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Quantum Reality as Life-Guiding: A Critical Analysis of the Existential Realist Interpretations of Quantum Mechanics

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Abstract

This essay offers a critical reading of Karen Barad's and Heinrich Päs' interpretations of quantum mechanics, using a Categorical Differentiation approach to science and religion, which is inspired by Wittgenstein and van Fraassen. Barad and Päs are ontological realists, but their philosophies of quantum mechanics depart from what I call scientific realist interpretations of quantum mechanics, which are mainstream in the analytic philosophy of physics. After an overview of the ontological turn in the philosophy of quantum mechanics and explaining the basic difference between scientific and existential kinds of realism, I examine the central features of Barad's agential realism and Päs' quantum monism. The Categorical Differentiation approach, which offers a normative perspective on the relationship between science and religion, is introduced, and its relevance for the philosophy (and theology) of quantum mechanics is explained. I conclude the essay with a critical analysis of Barad's and Päs' interpretations from this Wittgensteinian perspective, focusing on the ways in which they relate the science of quantum mechanics with their respective existential-moral visions.

Keywords: Wittgenstein; science and religion; philosophy of religion; philosophy of quantum mechanics; alternative religions

1. Introduction

In recent years, interesting new scholarship has appeared at the intersection of the philosophy of quantum physics and philosophy of religion. Its common feature is a rejection of the Copenhagen interpretation of quantum mechanics, proceeding from some version of the realist interpretation. Using 'interpretation' in a slightly broader sense than what is typical in analytic philosophy of physics, I distinguish in this essay between two kinds of realist interpretations of quantum mechanics: scientific and existential. The scientific realist interpretations of quantum mechanics operate strictly within, for want of a better world, the scientific-materialist world-picture, while the existential realist interpretations venture beyond, are critical of, or otherwise depart (at least in some respects) from the scientific-materialist world-picture.

In this essay, I offer a critical reading of two existential realist interpretations of quantum mechanics: Karen Barad's agential realism and Heinrich Päs' quantum monism. To do this, I use what I call a Categorical Differentiation approach to science and religion, which is inspired by Ludwig Wittgenstein and Bas van Fraassen. After an overview of the ontological turn in the philosophy of quantum mechanics and explaining the basic



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difference between scientific and existential kinds of realism, I examine central features of Barad's agential realism and Päs' quantum monism, respectively. Then, I explain what the Categorical Differentiation approach to science and religion is, with particular attention to its relevance for the philosophy (and theology) of quantum mechanics. This will equip us for Section 7, in which I develop a critical analysis of Barad's and Päs' interpretations from this Wittgensteinian perspective, focusing on different ways in which Barad and Päs relate the science of quantum mechanics to their respective existential–moral visions.

2. The Ontological Turn in the Philosophy of Quantum Mechanics

In many ways, the driving thought behind ontological realist interpretations in the philosophy of quantum mechanics is a strong unease with the instrumentalism and agnosticism (in relation to the quantum reality 'behind' the measurements) of the orthodox Copenhagen interpretation. This unease is aptly expressed by Travis Norsen:

... to whatever extent the Copenhagen philosophy insists that it is not merely wrong, but impossible, to provide a uniform, coherent, realistic description of the world, which is nevertheless consistent with all known experimental facts, the Copenhagen philosophy is in that regard simply wrong. (Norsen 2017, p. 171)

Two significant realist interpretations of quantum mechanics in the mid-20th Century—namely, Everett's many worlds theory and De Broglie-Bohm pilot-wave theory—did not become the most widely accepted interpretations of quantum mechanics, at least among the physicists. However, the internal coherence, consistency with empirical measurements and predictions of quantum mechanics, and at the same time their rejection of some of the tenets of the Copenhagen interpretation, kept alive the spirit of realist metaphysics within (the philosophy of) quantum physics.

An early harbinger of a more notable ontological turn in the philosophy of quantum mechanics that was to come was John Bell, whose work persistently treated metaphysical questions about the reality behind the mathematical objects of quantum theory as unavoidable. In fact, such questions, intertwined as they are with the question of the relation between the mathematical equations of quantum physics and its observables, are for Bell strictly part of "professional" physics rather than something 'merely philosophical' that would be external to, or even redundant for, physics (Bell 2004, p. 173). Bell is best known for his theorem, which demonstrates that the predictions of quantum mechanics cannot be reproduced, i.e., are incompatible with a realist theory that includes local hidden variables. In other words, Bell's theorem shows that realism and locality cannot coexist, demonstrating theoretical limitations of any realist interpretation of quantum mechanics. He was impressed by the de Broglie-Bohm pilot-wave theory, not because Bell would unequivocally accept it as the correct ontological representation of reality, but because the theory is an example of a realist, deterministic, but non-local theory of quantum mechanics. Crucially, the pilot-wave theory accounts for all the empirical predictions equally successfully, as does the instrumentalist and anti-deterministic approach of the Copenhagen interpretation.

Bell's own position, however, was a principled and, in this sense, more general realist commitment.¹ He did not offer or endorse a detailed, particular ontological model. Instead, Bell's effort resulted in exact logical and conceptual implications of quantum theory, given its empiria, just like the Copenhagenists were claiming to have done, only that Bell did it from the standpoint of a realist, rather than an instrumentalist, commitment.

3. Scientific and Existential Realist Interpretations

In the last three to four decades, the ontological realist interpretations of quantum mechanics have proliferated, mostly within philosophy, but this time they are gaining wider acceptance among the physicists as well. As defined earlier, the scientific realist

interpretations operate within the scientific-materialist world-picture, while the existential realist interpretations venture beyond, are critical of, or otherwise depart (at least in some respects) from it.

Most realist interpretations within the philosophy of quantum physics in the analytic tradition are, in this sense, scientistic, but they differ in their theoretical purpose and/or fundamental ontologies. What has become another classic realist interpretation, which is an alternative to both the pilot-wave theory and the many-worlds theory, is the Ghirardi–Rimini–Weber (GRW) theory (Ghirardi et al. 1986). This is the most prominent spontaneous/objective-collapse interpretation, which solves the measurement problem by making the collapse of the wave function a genuine physical process that occurs randomly, but according to a precise stochastic, dynamical law (independently of measurement). More recently, Allori, Goldstein, Tumulka and Zanghi (Allori et al. 2008) argued that GRW’s spontaneous collapse theory “is not the whole story”, and “depending on the choice of . . . *primitive ontology*, . . . there are correspondingly different versions of the theory” (ibid., pp. 358–59). In other words, the original GRW theory as such still does not answer (as the pilot-wave theory does, for example)—and allows different answers to—the question: what is it in the physical world that fundamentally exists and connects to what the wave function mathematically describes? One option for fleshing out the primitive ontology, Allori explains, is the so-called *Sm* primitive ontology, which offers a “matter density field ontology in three dimensional space . . . combined with a Schrödinger evolving wave function that determines the temporal evolution of the primitive variables” (Allori 2013, p. 70). An example of this primitive ontology approach is a refinement of GRW—the so-called GRW_m—option, argued by Ghirardi himself (cf. Allori et al. 2008, pp. 359–60). A version of scientistic realism that is, in a sense, the opposite of the primitive ontology approach(es) is David Albert’s wave function realism, according to which the fundamental reality is that of the wave function itself. While in several other interpretations, the wave function is considered to be a mathematical tool that provides a complete description of the quantum state of a physical system, for Albert, the wave function itself is the primary reality of the world that “lives” as a field in configuration space. Consequently, what we experience as physical reality of our three (or four)-dimensional objects are—not merely grounded in the wave function while still being in important sense real, but—an illusion (D. Albert 1996; D. Z. Albert 2013). All the above interpretations, at least in their basic expositions, stay within a scientistic-realist metaphysical framework and firmly in the analytic philosophical tradition.

