

Reply to David Lindsay's Letter to the Journal of Conscientiology [JofC, Vol. 12, No 45, July 2009]¹

I was more than pleased to read Dave's appreciative review-letter of my two-part *Dialogue about Science, Reality and the Consciousness*. His interesting comments, for which I thank him, give me the opportunity to further clarify some of the fundamental topics that were addressed in the essay.

First of all, a clarification regarding the so-called "hidden variables theories", that Dave cites in relation to Einstein's famous quote that "God doesn't play dice". It is worth mentioning that the ideas I presented in relation to the measurement problem and the corresponding interpretation of quantum probabilities, have been called by its creator, the physicist Diederik Aerts, "hidden measurement formalism". This because the lack of knowledge is not here considered to be related to unknown hidden variables (i.e., elements of reality) that would actually exist in the system under investigation (as assumed in standard hidden variable theories), but instead on a lack of knowledge about what really happens during the measurement process. In other terms, what is unknown here (and therefore hidden) is the deeper deterministic reality of the measurement, which is not just an observation, in the usual sense of the term, but a creation, that provokes a real change of the state of the system.

Having said that, let me now consider Dave's main remark about the idea that microscopic particles would not be physical entities, as in general they wouldn't possess a position in physical space, which is only created during a detection (i.e., an interaction with a macroscopic measuring device). A logical consequence of this, as I explained in the dialogue, is that microscopic particles would in fact be *multidimensional entities*, staying most of their time in a non-physical (i.e., extraphysical) dimension. And if this is true, appropriately observes Dave, then by means of an OBE, or a remote viewing experiment, it should be possible,

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at least in principle, to monitor the “materialization” process of a microscopic particles as it is pulled from the extraphysical to the physical domain, during its interaction with the measuring device, thus providing some supporting experimental evidence to the theory.

Now, what he is tacitly assuming in his experimental proposal, is that the extraphysical dimension in which microscopic particles sojourn most of their time, would have something to do with the existential extraphysical dimensions that are usually visited by lucid projectors or clairvoyants. This however is a very strong hypothesis, that the Lecturer in the dialogue never formulated (quite on the contrary, he said he could not guess in what kind of dimension an electron would usually stay, when not present in physical space), as there is no logical necessity to assume that these extraphysical dimensions would coincide, or be contained one into the other. And in fact, nothing is less sure.

But, even assuming for a moment that these extraphysical dimensions would have something in common, so that, at least in principle, some room would be left to attempt an interdimensional experimentation, there is nevertheless a shortcoming in Dave’s reasoning, when suggesting to psychically *observe* the particle’s “materialization” process. Indeed, what he is ultimately proposing is to *observe observation* (i.e., to meta-observe!), and in doing so he tacitly assumes that this process of meta-observation would be of a classical nature, that is, a process leaving what is observed (in the present case the observation itself) unaffected. But of course, nothing is less certain, seeing that, as explained in the dialogue, observation is not in general an act that leaves what is observed unaffected, but an interaction that can literally creates what is observed.

The above is to emphasize that, seeing the subtleties of the concepts we are here considering, a lot of care is needed not to be mistaken or incur in circular reasoning. Our way of thinking reality is in fact full of unconscious preconceived ideas (that D. Aerts likes to call AUUA: Additional Unconsciously Used Assumptions), that we must always try to bring to a conscious level and investigate. This is, to my opinion, the main mission of a physicist, when questioning the foundations of physical reality, and more generally of a parapsychicist (i.e., a conscientologist), when questioning the foundations of the extraphysical ones.

Here above I have considered two examples of AUUA, that are inherent in Dave’s proposal: (1) that the extraphysical reality of

microscopic particles has something to do with the extraphysical reality experienced by a lucid projector or remote viewer, and (2) that psychic observation is a classical process of pure discovering, leaving the observed entity unaffected. But there is an even strongest AUUA in Dave's proposal: (3) that microscopic particles are real entities. In fact, as surprising as it might appear, this is not true!

Unfortunately, a majority of physicists, be them theoreticians or experimentalists, researchers or teachers, still believe today that the basic building blocks of our physical reality are the so-called elementary particles (quarks, leptons and gauge bosons). This however is a false belief – an AUUA! – based on our macroscopic prejudice about the microscopic reality, as since the early days of quantum mechanics there has been strong evidence that: *microscopic particles do not exist!*²

To understand why microscopic particles do not exist as such, but are just the result of a cognitive illusion, we need to reflect about what we exactly mean when we speak about *microscopic particles*. In atomic physics, a possible definition of the concept of *microscopy* is to say that an entity is microscopic if *Heisenberg's Uncertainty Principle* (HUP) is relevant for the description of its kinematic observables, like position and momentum. On the other hand, concerning the concept of *particle*, we can observe that there are essentially two meanings that are today associated with it. The original, etymological meaning, is that a particle is a small part of a bigger composite system, i.e., a small subsystem, whereas the second, more general and nowadays more common meaning, that we can adopt in the present discussion, is that a particle is simply a small localized physical system, a corpuscle, a small body which doesn't necessarily need to be part of a bigger composite system.

