Spiritual Dimensions of Reality

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1. Two quandaries

"Nobody has the slightest idea how anything material could be conscious. Nobody even knows what it would be like to have the slightest idea about how anything material could be conscious. So much for the philosophy of consciousness," Jerry Fodor (1992) wrote. In his entry on consciousness in the *International Dictionary of Psychology*, Stuart Sutherland (1989) echoes this gloomy appraisal: "The term is impossible to define except in terms that are unintelligible without a grasp of what consciousness means.... Consciousness is a fascinating but elusive phenomenon: it is impossible to specify what it is what it does or why it evolved. Nothing worth reading has been written about it."

Where the fundamental theoretical framework of contemporary physics is concerned, the situation appears equally bleak. Richard Feynman (1967) thought that it was "safe to say that no one understands quantum mechanics," to Roger Penrose (1986) quantum theory "makes absolutely no sense," and Michio Kaku (1995) wrote: "It is often stated that of all the theories proposed in this century, the silliest is quantum theory."

These quandaries appear to have a common root, which is that, scientifically, we are unable to go beyond mere correlations. What is warranted by the empirical data is correlations, but we want more; we seek to know underlying mechanisms or processes. For example, if I look at a ripe cherry, two kinds of correlations appear to be at work: (i) correlations between physical goings-on at the cherry's surface and neural goings-on in my brain, and (ii) correlations between neural goings-on in my brain and the quality-rich goings-on in my mind. We seek to know how—by what mechanism or process—neural activity *causes* (leads to, produces, ...) conscious experience, and we seek to know how quantum transitions at the cherry's surface *cause* quantum transitions in rhodopsin molecules in the membrane stacks of retinal rod cells. Unfortunately, whereas *predictions* based on correlations are testable by scientific methods, theories *explaining* correlations are not.

2. The quantum quandary

Classical (i.e., pre-quantum) theory allows us to predict the effects that electrical charges have on electrical charges. For this it provides us with two computational tools. Given the distribution and motion of charges, the first tool (a set of four differential equations known as Maxwell's equations) allows us to calculate a set of six functions of position and time, the so-called electromagnetic field. Given these six functions, the second tool (the so-called Lorentz force law) allows us to calculate the effects that those charges have on any other charge.

So much for the testable part of classical electrodynamics. The rest is metaphysics, which generally takes the following form: The electromagnetic field is a physical entity in its own right, is locally generated by charges, mediates the action of charges on charges by locally acting on itself, and locally acts on charges.[1] In the correct version of the theory, quantum electrodynamics, this sleight-of-hand—the transmogrification of a mathematical tool for calculating the effects that charges have on charges, into a physical mechanism or process by which charges act on charges—no longer works. As physicist N. David Mermin (2009) reminisced towards the end of a distinguished career,

> [w]hen I was an undergraduate learning classical electromagnetism, I was enchanted by the revelation that electromagnetic fields were real. Far from being a clever calculational device for how some charged particles push around other charged particles, they were just as real as the particles themselves, most dramatically in the form of electromagnetic waves, which have energy and momentum of their own and can propagate long after the source that gave rise to them has vanished.
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> That lovely vision of the reality of the classical electromagnetic field ended when I learned as a graduate student that what Maxwell's equations actually describe are fields of operators on Hilbert space. Those operators are quantum fields, which most people agree are not real but merely spectacularly successful calculational devices. So real classical electromagnetic fields are nothing more (or less) than a simplification in a particular asymptotic regime (the classical limit) of a clever calculational device. In other words, classical electromagnetic fields are another clever calculational device.

1 Did you notice that this story fails to explain how a charge locally acts on the electromagnetic field, how the electromagnetic field locally acts on itself, and how the electromagnetic field locally acts on a charge? Apparently the familiarity of what only *seems* to be local action makes us feel as if local action was well understood. As DeWitt and Graham (1971) wrote, "physicists are, at bottom, a naive breed, forever trying to come to terms with the 'world out there' by methods which, however imaginative and refined, involve in essence the same element of contact as a well-placed kick."

If we have as much information as according to the laws of *classical* physics is in principle available,[2] then classical physics allows us to make exact predictions, to hold that the predicted properties/values exist independently of measurements, and to imagine “causal strings” by which the independently existing properties/values are connected. One consequence of the technicalities mentioned by Mermin is that even if we have all the information that according to the laws of *quantum* physics is in principle available, the theory only allows us to make probabilistic predictions. This nomic limitation may be construed as a limitation either on what is measurable or on what exists. The former, more conservative interpretation faces enormous and most probably insurmountable difficulties. As philosopher of science Dennis Dieks (1996/2007) explained,

> the outcome of foundational work in the last couple of decades has been that interpretations which try to accommodate classical intuitions are impossible, on the grounds that theories that incorporate such intuitions necessarily lead to empirical predictions which are at variance with the quantum mechanical predictions. However, this is a negative result that only provides us with a starting-point for what really has to be done: something conceptually new has to be found, different from what we are familiar with. It is clear that this constructive task is a particularly difficult one, in which huge barriers (partly of a psychological nature[3]) have to be overcome.

If what is limited were merely the measurability of physical quantities, it ought to be possible to consistently assume that physical quantities are nevertheless in possession of definite values, just as in classical physics. This classical intuition is defeated by the so-called no-go theorems (e.g., Bell, 1964, Kochen and Specker, 1967, Conway and Kochen, 2006) alluded to by Dieks. A fortiori we are precluded from imagining a causal nexus between independently existing properties/values.