The existential realist interpretations come from, or combine, different philosophical traditions, both analytic and continental traditions of the West, while some also engage with non-Western philosophies. In addition to explicitly theological interpretations (such as the Christian theological interpretations by Harris 2023; Simmons 2023), we should also count among the existential interpretations some that do not invoke god or gods, nor any other particular religious metaphysics in full. In this essay, I analyse two such interpretations, namely Karen Barad’s agential realism and Heinrich Päs’ quantum monism. It is this very feature, i.e., that they are not overtly theological, which, together with their extensive and excellently informed engagement with quantum theory, makes these two interpretations particularly interesting for an analysis from the perspective of the Categorical Differentiation approach to science and religion proposed later in this essay.

A crucial difference between the scientistic and the existential ontological realist interpretations of quantum theory is that the former do not attempt to make any connections between the basic ontology of the world on the one hand, and what we can call human existential attitudes towards the world—moral, religious, or spiritual—on the other, while the latter do that. For scientistic ontological realists, any project that relates the basic

ontology of the world (in their interpretations, a scientific image of the world) to our existential attitudes is resolutely outside of not only physics, but also outside ontology proper and the philosophy of science. For the existential ontological realists, the question of our existential attitude towards the world (including other humans and living beings, as well as the non-living world) is in some significant way bound up with the basic ontology of the world. In other words, it is a part of ontology proper, and in that sense, a fully legitimate part of the philosophy of science.

We should note, however, that both the scientific and the existential realist interpretations—at least the two existential interpretations considered in this essay—accept Bell’s central argument that the notion of measurement, as it has been used by several proponents of the Copenhagen interpretation, is too problematic to be used in any fundamental theory of the world. As Alyssa Ney explains,

Bell . . . raises a more fundamental worry about orthodox quantum mechanics. This is that by introducing the concept of measurement into the basic laws of quantum mechanics, we make this theory about measurers or observers, about us, in a way that is inappropriate if this is to be a true, fundamental physical theory of the world. A fundamental theory should not make appeal to such complex organisms as observers as part of its most basic framework. (Ney 2013, p. 28)

As we shall see, Karen Barad adopts a different approach to solving the measurement problem than many other realists: instead of removing a theory of measurement from the basic laws of quantum mechanics, she attempts to decouple the notion of measurement from the notion of the human observer. Such a move is not without problems. But to grasp the significance of this, we must first explain her approach in a bit more detail.

4. Karen Barad’s Agential Realism

Barad (2007) bases her metaphysical vision of reality, the theory she calls ‘agential realism’, on a radically relational but realist reading of quantum indeterminacy and entanglement. She develops her metaphysics as an all-encompassing reading of the idea that sub-atomic particles—before the arrival of quantum mechanics, these were of course thought to make up the fundamental level of reality—do not have a self-standing existence as individuated entities since “relations do not follow relata, but the other way around” (Barad 2007, pp. 136–37). In contrast to the traditional Western metaphysics, as well as a ‘common sense’ or folk-ontology based on human perceptual interactions with the world, reality should not be understood as consisting of independent entities, however small or spread in space, their properties, and the relations between them. Instead, what we recognise as entities or objects emerge from what Barad calls ‘intra-actions’. Rather than interactions between supposedly ‘fundamental’ entities, intra-action is ontologically prior to any entities or objects (including sub-atomic particles), which shows their ontological inseparability.

From this perspective, the central and once problematic concept of ‘measurement’ in quantum mechanics should be read in a thoroughly non-anthropocentric way. Building on Bohr’s re-conceptualisation of what ‘measurement’ and ‘phenomenon’ are, Barad emphasises that measurements are not interactions between separate entities or a process where the human observer ‘disturbs’ the physical phenomenon, but rather become a co-constitutive part of what the physical phenomenon is in the first place. A “phenomenon is a specific intra-action of an ‘object’ and the ‘measuring agencies’; the object and the measuring agencies emerge from, rather than precede, the intra-action that produces them” (Barad 2007, p. 128). This is based on Bohr’s characterisation of the physical phenomenon: “the unambiguous account of proper quantum phenomena must, in principle, include

a description of all relevant features of the experimental arrangement” (Bohr, quoted in Barad 2007, p. 119).

For Barad, this means we need to abandon some of the deep-seated ontological and epistemological principles of the Enlightenment. The ontology of a “fundamental inseparability based on a proper understanding of quantum intra-actions” “cuts across any Kantian noumena-phemonena distinction” (ibid.). This all comes, she claims, from reading Niels Bohr as a realist, effectively saving Bohr from what has become the standard reading of the Copenhagen interpretation, which has been either instrumentalist or agnostic (or both).

In the process, Barad reforms the meaning of ‘realism’ compared to the standard formulation of realism in the philosophy of science, following Bohr’s redefinition of what constitutes a physical phenomenon:

Apparatuses are not Kantian conceptual frameworks; they are physical arrangements. And phenomena do not refer merely to perception of the human mind; rather, phenomena are real physical entities or beings (though not fixed and separately delineated things). Hence . . . Bohr’s framework is consistent with a particular notion of realism, which is not parasitic on subject-object, culture-nature, and word-world distinctions. (Barad 2007, p. 129)

This allows Barad to accept Bohr’s central claim that indeterminacy manifested in quantum mechanics is ontological, not merely epistemological. It does not only reflect a lack of knowledge about the pre-existing or hidden properties; instead, such properties do not exist prior to any specific experimental arrangements of the measuring apparatus (Barad, 2007, pp. 107–10). However, in order to correct Bohr’s anthropocentric idea of an apparatus—intertwined, of course, with his notion of ‘measurement’—Barad offers the following reinterpretation: “In my agential realist elaboration of Bohr’s account, *apparatuses are the material conditions of possibility and impossibility of mattering*; they enact what matters and what is excluded from mattering” (ibid., p. 148; emphasis original). It is the very ambiguity of ‘mattering’ that seems to do a lot of work here—a critical point to which we shall return in Section 7.