Undoubtedly, many different properties can be associated to the concept of particle, or corpuscle, but for our purpose it will be sufficient to focus on one of the most fundamental: *spatiality*. So, if a physical entity is a particle, then, in every moment, it must possess a specific

² The Lecturer in the dialogue didn't mention this surprising fact explicitly (probably not to unnecessarily complicate the discussion at that moment), but only affirmed, in a rather cryptic way, that microscopic particles had to be considered multidimensional entities. However, he didn't explain how this statement had to be understood.

location in space, characterizable by a position (for instance of its center of mass) with reference to a given coordinate system. In other terms, it has to exist somewhere in our three-dimensional Euclidean physical space. But then, we are forced to admit that the concept of “microscopic particle” is an *oxymoron*, i.e., a self-contradictory concept, as microscopic entities are non-spatial entities, and therefore cannot be particles.

Let me briefly explain why it is so. According to *Einstein’s reality criterion* (ERC), our description of reality is essentially based on our dependable predictions about it. In other terms, what exist (and is therefore real) is what can be (at least in principle) predicted with certainty (this criterion was discussed at some length in the second part of the dialogue). But then, if an entity obeys HUP, we cannot simultaneously determine its position and momentum and, as a consequence, we cannot determine, *even in principle*, how the position of the entity will vary in time and therefore predict with certainty its future locations. Using the ERC, we are then forced to conclude that the microscopic entity doesn’t actually possess the property of being somewhere in physical space, so that whatever the entity is, it is a non-spatial entity, and therefore certainly cannot be a particle.

Of course, in addition to *spatiality* there are other fundamental properties a particle needs to have, to be so called, that one can show are generally not possessed by a microscopic entity. One of these is *individuality*. Therefore, if microscopic particles do not exist, it is not only because they aren’t present in space, but also because they don’t possess the essential attribute of individuality, i.e., the property of existing as separate entities. In fact, microscopic particles do not exist for many other reasons as well, that would take too much space to discuss here.

Let me stress that the hypothesis of microscopic particles, although incorrect, has nevertheless proved to be an incredibly fertile idea. Atomism, and more generally reductionism, have been and still are a source of great explicative power. Physical systems are not made of atoms, or of elementary particles, but doing *as if* they are can certainly be useful in many circumstances. Yet, we must not forget the “as if”, because then the risk is to miss all the more advanced explanations and predictions that lie beyond our incomplete corpuscular vision, which is

just a lucky conceptual analogy extrapolated from our experience of the macro world.

In that sense, Quantum Mechanics (QM), in its usual formulation and interpretation, is certainly an incomplete theory. This because it pretends to give a proper meaning to the concept of “individual quantum particle”. And by doing so, a huge number of unnecessary paradoxes automatically appear. What we don’t have to forget, when discussing about QM, is that, quoting the great Italian physicists Giuliano Preparata “[...] quantum mechanics is a rigorous consequence of the corresponding quantum field theory in the limit of *infinite dilution*, where the world is only populated by a small, finite number of quanta”.

In other terms, QM is just an approximation of a more general and advanced theory, called *Quantum Field Theory* (QFT), and, as its name indicates, the basic ingredients of QFT are not particles, but quantum fields! When quantum fields interact together, they do it locally, exchanging quanta of energy, and when they do so they leave visible traces in our three-dimensional physical space, for instance in the form of little spots on a screen. And these traces are easy to be mistaken for the traces that would be left by some hypothetical microscopic corpuscles with a proper kinematics and dynamics. This however is only a cognitive illusion, as these traces are just the consequence of the fact that quantum fields, contrary to classical ones, can only exchange their energy in a discontinuous way, that is in small packets, or bundles, or quanta.

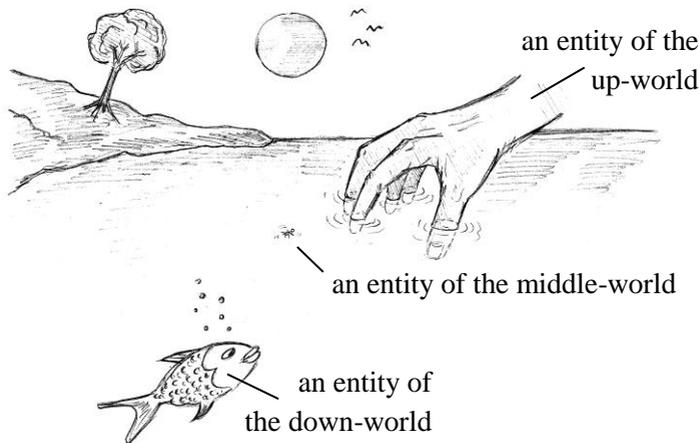
As far as we know, our microscopic reality is not made of tiny particles moving in empty space, but of quantum fields. These, however, are no ordinary substances, and all we concretely know about them comes from the traces they leave when they interact with our instruments. These traces are certainly present in our ordinary physical space, but in general quantum fields are not: they are not present in space, but somehow emerge (or immerge) in it every time they interact with our macroscopic three-dimensional measuring apparatus.

