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THE THIRD WAY OUT OF THE ANTHROPIC COINCIDENCE QUANDARY

M. M. ĆIRKOVIĆ

Astronomical Observatory, Volgina 7, 11160 Belgrade – 74, Serbia and Montenegro
E–mail mcirkovic@aob.aob.bg.ac.yu

Abstract. It is well-known that the two basic explanations for the so-called anthropic coincidences in cosmology and fundamental physics are offered: the multiverse hypothesis and the design hypothesis. Hereby we would like to show that there is a third possible explanatory solution, different from the widely debated two, and superior in at least some respects. This "third way" relies on the novel results in fundamentals of quantum theory, and presents a modern and significantly improved version of Wheeler's classical participatory universe hypothesis.

No phenomenon is a phenomenon until it is an observed phenomenon.

John A. Wheeler (1979)

It has been known for some time that both fundamental physical constants (like the fine-structure constant α, Newtonian gravitational constant G or Planck's constant $\hbar$) and some cosmological parameters (like the total cosmological energy density Ω, or the cosmological constant Λ) are fine-tuned for allowing very complex structures, like living and intelligent beings. This was first elaborated by Idlis (1958), and later Carter (1974), and acquired the name of an "anthropic" principle. The existing literature on these "anthropic" coincidences is already voluminous; celebrated reviews can be found in Carr & Rees (1979) or Barrow and Tipler (1986).

Two hypotheses have been historically put forward for explanation of these coincidences:

- The **Design** (D) hypothesis: the universe was created with properties fine-tuned for life and intelligence;

and

- The **Multiverse** (M) hypothesis: the universe is just one out of many in the multiverse, where a large variety of conditions exist, and only those in accordance with the weak anthropic principle will possess observers like us.

Both have many unsatisfactory features! They are both rather metaphysical, and while insufficiencies of the design hypothesis are very well-known and have been an object of study for several centuries, since the age of Enlightenment, deficiencies of the multiverse hypothesis are less well-known, so we may wish to mention some points here. As discussed by Craig (1988), not any multiverse is capable of accounting for the perceived fine-tunings; and if generic conceivable multiverse won't do, we have just moved the puzzle one level higher. In addition, the multiverse concepts have serious epistemological problems, involving us with controversies about the Popperian falsifiability, etc.

The **third way** opens after we realize what is the real question to be asked in this discussion. It is:

- (I) why we observe particular values of physical and cosmological constants/laws?

rather than:

- (II) how did we (intelligent observers) come about? or anything similar.

But why people tend to overlook any third possibility apart from hypotheses D and M is usually just because their perceived answers to (I) entail a sort of an answer to (II) also; on emotional level, we desire to answer (II). Thus, D implies that we are part of (or crown of) the entire intricate design/plan, and M suggests that the shear number and random character of domains ("universes") guarantees that there **must** be creatures like us somewhere. Thus, both D and M give much more than it was originally asked for, thus violating Occam's razor.

Instead, we propose that the issues of origination of our (fine-tuned) cosmological domain and the origination of consciousness are **inseparable**, and that the same (quantum) physics accounts for both puzzles. This idea has its origins in speculations of Wigner (1967) and, especially, John A. Wheeler (1979, 1988); recently, related ideas have been expounded by Richard Mould (2001a,b, 2002a,b). In particular, we point out that modern quantum mechanics allows for formulating a physical metatheory (metaphysical theory) of consciousness. This observation comes from some recent progress in the foundations of the so-called decoherence theory (Zurek 1991; Dugić 1996, 1997; Dugić et al. 2002). We use practically universally accepted hypothesis in physical considerations devoted to the issue of consciousness: **there is a physical background (and/or physical basis) of consciousness that, as a physical system, can be described and treated by the methods of the physical sciences**. This partially trivial assertion will later on prove useful for our considerations, finally leading to a wider physical picture naturally involving consciousness, and eventually pointing out something new as regards the connection between physics and (the physics of) consciousness. As will become clear below, this reductionist attitude is justified exactly because quantum mechanics (which we use as a physical basis for discussion) is generally perceived as introducing a substantial holistic element in modern physics.