As an illustration, consider the following scenario (Mohrhoff, 2009b, pp. 154–155). It is possible to prepare three particles A, B, C in a certain manner and to subject each to either of two measurements X, Y, so that

(i) the outcome of each measurement is either +1 or –1,

(ii) the product of the three outcomes is –1 if each particle is subjected to a measurement of X, and

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2 Classical chaos theory highlights the fact that all of the information that is in principle available is never actually available.

3 The psychological aspects of these barriers are discussed in my (2001, 2006, 2007b).

(iii) the product of the three outcomes is +1 if one particle is subjected to a measurement of X and the two other particles are subjected to a measurement of Y.

Suppose that the quantities being measured have values irrespective of whether they are actually measured. Let us call these purportedly pre-existent values X_A, X_B, X_C and Y_A, Y_B, Y_C. If Y_A, Y_B, and Y_C have actually been measured, we can argue that a measurement of X_A would have yielded the product $Y_B\,Y_C$ since both the product $X_A\,Y_B\,Y_C$ and the square of each value are equal to 1. By the same token, we can argue that a measurement of X_B would have yielded the product $Y_A\,Y_C$, and that a measurement of X_C would have yielded the product $Y_A\,Y_B$. It follows that if we had measured X_A, X_B, and X_C instead of Y_A, Y_B, and Y_C, the product of the outcomes would have been

$$X_A, X_B, X_C = Y_B\,Y_C\,Y_A\,Y_C\,Y_A\,Y_B = (Y_A)^2\,(Y_B)^2\,(Y_C)^2 = 1.$$

But we already know that if we had measured X_A, X_B, and X_C, the product of the outcomes would have been -1!

What went wrong? Which assumption has just been reduced to absurdity? Most physicists would agree that it is the assumption that physical quantities are in possession of values irrespective of whether they are actually measured, though there appears to be a narrow escape route for the proponents of pre-existent values. To see what this amounts to, consider the following table. You already know that the empty field cannot be filled in so that the above three conditions are satisfied given the values already present in the table: if $Y_B = +1$ then $X_A\,Y_B\,Y_C = -1$, and if $Y_B = -1$ then $Y_A\,Y_B\,X_C = -1$. Neither implication is consistent with these conditions. Nor can they be satisfied by any other choice of values, as we have seen.

	A	B	C
X	+1	–1	+1
Y	+1		–1

Those who nevertheless believe in the reality of unmeasured values argue that (most) physical quantities are *contextual*. This means, in particular, that the value of Y_B does not exist in isolation but only as a member of this or that set of physical quantities, and that it differs between such sets. As a member of the set $\{X_A,Y_B,Y_C\}$, the value of Y_B (given the other values in the table) equals -1, and as a member of the set $\{Y_A,Y_B,X_C\}$, it equals +1.

Contextuality exemplifies the kind of absurdity to which one is driven if one wants to separate physical quantities from the *measurement* of physical quantities. While the evident aim of contextualists is to allow physical quantities to exist independently of measurements, their values are said to exist only as members of sets, and the defining condition of these sets is that its members are measured together.

3. The consciousness quandary

Current scientific theories of perception—direct theories (Gibson, 1966, 1979; Michaels and Carello, 1981) as well as indirect ones (e.g., Palmer, 1999; Enns, 2004)—take it more or less for granted that perception approximates if not matches true properties of an environment that exists independently of our perceptions. In spite of massive philosophical skepticism past[4] and present (Stroud, 1984; Nagel, 1986; Fumerton, 1995), this hypothesis, which Hoffman (2008) calls the "hypothesis of faithful depiction," is rarely questioned in the scientific study of perception.

Yet it ought to be questioned. From a Darwinian point of view, our sensory systems are shaped by natural selection to allow the species *homo sapiens* to survive within its niche. We do not expect the sensory system of a cockroach, a gecko, or a chipmunk to create a faithful depiction of its niche. We expect it to give simple signals suited for survival. Why should our sensory system be different in this respect? Our phenomenal world is a species-specific user interface. A user interface, like your computer's desktop with its icons, is useful precisely because it does not resemble what it represents. A file icon is useful precisely because it hides the complexity of both the hardware and the software that make it useful as a representation of a file (Hoffman, 2000, 2008, 2010).

While vision is now widely regarded as a process of construction (Marr, 1982; Hubel, 1995), it appears to be guided by surprisingly sparse sensory data (Velmans, 2000; Durgin, 2002) and surprisingly elaborate rules (Hoffman 2000; Enns 2004). Here is a list of some of these rules, which are most readily demonstrated by the optical illusions to which they give rise when they are misapplied:

- If the tips of two lines coincide in an image, interpret them as coinciding in 3D.
- Where possible, interpret a curve in an image as the rim of a surface in 3D.
- If two visual structures have a non-accidental relation, group them and assign them to a common origin.
- Divide shapes into parts along concave creases.
- Interpret gradual changes in hue, saturation, and brightness as changes in illumination.
- Interpret an abrupt change as a change in surface reflectance.
- Put light sources overhead.
- Interpret the highest luminance in the visual field as white, fluorescent, or self-luminous.

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4 As early as the 6th century BCE, the Greek philosopher Xenophanes wrote: "Even if a man were to represent to himself the world exactly as it is, he could not discover that this is the case." (von Glasersfeld, 1984)

- Find the smoothest velocity field.