The radicality of Barad’s position is, however, not so much in the realist reading of Bohr. In that, she has some, although not many, allies among historians of science and even scientific ontological realists (e.g., Folse 1985). The radical nature of Barad’s approach lies in the particular way in which she connects her agential realism to ethics. In that move, which is central to her entire philosophical project, she clearly departs from scientific realism. Putting it succinctly, and with the help of her own words, Barad’s metaphysical picture of the entangled and intra-related world fully emerges only at the point her “onto-epistemology” becomes “onto-*ethico*-epistemology”. Quantum entanglement thus becomes both a sort of empirical grounding and—together with her feminist critique of the enlightenment scientism, which emphasises “the mutual constitution of the ‘social’ and the ‘scientific,’” (Barad 2007, p. 87)—an important part of the philosophical inspiration for a relational ontology that reconfigures the understanding of matter, meaning, the mind-world and subject-object relations, and the nature of ethics.

This becomes most apparent with something that comes out as central to Barad’s interpretation: a connection between the idea of intra-action on the quantum level of reality and the Levinasian idea that moral responsibility precedes the constitution of self, i.e., the ethical subject. Just like, on the quantum level, intra-actions exclude some possibilities and enable others to become what we know and experience as matter (entities, objects, and particles), so too “responsibility is not a commitment that a subject chooses but rather an incarnate relation that precedes the intentionality of consciousness, ‘an obligation which is *anachronistically* prior to every engagement’” (Barad 2007, p. 392, also quoting Levinas).

In other words, ethical mattering is ontologically rooted, not in the relationships between fully formed individual humans, but in the (correct understanding of) quantum reality. Barad nevertheless claims that:

(a) delicate tissue of ethicality runs through the marrow of being. There is no getting away from ethics–mattering is an integral part of the ontology of the world in its dynamic presencing. ... Intra-acting responsibly as part of the world means taking account of the entangled phenomena that are intrinsic to the world’s vitality and being responsive to the possibilities that might help us flourish. Meeting each moment, being alive to the possibilities of becoming, is an ethical call, an invitation that is written into the very matter of all being and becoming. We need to meet the universe halfway, to take responsibility for the role that we play in the world’s differential becoming. (ibid., p. 396)

At this point, the philosophical ambition of Barad’s agential realism becomes clear. It includes, among other aims, a radical reinterpretation of science as such. She rejects scientific approaches to ontology, be they realist or not, “blast[ing] apart the notion that science is an independent field of thought driven only by empirical findings devoid of any metaphysical, theological, or political commitments” (Barad 2017, p. 26), deconstructing human exceptionalism, and she offers a morally and politically minded relational ontology of matter, including us, instead.

Before proceeding with a critical exploration of how agential realism can be analysed from the Categorical Differentiation approach to science and religion, we must introduce another existential realist, the quantum monist Heinrich Päs.

5. Heinrich Päs’ Quantum Monism

In his recent book *The One: How An Ancient Idea Holds The Future of Physics* (2023), German physicist Heinrich Päs argues that quantum physics shows that the fundamental reality of the world is merely one ‘object’, namely the universal quantum state. Päs is by no means alone in adopting a quantum monist metaphysics of the cosmos. Notable recent work that argues for quantum monism and/or holism include Schaffer (2010) and Ismael and Schaffer (2020), who argue that, since entangled wholes are more fundamental than their parts in quantum mechanics, and “given that everything interacts at the Big Bang ... [and hence] the entanglement [of the cosmos] is always preserved”, the cosmos as an entangled whole is ontologically prior to its parts (ibid., pp. 4150–51)—the view also called ‘priority monism’.² However, with his book-length argument for quantum monism, which ranges from different subfields of quantum physics to philosophy and the history of ideas, Päs has recently emerged as its prominent voice. His claim is encompassing significantly more than that of Ismael and Schaffer: Päs argues that, as a metaphysical position, monism has both great potential for the future of physics (for solving the open questions in quantum gravity, particle physics, cosmology, and other fields) as well as a much broader relevance for our understanding of the world, our place in it, and how we should relate to it. We will arrive at these final points later.

Since the unity of a single, entangled and irreducible whole is ontologically fundamental, argues Päs, the multiplicity of objects, including that of ‘elementary’ particles, fields, and larger things we perceive and measure, is derivative. Päs takes Everett’s many worlds interpretation as a historically significant predecessor of his own ontological realism, despite its seemingly opposite metaphysical tendencies to those of monism, namely the wild multiplicity of worlds in Everett’s interpretation. However, there is an underlying monism in Everett’s theory, as he argues for the oneness of the universal wave function, which does not collapse but branches out into relative parallel subsystems (Päs 2023, pp. 80–81). Furthermore, building on the work of Dietrich Zeh, Wojciech H. Zurek, and others on

decoherence, Päs explains how classicality emerges from the interaction of a quantum state with the environment, through what Zurek calls superselection or *einselection*, which is “a quantum process associated with selective loss of information” (Zurek 2003, p. 715).

It is, of course, entanglement that enables quantum mechanics to “integrate parts into a whole”, providing “the glue that allows quantum mechanics to constitute a monistic philosophy” (Päs 2023, pp. 48–49). The fundamental reality in Päs’ theory is not the universal wave function—although sometimes his interpretation certainly sounds like Albert’s wave function realism, for example, when approvingly quoting Zeh’s statement that “At the beginning was the wave function. . .” (ibid., p. 281)—but a non-local, entangled reality of the universal quantum *state*, which would be correctly described mathematically by the universal wave function. Still, insofar as the only object that really exists is the quantum state of the whole universe (Zeh), our spatio-temporal world of particles and fields we measure can be described as “illusion” in a certain sense (ibid., p. 88). This is because the classical world is relative to local subsystems, merely perspectival, and emergent from the single, global state.

Zeh’s formulation helps Päs flesh out the monist ontology as an alternative to the Copenhagen interpretation:

Instead of conceiving the wave function as a tool providing information about the potential behaviour of the classical objects in everyday life, this new view suggests nothing less than the contrary: classical objects, space, time, and matter have to be conceived as information about the underlying quantum reality. The behaviour of classical objects allows us to constrain the space of possibilities that characterises this fundamental reality, and the more we learn about quantum cosmology, the better we will understand what ‘the One’ really is. (Päs 2023, pp. 281–82)

Therefore, if we take quantum physics seriously and follow through its logical consequences, we see that the “individual properties of constituents cease to exist for the benefit of a strongly correlated total system” (ibid., p. 47).