Of course, much more could be said on this fascinating topic and on the strange features of quantum fields, but my purpose here was just to point out what Dave’s experimental proposal is really about. It is not about meta-observing the trajectories of microscopic particles, when they impinge from one dimension upon another, as there are no trajectories and, even less, microscopic particles! It is about penetrating the

mysteries of the enigmatic quantum fields: the non-ordinary multidimensional substances which are probably at the basis of our reality.

I don't want to affirm that this is impossible (until proven to the contrary, everything is in principle possible!), but to grasp the true essence and functioning of non-spatial and non-local realities, from a genuine multidimensional perspective, certainly requires some (purely mentalsomatic) cosmoconsciousness' experiences of a very advanced level. And, although I hope that one day (be it in this life or another) I will succeed having access to such a great possibility, even in that circumstance I doubt I could meaningfully express its content in ordinary language. In fact, the only known language that allows us, intraphysical consciousnesses, to properly express what we know about quantum fields, is (higher) mathematics, the natural language of science.

I'd like to conclude with a metaphor in the Abbott's style³. Imagine a lake, in a beautiful spring day. Its surface defines three distinct worlds.



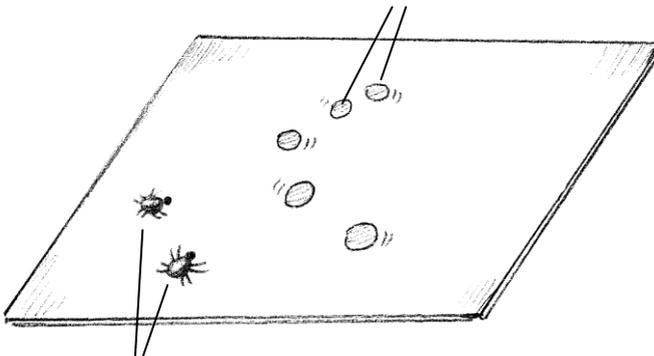
³ Edwin A. Abbott (1838–1926) was an English schoolmaster and theologian, better known for his satirical novella: *Flatland: A Romance of Many Dimensions* (1884).

There is the down-world, rather thick, populated by three-dimensional aquatic creatures such as fish; there is the up-world, more rarefied, also populated by three-dimensional creatures, like birds; and there is the middle-world, as defined by the very surface of the lake, a reality of an intermediate density populated by essentially two-dimensional creatures, like small wingless insects that never leave the thin film of water.

Intraphysical consciousnesses, in some way, are like the creatures of the middle-world, with all the cognitive disadvantages it entails. Let me explain. Imagine being one of the insects that live at the boundary between the up-world and the down-world, and imagine not knowing being at the frontier of two realities of higher dimensionality, as you always lived in a two-dimensional environment, with a two-dimensional body, and you cannot directly experience a third dimension.

Suppose now that a three-dimensional entity of the up-world, say a human hand, dips its five fingers into the water. What would you see from your limited perspective of a middle-world creature? What happens when a creature of higher dimensionality traverses your personal space?

hypothetical individual entities, apparently separated, appearing from nowhere in the space of middle-world



two-dimensional entities
of the middle-world

Well, in this case, you will see appearing, out of nowhere, five strange entities, more or less spherical, that for just a moment will manifest in your space. Surely, you will mistake those ephemeral traces for genuinely two-dimensional individual entities, completely separated and independent. But, from the perspective of a three-dimensional hyper-being of the up-world, it is clear that those five spherical-entities are not separate, nor individual and independent, but simply the effect of the interaction between a unitary three-dimensional entity – the hand – and another unitary entity – the two-dimensional surface constituting middle-world. An interaction whose traces produce the illusion of the creation and destruction of individual separate entities, only existing in the limited imagination of the inhabitants of middle-world!

This, clearly, is just a metaphor, but it usefully illustrates, in a simple and straightforward way, my previous statement about the inexistence of microscopic particles: although the traces we discover in our detectors encourage us to believe in the existence of local, spatially separated microscopic corpuscles, in fact those are just illusions resulting from the interaction of our instruments with non-spatial and non-local realities, that modern physicists like to call quantum fields.

The natural working hypothesis in physics is that the “hands” of the different quantum fields composing our reality are just the “fingers” of a greater hand, a *unified quantum field*, and this brings me to the final remark of Dave’s stimulating letter, regarding my suggestion that we are all part of a unique consciousness. I agree with him that we have some distance to travel before we will be in a position to test, in whatever way, such a remarkable hypothesis. However, as I hope I was able to highlight in the present letter, we also have some way to go before being able to meaningfully experience (for instance by means of very advanced mentalsomatic projection) the full complexity of quantum fields and the manifold of their multidimensional and interdimensional interactions, which are at the basis of our manifestation.

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