The astonishing extent to which our perceptions appear to be inventions (Ballard, 2002) argues that the constructions of vision cannot be regarded as *re*-constructions (Davies, et al., 2002). It lends fresh support to the philosophical scepticism so blithely disregarded by current theories of perception. By way of both illustration and emphasis, suppose that a neuropsychologist puts in front of me what looks to her like a square, so that I see what looks to me like a square. If what I see is a *re*-construction, it is my re-construction of *her* construction. If she can identify in my visual cortex a firing pattern that occurs whenever she puts in front of me what looks to her like a square, this signals to her a correlation in *her* visual world between this firing pattern and the presence of a square, and it is certainly legitimate for her to infer a correlation between this firing pattern (in her visual world) and the presence of a square in *my* visual world. But this does not warrant the existence of a *real* square over and above our respective phenomenal squares. It does not warrant the existence of a real something that in any discoverable way resembles a phenomenal square.

The brains studied by neuroscientists are phenomenal brains in the phenomenal worlds of neuroscientists, and phenomenal brains do not cause conscious experience. Only real brains can cause conscious experience, but if they do not in any discoverable way resemble phenomenal brains, then any attempt to design a causal theory of perception is doomed to fail.

If phenomenal brains are nevertheless believed to cause perceptions, various pseudo-questions arise. The first is the so-called binding problem. As the study of phenomenal brains has shown, incoming visual information is neurally processed along several pathways, concerned with features such as form, colour, motion, texture, and stereopsis. These pathways do not converge anywhere in the brain. Whereas the visual cortex is teeming with so-called feature maps, it is known to lack a master map where the neural correlates of phenomenal features attain the integrated form in which they are perceived. So where do the pathways converge? Where are the features put together again?

A second pseudo-question concerns the mysterious stuff that appears to constitute phenomenal features (“qualia”). How is this generated by electrochemical firing patterns in a brain?[5] And if one accedes to the notion that the perceived world is created by the brain, one faces the problem of the perceiver. It seems to me that the conceptualization of vision as a causal process reaches its absurd climax when attempts are made to account for even the perceiving self in causal terms.

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5 Velmans (2008), like many other psychologists or philosophers, believes that “it is simply a ‘natural’ empirical fact about the world that certain physical events in the brain (the correlates of consciousness) are accompanied by experiences.” This obviously begs some questions.

4. A spiritual dimension: Quantum mechanics

As the reader will recall, even if we have as much information as is in principle available, the fundamental theoretical framework of contemporary physics only allows us to make probabilistic predictions. In addition there are “no-go theorems” to the effect that this nomic limitation cannot be construed as a limitation merely on the measurability of independently existing physical quantities but must be seen as a limitation on what exists. Two specific consequences of this are that if conceptually we go on decomposing a material object, its components lose their separate individualities, and if in our minds we partition the world into smaller and smaller regions, we reach a point where the distinctions we make between these regions cease to be objectifiable (Mohrhoff, 2005, 2006, 2007b, 2009ab, 2010/11).

Since the early days of quantum mechanics it has been claimed, most famously by Einstein, that the theory is incomplete. What the aforesaid no-go theorems imply (none of which were known to Einstein) is that what is incomplete is not the theory but the world—incomplete in the light of theoretical expectations that have psychological underpinnings (Mohrhoff, 2001, 2006, 2007b) but are physically unwarranted.

One such expectation is that physical space is an intrinsically and completely partitioned expanse. What quantum mechanics is trying to tell us is in this respect is that the spatial differentiation of the physical world is incomplete; it does not go “all the way down”. Hence physical space cannot be such an expanse. Another such expectation is that the so-called ultimate constituents of matter[6] are distinct in much the same way that macroscopic objects are (or appear to be) distinct. What quantum mechanics is trying to tell us in this respect is that, considered by themselves, out of relation to each other, these “ultimate constituents” are identical in the strong sense of numerical identity.[7]

It deserves to be stressed that these conclusions have been reached through analyses of the manner in which quantum mechanics assigns probabilities in a variety of experimental contexts (Mohrhoff, 2005, 2009a, 2010/11). They are thus based on the testable predictions of

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6 According to the so-called standard model of fundamental particles and forces, which together with the general theory of relativity comprises all well-tested laws of contemporary physics, the “ultimate constituents” are of two kinds: quarks (which make up the atomic nucleus) and leptons (which include the electron and several types of neutrino).

7 Numerical identity contrasts with qualitative identity or exact similarity. Examples of numerical identity are (i) the evening star and the morning star, (ii) Clark Kent and Superman.

the theory and not, like so many interpretations in circulation, on “our habit of inappropriately reifying our successful abstractions” (Mermin, 2009).

These conclusions invalidate a twenty-five centuries old paradigm, which made us ask: what are the ultimate building blocks, and how do they interact and combine? Attempts to model reality from the bottom up, on the basis of an intrinsically and/or completely differentiated spatiotemporal manifold or out of a multitude of individual building blocks, have failed. There is no intrinsically and/or completely differentiated spacetime manifold, and there are no individual building blocks. Reality is structured from the top down, by a spatiotemporal and a substantial differentiation, and these do not “bottom out”. As said, if in our minds we partition the world into smaller and smaller regions, we reach a point at which the distinctions we make between regions cease to correspond to anything real,[8] and if conceptually we keep decomposing a material object, its components lose their separate individualities.

There is a notion that is decidedly at odds with the incomplete spatial differentiation of the physical world—the notion that the “ultimate constituents” of matter are pointlike (or, God help us, stringlike). What does the theory have to say on this issue? Nothing; none of the well-tested laws of physics makes any reference to the shape of an object that lacks structure. And experiments? While they can provide evidence of structure, they cannot provide evidence of the absence of structure. A fortiori, they cannot provide evidence of a pointlike form, inasmuch as this would be evidence of the absence of structure. The notion that an object without internal structure has a pointlike form is therefore unwarranted on both theoretical and experimental grounds.

