The Next Paradigm

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In order to perceive the world, we need more than just raw sensory input: a subliminal paradigm of thought is required to interpret raw sensory data and, thereby, create the objects and events we perceive around ourselves. As such, the world we see reflects our own unexamined, culture-bound assumptions and expectations, which explains why every generation in history has believed that it more or less understood the world. Today, we perceive a world of objects and events outside and independent of mind, which merely reflects our current paradigm of thought. Anomalies that contradict this paradigm have been accumulated by physicists over the past couple of decades, which will eventually force our culture to move to a new paradigm. Under this new paradigm, a form of universal mind will be viewed as nature's sole fundamental entity. In this paper, I offer a sketch of what the new paradigm may look like.

Keywords: scientific paradigm, figuration, quantum mechanics, quantum entanglement, non-contextuality, idealism, mind, consciousness, dissociation, dissociative identity disorder.

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Introduction

Every generation tends to believe that their views on the nature of reality are either true or at least quite close to the truth. They believe that previous generations, which held vastly differing views, were simply intellectually inferior and deluded.

True to this tendency, we today believe our ancestors held primitive, naïve, even absurd views about self and world. They were part of a less evolved culture incapable to discern the finer logical and empirical conclusions we have now formulated. Whereas we can see the world and our condition within it objectively, our ancestors were beset — or so we tell ourselves — by self-deception, wish fulfillment and superstition.

Although we know that, historically speaking, the views of an earlier generation were each time supplanted — and even ridiculed — by those of a later generation, we still believe that, *this time*, we must have gotten it right. Immersed as we are in our own cultural context — with its myriad unexamined assumptions and conceptual categories — we seem unable to raise our head above the water so to recognize the relativity of our situation. We do not realize that our contemporary views, too, are most likely just as plagued by the whole gamut of psychological mechanisms of self-deception as those of our ancestors.

Why are contemporary views always so spellbinding? It may have to do with the fact that what we *perceive* about the world is, in fact, already loaded and suffused with subliminal interpretations and fitted into culture-bound conceptual categories. What we ordinarily perceive is not really the world out there, but a representation thereof as much determined by our own intellectual baggage as by whatever is actually out there. Owen Barfield called this process 'figuration':

> two operations are necessary … in order to produce the familiar world we know. First, the sense-organs must be related to [whatever is really out there] in such a way as to give rise to sensations; and secondly, those mere sensations must be *combined and constructed by the percipient mind* into the recognizable and nameable objects we call 'things.' (Barfield, 2011: 20, emphasis added.)

So there are no such things as cars, trees, tables and chairs without the percipient mind contributing something of its own — its subliminal assumptions, expectations, conceptual categories, etc. — to the resulting representation. Without this contribution, the sensed world would be just pixels without any discernible meaning.

To clarify this subtle but important point, it is worthwhile to quote Barfield more extensively:

> I do not perceive any *thing* with my sense-organs alone, but with a great part of my whole human being. Thus, I may say, loosely, that I 'hear a thrush singing.' But in strict truth all that I ever merely 'hear' — all that I ever hear simply by virtue of having ears — is *sound*. When I 'hear a thrush singing,' I am hearing, not with my ears alone, but with all sorts of other things like mental habits, memory, imagination, feeling and (to the extent at least that the act of attention involves it) will. (Barfield 2011: 15-16, original emphasis.)

Thus, each generation is convinced of the accuracy of their worldview because the world they perceive — a world of representations, not raw sensation — is, in fact, constructed by this worldview. The things they see around themselves confirm their beliefs because those things are a product of these beliefs.

As argued by Thomas Kuhn (1996), even science falls pray to this inherent subjectivity of perception: science's view of nature is also determined by a 'paradigm,' a set of underlying assumptions and beliefs that enables interpretation of empirical data. According to Kuhn, the data are themselves already suffused with a subjective paradigm the very moment they are collected:

> No natural history can be interpreted in the absence of at least some implicit body of intertwined theoretical and methodological belief. (Kuhn, 1996: 16-17.)

So even the world measured by science is already loaded with, and molded by, the unexamined assumptions of the paradigm — the cultural belief system — of the time. Kuhn leaves no doubt here:

> Surveying the rich experimental literature from which [historical examples of classic scientific experiments] are drawn makes one suspect that something like a paradigm *is prerequisite to perception itself*. What a man sees depends both upon what he looks at and also upon what his previous visual-*conceptual* experience has taught him to see. In the absence of such training there can only be, in William James's phrase, "a bloomin' buzzin' confusion." (Kuhn, 1996: 113, emphasis added.)

