deep sleep itself, borderline experiences are experiences of the presence of non-dual reality, with neither object nor subject but still representational. The stage of transcendental consciousness culminates in the pure experience of non-dual reality directly. To put it succinctly, in borderline experiences there is awareness of non-dual reality; in pure experience, non-dual reality is no longer an object of awareness – it just is.⁸⁵

The pure experience of reality is the ultimate realization of the *atman* in which it merges with the *brahman*, so that their distinction, the most fundamental one, becomes lifted. In Advaita Vedanta, to affirm oneself as reality is the act of a free human. In Patanjali's account, this is a state in which consciousness B becomes aligned with consciousness A, in which all *avidya* collapses as all distinctions are gone. Likewise, realizing the archetype of the self in Jungian terms is the goal of the process of individuation, in which the conjunction with the *unus mundus* is accomplished.

As Advaita Vedanta can be phrased in terms of successive stages of consciousness terminating in a state of cosmic consciousness Φ_{CC} , it is tempting to classify this state in terms of objective idealism. This is consolidated by the fact that even on the physical side, the targets of discussion are not physical objects and their relations but experiences of those objects and relations. However, insofar as an experience of non-dual reality is explicitly beyond the mind–matter and subject–object distinction, Advaita Vedanta also shares an essential feature of a psychophysically neutral reality: $\Phi_{PPN} \neq \Phi_M \otimes \Phi_P$. Or, at least, one might submit that more than traces of the psychophysically neutral stand out.

5 Some conclusions

A common basic characteristic in all approaches discussed in this outline is the assumption of a kind of underlying reality in relation to which the mental (in its usual form as human consciousness) and the physical (in its usual form of particles and fields) are subordinate: aspects, perspectives, manifestations, explications, and appearances. The precise nature of the underlying reality comes in essentially three variants: psychophysical neutrality (*PPN*), panpsychism (*PP*), or objective idealism with a cosmic consciousness (*CC*) – including ambiguities among them.

A psychophysically neutral reality is neither mental nor physical, void of the mind–matter distinction. The Pauli–Jung conjecture is clearly of this kind, and Bohm and Hiley's holomovement seems to express the same idea – although implicate orders in general are typically described as both mental and physical, hence panpsychist. The compositional approaches of neutral monism also proclaim their neutral elements as neither mental nor physical. Interestingly, neutral monists denote

⁸³ See, e.g., Thompson, *Waking, Dreaming, Being*, and Windt et al., “Does Consciousness Disappear?”

⁸⁴ Deutsch, *Advaita Vedanta*, 62ff.

⁸⁵ Interestingly, Metzinger (“Minimal Phenomenal Experience,” footnote 21) delineates states of pure knowing and of pure being, which seem to match the two forms of *samadhi* perfectly well. In Metzinger's parlance, pure knowing is exhibited in a “non-agentive phenomenology of epistemicity” (sometimes also referred to as witness consciousness); pure being is exhibited in a “phenomenology of pure onticity.” See also Albahari (“Beyond Cosmopsychism”) for more commentary.

their neutral domain using concepts such as “sensations” or as “pure experience” whose connotations are leaning toward objective idealism.⁸⁶

The notion of a cosmic consciousness as such in the Yoga Sutra points toward an objective mind as in objective idealism, as opposed to the consciousness of individual subjective minds. Advaita Vedanta, too, proposes a number of features that fall into this class – especially that experiences are central also beyond the mental – but one may also see it expressing psychophysical neutrality in its ultimate reality. Schelling’s philosophy, though standardly counted as objective idealism, also seems to oscillate between panpsychism and psychophysical neutrality.