We need a name for what the so-called ultimate constituents of matter intrinsically are. (The reader will recall that, considered by themselves, out of relation to each other, the “ultimate constituents of matter” are identical in the strong sense of numerical identity.) We shall refer to it as Ultimate Reality and abbreviate it to UR, mindful of the fact that the prefix “ur-” carries the sense of “original.”

Instead of asking, what are the ultimate building blocks etc., we thus ought to ask, how does UR manifest itself? How does it get differentiated or differentiates itself? How does it take on the aspect of a multitude of material objects? If we pursue these questions, we arrive at a unified conception of matter and space that is elegant and economical by any standard (and may be the most concise creation story ever told):

8 Owing to the relativity of simultaneity implied by the special theory of relativity, what holds for the spatial differentiation of the world holds for its temporal differentiation as well.

> By the simple device of entering into spatial relations with itself, UR creates both matter and space, for space is the totality of existing spatial relations, while matter is the apparent multitude of corresponding relata —"apparent" because the relations are *self*-relations. (Mohrhoff, 2002ac, 2005, 2009a, 2010/11)

We tend to think that spatial relations derive their spatial character from a pre-existent (substantial) expanse in which they are somehow embedded. To understand how UR's entering into spatial relations with itself creates space, we must desist from reifying the property of spatial extension; we must think of it not as a thing—a pre-existent expanse—but as a property that is shared by all spatial relations.

In addition to making us understand the coming into being of matter and space, quantum mechanics makes us understand the coming into being of form. Forms in the most general sense are sets of spatial relations in more or less stable configurations. They come into existence through aggregation—the formation of composite objects or bound states. Because they "exist" in abstract, multi-dimensional spaces, as probability distributions, they cannot be visualized (or cannot be visualized except as multi-dimensional probability distributions).[9] The smallest structures that can be visualized consist of the mean relative positions of a molecule's constituent nuclei—the sticks of your chemistry teacher's balls-and-sticks models of molecules. What makes these structures visualizable is the fact that the fuzziness[10] of the relative positions of the nuclei (as measured by the standard deviations of the corresponding probability distributions) is generally small compared to the relative positions themselves (as given by their mean values).

A new way of thinking about the so-called microworld thus suggests itself. If we identify the macroworld[11] with the manifested world, then the microworld is best thought of not as

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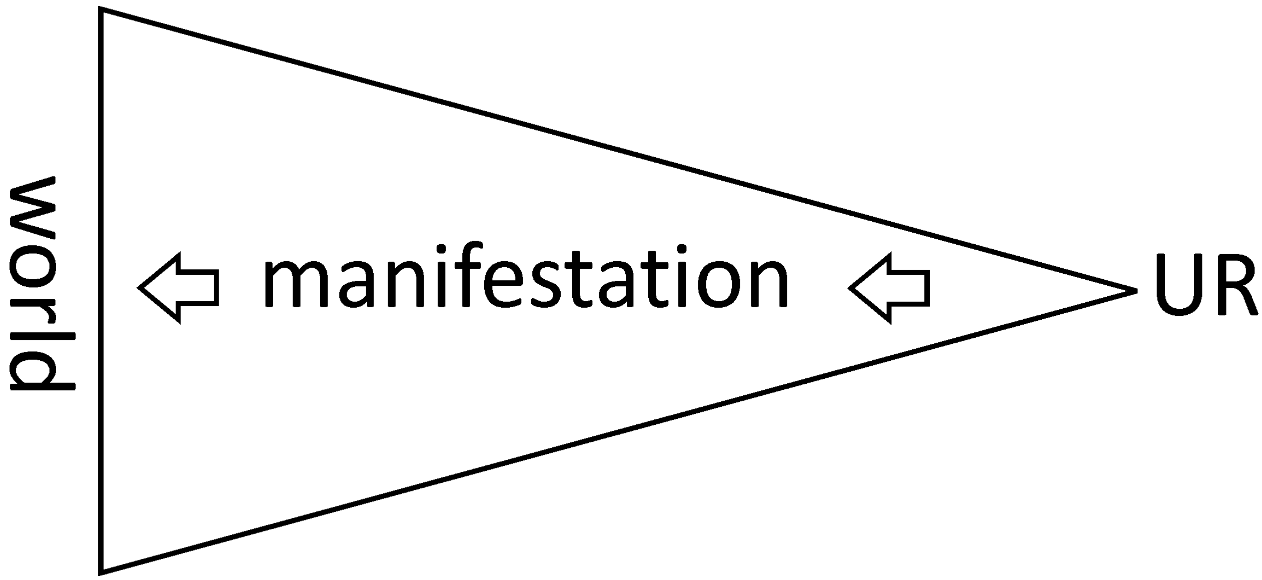
9 It is not hard to see why these probability distributions are multidimensional: the joint probability, say, of detecting one particle at (x,y,z) and another at (x',y',z') is a function of the six coordinates (x,y,z,x',y',z')—and thus a distribution over a six-dimensional probability space.