What I have described so far of Päs’ metaphysics remains, we can say, within the confines of theoretical physics and hence reads more or less like a scientific realist interpretation of quantum mechanics. Why, then, do I suggest his quantum monism is to be read as an instance of existential realism? Because, as we shall see, Päs makes connections between monism, religious world-pictures, and ethics, and thus allows his quantum monism to reach beyond the scientific picture. Before explaining how he does this, let us see how Päs’ metaphysics differs from Barad’s.

Even more resolutely than Barad, Päs is clear that the picture of the world that emerges from quantum mechanics, namely quantum monism, does not itself “provide us with a moral compass” (Päs 2023, p. 286). *Primarily*, Päs’s quantum monism is meant to work as a scientific concept, a scientific–metaphysical theory which can solve old philosophical problems with quantum mechanics as well as some of the current theoretical conundrums in several areas of physics. In a somewhat Dawkinsian vein, he also reminds us that nature includes both cruel and terrible things as well as good and beautiful ones, and hence, neither nature nor science gives us direct answers to our ethical questions. After all, “there is nothing that isn’t nature. . . . For all we know, the universe doesn’t care about us, our problems, or the existence of humanity in the first place” (ibid., p. 287).

However, Päs also claims that monism has important philosophical potential for existential orientation, an ethically fruitful worldview that can help us relate to the environment in better, more responsible ways and even overcome our differences. It can do this by making us aware of the underlying unity of all things:

Only if monism can preserve an unbiased openness for diversity, an integrative perspective, can it become a philosophical guiding principle for humanity's future. . . . After all, monism changes the focus from the individual to the interdependent network of individual beings. In particular the monistic spirit influencing most (if not all) religions and science alike may help to find a common ground shared by individuals of different backgrounds and beliefs. (Päs 2023, p. 287)

We find, then, an affirmation of a link between understanding and accepting quantum monism, or at least its basic features, and an ambitious ethic of interconnectedness. Realising “that we are all facets of an underlying unity” leads us, or *should* lead us, according to Päs, towards connecting “with our immediate, ecological environment and eventually to the entire universe”. Awareness of this interconnectedness can prepare us better to face the huge current and future challenges that humanity and the environment are facing. To achieve this moral potential of quantum monism, it has to be communicated effectively and in an inclusive manner beyond the scientific communities and intellectual elites, via a carefully calibrated popular science discourse (*ibid.*, pp. 288–89).

This is certainly very different from Barad's onto-ethico-epistemology. For Päs, moral mattering is not “an integral part of the ontology of the world” (Barad). What we notice, however, is a resolute hope and a type of speculative faith in the power of quantum monism to steer us and produce a significantly better world than the one we have now. Quantum monism, which, if Päs is correct, just happens to be the correct scientific ontology of the world, in this way seems to become a part of an existential–moral stance.

To bring out its links with philosophical and religious traditions, Päs describes quantum monism (also) as an inheritor of the long lineage of monist philosophies, secular and religious, tracing the history of monism in the West in particular, but also beyond. Although it has, at times, been associated with excesses and anti-science attitudes—for example, in the Romantic philosophy of nature, where monism was to some extent intertwined with a negative attitude towards the experimental method, which was considered violent—overall, the “monistic paradigm” tended to lead towards “the embrace of nature and the quest for unification and beauty”. This paradigm was also at the root of modern science, including electrodynamics and thermodynamics, and hence, it also sets the stage for quantum physics (*ibid.*, pp. 187–88). Päs finds significant parallels between Zeh's work on decoherence and the theology of John Scotus Eriugena, whose idea of “separation of the universe into subject, object, and environment” reads like a “metaphor for decoherence” (*ibid.*, p. 128), and between the idea of quantum entanglement of the One on the one hand, and Meister Eckhart's thought that “God. . . is One in his hidden unity” and “flows into all things” (Eckhart, quoted in Päs 2023, p. 134) on the other. We are then reminded that the Church's dogmatic acceptance of dualism, stemming from the crucial theological distinction between the Creator and creation, achieved that monism, often in its religious form as pantheism, and was largely suppressed and often persecuted in the West (*ibid.*, pp. 115–20, 145).

This interweaving of popular-scientific explanations of quantum monism with a particular reading of the story of Western monism—or philosophies close to monism but not quite reaching it, like, arguably, those of Eriugena and Eckhart—could be read simply as a rhetorical device, with the purpose of directing the attention of readers more interested in history, philosophy, and religion towards the modern metaphysical foundations of quantum theory. However, the persistent retelling of these connections makes the impression that there is more to it for Päs. This is confirmed in the final chapter of his book *The One*, where he again returns to the mystics and Romantic intuitionists. At his most speculative moment, we find him conjecturing about the possibility of *experiencing* quantum holism in the cultures before the dawn of quantum physics and wondering whether that is expressed in the mystical tradition.

Maybe it is not entirely impossible that subjects experience a quantum holism in altered states of consciousness, including what has been understood as “mystical experience” from the beginning of time. Alternatively, maybe humanity somehow preserved some unconscious memory about being “one with nature” from primordial times when individuation was not fully developed—an arguably paradisiac state, as suggested in the interpretations of the Fall of Man and discussed in the works of John Scotus Eriugena or Friedrich Schelling. Such a memory may have been subsequently fostered in pagan religions, mystery cults, and secret societies. Or the feeling of a dissolved ego that can be experienced in altered states of consciousness could have contributed to keeping this memory alive or to reviving it from time to time. (Päs 2023, p. 284)

This bold—if not very speculative—suggestion reveals an underlying hope in Päs’ existential interpretation, which is to achieve a certain integration of science in religion through quantum monism, an ambition to which we shall return with a careful and critical look in the final section (Section 7) of this paper. Before that, we must say something more about the Categorical Differential approach to science and religion.

6. The Categorical Differentiation Approach to the Science–Religion Relationship

What I call the Categorical Differentiation approach (CDa) to science and religion draws its main inspiration from Wittgenstein’s philosophy of religion and van Fraassen’s philosophy of science. In first approximation, the main idea is that an appropriate scientific belief–attitude is very different from religious or spiritual belief–attitude, a difference that, if reasonably maintained, shows up in practices, treatment of claims, and in different ways in which these two categories relate to experience: the ‘ordinary’ sense experience in relation to empiria in the case of science, and especially felt experience in the case of religion. If we use the standard categorisation (Barbour’s—see de Cruz 2022), we can place the CDa somewhere between the *independence* model and the *dialogue* model of science and religion, although it is notably closer to the independence model. Needless to say, applying different models of science and religion from the CDa would very likely lead to notably different evaluations of the picture of (quantum) science–religion relations portrayed by Barad and Päs, respectively.

