

# Causal Connection and Global Consciousness

## Is individuality an evolutionary accident?

Alessandro De Angelis

**Abstract** We propose a novel interpretation of consciousness and an enlarged definition of locality, which provide a solution to the problem of the consistency of measurements in quantum mechanics: consciousness is a characteristic of the Universe as a whole. Besides its physical consequences, this interpretation has also moral implications: individuality comes out naturally to be just an accident functional to evolution which shaped past and present history through competition, and realizing this fact should enforce cooperation.

**Keywords** Consciousness · Mind · Interpretations of Quantum Mechanics · Causality · Evolution

**PACS** PACS 03.65.Ta · 03.65.Ud

### 1 Introduction

We can summarize quantum physics as follows. A physical system is described by a state function  $\psi$ , which is an element of a Hilbert space, and gives information only concerning the probabilities of the results of various observations that can be made on the system. The state function  $\psi$  is objectively characterizing the physical system, i.e., at all times an isolated system is thought of as possessing a state function, independently of the state of knowledge of it by observers.

There are, in principle, two fundamentally different ways in which the state function can change [1, 2]:

- *Process 1*: The continuous, deterministic change of state of the (isolated) system with time according to a wave equation  $(i\hbar/2\pi) \partial\psi/\partial t = U\psi$ , where  $U$

---

Alessandro De Angelis  
University, INFN and INAF Padova (Italy); LIP/IST Lisboa (Portugal)  
Tel.: +39-049-8275942; +39-049-967-7364  
E-mail: alessandro.deangelis@unipd.it

is a linear operator. As long as the system remains isolated,  $\psi$  changes in a causal manner, obeying the appropriate equation.

- *Process 2*: The discontinuous change brought by the measurement by an observer of a quantity with value  $\varphi_j$ : the state  $\psi$  will be changed to the (collapsed) state  $\psi_j$  with probability  $|\langle\psi, \psi_j\rangle|^2$ ,  $\psi_j$  being the eigenstate corresponding to the eigenvalue  $\varphi_j$  of the operator describing the measurement.

For example, related to Process 1, in nonrelativistic physics the unitary operator can be the Hamiltonian  $\hat{H} = \hat{p}^2/2m + V$  and the Hilbert space can be defined over the complex field  $\mathbb{C}$ : in this case the deterministic evolution is driven by the Schrödinger equation, and we speak about nonrelativistic quantum mechanics.

The question of the consistency of this scheme arises when one contemplates the observer and his object-system as a single (composite) physical system. Indeed, the situation becomes quite paradoxical if we allow for the existence of different observations, as Process 2 might induce discrepant versions of reality. And indeed several paradoxes have been conceived based on this, see for example [3, 4, 5] for reviews and proposed ways out.

A notable solution recovering the consistency of quantum physics has been proposed by Everett [2, 6]. It is known as “many-world interpretation of quantum mechanics”, and it can be formalized as *the non-existence of Process 2* – thus, a causal evolution of the Universe. Decoherence can branch and split the Universe by generating mutually unobservable alternate histories: distinct worlds within a greater Multiverse.

Being the Multiverse interpretation unpleasant/unsatisfactory for many, we propose here a different way out to the problem of consistency.

## 2 Proposal

We start from the interpretation of von Neumann [1] according to which the problem of the collapse of the wavefunction can be related to consciousness. In this interpretation, *the conscious mind is the entity who has the power to induce Process 2, and is thus at the origin of the collapse of the wavefunction. We posit this as the formal definition of consciousness.*

A trivial way out to the problem of the consistency in the interpretation of reality could then be, clearly, solipsism: to postulate the existence of only one observer in the Universe. The Universe obeys at all times Process 1 except when under his/her observation. This view is trivially consistent, but largely unsatisfactory.

We put forward here a different hypothesis that incorporates solipsism in a more general view: *the Universe is a unique consciousness*. Our perception of individuality is just an evolutionary accident (however not a spandrel, since it has been functional to the way we evolved).

How is locality affected by this view? Namely, are changes of the internal structure of the “global” observer (i.e., the Universe) consistent with causality?

Apparently, a global Universe can induce coherent changes in events which can not be causally connected according to the definition of Special Relativity (SR). Calling  $P = (t, x, y, z)$  a generic event in 4-dimensional space,  $C$  the maximum speed of propagation of a signal at time  $t$ , and defining the metrics  $||P||^2 \equiv C^2t^2 - x^2 - y^2 - z^2$ ,

one might have correlated changes between pairs of points 1 and 2 (events in 4-dimensional space) for which

$$||P_1 - P_2||^2 < 0$$

(i.e., the 4-vector joining them is space-like and they cannot be causally connected according to the definition of SR if  $C = c$ ,  $c$  being the speed of light *in vacuo* [7]). We can find a way out by formulating a definition, and a conjecture.