10 Fuzziness—Heisenberg's *Unschärfe*, usually mistranslated as "uncertainty"—is an objective feature of the physical world. The stability of a material object rests on the objective fuzziness of its internal relative positions and momenta, not on our subjective uncertainty about the values of these quantities. In fact, the objective fuzziness of physical quantities is the main reason why the fundamental theoretical framework of contemporary physics is a probability calculus: in order to be able not merely to quantify but to define a fuzzy variable, one has to assign probabilities to the possible outcomes of a measurement of this variable (Mohrhoff, 2002b, 2005, 2009ac, 2010/11).

11 For a rigorous distinction between the macroworld (a.k.a. the "classical domain") and the microworld (a.k.a. the "quantum domain") see my 2009d and 2010/11.

another world or part of the world but as a non-physical dimension in which the transition from unity (UR) to multiplicity (the manifested world) takes place. Quantum mechanics affords us a glimpse “behind” the manifested world at formless and numerically identical particles, non-visualizable atoms, and partly visualizable molecules, which, instead of being the world’s constituent parts or structures, are instrumental in its manifestation.



[FIGURE 1]

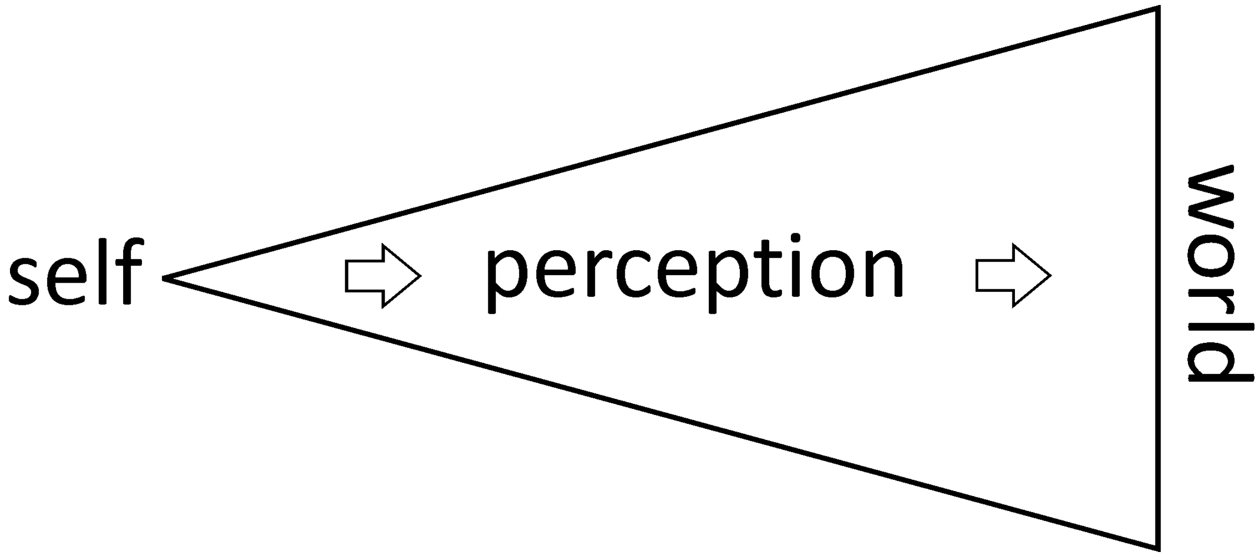
This way of thinking helps explain one of the most disconcerting implications of quantum mechanics, which is that out of relation to experimental arrangements the properties of quantum systems are undefined (Bohr, 1934, 1963; Jammer, 1974; Petersen, 1968; Mohrhoff, 2009ad, 2010/11). While QM affords us a glimpse of what lies “behind” the manifested world, it does not allow us to describe this except in terms of the finished product—the manifested world. For the distinctions we make—such as the distinction between being inside a region *R* and being outside—are warranted only if, and only to the extent that, they are physically realized (made real), for instance by *R*’s being the sensitive region of a detector. Since regions of space do not exist by themselves, as intrinsic parts of a pre-existent expanse, and since physical properties have value only if, and only to the extent that, they are measured (i.e., indicated by a macroscopic device), the property of being in *R* cannot be attributed to a particle unless the particle’s presence in *R* is indicated by a detector (in the broadest sense of the term), *and* unless the property of being in *R* is made available for attribution by being a detector’s sensitive region. What lies “behind” the manifested world is, to varying degrees, indefinite and indistinguishable. But to describe—and even define—the indefinite and indistinguishable, we need to use probability distributions over events that are definite and distinguishable, and such events only exist in the manifested world.

5. A spiritual dimension: Consciousness

It has become customary to distinguish between the so-called hard problem of consciousness (Chalmers, 1995) and the "easy" ones.[12] If we are to have a fighting chance of solving the former—of understanding how anything material can have the subjective, private, first-person aspect of consciousness—it seems to me that at some point we need to take seriously a dualistic theory of consciousness. The main problem with dualism is not that it is flawed but that it is hardly ever taken seriously, as it is by Meixner in his excellent (2004), so that most students of the philosophy of mind only know it through caricatures (e.g., Churchland, 1998; Dennett, 1991; Kim, 2000; McGinn, 1999). To arrive at an integral monism, one must accept the mutual irreducibility of body and mind. Psycho-physical dualism cannot be the last word, but it is a most helpful stepping-stone towards understanding the relation between matter and the conscious self.

