

# Synchronicities of Carl Jung Interpreted in Quantum Concept of Consciousness

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## ABSTRACT

The phenomenon of synchronicities which has been first described by Carl Jung, is explained in the framework of Extended Everett Concept proposed by the author. EEC differs from the Everett's "many-worlds interpretation" of quantum mechanics in that it explicitly includes the phenomena of consciousness, super-intuition (direct vision of truth) and ability to choose the version of reality which is to be subjectively experienced. Extended Everett Concept can explain synchronicities since, according to this theory, the subjective perception of reality by humans is governed not only by material causes but also by goals that may be immaterial (words, images or ideas).

**Key Words:** synchronicity, consciousness, quantum mechanics, Everett's interpretation, extended Everett concept

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## 1. Introduction

There is a phenomenon known in fact to many people but first seriously investigated by great psychologist Carl Gustav Jung. This is the phenomenon of *synchronicities* (Jung, 1960; Jung, 1993). Jung called it synchronicity if someone observed, during a short period of time, a number of events that seem connected by their meaning but cannot be connected causally. A synchronicity may consist of the unjustified appearance of a number of subjects or images which are connected with each other in their names, shapes, functions or other characteristics, but have no reason for their appearance at the same time and place. Emergence of the observed events looks as coincidence, but it seems incredible that such a coincidence may happen.

The most known example of a synchronicity was described by Jung as follows:

"A young woman I was treating had, at a critical moment, a dream in which she was given a golden scarab. While she was telling me this dream, I sat with my back to the closed window. Suddenly I heard a noise behind me, like a gentle tapping. I turned round and saw a flying insect knocking against the window-pane from the outside. I opened the window and caught the creature in the air as it flew in. It was the nearest analogy to a golden scarab one finds in our latitudes, a scarabaeid beetle, the common rose-chafer (*Cetonia aurata*), which, contrary to its usual habits had evidently felt the urge to get into a dark room at this particular moment. I must admit that nothing like it ever happened to me before or since" (Jung, 1960).

Jung associated the phenomenon of synchronicity with the notion of symbol. When he was studying the symbolism of the fish in Christianity, alchemy and world mythology, the theme of fish started to appear before him in everyday life. On April 1, 1949, he made some notes about an ancient inscription describing a man whose bottom half was a fish. At lunch that day, he was served fish. In the conversation with someone, there was talk of the custom of making an "April fish" - an European term for "April fool". In the afternoon, a former Jung's patient, whom he

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had not seen for months, came brought some pictures of fish for him. In the evening someone showed him an embroidery representing fishy sea monsters. The next day, another former patient he had not seen in a decade recounted a dream in which a large fish swam towards her.

There was no reasonable explanation why the image or idea of fish appeared so many times during two days. The happening could in principle be not more than a coincidence. However, Jung wrote about such events: "When coincidences pile up in this way, one cannot help being impressed by them - for the greater the number of terms in such a series, or the more unusual its character, the more improbable it becomes." Further consideration made Jung to ask whether it is possible that the physical world mirrors psychic processes "as continuously as the psyche perceives the physical world."

The coincidences of this type happen not so rarely, although most people do not consider them important and therefore do not remember of them. However, Jung estimated the phenomena of synchronicities as very important just because they seem to have no reasonable explanation. He associated this phenomenon with his idea of archetypes, the images that express the "eternal" ideas and are common for the whole mankind.

In attempts to solve this hard problem, Jung was working on synchronicities in collaboration with the great physicist Wolfgang Pauli. They hoped to make use of specific features of quantum physics for the explanation of this as well as some other unusual manifestations of our consciousness. No quite satisfactory explanation was found, but the very idea of connection between the phenomenon of consciousness and quantum mechanics is now under active discussion.

The phenomenon of synchronicity has been thoroughly studied from psychological and philosophic viewpoints (Koestler, 1973; Main, 2000), but the most popular opinion is that this phenomenon contradicts to the laws of natural sciences.

In our days the idea (originated by Pauli and Jung but supported or independently put forward by many other specialists including Niels Bohr) that human consciousness is somehow connected with quantum physics, becomes more and more

popular (see Penrose, 1989; Penrose, 1994). In the light of thorough elaboration of the notion of so-called "quantum reality", this idea seems to be not only valid, but unavoidable (Tarlaci, 2010).