	<i>PPN</i>	<i>PP</i>	<i>CC</i>
Pauli–Jung	x		
Bohm–Hiley	x	x	
Mach–James–Russell	x	x	
Schelling	x	x	x
Advaita Vedanta	x		x
Patanjali			x

From a formal point of view, the closest relative of the Pauli–Jung conjecture is no doubt the approach by Bohm and Hiley. One reason is that both approaches have been strikingly influenced by concepts of quantum theory, suitably generalized to be applicable beyond the limitations of physics. In their corresponding work after Pauli and Jung had passed away around 1960, Bohm and Hiley proposed algebraic structures that are abstract enough to underlie both the mental and the physical without presupposing a distinction between them. Appropriate representations of these algebraic structures have been exploited to successfully describe concrete situations in physics (algebraic quantum mechanics) and psychology (quantum cognition) by now. A key element in these applications is the non-commutativity of operations, something that Pauli, Bohr, and others had anticipated long ago.

Contemporary developments of the Pauli–Jung conjecture offer great potential to be vindicated by the study of psychophysical correlations in exceptional experiences. This can be seen closely related to the Yoga Sutra and Advaita Vedanta, which have a lot to say about practical techniques to induce such experiences in order to facilitate the path toward non-dual awareness. However, exceptional experiences can also cause digressions to be left aside along the way. Depending on specific traditions, they are sometimes referred to as epiphenomena, and it is recommended not to devote much attention to them in order to keep the process of liberation in flow. On the other hand, tantric systems such as Hatha Yoga, Kashmiri Shaivism, and others concentrate more on them as they assume that a substantially developing mind goes hand in hand with certain physical, especially bodily, phenomena.⁸⁷

The metaphysics of the Pauli–Jung conjecture is close to Spinoza’s philosophy, albeit mostly formulated in a theologically deplete fashion. It has been a matter of debate whether Spinoza’s religious standpoint is pantheist or panentheist, i.e., whether the creator is regarded as identical with his creation or whether the creator, in addition, transcends his creation. Schelling was arguably the first in the history of philosophy to use the notion of panentheism in his freedom essay.⁸⁸ With respect to the Pauli–Jung conjecture and Jung’s major work on the psychology of religion,⁸⁹ a panentheist perspective is highly informative for an appropriate understanding.⁹⁰

⁸⁶ Modern versions of compositional dual-aspect thinking have a tendency to blend into or straightforwardly represent panpsychist structures, such as Chalmers, *The Conscious Mind*. A concrete way to implement Chalmers’ information theoretical proposal is information integration theory (Tononi, “Integrated Information Theory”).

⁸⁷ Scholars in the comparative history of religion such as Kripal (*Secret Body*) have argued this way too.

⁸⁸ Schelling, *Essence of Human Freedom*.

⁸⁹ Jung, “Answer to Job.”

⁹⁰ Main, “Panentheism.”

In so doing, the undivided, psychophysically neutral reality in the Pauli–Jung conjecture can be interpreted as a placeholder for the divine, which transcends the multiplicity of profane phenomena in the mental and the physical. Yet, panentheism also allows us to turn this transcendence into immanence, if the archetypal origin of meaningful coincidences can become experientially (not discursively!) accessible. Revelatory experiences and epiphanies of great mystics point to this thesis, and Jung himself referred to them as ultimate insights into the *unus mundus*.⁹¹ The late Schelling went a similar route when he turned to Jacob Boehme’s mysticism. And a divine reality, obviously with a very different cultural background, is also recognized in the Indian systems discussed.

Acknowledgments: The author thanks Alexander Borbely, Markus Gabriel, Michael Hampe, Hans Christian Öttinger, Roderick Main, Robert Prentner, Bill Seager, and Wolfgang Tschacher for helpful commentary and clarifying discussions.