As a further step towards understanding this relation, I propose that just as UR is situated in a non-physical dimension, so is the self. Suppose that the brain seen by the neurosurgeon is the 3-dimensional, physical aspect of something that extends into the non-physical dimension in which the self is situated. Let us call it "the Brain" with a capital B. Through the Brain the self looks at the manifested world from a direction that is "perpendicular" to (every axis in) the manifested world. As what lies between UR and the world is instrumental in manifesting the world, so what lies between the self and the (3-dimensional, physical) brain is instrumental in the self's seeing the world. When a neurosurgeon opens a patient's skull, she looks (i) along a non-spatial axis through her own Brain (without seeing it) and (ii) along a spatial axis at her patient's brain (which she sees).

12 Lowe (1995) is closer to the mark when he stresses the non-existence of easy problems of consciousness, inasmuch as every problem of consciousness involves the hard problem in some way or other.



[FIGURE 2]

If the perceiving self is situated in a non-physical dimension, it cannot be a product of neural processes or electrochemical firing patterns in a brain, for these are concatenations of causal links across *physical* dimensions and do not reach into the non-physical dimension that extends towards the perceiving self. So much for a causal theory of perception.

Why then are we not aware of this non-physical dimension? The reason should be obvious: the non-physical dimension of the Brain is transparent[13] to the self (and thus invisible from the subject's perspective), and it is invisible from any spatial direction (i.e., from an objective perspective).

And what is the role of neural states in the context of vision? While they cannot cause perceptions, they can, and obviously do, play an instrumental or mediating role in the self's perception of the manifested world. They are mediating states, which misleadingly tend to be referred to as "representations". As Markman and Dietrich (1998) wrote, "there is nothing more to being a representation than being a mediating state. Mediating states not only constitute the general class to which more specific kinds of representations belong; they capture the essence of representation."

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13 A superficially similar view has been propounded by Tye (1995, 2007). According to it, perceptual experiences are nothing but transparent representations in a brain. Since neural representations are obviously opaque when looked at along any spatial axis, their transparency can only pertain to a non-spatial axis and can only exist for a non-physical self, neither of which a physicalist such as Tye would be willing to countenance.

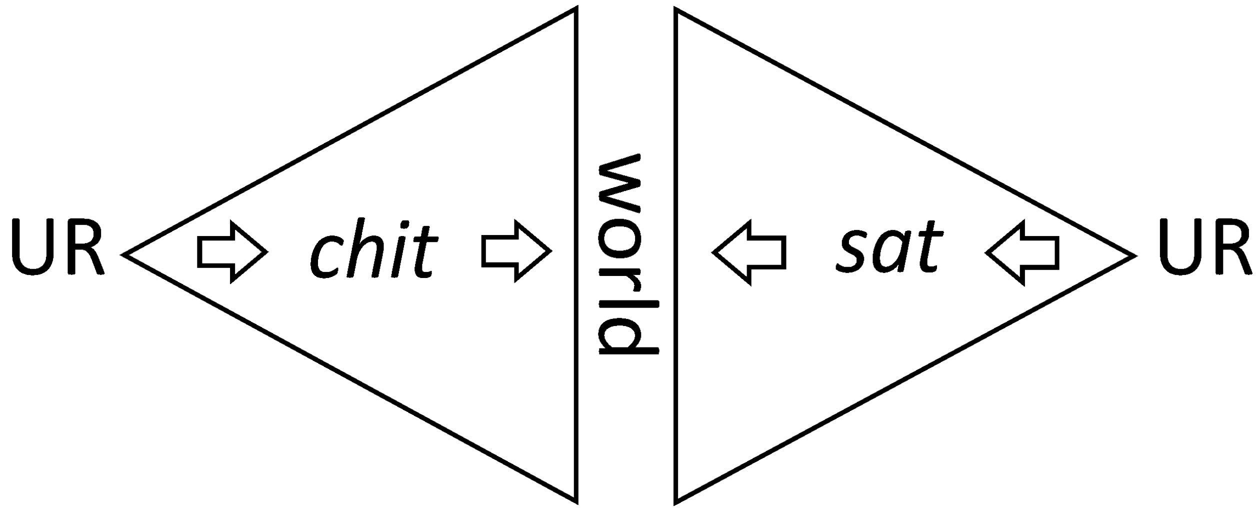
What about optical illusions, after-images, and such? What about people suffering from achromatopsia (who see only shades of gray)? What about Penfield's demonstration that micro-electrode stimulation of the visual system can result in visual experiences (Penfield and Rassmussen, 1950)? All of these points have been cited as evidence that the visual world is the end product of a causal chain. Yet they can just as well, if not with greater justification, be cited as evidence that the brain serves to mediate a non-physical self's perception of the manifested world.

If the direction of vision is "outward"—from the non-physical "vantage point" of the perceiving self to the perceived part of the manifested world—then there is no need to put phenomenal features back together again. Phenomenal features are situated "out there", in the manifested world. Nor is there any need for qualia, let alone for such things to be generated by electrochemical firing patterns. So much for the binding problem and the problem of qualia.

6. The bigger picture

Having added two non-physical items to the furniture of reality—an Ultimate Reality (UR) and a self that is neither a feature nor a product of neural activity—it pays to consider how the two might be related. A promising approach is suggested by a more than millennium-long philosophic tradition known as Vedanta, which is founded on a group of Indian scriptures, the Upanishads (Phillips, 1995; Sri Aurobindo, 2001, 2003, 2005; Mohrhoff, 2007a, 2009e).