Various authors tried to realize this idea in various ways, one of which is that brain works as a quantum computer (this variant was supported also in the paper of Hameroff and Penrose (Hameroff *et al.*, 1995)). Some authors, although with not enough concreteness, supposed that synchronicities may be explained by entanglement of some material structures in human bodies (Duch, 2003; Limar, 2010a; 2010b). The works of this type cannot, in our mind, give the solution of the problem. The main question arising in the connection with synchronicities remains without answer: how it may happen that events in the external (for the observer) world may be caused by any states of his/her brain.

In the papers and books of the present author the idea of connection between consciousness and quantum mechanics has been realized on the basis of Everett's ("many-worlds") interpretation (EI) of quantum mechanics (Everett, 1957). For this aim, the specific feature of EI was exploited, that different classical realities, or "Everett's worlds", coexist in our (actually quantum) world where not classical but so-called quantum reality is valid. The resulting theory of consciousness and super-consciousness (Mensky, 2000; 2005; 2007a; 2007b; 2010; 2011) was called Extended Everett's Concept (EEC).

We shall show below that EEC allows to quite naturally explain the phenomenon of synchronicity.

The main problem with the phenomenon of synchronicity is that the events forming it seem to be not accidental, but there is no cause for them to appear at this moment (or during a short time period). We shall show that synchronicities are eventual because;

- i) the subjectively perceived reality, according to EEC, is governed not only by causes (in the sense of natural sciences) but also by goals, and
- ii) an idea or an image in the person's consciousness may lead to the unconscious desire (a sort of a goal) to perceive the associated events or



images. The same may be formulated in another way: synchronicities is a special case of so-called probabilistic miracles which may, according to EEC, happen due to special features of our consciousness.

It is important to discuss the status of EEC and its main consequences which are exploited for explaining the phenomenon of synchronicity. This analysis concerns some subtle points of quantum mechanics, and we shall make it in Sect.2. The reader is invited, skipping this analysis, to start from somewhat naive consideration given in Sect.3, but with the clear understanding that these naive arguments are supported by more deep quantum-mechanical arguments. The arguments presented in Sect.2 require some level of knowledge of quantum mechanics and may be omitted in the first reading.

Various part of the paper are oriented at different categories of readers and may be read independently from each other. Because of this, some repetitions were unavoidable.

## **2. Everett's interpretation of quantum mechanics and Extended Everett Concept (EEC)**

In this section we, for the sake of completeness of the exposition, shall outline very briefly the conceptual difficulties of quantum mechanics, leading to the so-called "many-worlds" interpretation of this theory proposed by Everett, and further to the Extended Everett Concept suggested by the author. This section may be skipped for the first reading without detriment to the understanding of the main ideas of the article.

### **2.1 Counter-intuitive features of quantum mechanics**

The most important feature of quantum mechanics is its linearity. This feature radically distinguish the notion of reality in quantum mechanics from what we call reality in classical physics (and what seems for our intuition quite natural or even necessary). This is a reason of the well-known paradoxes of quantum mechanics.

#### **Superposition**

First of all linearity of quantum mechanics means that the states of a quantum system form a linear space (vector space), so that the

states may be multiplied by numbers and summarized. If any two (or many) states of an arbitrary physical system exist, then also the state exists which is a *superposition*, or a linear combination, of these.

For example, an electron may be in the state  $\psi_1$  which means that the electron is in the point  $A$ . Let one more state  $\psi_2$  of the same electron correspond to it being located in the point  $B$ . Then the electron (although being a pointer particle) can be in the state  $\psi = c_1\psi_1 + c_2\psi_2$  where  $c_1$  and  $c_2$  are (complex) numbers. This state is called a superposition of the states  $\psi_1$  and  $\psi_2$ . In generic case the number of components in a superposition may be arbitrary.

Being superposed, the states  $\psi_1$  and  $\psi_2$  in a sense *coexist*. Statement about coexistence of two different states would have no meaning in the context of classical physics, but it has quite definite meaning in quantum mechanics. If for example  $\psi_1$  and  $\psi_2$  are the states of a point particle located correspondingly in the points  $A$  and  $B$ , what is then the meaning of a superposition of these states? In classical physics the question would be senseless. Just because of this we cannot make quite clear what does this question mean in quantum mechanics. However, we know from experiments that, for any quantum system, superposition (in a sense, coexistence) of different states may exist. This statement is counter-intuitive (because our intuition is brought up on everyday experience and classical physics) but it is valid. We know the properties of a superposition, we manage to work with it.