*Definition.* We define two points  $P_1$  and  $P_2$  at the same time  $t_1 = t_2$  in 4-dimensional space as *akashically*<sup>1</sup> *connected* if

$$\exists t_0 \leq t \text{ such that } ||P_1 - P_2||^2 \geq 0.$$

The definition of akashical connection trivially extends the definition of time-like separation in SR: all pairs of events within the light cone (and thus causally connectable) in the sense of SR at  $t_0 = t$  are also akashically connected.

*Conjecture.* All pairs of points akashically connected can be causally connected.

Notice that this solves nonlocality paradoxes like the Einstein-Podolsky-Rosen paradox, which applies to pairs of particles which are not in general causally connected, but were in their past history – and a larger class of paradoxes in which a causal connection between points in 4-dimensional space with space-like separation is established.

We point also the attention of the reader to the fact that, in the *big bang* hypothesis, all the (knowable) Universe is akashically connected, and thus, following our conjecture, can be causally connected; the Universe as a whole can thus be thought as a unique consciousness, and is coherent.

Another consequence is that local systems, irrespective of how small, encode the wavefunction of the Universe field with their wavefunction: in this sense our interpretation is thus holographic.

<sup>1</sup> The term is based on the Sanskrit word *ākāśa*, derived from a root *kāś*, meaning “to be” [8, 9]. In the old Jainistic religion of India, *akasha* one of the eternal categories of being; an ambient similar to the fifth essence of Aristotle [10], in which events take place. Theosophy, antroposophy and other non-quantitative disciplines have later popularized the word *akasha* and its adjective, *akashic*, referring to an etheric compendium of all knowledge and history of the Universe. Ervin László in [11, 12], based on ideas by Rudolf Steiner [13], and more loosely by Carl Gustav Jung [14], posits a “field of information” as a fundamental substance of the cosmos, and calls it “Akashic field”: a causal field in which all information on what can be physically described is saved, with its historical evolution. All phenomena are “in-formed” (using a term from Bohm [15]) from this field, which has a holographic imprint.

### 3 Conclusion

We have presented a novel interpretation of consciousness which formalizes a panpsychic concept and provides a solution to the problem of the consistency of measurements in quantum mechanics, enlarging the definition of locality. In this interpretation consciousness belongs to the Universe as a whole.

This interpretation respects Occam's razor: it provides a justification for inconsistencies without introducing new entities.

We want in conclusion to stress the moral consequences of the interpretation proposed in this paper. Being the expression of a unique entity, all individuals should realize (at the best level at which they can perceive) that individuality is just an accident functional to evolution which shaped past and present history through competition, and they should enforce cooperation by all means. As the most intelligent species locally known, the bulk of the responsibility for such a new shaping of evolution stays on human beings.

**Acknowledgements** – We thank Francesco de Stefano and Marco Roncadelli for discussions and useful suggestions.

### References

1. J. von Neumann, *Mathematical Foundations of Quantum Mechanics*, Princeton University Press (1995 edition of the 1932 work)
2. H. Everett, *Theory of the Universal Wavefunction*, Thesis, Princeton University (1956, 1973)
3. R.I.G. Hughes, *The Structure and Interpretation of Quantum Mechanics*, Harvard University Press (1992)
4. C. Friebe et al., *The Philosophy of Quantum Physics*, Springer Nature (2018)
5. Y. Aharonov and D. Rohrlich, *Quantum Paradoxes*, Wiley (2005)
6. H. Everett, J.A. Wheeler, B. DeWitt, L.N. Cooper, D. Van Vechten, N. Graham, *The Many-Worlds Interpretation of Quantum Mechanics*, Princeton University Press (1973)
7. L.D. Landau and E.M. Lifshitz, *The Classical Theory of Fields*, Sect. 1.2, Pergamon Press, Oxford (1971)
8. Akasha, in Encyclopaedia Britannica <https://www.britannica.com>
9. Akasha, in Wikipedia <https://en.wikipedia.org>
10. D.E. Hahm, *Aristotle's De Philosophia and the Introduction of the Fifth Element*, The Society for Ancient Greek Philosophy Newsletter, 191 (1971)
11. E. Lázló, *The connectivity Hypothesis*, State University of New York Press (2003)
12. E. Lázló, *Science and the Akashic Field: An Integral Theory of Everything*, Inner Traditions International (2004)
13. R. Steiner, *The Fifth Gospel. Investigation of the Akasha Chronicle*, London (1950)
14. K.G. Jung, *Collected Works*, vol. 9 (1959)
15. D. Bohm and B. Hiley, *The Undivided Universe: An ontological interpretation of Quantum Theory*, Routledge, New York (1993)