References

- Albahari, Miri. “Beyond cosmopsychism and the great I am.” In *Routledge Handbook of Panpsychism*, edited by William Seager, 119–30. London: Routledge, 2020.
- Alexander, Archibald B. D. *A Short History of Philosophy*. Glasgow: Maclehose, Jackson and Co., 1922.
- Allefeld, Carsten, Atmanspacher, Harald, and Wackermann, Jiri. “Mental states as macrostates emerging from EEG dynamics.” *Chaos* 19 (2009), 015102.
- Alter, Torin, and Pereboom, Derk. “Russellian monism.” In *Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta. 2019, accessible at <https://plato.stanford.edu/entries/russellian-monism/>.
- Anderson, Michael. “Neural reuse: A fundamental organizational principle of the brain.” *Behavioral and Brain Science* 33:4 (2010), 245–88.
- Atmanspacher, Harald. Dual-aspect monism à la Pauli and Jung. *Journal of Consciousness Studies* 19:9 (2012), 96–120.
- Atmanspacher, Harald. “20th century variants of dual-aspect thinking” (with commentaries and replies). *Mind and Matter* 12 (2014), 245–88.
- Atmanspacher, Harald. “The status of exceptional experiences in the Pauli–Jung conjecture.” In *Jung, Deleuze, and the Problematic Whole*, edited by Roderick Main, David Henderson, Christian McMillan, 142–66. London: Routledge, 2020.
- Atmanspacher, Harald, and Beim Graben, Peter. “Contextual emergence.” *Scholarpedia* 4:3 (2009), 7997. Accessible at http://www.scholarpedia.org/article/Contextual_emergence.
- Atmanspacher, Harald, and Demmel, Gerda. “Methodological issue in the study of complex systems.” In *Reproducibility – Principles, Problems, Practices, Prospects*, edited by Harald Atmanspacher, Sabine Maasen, 233–50. New York: Wiley, 2016.
- Atmanspacher, Harald, and Fach, Wolfgang. “A structural-phenomenological typology of mind-matter correlations.” *Journal of Analytical Psychology* 58 (2013), 218–43.
- Atmanspacher, Harald, and Fach, Wolfgang. “Exceptional experiences of stable and unstable mental states, understood from a dual-aspect point of view.” *Philosophies* 4:1 (2019), 7.
- Atmanspacher, Harald, and Fuchs, Christopher A. eds. *The Pauli–Jung Conjecture and Its Impact Today*. Exeter: Imprint, 2014.
- Atmanspacher, Harald, and Kronz, Fred. “Relative onticity.” In *On Quanta, Mind, and Matter. Hans Primas in Context*, edited by Harald Atmanspacher, Anton Amann, Ulrich Müller-Herold, 273–94. Dordrecht: Kluwer, 1999.
- Atmanspacher, Harald, and Primas, Hans. “The hidden side of Wolfgang Pauli.” *Journal of Consciousness Studies* 3:2 (1996), 112–26.
- Atmanspacher, Harald, and Primas, Hans. “Pauli’s ideas on mind and matter in the context of contemporary science.” *Journal of Consciousness Studies* 13:3 (2006), 5–50.
- Atmanspacher, Harald, and Primas, Hans, eds. *Recasting Reality. Wolfgang Pauli’s Philosophical Ideas and Contemporary Science*. Berlin: Springer, 2009.
- Beckermann, Ansgar, Flohr, Hans, and Kim, Jaegwon, eds. *Emergence or Reduction?* Berlin: de Gruyter, 1992.
- Bell, John. “On the Einstein–Podolsky–Rosen paradox.” *Physics* 1 (1964), 195–200.
- Bishop, Robert C. *The Physics of Emergence*. Bristol: IOP Publishers, 2019.
- Bohm, David. *Wholeness and the Implicate Order*. London: Routledge, 1980.

⁹¹ Jung, “Mysterium Coniunctionis.”