#### **Coexisting of macroscopically distinct states**

It was difficult for physicists to reconcile with this counter-intuitive statement, but experiments proved that the statement about existence of superpositions is valid for microscopic systems. It is much harder, almost impossible, to accept that the same might be valid for macroscopic systems. However, linearity of quantum mechanics allows to formally prove that the macroscopically distinct states also may coexist (to be the components of a superposition). This conclusion follows from the analysis of the situation of quantum measurement.



In the situation of measurement, a microscopic system interacts with a macroscopic system, the latter is called a measuring device. As a result of this interaction, some characteristics of the microscopic system's state are reflected in the state of the measuring device. This device, although being macroscopic, consists of microscopic parts (say, of atoms), and therefore quantum laws are applicable to it. Quantum laws, including linearity, may be applied also for describing the compound system including both the measured system and measuring device. This fact allows one to prove that macroscopically distinct states of a macroscopic system may be superposed. Let us show this.

Let the measuring device distinguish two states of the measured system,  $\psi_1$  and  $\psi_2$ , from each other. This means that the initial state  $\Phi_0$  of the device converts into the state  $\Phi_1$  (correspondingly into  $\Phi_2$ ) in case if the measured system is in the state  $\psi_1$  (correspondingly in  $\psi_2$ ). Therefore, the initial state  $\psi_1\Phi_0$  (correspondingly  $\psi_2\Phi_0$ ) of the compound system converts into  $\psi_1\Phi_1$  (correspondingly into  $\psi_2\Phi_2$ ):

$$\psi_1\Phi_0 \rightarrow \psi_1\Phi_1, \quad \psi_2\Phi_0 \rightarrow \psi_2\Phi_2.$$

But now we can immediately come to the final conclusion making use of the linearity of evolution of quantum systems.

Linearity of quantum mechanics includes linear law of time evolution of any closed (isolated from anything else) system. The compound system comprising of the measured system and the measuring device, is (in a very good approximation) closed, and the evolution of this system during the measurement (which is nothing else than interaction of two subsystems) must be linear. Therefore, knowing how each of the two states of this system,  $\psi_1\Phi_0$  and  $\psi_2\Phi_0$ , evolve, we can conclude, simply on the ground of linearity, how their superposition evolves:

$$(c_1\psi_1 + c_2\psi_2)\Phi_0 = c_1\psi_1\Phi_0 + c_2\psi_2\Phi_0 \rightarrow c_1\psi_1\Phi_1 + c_2\psi_2\Phi_2. \quad (1)$$

This is the evolution law for an arbitrary initial state of the measured system, and we see from this law that the macroscopic (compound) system is brought into the state of the superposition after the measurement.



In the right-hand-side of this formula we have a superposition of two states of a macroscopic system (the measured system and the measuring device). The components of this superposition are macroscopically distinct, since the two state of the measuring device,  $\Phi_1$  and  $\Phi_2$ , have to be macroscopically distinct, simply by definition of a measuring device. The conclusion is that a macroscopic system can (and in fact should, at least sometimes) be in the state of a superposition of macroscopically distinct states. *Macroscopically distinct states may coexist.*

## 2.2 What is Everett's interpretation (EI)

Conclusion about coexisting macroscopically distinct states is counter-intuitive, and the physicists tried to avoid this conclusion. This may be made only at the cost of rejecting linearity of quantum mechanics. Thus, *Copenhagen interpretation* (CI) of quantum mechanics has been proposed. According to CI, change of the states of the measured system and measuring device is presented, instead of Eq. (1), by the so-called *state reduction*, or *wave function collapse*:

$$(c_1\psi_1 + c_2\psi_2)\Phi_0 = c_1\psi_1\Phi_0 + c_2\psi_2\Phi_0 \rightarrow \psi_1\Phi_1 \text{ or } \psi_2\Phi_2 \quad (2)$$

with the probabilities correspondingly  $p_1 = |c_1|^2$  and  $p_2 = |c_2|^2$ .

The state reduction contradicts linearity. Therefore, it is accepted in CI that linearity is violated in the situation of quantum measurement when a microscopic system interacts with macroscopic measuring device. The abandonment of the linearity is justified by the formal statement: "any measuring device is classical". This is hardly convincing. Any measuring device is in fact a quantum system, although it has macroscopic number of (quantum) degrees of freedom and therefore may be presented by classical formulas in many situations. But not in the situation of quantum measurement!

Real "practical" justification of CI is that Eq.2 gives correct results in probabilistic calculations. This is why CI is quite appropriate for FAPP (for all practical purposes). But theoretically it is incorrect and has to be replaced with a better interpretation. Such interpretation has been proposed by Everett.