As it was distinguished in Dugić (1996) and further elaborated in Dugić et al. (2002), the decoherence theory allows for the following analysis: Let us suppose that the two systems, an open system S and its environment E are in mutual interaction not leading to decoherence. Then, according to a plausible assumption, one cannot

determine the border-line between S and E. But suppose that there exist such coordinate transformations as to allow for redefining the interaction and leading to the definitions of new physical systems—the new open system S' and its environment E'. Now, relative to the coordinates of the new systems, S' and E', one may say that there occurs the decoherence effect leading to unambiguous definitions of both systems, S' and E', and simultaneously defining the desired border-line between the two systems. This transformation is substantial (for a strict treatment see Dugić et al 2000), in the sense that the "old" systems, S and E, cannot be even in principle defined or observed. That is, one deals with the same composite system, S+E (identical with S'+E'), but the two definitions of the subsystems (the "old" one, S and E, and the "new" one, S' and E') are mutually **exclusive**! The process of decoherence, which establishes the classical reality only for the "new" subsystems, S' and E', clearly states: the open system S' bears classical reality, and can be defined only simultaneously with its environment, E'. The composite system cannot be considered decomposable into the "old" "system" S and its "environment" E': they simply do not bear classical reality, which is generally expected in the "macroscopic" world.

When extended to **complex systems** consisting of a set of **mutually interacting** (open) macroscopic systems plus their environments, this notion obtains an unexpected element. Actually, in a set of such systems, the local interaction at some place determines interaction (and therefore the definition of the systems) at spatially distant place(s), thus making the macroscopic piece of the Universe (henceforth MPU) as an interconnected physical system, in which the definition of each of its part (element) depends on the definition of a **local** system and its environment; and this can be rigorously proved (Dugić et al 2002). It cannot be overemphasized: even for complex systems, the different definitions of the MPU are mutually exclusive, in so far as only one of them bears classical reality.

However, one may ask if the composite system as a whole, can—in due course of its time evolution—survive transition of the classical reality from one to another definition of the MPU. But this is a nonphysical transition, for **it cannot be observed**. Actually, the conscious observer could never be aware of this transition, for the simple reason: according to the assumption that consciousness bears a macroscopic (Dugić and Raković 2000) physical system as its origin, the transformation from one definition of MPU as a realistic system to another definition of the MPU bearing classical reality equally refers to the physical system which is the physical basis of consciousness. In other words, the different Universes define the different, mutually exclusive definitions of the systems, which the consciousness originates from.

This gives us a clue for the physical metatheory of consciousness: different definitions of the MPU, bearing classical reality or not, in principle, define different consciousnesses. The physical bases of consciousness in the different Universes (MPUs) are **mutually exclusive**, bearing the following substantial characteristics for each Universe: (i) consciousness (through its macroscopic-physics origin) can be defined only simultaneously with defining the rest of the MPU, and (ii) different Universes define different, mutually exclusive consciousnesses.

Therefore, consciousness, treated as a physical system, in the context of universally valid quantum mechanics is only a relative concept, its physical characteristics being determined by even remote pieces of the actual Universe. In practice, it means that observations in a given Universe can be performed only by the conscious beings

physically (in the sense of our considerations) belonging to that Universe. This, **the relative-metatheory of consciousness** is a sort of **psycho-physical parallelism** bearing the holistic nature of the physical Universe, which naturally incorporates consciousness as its part (Hoyle 1982; Barrow and Tipler 1986). In a Wheelerian sense, the universe grows as the conscious phenomena in it increase in quantity and quality.

To conclude, we present a new strategy in dealing with the anthropic coincidences, which borrows something from Wheeler's participatory universe and employs recent advances in the fundaments of quantum mechanics. Only time will tell whether this strategy can successfully compete with the Design and the Multiverse hypotheses in the cosmological and philosophical arenas.

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