- Bohm, David. "A new theory of the relationship of mind and matter." *Philosophical Psychology* 3 (1990), 271–86.
- Bohm, David, and Hiley, Basil J. *The Undivided Universe*. London: Routledge, 1993.
- Bohm, David, Davies, Paul G., and Hiley, Basil J. "Algebraic quantum mechanics and pregeometry." 1981, manuscript accessible at <https://arxiv.org/abs/quant-ph/0612002>.
- Bowie, Andrew. "Friedrich Wilhelm Josef von Schelling." In *Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta. 2016, accessible at <https://plato.stanford.edu/entries/schelling/>.
- Butterfield, Jeremy. "Emergence, reduction and supervenience: a varied landscape." *Foundations of Physics* 41 (2011), 920–60.
- Chalmers, David. *The Conscious Mind*. Oxford: University Press, 1996.
- Chalmers, David. "Idealism and the mind-body problem." In *Routledge Handbook of Panpsychism*, edited by William Seager, 353–73. London: Routledge, 2019.
- Chibbaro, Sergio, Rondoni, Lamberto, and Vulpiani, Angelo. *Reductionism, Emergence, and Levels of Reality*. Berlin: Springer, 2014.
- Clauser, John F., Horne, Michael A., Shimony, Abner, Holt, Richard A. "Proposed experiment to test local hidden-variable theories." *Physical Review Letters* 23 (1969), 880–4.
- Deutsch, Eliot. *Advaita Vedanta. A Philosophical Reconstruction*. Honolulu: University of Hawaii Press, 1969.
- Devlin, Keith. A mathematician reflects on the useful and reliable illusion of reality in mathematics. *Erkenntnis* 68 (2008), 359–79.
- Eddington, Arthur S. *The Philosophy of Physical Science*. Cambridge: University Press, 1939.
- Fach, Wolfgang. "Complementary aspects of mind-matter correlations in exceptional human experiences." In *The Pauli-Jung Conjecture and Its Impact Today*, edited by Harald Atmanspacher, Christopher Fuchs, 255–73. Exeter: Imprint, 2014.
- Fach, Wolfgang. *Das Spektrum des Aussergewöhnlichen. Konzeptionelle Ansätze, empirischphänomenologische Untersuchungen und plananalytische Fallstudien zur mentalen Repräsentation bei aussergewöhnlichen Erfahrungen*. PhD Thesis, University of Bern, 2020.
- Fach, Wolfgang, Atmanspacher, Harald, Landolt, Karin, Wyss, Thomas, and Rössler, Wulf. "A comparative study of exceptional experiences of clients seeking advice and of subjects in an ordinary population." *Frontiers in Psychology* 4:65 (2013), 1–10.
- Fields, Chris, Hoffman, Donald, Prakash, Chetan, and Singh, Manish. "Conscious agent networks: Formal analysis and application to cognition." *Cognitive Systems Research* 47 (2018), 186–213.
- Frescura, Fabio A. M., and Hiley, Basil J. "The implicate order, algebras, and the spinor." *Foundations of Physics* 10 (1980), 7–31.
- Gabriel, Markus. *The Meaning of Thought*. New York: Wiley, 2020.