Everett asked himself what could follow if one take quantum mechanics seriously and accept its linearity in all situations. The logical arguments led him to a new interpretation of quantum mechanics which was called Everett's interpretation (EI), or "many-worlds" interpretation. In EI it is accepted that linearity of quantum mechanics is always valid and therefore our (quantum) world may be in the state of superposition of macroscopically distinct (quasi-) classical states:

$$\Psi = \sum_i \Psi_i. \quad (3)$$

In other words, macroscopically distinct classical states of the world may coexist.<sup>2</sup>

Of course, this interpretation is counter-intuitive. First of all, one would like to have an answer to the natural question: why we never observe anything that may be called "superposition of macroscopically distinct states" of the world.

In fact, it is not necessary to answer this question, just as in case of superpositions in micro-world. One only needs to clearly formulate the rules for working with superpositions and to supply the operational interpretation of these rules. Nevertheless, some verbal justification of this counter-intuitive statement seemed to be necessary, and it was given by Bryce DeWitt, one of the first successors of Everett.

DeWitt said that the components  $\Psi_i$  in Eq.3 may be interpreted as various classical worlds ("*Everett's worlds*") which are "equally real" (hence, the name "many-worlds interpretation"), and each observer has his "twins" (or "clones") in all of these worlds. Thus, each observer perceives (through all his "clones") all Everett's worlds but subjectively he has an illusion that only a single Everett's world exists (such is the picture before the eyes of every "clone").

This verbal formulation of EI is in fact misleading because the term "worlds" creates the wrong impression that real physical worlds correspond to the components of the superposition. In many cases this incorrect treating of the Everett's interpretation was used to put forward "damning objections"

against it.<sup>3</sup> It is quite likely that this misunderstanding made especially difficult recognizing EI in the wide community of physicists (although it was immediately recognized by such distinguished physicists as Bryce DeWitt and John Archibald Wheeler).

The present author suggested (Mensky, 2000) an equivalent but more convenient verbal formulation of EI. Let us say that the superposition of the type of Eq.3 describes a state of the quantum world while single counterparts of this superposition are "*classical projections*" of this state. Since these projections are, from classical viewpoint, inconsistent, they may be also called "*alternative classical realities*" or simple "alternatives". All alternatives objectively coexist (but only as projections of a single quantum world, not as separate worlds), but they *are separated in consciousness*. This means that, when an observer subjectively perceive one of the alternatives, he does not perceive the rest of them (they are separated off). As a result, an illusion appears that only a single classical world exists.

Let us remark that in this formulation the EI is similar (but not identical) to what is called "many-minds interpretation" proposed in (Zeh, 1970).<sup>4</sup> We however prefer to make use of the term EI because the difference between CI and EI is the only essential in our context.

### 2.3 What is Extended Everett Concept

At the end of Sect.2.2 we remarked that it is more convenient to formulate EI in a way other than the standard formulation in terms of "Everett's worlds". Now we shall see that this change improves the logical structure of the theory and allows one to do next step, which results in quantum conception of consciousness.

The formulation of EI mentioned at the end of Sect.2.2 reads that all alternative

<sup>2</sup>More precisely, each of these states is of course quantum but close to classical.



<sup>3</sup>Someone wrote that, according to many-worlds interpretation, each measurement leads to enormous energy non-conservation (a single world converts into many worlds). To overcome this type of statements, Max Tegmark had to insistently claim: "What Everett does NOT postulate: At certain magic instances, the world undergoes some sort of metaphysical "split" into two branches that subsequently never interact" (Tegmark, 1998).

<sup>4</sup>I am extremely grateful to my friend Dieter Zeh, many long conversations with whom helped me to understand the essence and necessity of EI. However, I believe that EEC proposed by me much later, has significant advantages over the "many-minds" interpretation.

classical realities (alternatives, for simplicity) do objectively exist, and all of them are perceived by our consciousness, but they are perceived separately from each other, just producing the subjective impression, actually illusion, that only a single alternative exists. For short, *alternatives are separated by consciousness.*

Instead of this, it is accepted in Extended Everett Concept (EEC) that *consciousness is the separation of the alternatives.* This seemingly small reformulation leads to an evident simplification of the logics of the theory. Thus formulated EEC includes a single notion (*consciousness = alternatives' separation*) instead of two primary (i.e. not definable through anything else) notions. Moreover, this single notion can now be enlightened from two qualitatively different viewpoints: from the side of psychology and from the side of quantum mechanics.