We should note right away, however, that CDa is quite different from the most well-known independence model, namely S.J. Gould’s Nonoverlapping Magisteria, or NOMA. Gould claimed that the respective magisteria of science and religion are not only separate and independent when approached correctly (i.e., in a normative sense) but have also been so historically as a mainstream position in Western intellectual history, which is accepted by most scientists and theologians (Gould 2002, pp. 75–89). The Wittgensteinian approach is not committed to this historical-descriptive claim. And second, while Gould’s NOMA was importantly shaped by the motivation to offer a reconciliatory interpretation between science and religion in order to alleviate the culture wars between evolution and conservative Christianity in the US—where the “strategy was to give a certain legitimacy and autonomy to religion in public education and universities by blending the question of the relationship between science and religion with the question of the relationship between humanities and sciences in modern universities” (Andrejč 2023, pp. 8–9; see also McGrath 2021, p. 556)—CDa does not treat religion itself as if it was an academic discipline in humanities, but, following Wittgenstein, rather as an “extension of instinct” (RFGB 80) where “language is . . . a refinement, ‘in the beginning was the deed’” (CV 36).

The normativity of CDa pertains, first and foremost, to the beliefs/–attitudes appropriate for science and religion, respectively. Let us tease out the distinction between scientific and religious belief–attitude a bit more: Proper scientific claim-making and belief–attitude

are inseparable from rigorous empirical testing (at some point and, crucially, in principle), which implies a continuous openness for evidential falsification and theoretical optimisation. Religious claims and beliefs are different: they are not “something we can test” (LC 60) via any standard, empirical scientific method, nor should we expect them to be. Within this non-evidentialist manner of believing, religion can involve a notable variety of what we can still call ‘belief’. In other words, the concepts, symbols, stories, and ideas that operate religiously can be affirmed, adhered to, or held on to in various ways. Instead of rehearsing the enduring discussion about the nature of ‘faith’ in philosophy of religion and theology, CDa allows for a variety of non-evidentialist belief-attitudes in religion. In the mildest sense of ‘belief’, that could be a mere commitment to use certain concepts (God, sacred, etc.) as part of the preferred or ‘best’ conceptual framework for living, relating and experiencing; or, a religious idea can be ‘taken as true’ in a pragmatist sense; or as an attitude akin to hope; or as something to holding onto because “experiences, thoughts,—life can force this concept on us” (CV 97); or, if taken up more theoretically (which is somewhat contrary to the Wittgensteinian spirit, but can still be accommodated here), adopted as a postulate for morality (Kant).

According to the CDa perspective, the other noteworthy aspect of religion is a significant connection with felt experience, especially what the phenomenologist Matthew Ratcliffe calls *existential feelings* (Ratcliffe 2008), e.g., feeling intensely alive, or feeling cut off from the world or from life, feeling existential dread or angst, feeling that the world or oneself is ‘not real’, or feeling love towards the whole world, nature, or humanity (ibid., pp. 7, 37–40). This normative idea—namely, that certain kinds of feelings have an important role in religious life—was expressed by Wittgenstein several times in different periods of his philosophical development. Before stating that life can “educate us to ‘believing in God’”, Wittgenstein adds that

... *experiences* too are what do this but not visions, or other sense experiences, which show us the ‘existence of this being’, but e.g., sufferings of various sorts. And they do not show us God as a sense experience does an object, nor do they give rise to *conjectures* about him. Experiences, thoughts,—life can force this concept on us. (CV 97)

Wittgenstein also considers the feeling of being “absolutely safe” (despite not being literally or physically absolutely safe in the usual meaning of the word) and feelings of deeper or existential kinds of “guilt” to be characteristic of religion in his *Lecture on Ethics* (LE 11–12). Perhaps most notably, however, Wittgenstein’s phenomenology of religion emphasises the feeling of existential wonder, which he calls his “experience *par excellence*” and describes as a “wonder at the existence of the world”, explaining that he is inclined to use phrases such as “how extraordinary that anything should exist” or “how extraordinary that the world should exist” when trying to express such experience (LE 11).

We will return to the felt aspect of religion later. Going back to the topic of belief-attitudes, we can now explicate the belief-attitude appropriate for science further with the help of two ideas of Bas van Fraassen. What CDa takes from van Fraassen here is not his entire philosophy of science, or his well-known instrumentalism in full, but (1.) the conception of science as a practice of *objectification*, as well as (2.) an understanding of empiricism, and of religious attitude, as ‘stances’. As we shall see, this approach—and I cannot argue this properly here—while certainly not denying the importance of historical-contextual, social, and political influences in science, and departing from scientism, largely does not share Barad’s feminist rejection of scientific objectivity.

A crucial characteristic of scientific inquiry, van Fraassen explains, is that it is *objectifying*. This is so in different senses of this word, of which we will only mention two. First, scientific investigation of the world involves “objective distancing”, i.e., a particular way of

constituting a scientific object: “an object that is collected, labelled, put in a museum, that is sliced, dissected, solidified, dyed, and put under a microscope” (Catherine Wilson, quoted in van Fraassen 2002, p. 157). While such objectification of living beings (including humans) can have morally negative connotations because of the possible and often real dissociation of scientific objectification from a value-based attitude, that is not necessarily the case. Science is also objectifying in the sense of being an “objectifying inquiry”: It delimits the questions that science asks of the world and is based on the realisation of “how much we could accomplish cognitively by taking ourselves out of the picture” (van Fraassen 2002, p. 159). Scientific objectification, then, became crystallised in a regulating idea that scientific inquiry should be, in an important sense, independent from the person(s) carrying out the research (ibid., p. 161). van Fraassen reminds us of what this came to mean in the philosophy of quantum mechanics post-Bell, which is something we noted earlier, namely, that involving the human observer as a variable in a fundamental scientific theory is not properly scientific, and that the solution is taking the dependency on human observers out of the picture. The result is that “(the) measurement problem in quantum mechanics takes precisely the same form for inanimate instruments as for conscious observers” (ibid., pp. 161–62).

Scientific objectification does not entail or assume a reductionist or other scientific metaphysical position (e.g., reductive physicalism). What it does imply, however, is *empiricism*, which van Fraassen interprets as a *stance* rather than a set of fixed metaphysical beliefs about the world. Adopting the empirical stance means a steady commitment to a particular set of epistemic and evaluative attitudes (ibid., p. 47): to follow epistemic rationality guided by careful observation, to affirm the value of argued disagreement, to rebel against metaphysical theorising and over-speculation in science, and to limit the explanation of phenomena with natural explanations. A crucial epistemic feature of the empirical stance is the nature of scientific belief–attitude: “All our factual beliefs are to be given over as hostages to fortune, to the fortunes of future empirical evidence, and given up when they fail, without succumbing to despair, cynicism, or debilitating relativism” (van Fraassen 2002, p. 63).