The central affirmation of this tradition is an Ultimate Reality, *brahman*, which relates to the world in a threefold manner: it is the all-constituting substance, *sat*, by which the world exists, it is the all-containing consciousness, *chit*, for which the world exists, and it is (subjectively speaking) an infinite delight or bliss, *ānanda*, and (objectively speaking) an infinite quality or value that expresses and experiences itself in the world. Figure 3 illustrates the first two relations:



[FIGURE 3]

What we wish to investigate is how the individual self of Fig. 2 fits into the bigger picture illustrated by Fig. 3. But before this question can be usefully addressed, the bigger picture needs to be fleshed out a bit.

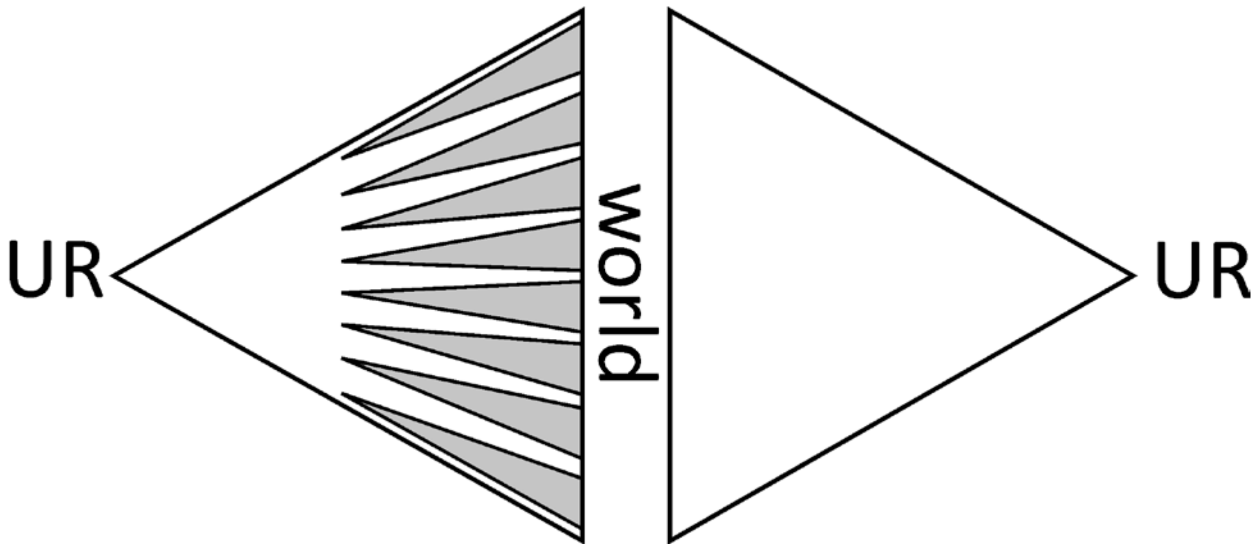
In the Vedantic scheme of things, the process of creation (or manifestation) is essentially a psychological process, which has matter as its final outcome. This process may usefully be divided into three stages, the first encompassing the development of infinite quality or delight (*ānanda*) into expressive ideas, the second concerned with the translation of expressive ideas into executive forces, the third consisting in the creation, by the executive forces, of revealing forms. Each transition—from infinite quality to expressive idea, from expressive idea to executive force, and from executive force to revealing form—brings with it a diminution of the powers of consciousness.

In the original consciousness itself, two poises of relation between self and world can be distinguished: a comprehending poise (*vijñana*) and an apprehending poise (*prajñana*). In the former, the conscious self is both coextensive with the content of its consciousness and indistinguishable from the substance constituting the content. In this radical knowledge by identity, the self is where its objects are; no distance separates the perceiver and the perceived.

In the apprehending poise, the conscious self locates itself manifoldly within the content of its consciousness, so that now there is a distance between the perceiver and the perceived, and objects are seen from outside, presenting their surfaces. It is in this poise that space with its three dimensions—viewer-centred depth and lateral extent—becomes a reality.

The transition from the comprehending to the apprehending poise is effected by a multiple concentration of consciousness. This leaves the resulting individual selves conscious of their mutual identity. A first diminution of consciousness arises if the multiple concentration of consciousness becomes exclusive.[14] The individual self then loses sight not only of its essential identity with the other selves but also of the infinite quality/delight at the heart of existence, for the consciousness of unity goes hand in hand with the consciousness of *ānanda*. To the extent that the individual remains capable of expressing and/or experiencing this quality/delight, it is by an influx of intuition or inspiration of whose origin it is unaware.

This brings us closer to where we are in the Vedantic scheme of things:



[FIGURE 4]

Each of the shaded triangles represents an individual self's relation to the manifested world. One obvious (and rather trivial) fact illustrated by Fig. 4 is that whereas UR qua *chit* is aware of the world in its totality, the individual self is aware of only a (minute) part thereof. What is less obvious (though it stands to reason) is that UR's awareness even of the part seen by the individual differs significantly from the individual's own awareness of it, for no part is seen as it is (i.e., as it exists by and for UR) unless it is seen in the context of the whole. This totality and integrality is a prerogative of the original consciousness (UR qua *chit*).

There is however a major difference between a status "devolved" by exclusive concentration and a status evolved from matter, as we shall see presently. The multiple exclusive

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14 We all know first-hand a state of exclusive concentration, in which awareness is focused on a single object or task, while other goings-on are registered, and other tasks attended to, subconsciously if at all. It is by a similar—though not as readily reversible—concentration that each self loses sight of its identity with the other selves.

concentration of consciousness can be carried further, beyond the point at which even the translation of expressive ideas into executive forces takes place subliminally,[15] to the point at which the executive force at work in the individual too falls dormant. Since this is instrumental in creating and maintaining individual forms, what remains is a multitude of formless individuals—the apparent multitude of relata we call “matter”.