**Remark 1.** *One may object that the notion “consciousness” is not primary, it can be defined through other notions. Moreover, it has been defined by various authors in many different ways. However, this is valid only in respect of the term “consciousness” if this term is understood in a broad sense, as the whole scope of mental processes that could happen in conscious state of mind. In the framework of EEC (and everywhere in the present paper) we make use of the term “consciousness” in the very narrow sense which concerns only the difference between “being conscious” and “being unconscious” of something. Just in this meaning the term “consciousness” has been introduced in quantum mechanics (usually in the word combination “consciousness of an observer”), and just this notion of consciousness is in fact primary, it cannot be defined through anything else (some attempts to do this include in fact logical circles).*

Thus, identifying the notion (or phenomenon) of consciousness with the notion “separation of alternatives” simplifies logical structure of the theory. The most important however are conclusions which follow if this reformulation is accepted (Mensky, 2000; 2005; 2007a; 2007b; 2010; 2011).

The main conclusion is almost evident. If consciousness is nothing else than the

separation of the alternatives, then in the state of *consciousness being turned off* (in sleep, trance or meditation), there is no separation of the alternatives, all of them are somehow accessed as a whole, without separating them from each other. This means that in this state of mind one obtains *access to the complete state of the quantum world* ( $\Psi = \Psi_1 + \Psi_2 + \dots$ ) as a whole, not to each of the superposed components (classical alternatives,  $\Psi_i$ ) separately. Particularly, the alternatives may (somehow) be compared with each other, if one is in this state of mind.

The next conclusion is that the complete state  $\Psi$  of *the quantum world is accessed at every time moment* (in the future as well as in the present or past). In fact, the evolution of the complete quantum state is presented by the evolution operator (equivalently, by Schrödinger equation) which is revertible, so that knowing this state in any time  $\Psi(t_0)$  means knowing the same state  $\Psi(t)$  at any other time.

Thus, EEC leads to the conclusion that, in special states of mind (characterized by turning off or at least weakening consciousness), one has access (in a form which in principle cannot be specified) to all possible classical realities at every moment of time. Access to this enormous “database” allows one to compare various classical realities, particularly by their future consequences. Bringing a certain part of this information back to the usual (conscious) state of mind, one can make much better decisions (based in fact on the direct vision of truth). Moreover, access to the quantum world as a whole enables one to manage his “subjective reality” (to influence on what of the possible alternatives will be subjectively perceived by him in the future).

The ability described in this way may be called *super-consciousness*. Therefore, when consciousness is turned off, one discovers at its place not nothing (as could probably be expected), but even more powerful instrument called super-consciousness. The fact that this unusual ability appears in the state of being unconscious, is evidently associated with the Jung's concept of *collective unconscious* as well as with the well-known fact that adepts of oriental psychic practices manage to achieve “super-natural” abilities in



the states of the type of trance or meditation (when consciousness is weakened).

It is important to remark that the state of mind which leads to the appearance of super-consciousness arises not only in case of complete (or almost complete) turning off the consciousness, but even in case of *diverting attention from a certain subject*. Then super-consciousness can achieve some “super-information” just about this subject.

### 2.4 Does EEC go beyond quantum mechanics?

Everett's interpretation (EI) of quantum mechanics differs from the commonly accepted Copenhagen interpretation (CI) in that coexistence of different classical realities is assumed (Sect.2.2). The crucial point leading from EI to Extended Everett Concept (EEC) is the definition of consciousness as the phenomenon identical to the separation of alternative classical realities (Sect.2.3). An important question is whether all these approaches may be considered as belonging to quantum mechanics or some of them go beyond quantum mechanics. This is important because the natural conservatism of physicists doing for them almost obligatory to remain in the framework of the traditional (and of course materialistic) science, avoiding purely “philosophical” arguments.

Transition CI → EI does not go out of the sphere of quantum physics, although it generalizes the conventional quantum rules in one respect: macroscopically distinct states may be superposed (may coexist). But the transition EI → EEC seemingly does go out of quantum physics, since this transition introduces into the theory the notion of *consciousness*, characteristic for psychology and philosophy (as well as even more exotic notion of *super-consciousness*).

Is this suspicion justified? Is EEC actually outside quantum physics? This important question will be discussed in more detail elsewhere, but now we shall comment on it very briefly.