- Gibson, James J. *The Ecological Approach to Visual Perception*. Boston: Houghton Mifflin, 1979.
- Goff, Philip, Seager, William, and Allen-Hermanson, Sean. "Panpsychism." In *Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, 2017, accessible at <https://plato.stanford.edu/entries/panpsychism/>.
- Guyer, Paul, and Horstmann, Rolf-Peter. "Idealism." In *Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta. 2015, accessible at <https://plato.stanford.edu/entries/idealism/>.
- Halmos, Paul R. *I Want To Be a Mathematician*. Berlin: Springer, 1985.
- Harbecke, Jens, and Atmanspacher, Harald. "Horizontal and vertical determination of mental and neural states." *Journal of Theoretical and Philosophical Psychology* 32 (2012), 161–79.
- Hiley, Basil J. "Non-commutative geometry, the Bohm interpretation and the mind-matter relationship." In *Computing Anticipatory Systems – CASYS 2000*, edited by Daniel Dubois, 77–88. Berlin: Springer, 2001.
- Hiley, Basil J. "Algebraic quantum mechanics, algebraic spinors, and Hilbert space." In *Boundaries*, edited by Keith Bowden, 149–86. London: ANPA, 2003.
- Hiley, Basil J. "Process, distinction, groupoids and Clifford algebras: An alternative view of the quantum formalism." In *New Structures for Physics*, edited by Bob Coecke, 705–50. Berlin: Springer, 2011.
- Hiley, Basil J. "Quantum mechanics: Harbinger of a non-commutative probability theory?" In *Quantum Interaction. QI 2013*, edited by Harald Atmanspacher, Emmanuel Haven, Kirsty Kitto, Derek Raine, 6–21. Berlin: Springer, 2014.
- Jacob, Pierre. "Intentionality." In *Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta. 2019, accessible at <https://plato.stanford.edu/entries/intentionality/>.
- James, William. "Does 'consciousness' exist?" *Journal of Philosophy, Psychology and Scientific Methods* 1:18 (1904), 1–38.
- Jung, Carl G. "On the nature of the psyche." In *Collected Works*, Vol. 8, 159–236. Princeton: University Press, 1969.
- Jung, Carl G. "Answer to Job." In *Collected Works*, Vol. 11, 355–473. Princeton: University Press, 1969.
- Jung, Carl G. "Psychological Commentary on 'The Tibetan Book of the Great Liberation'." In *Collected Works*, Vol. 11, 475–508. Princeton: University Press, 1969.
- Jung, Carl G. "Mysterium Coniunctionis." In *Collected Works*, Vol. 14. Princeton: University Press, 1970.
- Jung, Carl G., and Pauli, Wolfgang. *Naturerklärung und Psyche*. Zürich: Rascher, 1952. English translation as *The Interpretation of Nature and the Psyche*, New York, Pantheon, 1955.
- Kripal, Jeffrey. *The Secret Body*. Chicago: University Press, 2017.
- Main, Roderick. *Revelations of Chance*. Albany: SUNY Press, 2007.
- Main, Roderick. "Panentheism and the undoing of disenchantment." *Zygon* 52 (2017), 1098–122.