Of course, the vast cultural phenomenon of science—‘science’, now, in a broader sense, which includes its institutional functioning and community dynamics, popular science, education and science communication, and so on—includes storytelling, poetry, and other modes of communication that often include expression of felt attitudes (Taddicken and Reif 2020). In this broader sense, science always combines the empiricist values with other dominant values of the societies in which it is a part, whether religious (also meant now in a broader sense than in most of this essay) or not. For those religious cultures that live in societies permeated with modern technologies and science-based infrastructures, which is today the case for most religious cultures, scientific investigation and engineering often constitute a hugely important part of what it means to ‘live in the world’. Still, this does not make the process of constructing the best natural explanations of empirical phenomena a primary task of religion, nor does it make religious claims and beliefs evidence-based in an empirical way. Following Wittgenstein, CDA holds that the primary way religious ideas and beliefs are made persuasive and resonate with (potential or existent) believers is not through evidence-based argument but ‘preaching’ (broadly speaking): evocative speech-acts, as well as similarly potent non-verbal kinds of expressions and practices (e.g., art) (Andrejč 2025, p. 289).

van Fraassen encapsulates the importance of feeling in religious attitude (which he describes as a stance, but a different kind than the empirical stance), in this way:

[What] distinguishes the secular from the religious is not the theories they hold, or beliefs about what the world is like, although those too are often found among the

differences. The crucial distinction lies in a certain attitude, in how we approach the world and relate to our own experience. We can theorize about that, of course, but having a theory about a stance is no substitute for having it, and rejecting it won't consist in disbelieving a theory. (van Fraassen 2002, p. 194)

With a nod to the phenomenological and liberal-theological tradition, van Fraassen holds the feeling of 'abiding astonishment' (p. 182) as characteristic of the religious stance. Abiding astonishment, he explains, is not the same as scientific curiosity, which is 'quenched' after the satisfying natural explanation is provided; rather, it is a kind of wonder "that does not cease with the conclusion of [empirical, causal] inquiry" (ibid., p. 188). This phenomenological description, while not necessarily 'global' (i.e., intentionally directed toward the 'whole world'), is nevertheless very similar to Wittgenstein's expression of existential wonder in the *Lecture on Ethics* mentioned earlier. It is also relevantly similar to what Albert Einstein calls "cosmic religious feeling" (Einstein 2011, p. 329)—an existential wonder which, according to the physicist, inspires humility in the face of the cosmos and *precedes* scientific curiosity and reasoning (ibid., p. 330). For Einstein, this feeling, rather than any scientific idea, was central to his 'mild' pantheistic stance. As Max Jammer explains, Einstein "never based his religion on logical inferences from his scientific work" (Jammer 1999, p. 11).³

In the spirit of Wittgenstein, Einstein, and van Fraassen, then, we can see religion as connected in some significant way to existential feelings and related, felt attitudes, as well as involving non-evidentialist belief-attitudes. Now, from the perspective of the psychology of religion, *emotional* (not only existential) feelings like love, respect, and longing, as well as fear or disgust towards objects, beings, or actions, are usually important in religion and morality (Haidt 2003; Haidt and Algoe 2004). However, from the Wittgensteinian perspective, existential feelings carry special significance because, phenomenologically speaking, they relate (one) to the *whole* environment, the world "as a whole" (TLP 6.432), cosmos, or 'all'. In the phenomenological structure of a religious stance, these all-encompassing feelings of being can, of course, be connected to the more particular, intentional (emotional) feelings, moral orientation, and values. Furthermore, once religious beliefs become a fundamental part of an intellectual system or a worldview—which tends towards coherence—we normally find metaphysics and ethics interwoven, sometimes even inseparable. That we can see these connections at work in Karen Barad's agential realism, and even—much less obviously, or rather, only very tentatively—in Päs' quantum monism is why we should consider their stances religious in the sense here explained.

Finally, the CD approach does not preclude the possibility of a person, or a community, upholding both the empirical stance and a religious stance. To combine the values pertaining to these two different stances is, of course, not without difficulties as, at the very least, it involves some psychologically demanding perspective- and attitude-switching. While there can be traffic of ideas and metaphors between the two, as well as dialogue and shared values (e.g., honesty, integrity), CDa guards against both, collapsing religion into science and presenting science as religion. Taking the belief that nature is holy, or the belief that nirvana is the end goal of human existence, or even just the belief that living beings or functioning ecosystems have intrinsic value, as scientific hypotheses, means committing a distortive category mistake. As neatly expressed by neuroscientist Kevin Nelson: "It's folly to expect that science can prove or disprove the truthfulness of [mystical] experiences. . . . spiritual hope based on false science is cruel. The nature of faith makes it immune to science's demands for consensus, verification, and prediction" (Nelson 2011, p. 260).

Religious world-pictures and ideas, of course, often relate to or use scientific ideas. In such cases, scientific ideas leave their 'primary home' of scientific discourse and become recontextualised in a different kind of discourse. This can be done in various ways, some of

which are epistemically less virtuous than others. As Asprem (2016) shows in the case of Schrödinger's cat, the process of recontextualising scientific representations within religious discourse is often mediated via popular science. In both popular science and religion (including spirituality), counterintuitive concepts of professional science are cognitively optimised as the representations in question are brought closer to "natural ontological domains" of the common-sense discourse (Asprem 2016, pp. 120–21). So optimised, representations are picked up by influential authors in religion and spirituality and used in their own meaning-making, discursive practices. Eventually, they become stabilised with altered meanings and re-embedded within new, theological meaning-networks. Asprem explains how Schrödinger's cat has travelled from the professional science context to the New Age context and acquired different meanings in the process: originally designed as a critical thought-experiment with the intention to point out the counterintuitive and possibly contradictory consequences of the Copenhagen interpretation of quantum indeterminacy, Schrödinger's cat was decontextualised by popular science and then transformed into a heuristic device for illustrating the difference between the 'weird' and 'mysterious' quantum world on the one hand, and the everyday world on the other, a contrast that is utilised as an effective rhetorical device in the New Age spirituality contexts (Asprem 2016, pp. 130–32).

The problem is that the New Age appropriation of Schrödinger's cat imbues it with meanings not only different but also contrary to the original scientific meaning. It involves misrepresentation and obscurantism, an epistemically vicious mixing of (purportedly) scientific and spiritual discourses.⁴ However, a recontextualisation of scientific representations within popular-scientific, artistic, or religious discourses is not *necessarily* epistemically vicious. As we are entering the final section of this essay, we do so with a similar question for both Barad's agential realism and Pas' quantum monism in mind: is bringing '*quantum entanglement*' from the constrained scientific to an existential–moral or religious discursive context of agential realism and quantum monism, respectively, obscurantist and epistemically vicious? Or is it epistemically virtuous or even elucidating while aiming for existential meaningfulness?