### Quantum Coherence and Microcosm

Consider a state of brain (or, more precisely, of some structure in the brain which can be called the carrier of consciousness). This state somehow reflects the state of the rest of the

world (including the part of the body besides the brain as well as the bodies of other people). For simplicity we shall speak of brain and the rest of the world. Taking into account the quantum character of both systems and making use of EI (Sect.2.2), the reflection of the outer world in the brain may be presented as follows:

$$\Psi = \sum_i \Psi_i \left( \begin{array}{l} \text{quantum world and} \\ \text{its "classical projections"} \end{array} \right),$$

$$\Psi_i = c_i \psi_i \Phi_i \left( \begin{array}{l} \text{states of the brain } F_i \text{ and} \\ \text{of the outer world } y_i \text{ correlated} \end{array} \right).$$

These formulas do not go beyond physics, but there is one unusual feature in them: the state of the whole world  $\Psi$  is included into consideration along with states of restricted physical systems. This is practiced in quantum cosmology, but is not typical for quantum mechanics. However, this is necessary for our goals.

According to EEC, consciousness is defined as the ability to perceive “classical alternatives” separately from each other. This may be associated with the decoherence of each of the subsystems, the brain and the outer world. The density matrices of these subsystems are

$$R = \sum_i |c_i|^2 |\Phi_i\rangle\langle\Phi_i| \text{ (the brain),}$$

$$\rho = \sum_i |c_i|^2 |\psi_i\rangle\langle\psi_i| \text{ (the rest of the world).}$$

In these formulas the alternatives (enumerated by  $i$ ) are separated from each other in the sense that they are not in the superposition, but in mixture. Mixture is formally quantum, but essentially classical operation, so that the alternatives in each of the subsystems are classical (not quantum as they are in respect to the whole world).

The interpretation of these formulas is evident. Decoherence and the resulting mixed state correspond to the action of consciousness, since consciousness is defined in EEC as separation of the alternatives (the alternatives are separated in the mixed state). But is there anything in the preceding formulas that may be interpreted as super-consciousness?

The evident candidate is the vector  $\Psi$  since the alternatives are not separated in it. To be more precise, this vector presents an



object with which super-consciousness works. Super-consciousness deals with the whole quantum world and therefore with the wholeness of all its classical projections  $\{\Psi_i | \forall i\}$ .

The operations performed by super-consciousness over this object are connected with *the notion of subjectivity* and will be discussed elsewhere. However, one of these operations may be described as postcorrection (Mensky, 2007b; Mensky, 2011). We shall return to this operation in Sect.4.

An important conclusion following from this brief discussion is that the concepts of consciousness and super-consciousness, although they seem to go beyond physics and even to be non-materialistic (making use the notions from the sphere of psychic), in fact may be described in terms of quantum physics. However, the necessary for this must be inclusion in the consideration not only of restricted physical systems, but also of the whole world as one of the systems.

The latter circumstance is very important. While the consideration of restricted systems always leads to decoherence, the description of the whole world has to be absolutely coherent. This brings a new quality, a fundamental inseparability of the observer and the rest of the world. In philosophical view, this corresponds to the notion of *microcosm*: "I am the whole world".

Remark that the state vector  $\Psi$  of the whole world may be analyzed in respect to its reflection in the brain of any concrete person, but this vector itself is the same in all these variants of the analysis. This demonstrates the relations between individual consciousness of the given person and objectiveness of the quantum world and of its reflections in various brains.

### **Life Principle**

We have seen that the subject, over which super-consciousness works, may be interpreted in terms of quantum mechanics, provided that the whole world is considered as a physical system which is not subject to decoherence. In this way actual infinity essentially enters the theory. However, the question remains about super-consciousness itself and the action of super-consciousness. It

seems that these notions cannot belong to quantum mechanics. Is it right?

In a sense, yes. However, even these notions may be treated as quantum-mechanical ones, but of course not in the context of usual, routine, quantum-mechanical problems. The action of super-consciousness may be described on the basis of the so-called *life principle* as it is defined in (Mensky, 2010). This definition is formulated in terms of quantum mechanics.

To approach the notion of life principle, let us remark that the concept of consciousness may be (and should be) generalized in order to apply it not only to humans but to every living being. In this case it is of course cannot be called consciousness. In this more general case the corresponding notion must be understood as the way in which a living being reflects the quantum world. The principle is of course the same as for humans: the quantum world is perceived in such a way that its classical projections are perceived separately from each other (this is necessary for overcoming quantum non-locality, so that a strategy for survival could exist).