Our unreasonable trust in the accuracy of our contemporary scientific views may be due, at least partially, to the fact that the world we measure is as much a function of our subjective paradigm of thought as of what is really out there. There is a sense in which, even in science, we see what we expect to see.

Today, we look around ourselves and perceive a world made of matter outside and independent of mind. Based on culture-bound conceptual categories, we carve out this world into separate things — tables, chairs, trees, etc. — all of which we perceive to have autonomous existence independent of mentation. Might this view — just as the views of our ancestors, who perceived rocks as living beings, the Earth as a flat surface, etc. — be merely an illusion? May our generation be just as wrong about what is going on as our ancestors were? Will a future generation regard our present-day materialist view of nature as something as absurd and laughable as animism and flat-Earthism? If history is any indication, the answer is categorically 'yes.'

Kuhn observed that, historically speaking, paradigms collapse when enough anomalies — phenomena that are empirically undeniable but cannot be accommodated by the reigning belief system — accumulate over time and reach a critical mass. Are there empirically verifiable anomalies today that foreshadow the end of materialist beliefs? As it turns out, there are plenty.

Anomalies in quantum mechanics

The present-day materialist view that the world is outside and independent of mind is an abstract explanatory model constructed in thought, not an empirical observation. After all, what we call 'the world' is available to us solely as 'images' — defined here broadly, so to include any sensory modality — on the screen of perception, which is itself mental. We subliminally *interpret* the contents of perception as coming from a world outside mind because this seems to explain the fact that we all share the same world beyond the boundary of our skin, as well as the fact that the laws that govern this world do not depend on our personal volition. Stanford physicist Prof. Andrei Linde, well known for his theories of cosmological inflation, summarized it thus:

> Let us remember that our knowledge of the world begins not with matter but with perceptions. I know for sure that my pain exists, my "green" exists, and my "sweet" exists. I do not need any proof of their existence, because these events are a part of me; everything else is a theory. Later we find out that our perceptions obey some laws, which can be most

> conveniently formulated if we assume that there is some underlying reality beyond our perceptions. This model of material world obeying laws of physics is so successful that soon we forget about our starting point and say that matter is the only reality, and perceptions are only helpful for its description. This assumption is almost as natural (and maybe as false) as our previous assumption that space is only a mathematical tool for the description of matter. But in fact we are substituting reality of our feelings by a successfully working theory of an independently existing material world. And the theory is so successful that we almost never think about its limitations until we must address some really deep issues, which do not fit into our model of reality. (Linde, 1998: 12.)

This model of reality has intuitive implications amenable to confirmation — or refutation — through subtle experimental arrangements, which Linde alluded to when he spoke of "some really deep issues." Indeed, the properties of a materialist world should exist and have definite values even when this world is not being observed: the moon should exist and have whatever weight, shape, size and color it has even if nobody is looking at it. Moreover, a mere act of observation should not change the values of these properties: the weight, shape, size and color of the moon should not become different simply because someone happened to look at it.

Operationally, these intuitive tenets of materialism are translated into the notion of 'non-contextuality': the outcome of an observation should not depend on the way other, separate but simultaneous observations are performed. After all, the properties being observed are supposed to be independent of observation. What I perceive when I look at the night sky should not depend on the way other people look at the night sky along with me, for the properties of the night sky uncovered by my observation should not depend on theirs. Clearly — and in line with materialism — non-contextuality implies that the world is independent of perception, insofar as perception constitutes observation. My perceptions should simply *reveal* what the properties of the world are in and of themselves.

The problem is that, according to quantum theory, the outcome of an observation *can* depend on the way another, separate but simultaneous observation is performed. For instance, if two particles A and B are prepared in a special way, the properties of particle A as seen by a first observer — say, Alice — are predicted to correlate with the way another observer — say, Bob — simultaneously looks at particle B. This is so even when A and B — and, therefore, Alice and Bob — are separated by arbitrarily long distances.