- Main, Roderick. "The ethical ambivalence of holism: An exploration through the thought of Carl Jung and Gilles Deleuze." In *Jung, Deleuze, and the Problematic Whole*, edited by Roderick Main, David Henderson, Christian McMillan, 20–50. London: Routledge, 2020.
- Merleau-Ponty, Maurice. *Phenomenology of Perception*. London: Routledge, 1962.
- Metzinger, Thomas. "Precis: Being No One." *Psyche* 11 (2005), 1–35.
- Metzinger, Thomas. "Minimal phenomenal experience." *Philosophy and the Mind Sciences* 1 (2020), 7.
- Myrvold, Wayne. "Philosophical issues in quantum theory." In *Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta. 2016, accessible at <https://plato.stanford.edu/entries/qt-issues/>.
- Pauli, Wolfgang. "Letter to Goldschmidt of February 19, 1949." In *Nochmals Dialogik*, edited by Hermann L. Goldschmidt. Zürich: ETH Stiftung Dialogik, 1990.
- Pauli, Wolfgang. "Letter to Fierz of January 7, 1948." In *Wolfgang Pauli. Wissenschaftlicher Briefwechsel, Band III: 1940–1949*, edited by Karl von Meyenn, 496–7. Berlin: Springer, 1993.
- Popescu, Sandu. "Nonlocality beyond quantum mechanics." *Nature Physics* 10:4 (2014), 264–70.
- Prakash, Chetan, Fields, Chris, Hoffman, Donald, Prentner, Robert, and Singh, Manish. "Fact, fiction, fitness." *Entropy* 22 (2020), 514.
- Primas, Hans. *Chemistry, Quantum Mechanics, and Reductionism*. Berlin: Springer, 1981.
- Primas, Hans. "Hierarchic quantum descriptions and their associated ontologies." In *Symposium on the Foundations of Quantum Mechanics 1994*, edited by Kalervo V. Laurikainen, Claus Montonen, K. Sunnarborg, 210–20. Gif-sur-Yvette: Editions Frontières, 1994.
- Primas, Hans. *Knowledge and Time*. Berlin: Springer, 2017.
- Pylkkänen, Paavo. *Mind, Matter, and the Implicate Order*. Berlin: Springer, 2007.
- Pylkkänen, Paavo. "Quantum theory, active information, and the mind-matter problem." In *Contextuality from Quantum Physics to Psychology*, edited by Ehtibar Dzhafarov et al., 325–34. Singapore: World Scientific, 2016.
- Quine, Willard Van Orman. "Ontological relativity." In *Ontological Relativity and Other Essays*, 26–68. New York: Columbia University Press, 1969.
- Robinson, Howard. "Dualism." In *Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta. 2016, accessible at <https://plato.stanford.edu/entries/dualism/>.
- Russell, Bertrand. *The Analysis of Mind*. London: George Allen & Unwin, 1921.
- Russell, Bertrand. *The Analysis of Matter*. London: George Allen & Unwin, 1927.
- Russell, Bertrand. "Mind and matter." In *Portraits from Memory and Other Essays*, 145–65. London: George Allen & Unwin, 1956.
- Sayre, Kenneth. *Cybernetics and the Philosophy of Mind*. Atlantic Highlands: Humanities Press, 1976.
- Schaffer, Jonathan. "Monism: The priority of the whole." *Philosophical Review* 119:1 (2010), 31–76.
- Schelling, Friedrich W. J. In *Ideas for a Philosophy of Nature*, edited by Errol E. Harris, Peter Heath. Cambridge: University Press, 1988. Originally published 1797.
- Schelling, Friedrich W. J. "System of philosophy in general and of the philosophy of nature in particular." In *Idealism and the Endgame of Theory: Three Essays by F.W.J. Schelling*, edited by Thomas Pfau. Albany: SUNY Press, 1994. Originally published 1804.
- Schelling, Friedrich W. J. In *Philosophical Inquiries into the Essence of Human Freedom*, edited by Jeff Love, Johannes Schmidt. Albany: SUNY Press, 2006. Originally published 1809.
- Seager, William, ed. *The Routledge Handbook on Panpsychism*. London: Routledge, 2020.
- Skarda, Christine A., and Freeman, Walter J. "How brains make chaos in order to make sense of the world." *Behavioral and Brain Sciences* 10:2 (1987), 161–73.
- Stubenbergh, Leopold. "Neutral monism." In *Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, 2016, accessible at <https://plato.stanford.edu/entries/neutral-monism/>.
- Thompson, Evan. *Waking, Dreaming, Being: Self and Consciousness in Neuroscience, Meditation, and Philosophy*. New York: Columbia University Press, 2015.
- Tononi, Giulio. "Integrated information theory." In *Scholarpedia* 10:1 (2015), 4164. Accessible at http://www.scholarpedia.org/article/Integrated_information_theory.
- Tsirelson, Boris S. "Quantum generalizations of Bell's inequality." *Letters in Mathematical Physics* 4 (1980), 93–100.
- Wang, Gege. *Mind and Meaning: Representational Accounts, Non-representational Accounts and Beyond*. Thesis at the University of Neuchâtel, 2019.
- Wang, Zheng, Busemeyer, Jerome R., Atmanspacher, Harald, and Pothos, Emmanuel M. "The potential of using quantum theory to build models of cognition." *Topics in Cognitive Science* 5 (2013), 672–88.
- Whitney, Leanne. *Consciousness in Jung and Patanjali*. London: Routledge, 2019.
- Wilczek, Frank. *A Beautiful Question. Finding Nature's Deep Design*. New York: Penguin, 2015.
- Windt, Jennifer M., Nielsen, Tore, and Thompson, Evan. "Does consciousness disappear in dreamless sleep?" *Trends in Cognitive Science* 20 (2016), 871–82.
- Wyss, Thomas. *Behavioral, Physiological, and Subjective Aspects of Exceptional Experiences*. PhD Thesis at ETH Zurich, 2016.