The question about super-consciousness has also to be considered not only in case of humans, but also in case of primitive living beings. Again, in the latter case this cannot be called super-consciousness. Instead, we may talk of the analysis of the alternative classical realities and the choice of those which are favorable.

The question about the choice of the favorable alternatives (for humans as well as for any other living being) is better formulated in terms of the *Everett's scenarios*. All alternatives in all times forms a field, across which any living being may travel during its life (some of the available alternatives is chosen for each time moment). The chain of alternatives, one (or several) for each time moment, is an Everett's scenario. Some of these scenarios are favorable for life, the other are not favorable. The principle of life is defined as *the set of all favorable scenarios*. In a sense, this is a *definition of life* (Mensky, 2010). Life principle in this formulation may be considered as a generalization of the well-known anthropic principle.

Of course, the classification of scenarios as favorable or unfavorable depends



on the criterion of preference, and the criteria may be different. The most general is the criterion of survival, and the set of all scenarios satisfying this criterion is what can be called life in the most general sense. More strict criteria correspond to the specified qualities of life. Transition to more and more strict criteria is nothing else than *the evolution of life*, or evolution of species.

All these notions need of course more thorough elaboration. Our task now is only to supply a brief overview of the main directions along which these notions may be defined. But even from this overview one may see that these complicated notions may in principle be considered in the framework of quantum physics provided that the Everett's interpretation (EI) be applied. Extended Everett Concept (EEC) shows how EI may be further developed to make direct contact with those branches of knowledge which are conventionally considered as non-materialistic.

### 3. How synchronicities can be explained

In this section we, taking as a background the conclusions derived from Extended Everett Concept (EEC), will show how the phenomenon of synchronicity may appear.

The main conclusions from EEC are following (Sect.2.3). If consciousness is turned off (or even only diverted from some subject), the following special abilities of mind (called super-sonsciousness) may appear:

- access to all (or at least many) alternative classical realities in all (or many) moments of time including future time, with the capability of analysis of these alternatives according to appropriate (chosen by consciousness) criteria and attributes;
- ability to enlarge probability of subjectively perceiving in future ("subjective probability") those alternatives which are favorable (satisfy given criteria).

In Sect.3.2 we shall additionally discuss some details of EEC and status of the derivation of synchronicities from EEC. However, we shall start in Sect.3.1 with the arguments based on these two conclusions from EEC.

### 3.1 Why synchronicities may be experienced

Somewhat simplifying, one may claim that, according to EEC, all alternative classical realities which are feasible, are actually realized in our quantum world, but an observer (*i.e.*, any of us) can in principle influence on what of these classical realities he/she will subjectively perceive. More precisely, given objective probabilities of various alternatives, one may increase subjective probabilities (*i.e.*, probabilities to subjectively perceive) for those alternatives that are to be in some sense or another advantageous for him/her.

Of course, not all people possess this ability on significant level, and even if possessing this ability, they not always can efficiently apply it. Usually for efficient influencing his/her subjective reality, one has, first, to have very strong motivation for a certain variant of reality and, second, to actually and deeply believe that strong desire may in fact influence his/her subjective experience. However, people may have minor or larger level of this ability, which are either given by birth or obtained with the help of special training.

Taking this into account, it is almost clear that, according to EEC, an observer whose attention is concentrated on some idea, may (even not being aware of this) initiate appearance in his/her subjective reality of the images, which are connected in some way or another with this idea. As a result, a synchronicity may appear before him/her in the form of various images or hints which may differ in every respect, but all are connected with the given idea.

Let us construct a possible course of events leading to the synchronicity with the image of fish.

Consider a person (call him the observer), his thoughts or feelings, as well as the events he observes. Let his mind be busy, for some reason or another, with the image or idea of fish. In case of Jung, he thought over the idea of fish as a very important subject, an archetype. But in the every-day situation our observer might be simply delighted by a dish from fish eaten during his breakfast. We shall consider this version.

If the person is impressionable in respect to his food and if the dish eaten during



the breakfast really struck him by being especially tasty, then, even without being aware of this, he could in fact get involved in (subconscious) emotional recollection of other occasions of eating tasty fish. He may also imagine possible future occasions of tasty fish. This is enough reason for various images of the well prepared fish appearing before his imagination.

Simultaneously other associative connections may activate in his brain the records concerning various notions and events that include the idea of fish.