For instance, what Alice sees when she looks at particle A in, say, London, depends on the way Bob concurrently looks at particle B in, say, Sydney. If the properties of the world were outside and independent of Alice's and Bob's minds — that is, outside and independent of their perceptions — this clearly shouldn't be the case; unless there is some observation-independent hidden property, covertly shared by A and B *and entirely missed by quantum theory*, which could account for the correlations. This was Einstein's point when he (in) famously suggested that quantum theory was incomplete (Einstein, Podolsky & Rosen, 1935). However, as mathematically proven by John Bell (1964), the correlations predicted by quantum theory cannot be accounted for by these kinds of observation-independent hidden properties.

Consequently, quantum theory appears to contradict non-contextuality and render materialism untenable. A conceivable way to avoid this conclusion while accepting quantum theory would be to posit that particles A and B, or Alice and Bob themselves, somehow 'tip each other off' during observation, *instantaneously and at a distance*, so to coordinate their

actions and produce the predicted correlations. This, however, would require faster-than-light communication and fly in the face of the overwhelmingly confirmed theory of special relativity.

Alternatively, a materialist could attempt to salvage non-contextuality and the notion of a world outside and independent of mind by rejecting quantum theory itself. Yet, as it turns out, since Alain Aspect's seminal experiments (Aspect, Grangier & Roger, 1981; Aspect, Dalibard & Roger 1982; Aspect, Grangier & Roger 1982) the predictions of quantum theory in this regard have been repeatedly confirmed, with ever-increasing rigor. For instance, in an experiment performed in Geneva, Switzerland, in 1998 (Tittel et al.), the particles A and B were separated by more than 10 km — as opposed to the 12 meters of Aspect's original experiment (1981) — reducing the already low likelihood that they could be creating the correlations predicted by quantum theory through some kind of signal exchange. Despite this greater separation, the predictions of quantum theory were again confirmed.

Then, still in 1998 but this time in Innsbruck, Austria, another experiment (Weihs et al.) was done to eliminate another far-fetched possibility: that, *in advance* of the preparation of particles A and B, 'Alice,' 'Bob' and the system responsible for the preparation could somehow be 'pre-agreeing' on a hidden plan of action, so to later create the correlations without need for faster-than-light communication ('Alice' and 'Bob,' in this case, were automated measurement apparatuses). To close this unlikely 'conspiracy' loophole, the behaviors of 'Alice' and 'Bob' were programmed randomly and only *after* particles A and B had already been prepared. Nonetheless, the correlations predicted by quantum theory were yet again confirmed.

Critics continued to speculate about other far-fetched loopholes in these experiments. In an effort to address and close all conceivable loopholes, Dutch researchers have recently performed an even more tightly controlled test, which — unsurprisingly by now — echoed the earlier results (Hensen et al., 2015). This latter effort was considered by the periodical *Nature* the "toughest test yet" (Merali, 2015). Given all this, it seems now untenable to argue against the veracity of quantum theory.

The only alternative left for materialists is to try to circumvent the need for faster-than-light signal exchanges by imagining and postulating some form of non-locality: nature must have — or so they speculate — observation-independent hidden properties that are *not* confined to particular regions of spacetime, such as particles A and B. In other words, the argument is that the observation-independent hidden properties allegedly missed by quantum theory are 'smeared out' across space and time. It is this omnipresent, invisible but objective background that supposedly orchestrates the correlations predicted by quantum mechanics. Non-contextuality and materialism can thus be salvaged; or can they?

The problem, of course, is that non-local hidden properties are arbitrary: they produce no predictions beyond those already made by standard quantum theory. As such, it could be argued that they represent an effort "to modify quantum mechanics to make it consistent with [one's] view of the world," so to avoid the need "to modify [one's] view of the world to make it consistent with quantum mechanics" (Rovelli, 2008: 16).

Be it as it may, it turns out that certain specific correlations predicted by quantum theory are incompatible with non-contextuality *even for large classes of non-local hidden properties* (Leggett, 2003). Studies have now experimentally confirmed these correlations (Gröblacher et al., 2007; Romero et al., 2010), thus putting non-contextuality in even more serious jeopardy. To reconcile these results with materialism would require a profoundly counterintuitive redefinition

of what we call 'objectivity.' And since our contemporary cultural mindset has come to associate objectivity with reality itself, the science press felt compelled to report on some of these results by pronouncing, "Quantum physics says goodbye to reality" (Cartwright, 2007).