Evolution, Vedantically conceived, presupposes involution, and the steps just outlined trace its process. Why involution? According to Sri Aurobindo (2001, 2003, 2005), the foremost modern interpreter of the Upanishads and other Vedantic texts (Phillips, 1995; Heehs, 2008), UR is as it were playing Houdini, enchaining itself to the greatest possible extent and challenging itself to recover its true self of infinite quality/delight along with the faculties needed to experience and express it.

Evolution thus is not simply the reverse of involution. If it were, particles would acquire first forms with a growing capacity for self-determination and then minds with a growing capacity for self-expression. Instead, evolution proceeds by aggregation, at least initially. Aggregates of particles manifest forms of increasing complexity, in which the capacities for self-expression and self-determination progressively manifest themselves. This process is at every step shackled by its involutionary origin and its evolutionary past, which makes one wonder how it is possible for us to know the world as well as we do.

We are aware of our environment in a manner that does not seem warranted by the surprisingly sparse sensory data that our brains receive (Velmans, 2000; Durgin, 2002). Sri Aurobindo (2005, p. 547) anticipated this neurobiological finding when he wrote about our physical instruments of knowledge: “These means are so ineffective, so exiguous in their poverty that, if that were the whole machinery, we could know little or nothing or only achieve a great blur of confusion.”

The sensory parameters our brains receive concern such quantitative features as the relative locations, shapes, directions of motion, and viewer-centred depths of outlines, the reflectances and textures of surfaces, and the positions and spectral compositions of light sources. While for several of them it is known in considerable detail how the brain extracts them (Hubel, 1995; Enns, 2004), the physical brain “knows” nothing of their *phenomenal* significances. How do these so-called neural correlates of consciousness come to be interpreted in terms of outlines, surface colours, textures, and so on? What the scientific account of vision

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15 At this stage the force at work in the individual remains capable of executing expressive ideas, but unconsciously. Think of the angiosperms as evolutionary exemplifications of this possibility, and do not let yourself be bamboozled into believing that the beauty of a flower is nothing but a device for ensuring the survival of a species.

appears to have missed is a subliminal consciousness that interprets them in the light of a superior knowledge. As Sri Aurobindo (2005, pp. 560–561) explains,

> In the surface consciousness knowledge represents itself as a truth seen from outside, thrown on us from the object, or as a response to its touch on the sense, a perceptive reproduction of its objective actuality. Our surface mind is obliged to give to itself this account of its knowledge, because the wall between itself and the outside world is pierced by the gates of sense and it can catch through these gates the surface of outward objects though not what is within them, but there is no such ready-made opening between itself and its own inner being: since it is unable to see what is within its deeper self or observe the process of the knowledge coming from within, it has no choice but to accept what it does see, the external object, as the cause of its knowledge.... In fact, it is a hidden deeper response to the contact, a response coming from within that throws up from there an inner knowledge of the object, the object being itself part of our larger self.

More can be understood if we distinguish between two strands of UR's creative action, one that proceeds directly from UR, and one by which individuals contribute to determine themselves and each other. If an evolutionary manifestation be intended, it stands to reason that the former strand will conceal its mode of origination by obeying seemingly inflexible laws.[16] Much the same applies to the subliminal action that interprets and supplements the quantitative parameters our brains receive. It will mask itself by complying with surprisingly elaborate rules (Hoffman 2000; Enns 2004). Because these rules—which stipulate, among other things, that the shapes of things tend to be bounding surfaces, that objects tend to move rigidly or piecewise rigidly, that surface reflectances tend to change abruptly, and that light sources tend to be overhead—are implemented in a mechanical fashion, they seems to confirm that everything happens in a naturalistic fashion, as if no higher source of knowledge had anything to do with it.

One final point. Any theory that tries to tackle in earnest the co-existence of consciousness and matter seems bound to contain at least one fundamental mystery (Price, 1996). One such mystery is the relation between quality and quantity, such as that between colour on the one hand and frequency or reflectance on the other. It used to be said that qualities are "nothing but" quantities, or that quantities are real while qualities are "psychic addition" (Whitehead, 1920) that only exist "in the mind". Within the framework of thought presented in this article, it would be more correct to say that qualities are real while quantities merely serve to

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16 In point of fact, if one looks for the simplest set of laws required for an evolutionary manifestation of UR, one is led all but directly to the well-tested laws of contemporary physics—the standard model of fundamental particles and forces and Einstein's general theory of relativity (Mohrhoff, 2002b, 2009c, 2010/11).

manifest them. Just as particles, atoms, and such are instrumental in the manifestation of forms, so frequencies and reflectances are instrumental in the manifestation of colours.

I do not claim that by taking colours "out of the mind" and placing them in the manifested world I have solved the mystery of the dichotomy of quality and quantity. What I do claim is that I have situated the mystery at an ontological level appropriate for a fundamental mystery—not in brains but in the dual aspect of the relation between UR and its manifestation, which is a consequence of the fact that UR manifests itself to itself. Because UR manifests itself, the world exists *by* UR qua all-constituting substance. And because UR manifests itself *to itself*, the world exists *for* UR qua all-containing consciousness. As Sri Aurobindo (2005, p. 319) wrote,

> One begins to understand also how arrangement of design, quantity and number can be a base for the manifestation of quality and property; for design, quantity and number are powers of existence-substance, quality and property are powers of the consciousness and its force that reside in the existence; they can then be made manifest and operative by a rhythm and process of substance.

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