7. Science and Religion in Barad and Päs

Barad's onto-ethico-epistemology offers an interesting and, for many in the humanities and posthumanities, inspiring new materialist vision of the cosmos and our place with(in) it. The idea that ethics is a feature of the very constitution of the material world is part and parcel of Barad's recognisably posthumanist stance: relationality of the world, which includes what we have long considered to be elementary particles as well as living (non-human) and non-living matter, is, in an important sense, no less morally salient than relations between people. In the last decade and a half, agential realism has been incorporated into posthumanist philosophies and theologies, partly because it appears to offer a kind of grounding in a persuasive reading of the fundamental science of quantum mechanics. Barad does not claim she is 'doing theology', except perhaps in a particular Benjaminian sense, as messianic-political critique of the technoscientific perspective on time and progress (Barad 2017). Neither does she claim that her onto-ethico-epistemology is anything other than a particular brand of materialist metaphysics, co-inspired by quantum theory and feminist critique. As an influential example of anti-scientistic metaphysics, however, agential realism has clearly become an important ingredient of recent theological, religious, and spiritual projects.

Kocku von Stuckrad, who in his recent work develops a posthumanist and animist ontology as part of a new, relational approach to religious studies informed also by Barad's work, explains the significance of Barad for his own project:

Barad's interpretation of quantum physics, intra-actively read together with critical theory in the humanities, makes it clear that our tools of interpretation are themselves part of the diffraction that co-creates knowledges. . . . Situational or entangled agency . . . is located in humans, other animals, material subject-objects, and even in non-material members of the agential network. . . . *[And, while] gods and ancestors, or powerful words in rituals and poems do not necessarily have agency in themselves; their agency emerges from our entanglement with them.* (von Stuckrad 2023, pp. 626–27, emphasis added)

Stuckrad highlights something that the Categorial Differentiation approach helps us appreciate but is not obvious to many readers of Barad, namely that Barad's existential-ontological discourse offers a distinctive intellectual opening for certain kinds of religion and spirituality. Now, Barad acknowledges that ethics cannot, straightforwardly, "be derived from what physics tells us about the world" (ibid., p. 26). However, claiming that "intra-acting responsibly as part of the world means taking account of the entangled phenomena that are intrinsic to the world's vitality and being responsive to the possibilities that might help us flourish" (Barad 2007, p. 396), amounts to nothing less than using the idea of quantum entanglement in argumentative support of ethical and spiritual claims about the world's vitality and the possibilities of morally good action. Either agential realism is a theological project that interweaves representations from quantum physics in its religious-metaphysical discourse, or it attempts to derive existential and moral messages out of quantum physics in order to give those messages scientific legitimacy. From the way Barad interweaves ethics into her quantum ontology (and vice versa), it is often not clear or explicit which of these two very different kinds of projects agential realism might be.

This ambiguity is, of course, deliberate, and it is encapsulated in Barad's broadly encompassing use of one of her central concepts: 'mattering'. Mattering, for Barad, covers—and, in her onto-ethico-epistemological vision, ultimately *unites*—such very different processes as material becoming (emergence of physical matter), discursive-epistemological boundary-drawing between concepts, and arising or giving ethical significance to things/processes/actions. The idea is that these processes, due to the nature of reality and our interactions with it, cannot be really separated and, hence, we should think of them together as *mattering*. However, Barad does not give any detailed account of how exactly the 'measurement' event (bringing one possibility of material existence into actuality and closing others) is, in general, *the same* process as semantic boundary-making (understood as a practice paradigmatically done by linguistic communities of highly complex organisms) and is, at the same time, the very same process by which some things or actions become ethically salient and not others (again, paradigmatically, only complex organisms with a particular kind of embodied, emotional, and possibly also reflective responses, vulnerabilities, and interests seem capable of what, very broadly, is considered moral or ethical attitudes or actions). Only a creative and imaginative, indeed religious (in a sense used in this essay), vision of the world as a whole and our place in it—a vision with a recognisably animist sensibility—can draw such sweeping and bold connections between these vastly different processes. For this, a proper leap of faith is needed, a leap which Barad invites us to make when she uses an evocative rhetorical device: calling all these processes with the same word, 'mattering'.

Speaking more generally, ontological entanglement of any kind—not just quantum but any physical, biological, chemical, or social entanglement between various kinds of beings and/or things, and especially humans and non-humans, as well as between humans—can often be morally dark. In other words, we should not assume or expect that entanglement implies a morally virtuous kind of connectedness. Even when fully acknowledged as such—in other words, even when it is not ignored or overlooked due

to, say, kinds of ontologies that do not recognise it—entanglement can easily coexist with harmful or parasitic interdependence and abuse. For example, in the intimately entangled lives of humans and animals in Europe in the Middle Ages, cruelty and physical violence towards animals were, for all we know, normalised. Another cautionary tale of intensely entangled existence was the social and embodied entanglement of slave owners and slaves across different societies, where their interwoven and interdependent lives could involve notable intimacy and co-constitutive identities, but were maintained within the framework of domination and exploitation. In the non-human world, such moral judgements are harder to make, but the parasitic dependence of some organisms on others is, at least from the perspective of the flourishing of the ‘host’ species, destructive. The moral ambiguity of entanglement carries over to epistemological considerations as well. Not only being entangled but also knowing and understanding entanglement does not imply greater virtue or moral understanding of the knower.

The moral ambiguity of these (not quantum) kinds of entanglement includes cautionary lessons for existential realist ontologies of quantum mechanics. Could it not be that somebody understands and fully accepts the entangled quantum reality of all matter, scientifically speaking, interprets Bohr as an ontological realist, abandons individualist metaphysics and the “Enlightenment culture of objectivism” (Barad 2007, p. 107) in favour of a relational ontology, but is still not concluding anything morally or spiritually salient from it? Or, to put it even more bluntly: is it not entirely possible to possess all the quantum-physics-based understanding of entangled reality which Barad works with in her interpretation (e.g., the main features of Bohr’s interpretation) but nevertheless be a fascist rather than a Levinasian without contradicting *the science of quantum physics*? And, is it not possible to have an adequate scientific understanding of quantum entanglement but still not wonder at the world at all?

Barad, whose vision battles against the very distinctions between nature and culture, and between science and ethics (Barad 2007, pp. 391–96), would not agree, but an answer to the above questions from the perspective of the CDa is ‘yes, this is entirely possible’. At the same time, it is more than plausible that the ideas of interconnectedness and entanglement of everything work well, and have worked well, as guiding ethical and religious ideas without, and long before, the scientific concept of quantum entanglement. Quantum monism, likewise—or even an explicitly religious variety of it, a quantum pantheism—can work well as a morally potent, spiritual/religious guiding idea. But it does not make sense to say that monism *as a religious stance* arises from an adequate scientific understanding of quantum entanglement, or that it is confirmed as such by scientific evidence. Monism as a stance with moral and spiritual ambitions is not “something we can test” scientifically (LC 60). While Päs explicitly acknowledges this, his discursive practice at the same time repeatedly creates an impression as if an existential vision of monism, which I interpret as a religious stance, is arising out of the scientific quantum monism. In *The One*, something crucial is often obscured: namely, that it is only when the ideas of quantum entanglement and oneness are taken up, interpreted, and reflected upon within the existential–moral monist narrative, having been cognitively optimised (losing some of its highly specialised scientific content), and having travelled from one discursive regime to another, that they acquire meanings that go beyond physics and become part of a religious stance of monism. There is a clear tension between Päs’ repeated expression of a ‘pro-science’ ideology and rejection of any religious, theological, or mystical interpretation of reality on the one hand, while at the same time investing in monist existential–moral vision with the help of medieval mystics and Romantic religious philosophers on the other.