More recent experiments have again contradicted non-contextuality and confirmed that, unlike what one would expect if the world were separate or distinct from mind, the observed properties of the world indeed cannot be said to exist prior to being observed (Lapkiewicz et al., 2011; Manning et al., 2015). For all intents and purposes, the world we perceive is *physically* — not only cognitively — a product of observation. Commenting on this, physicist Anton Zeilinger has been quoted as saying that "there is no sense in assuming that what we do not measure [that is, observe] about a system has [an independent] reality" (Ananthaswamy, 2011).

So the question now is: Can some form of materialism survive the failure of non-contextuality? We have seen earlier that the intuitive tenets of materialism are: (a) there exists a world outside mind; and (b) mere observation does not change this independently existing world. The failure of non-contextuality clearly rules out (b). Can (a) still make any sense in the absence of (b)? If it can, then the world outside mind must somehow *physically change, instantaneously*, every time it is observed. The plausibility of this notion aside, notice that one never gets to see the observation-independent world, for it supposedly changes instantly, in an *observation-dependent* manner, the moment one looks at it. Clearly, the only motivation to entertain this notion is to try to salvage some rather artificial and counterintuitive form of materialism. And even if such an attempt were to succeed, the world we actually experience would *still* be conditioned by mind, insofar as it would be an outcome of conscious perception. For our purposes here, therefore, the result would be indistinguishable from a truly mental world.

Already in 2005, Johns Hopkins physicist and astronomer Prof. Richard Conn Henry had seen enough. In an essay he penned for *Nature*, he claimed, "The universe is entirely mental. … There have been serious [theoretical] attempts to preserve a material world — but they produce no new physics, and serve only to preserve an illusion" (Henry, 2005: 29). The illusion he was referring to was, of course, that of a world outside and independent of mind.

Naturally, Conn Henry's position is controversial and debate around it continues to unfold. Nonetheless, the experiments do show significant anomalies that cannot be accommodated by materialism.

Finally, notice that, although the argument in this section has been based on quantum mechanical experiments carried out on microscopic particles under laboratory conditions, we know that the implications of quantum theory apply to our macroscopic world of tables and chairs as well. Indeed, quantum effects have been experimentally demonstrated for macroscopic objects at room temperature (Lee et al., 2011; Klimov et al., 2015). As such, the failure of non-contextuality indicates that the seemingly mind-independent world we live in is a result of mental process at work and, as such, akin to a transpersonal dream: the tables, chairs, stars and galaxies we perceive within it do not have an existence independent of our minds.

The continuity of mind and world

In a famous paper titled "The Unreasonable Effectiveness of Mathematics in the Natural Sciences," physicist Eugene Wigner (1960) discussed "the miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics." Indeed, abstract

conclusions and methods derived purely in thought have, again and again, succeeded in precisely describing concrete phenomena in the world. That axiomatic intuitions turn out to correctly predict and model the structure and dynamics of the world at large is difficult to make sense of under materialism, this probably being the reason why Wigner used the word 'miracle' twelve times in his paper. After all, lest we incur the fallacy of circular reasoning, under materialism we cannot logically argue for the validity of logic beyond our own minds, so the world could very well be absurd (Albert, 1985). That it is *not* is Wigner's "miracle."

If the world is mental, however, the correspondence between the intuitive foundations of rational thought and the way the world works is perfectly natural. That we take the basic tenets of logic and mathematics to be self-evident truths betrays their *archetypal nature* in the Jungian sense: they reflect deeply ingrained mental templates according to which thought unfolds (Jung, 1991). As a matter of fact, psychologist Marie-Louise von Franz went as far as to argue that the natural numbers themselves are archetypal (1974). Then — and here is the key point — *the fact that these archetypes extend into the world clearly indicates that the world itself is mental and continuous with our minds*. If there is no intrinsic separation between our minds and the objects of perception, naturally these objects should comport themselves in a way consistent with mental archetypes. Perceptual objects should be an expression of archetypal patterns in just the same way that thoughts are, so the world should be consistent — as it is — with our logic and mathematics. The apparent eeriness of Wigner's "miracle" melts away.

To visualize all this consider the following analogy: if mind is like a guitar string, then particular conscious experiences are like particular notes or patterns of vibration of the string. In this case, the mental archetypes discussed above are analogous to the elasticity, mass and length of the string, which determine its normal modes of vibration. Some of the archetypically-defined normal modes of mind thus correspond to the laws of nature, which we discern as regularities on the screen of perception: they reflect some of the 'notes' in which a transpersonal segment of mind naturally 'plays' in the world at large.

Wigner's "miracle" is not only explainable by, but also constitutes further evidence for, the mental world hypothesis.

The next paradigm

Kuhn observed that paradigms are never simply abandoned, but instead replaced by a new paradigm that can accommodate the anomalies. In our present historical nexus, the next paradigm must be one that can accommodate the kinship and continuity between mind and world indicated by the anomalies just discussed. In other worlds, materialism will be replaced by a form of idealism: the view that a transpersonal mind is the sole fundamental aspect of reality, everything else being reduced to excitations of this mind.

If idealism is to supersede materialism as our culture's reigning paradigm, it needs not only accommodate anomalies, but also make sense of ordinary observations that materialism purports to make sense of. In other words, idealism must make sense of *all facts*, not only the anomalies. As such, it will need to answer questions such as: If mind is not a product of physically objective arrangements of matter, how can there be such tight correlations between brain activity and experience? If the world is not made of matter outside our individual minds, how can we all share the same world beyond ourselves? If the world is not independent of mind, why can we not change the laws of nature simply by imagining them to be different?

Below, I briefly sketch an idealist framework that can potentially answer these questions and accommodate all relevant facts of nature.

The defining tenet of idealism is the notion that every thing and event exist in a *universal* form of mind — thus not bound to personal boundaries — arising as a pattern of excitation *of* this universal mind. Our personal psyche forms through a process of dissociation in universal mind, analogous to how the psyche of a person suffering from dissociative identity disorder (DID) differentiates itself into multiple co-conscious centers of self-awareness called *alters* (Braude, 1995; Kelly et al., 2009). Recent research has demonstrated the literally *blinding* power of dissociation (Strasburger & Waldvogel, 2015). This way, there is a sense in which each living creature is an alter — a dissociated personality — of universal mind, which explains why we are not aware of each other's inner lives or of what happens across time and space at a universal scale.

The formation of an alter in universal mind creates a boundary — a "Markov Blanket" (Friston, Sengupta & Auletta, 2014: 430-432) — between phenomenality internal to the alter and that external to it. Phenomenality external to the alter — but still in its vicinity — impinges on the alter's boundary from the outside. The plausibility of this kind of phenomenal impingement across a dissociative boundary is well established: we know, for instance, that dissociated feelings can dramatically affect our thoughts and, thereby, behaviors (Lynch & Kilmartin, 2013), whereas dissociated expectations routinely mold our perceptions (cf. Eagleman, 2011).

The impingement of external phenomenality on an alter's boundary is what we call sense perception. The world we perceive around ourselves is thus a *coded phenomenal representation* (Friston, Sengupta & Auletta, 2014: 432-434) — which I shall call the *extrinsic appearance* — of equally phenomenal processes unfolding across the dissociative boundary of our alter.

A living biological body is the extrinsic appearance of an alter in universal mind. In particular, our sense organs — including our skin — are the extrinsic appearance of our alter's boundary. As such, our brain and its electrochemical activity are part of what our subjective inner life *looks like* from across its dissociative boundary, which explains the observed correlations between experience and brain function. Indeed, it has been empirically shown that there is something rather specific that dissociative processes look like (Schlumpf et al., 2014). In this context, I submit that life — metabolism — is simply what dissociation in universal mind looks like; there is nothing more to it.

As we have seen, a person's brain activity correlates with the person's reported inner life simply because the former is but a coded representation of the latter. Moreover, we all inhabit the same world because our respective alters are surrounded by the same universal field of phenomenality, like whirlpools in a single stream. Finally, we cannot change the patterns and regularities that govern the world — that is, the laws of nature — because our volition, as part of our alter, is dissociated from the rest of nature.

See Figure 1 for a graphical depiction of all this.