Päs’ problem with the way Copenhagen thinkers interpreted the relationship between science and religion further reveals the deeper assumptions of his own in this field. He is

critical of Bohr and Heisenberg for stopping short of accepting monism, even though they occasionally, often in informal conversations or their non-physics lectures, indicated that the Eastern monist picture of the world makes sense in the light of the discoveries in quantum physics at the time, or the other way around. It was a particular influence of Christian theology on the Copenhagenists, Päs argues, and its idea that the all-encompassing unity of ‘the One’, as a characteristic of God who “wouldn’t be considered part of nature”, belongs to religion and not to science, that precluded the physicists from drawing monist conclusions within a scientific context (Päs 2023, pp. 54–55). In effect, then, Bohr and Heisenberg, adopting an austere version of an independence model of science and religion akin to S.J. Gould’s NOMA, precluded them from going further into a realist and most monist theory of quantum reality in physics and pushed them into adopting an agnostic and instrumentalist approach: “Obediently [following a theologically inspired separation model], the Copenhagen physicists pushed the reality behind our immediate observations into the sphere of religion” (ibid.).

It might indeed be that the early Copenhagenists steered away from metaphysical speculation in physics, at least partly, because of the influence of the separation model of science and religion—that is a question I do not aim to resolve here. But the point of doing this was, for Bohr as well as Heisenberg, to, first, stay firmly within the confines of scientific, empirical method while doing physics, and second, to allow the freedom of inspired philosophical—and, in the sense we are using the word here, religious and maybe also theological—visions of reality to perform their meaning-making and life-guiding role. If properly respecting the authority, distinctiveness, and limitations of science, religious stances can have their discursive life outside of the confines of science. When Bohr, Heisenberg, Pauli and some other pioneers were inspired by Eastern philosophical and religious ideas in the process of making sense of what the early science of quantum physics appeared to show, relating those ideas to their personal attitudes towards life and the world, they often consciously and explicitly engaged in this as a different and separate kind of discursive and reflective practice from what the one they upheld as science of physics.

Talking of personal attitudes, in a biographical note on his website (but not in his book), Päs (n.d.) says something which might, inadvertently, help us make sense of some of the mentioned tensions in his book:

While living in Hawaii, on a small island in the midst of the vast Pacific Ocean with its culture coined by the belief in “lokahi”, the harmony and unity of diverse elements, my perspective on the Universe changed, and I grasped more clearly how Nature works as a “net-like intricate fabric” (in the words of . . . Alexander von Humboldt). Around the same time, through intensive discussions with quantum pioneer H. Dieter Zeh, I realized how quantum entanglement unifies the cosmos into a single quantum reality. These insights gradually converted me to the philosophy of monism. (Päs, “Heinrich Päs”)

Päs’ monism, then—especially the existential, moral, and political aspects of it argued in *The One*—clearly has another source than merely quantum mechanics. Using Wittgenstein’s words (CV 97), we can say that it was “experiences, thoughts,—life [that has] force[d] this concept” (monism), on the author. If it was indeed the Hawaiian belief in lokahi, “the harmony and unity of diverse elements”, that has changed Päs’ “perspective on the Universe” and paved the way for his conversion to monism, the picture of the complicated relationship of science and religion within his quantum monism becomes somewhat clearer. Bringing together a spiritual monism, inspired by lokahi and the Romantic idea of ‘all in one’, on the one hand, with quantum monism as a scientific theory with great explanatory power on the other, is Päs’ creative achievement. Something similar can be said for Karen Barad’s agential realism, which brings together a realist scientific

interpretation of quantum mechanics (and a realist reading of Bohr) where material objects are constituted by quantum intra-action with a feminist reading of Levinas' pre-subjective ethics of responsibility and posthumanist vision of reality where moral "mattering is an integral part of the ontology of the world" (Barad 2007, p. 396). Crucial for this bringing together of quantum mechanics and their respective religious stances is, in both Barad and Päs, *preaching*, i.e., communicative action that makes imaginative and evocative connections between categorially different discourses of science and religion. They aim to inspire us to see the world as a whole, reality as such, in the meaningful ways offered by their respective visions and then, implicitly or explicitly, invite us to take action in order to make the world a better place.

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Notes

- ¹ This is well encapsulated in Bell's postulation of the so-called 'beables'—elements of the theory "which might correspond to elements of reality, to things which exist" (Bell 2004, p. 174). Beables are not observables, and their existence does not *depend on* observation. Rather, "observation and observers must be made out of beables" (ibid.). Importantly, a beable, in contrast to the concept of 'an existent' or 'a being' of many theories in philosophical metaphysics, is meant to signal the fact that any theory of reality is "essentially tentative" (ibid.). In Bell's perspective, this goes for physics as well as metaphysics which, in effect, should be a part of theoretical physics if it is to be considered a legitimate theoretical exercise at all. A somewhat similar approach, a "fallibilist realism", was Abner Shimony's "experimental metaphysics" (Shimony 1993).
- ² See also Calosi (2018) for a helpful critical discussion of several possible interpretations of quantum monism.
- ³ While Einstein could hardly be described as religiously practising in any significant way that would be recognised by a sociologist or ethnographer, he upheld the value of existential wonder as a permanent, action and thinking-guiding attitude, where his overall "commitment to scientific rationality and empiricism as a stance did not... appear incompatible with [what appears to be his] minimalist pantheism as a religious stance" (Andrejč 2023, p. 14).
- ⁴ A less problematic example is the idea of humans and all other living beings on our planet as "creatures of stardust, made out of ashes of dead stars", as John Polkinghorne writes, reminding us that "in the death throes of a stellar supernova explosion... the chemical raw materials of life are ... made" (Polkinghorne 2006, p. 175). Taking this idea, not as part of a natural-theological attempt to argue for an intelligent creator on the basis of fine-tuning of the universe for intelligent life (as Polkinghorne arguably does), but rather as a natural fact that inspires existential wonder at the cosmos and poetic expressions of our material interconnectedness with the entire cosmos, we do get a scientific representation cognitively optimised and ready to be used within an existential, spiritual or religious discourse and world-picture, but in a way that does not necessarily include a quasi-scientific take nor does it misrepresent it.

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