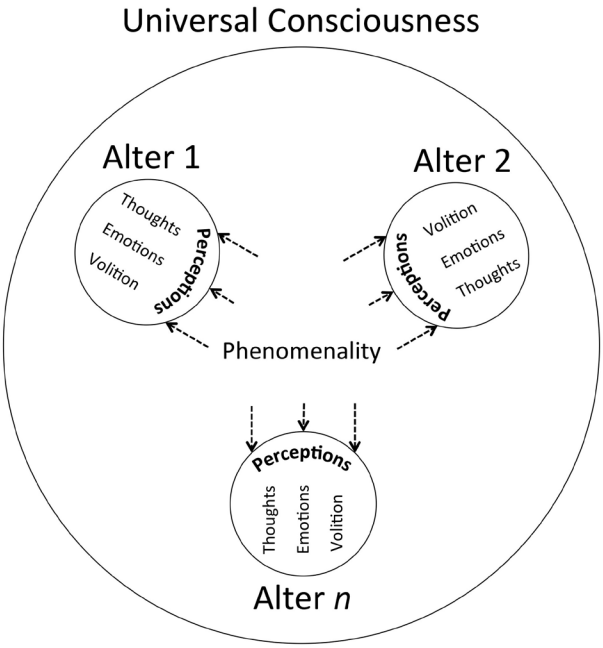

Figure 1: An idealist framework in a nutshell.

All relevant facts about nature can be accommodated and made sense of by this parsimonious idealist framework. Moreover, unlike materialism, the framework can also be reconciled with the quantum mechanical anomalies discussed earlier. It thus offers a more promising alternative for elucidating the nature of reality than the materialist paradigm.

Conclusions

Our confidence in our present-day materialist worldview is as unwarrantable as the confidence our ancestor had in worldviews we now consider absurd, such as animism and flat-Earthism. We believe in materialism for reasons analogous to those why our ancestors believed in their now-outdated views: what we perceive about the world is partly a function of our own hidden assumptions and expectations. Our beliefs are confirmed by our perceptions largely because our perceptions are, in an important cognitive sense, *constructed by those beliefs*.

Today, when we look around ourselves, we see a world of matter outside and independent of mind. But this may be merely because we subliminally *expect* to see matter outside and independent of mind.

Empirically robust observations replicated by multiple experiments under controlled laboratory conditions are inconsistent with the materialist worldview. These observations constitute what Kuhn called 'anomalies': undeniable empirical facts that contradict the reigning paradigm of thought. They suggest that our culture may be on the verge of a paradigm change, a transition into a new view of the nature of reality and of our condition within it.

This new paradigm will necessarily entail some form of idealism: the notion that a universal mind is nature's sole fundamental entity, everything else being reducible to excitations of universal mind. Idealism can not only accommodate all anomalies amassed to date, but also

make sense of all other relevant empirical facts. It is a more parsimonious, empirically robust and explanatorily powerful worldview than materialism.

Future generations will take idealism for granted, because they will grow up with it as the basis of their paradigm of thought. The world they will perceive around themselves will be a world of mental unfolding. They will look back at our present-day culture with alarm and bewilderment, asking themselves how it was ever possible for human beings to give credence to a worldview as flawed, inflationary, explanatorily limited and absurd as materialism. They will know how unjustified our arrogant confidence in the accuracy of our views is. In all likelihood, they will smile condescendingly at us just as we smile condescendingly at preliterate animists and flat-Earthists.

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🕮 References

Albert, H. (1985). *Treatise on Critical Reason*. Princeton, NJ: Princeton University Press.

Ananthaswamy, A. (2011). Quantum magic trick shows reality is what you make it. *New Scientist*, June 22. [Online]. Available from: https://www.newscientist.com/article/dn20600-quantum-magic-trick-shows-reality-is-what-you-make-it/ [Accessed 14 June 2016].

Aspect, A., Grangier, P. and Roger, G. (1981). Experimental Tests of Realistic Local Theories via Bell's Theorem. *Physical Review Letters*, 47 (7): 460-463.

Aspect, A., Dalibard, J. and Roger, G. (1982). Experimental Test of Bell's Inequalities Using Time-Varying Analyzers. *Physical Review Letters*, 49 (25): 1804-1807.

Aspect, A., Grangier, P. and Roger, G. (1982). Experimental Realization of Einstein-Podolsky-Rosen-Bohm Gedankenexperiment: A New Violation of Bell's Inequalities. *Physical Review Letters*, 49 (2): 91-94.

Barfield, O. (2011). *Saving the Appearances: A Study in Idolatry*. Oxford, UK: Barfield Press.

Bell, J. (1964). On the Einstein Podolsky Rosen Paradox. *Physics*, 1 (3): 195-200.

Braude, S. (1995). *First Person Plural: Multiple Personality and the Philosophy of Mind*. New York, NY: Routledge.

Cartwright, J. (2007). Quantum physics says goodbye to reality. *IOP Physics World*, April 20. [Online]. Available from: http://physicsworld.com/cws/article/news/2007/apr/20/quantum-physics-says-goodbye-to-reality [Accessed 14 June 2016].

Eagleman, D. (2011). *Incognito: The Secret Lives of the Brain*. New York, NY: Canongate.

Einstein, A., Podolsky, B. and Rosen, N. (1935). Can Quantum-Mechanical Description of Physical Reality be Considered Complete? *Physical Review*, 47: 777-780.

Franz, M-L von (1974). *Number and Time: Reflections Leading Toward a Unification of Depth Psychology and Physics*. Evanston, IL: Northwestern University Press.

Friston, K., Sengupta, B. and Auletta, G. (2014). Cognitive Dynamics: From Attractors to Active Inference. *Proceedings of the IEEE*, 102 (4): 427-445.

Gröblacher, S. et al. (2007). An experimental test of non-local realism. *Nature*, 446: 871-875.
Henry, RC (2005). The mental Universe. *Nature*, 436: 29.
Hensen, B. et al. (2015). Loophole-free Bell inequality violation using electron spins separated by 1.3 kilometres. *Nature*, 526: 682-686.
Jung, CG (1991). *The Archetypes and the Collective Unconscious* (2nd ed.). London, UK: Routledge.
Kelly, EF et al. (2009). *Irreducible Mind: Toward a Psychology for the 21st Century*. Lanham, MD: Rowman & Littlefield.
Klimov, PV et al. (2015). Quantum entanglement at ambient conditions in a macroscopic solid-state spin ensemble. *Science Advances*, 1 (10), e1501015.
Kuhn, T. (1996). *The Structure of Scientific Revolutions* (3rd ed.). Chicago, IL: University of Chicago Press.
Lapkiewicz, R. et al. (2011). Experimental non-classicality of an indivisible quantum system. *Nature*, 474: 490-493.
Lee, KC et al. (2011). Entangling Macroscopic Diamonds at Room Temperature. *Science*, 334 (6060): 1253-1256.
Leggett, AN (2003). Nonlocal Hidden-Variable Theories and Quantum Mechanics: An Incompatibility Theorem. *Foundations of Physics*, 33 (10): 1469-1493.
Linde, A. (1998). *Universe, Life, Consciousness*. A paper delivered at the Physics and Cosmology Group of the "Science and Spiritual Quest" program of the Center for Theology and the Natural Sciences (CTNS), Berkeley, California. [Online]. Available from: web.stanford.edu/~alinde/SpirQuest.doc [Accessed 14 June 2016].
Lynch, J. and Kilmartin, C. (2013). *Overcoming Masculine Depression: The Pain Behind the Mask*. New York, NY: Routledge.
Manning, AG et al. (2015). Wheeler's delayed-choice gedanken experiment with a single atom. *Nature Physics*, 11: 539-542.
Merali, Z. (2015). Quantum 'spookiness' passes toughest test yet. *Nature*, News, August 27. [Online]. Available from: http://www.nature.com/news/quantum-spookiness-passes-toughest-test-yet-1.18255 [Accessed 30 August 2015].
Romero, J. et al (2010). Violation of Leggett inequalities in orbital angular momentum subspaces. *New Journal of Physics*, 12: 123007. [Online]. Available from: http://iopscience.iop.org/article/10.1088/1367-2630/12/12/123007 [Accessed 14 June 2016].
Rovelli, C. (2008). Relational Quantum Mechanics. *arXiv:quant-ph/9609002v2*. [Online]. Available from: https://arxiv.org/abs/quant-ph/9609002v2 [Accessed 1 August 2017].
Schlumpf, Y. et al. (2014). Dissociative Part-Dependent Resting-State Activity in Dissociative Identity Disorder: A Controlled fMRI Perfusion Study. *PloS ONE*, 9, doi:10.1371/journal.pone.0098795.
Strasburger, H. and Waldvogel, B. (2015). Sight and blindness in the same person: Gating in the visual system. *PsyCh Journal*, 4 (4): 178-185.
Tittel, W. et al. (1998). Violation of Bell Inequalities by Photons More Than 10 km Apart. *Physical Review Letters*, 81 (17): 3563-3566.
Weihs, G. et al. (1998). Violation of Bell's Inequality under Strict Einstein Locality Conditions. *Physical Review Letters*, 81 (23): 5039-5043.
Wigner, E. (1960). The Unreasonable Effectiveness of Mathematics in the Natural Sciences. *Communications on Pure and Applied Mathematics*, 13 (1): 1-14.