This leads to formation, without awareness of the person, some query based on the idea of fish. When consciousness of the observer is disconnected from the image of fish, his super-consciousness starts to work, analyzing the quantum world (*i.e.*, all alternative realities in all time moments) along the lines of the query centered around the idea of fish. As a result of this analysis, the alternatives (present and future) connected with the idea of fish are somehow distinguished. Thus, according to the first point of the above-mentioned abilities of super-consciousness, it performs the analysis of the alternatives from the viewpoint of the query of "idea of fish".

Now comes the second of the above-mentioned abilities of super-consciousness, the capability to influence the observer's subjective probabilities ascribed to various alternatives in the future. The criterion of being somehow connected with the idea of fish is at the moment imperative. Therefore, subjective probabilities of those alternative realities which include fish in one way or another, become large (even if these alternatives, although feasible, objectively have negligible probabilities). Therefore, with significant probability the observer will subjectively perceive in close future one of these alternative realities. Unexpectedly for himself he will see some event which again is connected with fish.

Thus, super-consciousness provided that the observer perceived one of the alternatives which contain in some way or another the idea that has been emotionally important for the observer beforehand, namely, the idea of fish.

For example, it is quite probable (according to EEC) that, after forgetting the

emotional feelings connected with the breakfast, the observer will unexpectedly hear that someone mention the biblical miracle of the five loaves and two fish. He will be then a little been astonished by the coincidence, and the idea of fish will return into his mind and become even more alive than it was previously.

When his consciousness will again be diverted from the idea of fish, super-consciousness will again do its work, and the observer will suddenly be struck by the sight of enormous fish his neighbor brought from somewhere (in all other alternative realities the neighbor brings no fish in this day, but the specific variant of reality with a big fish was chosen by the super-consciousness of the observer). And so on. The reader can prolong the chain of the events of fish-synchronicities.

### **3.2 The weird theory for explaining the weird phenomenon**

The very specific circumstance arising in case of a synchronicity is that the events forming this phenomenon are connected not by something material (matter, force, energy etc.) but by some idea, image or even a word (for example the idea of fish or the word "fish"). Such a series of events has nothing material as its common cause.

Vice versa, the origin of such a phenomenon belongs to the spiritual (ideal) sphere because human consciousness is closely connected with ideas, images and words. According to the conventional viewpoint, consciousness plays purely passive role in respect to reality (it reflects reality but not influence on it). According to this point of view, consciousness cannot manage reality.<sup>5</sup> This is why it seems that the phenomenon of synchronicities contradicts to natural sciences and cannot be explained in the framework of them.

However, quantum mechanics, although it is one of the natural sciences, essentially differs from classical areas of science. Quantum mechanics has conceptual problems (meets with paradoxes) that cannot be considered already solved, and these problems are connected with the notion of

<sup>5</sup>We do not consider a trivial situation when consciousness gives rise to some actions of the person who finally influences on the reality. In the phenomenon of synchronicities, reality is influenced by consciousness itself rather than by real actions which in turn are motivated by the consciousness.



reality. This is why quantum mechanics is often qualified as a weird theory, and this is why this theory (with the addition of an appropriate interpretation of it) can explain the weird phenomenon of synchronicities.

According to EI and especially EEC, the notion of reality is much more complicated than in classical physics and even in Copenhagen interpretation of quantum mechanics. First, in EI (and in EEC) quantum reality is presented by the set of different classical realities. Second, in EEC the subjectively perceived classical reality can be chosen (more precisely, the probabilities of perceiving various classical realities can be modified) in the course of interrelation between consciousness and super-consciousness ("the unconscious").

In this sense, in EEC consciousness may play active role in the choice of (subjective) reality. This is why in this theory (or in a theory of this type) the phenomenon of synchronicity finds a quite natural explanation.

An amazing illustration of the active role of consciousness in EEC is possibility of what is called *probabilistic miracles* (the events that are characterized by very small objective probabilities but nevertheless are subjectively observed because of increasing, due to super-consciousness, their subjective probabilities). The phenomenon of synchronicities is in fact a particular case of probabilistic miracles.

EEC demonstrates that there is no contradiction between the phenomenon of synchronicities and natural sciences. This theory shows that quantum theory, which is a necessary part of natural sciences, after its quite natural logical extension, can explain the strange phenomenon of synchronicities as well as some other phenomena traditionally treated as mystical (Mensky, 2010).

At the first glance this means that EEC, as well as the explanation of synchronicities in the framework of EEC, is going beyond materialism. However, this is valid only if materialism is understood too narrowly, as vulgar materialism. From a more general point of view, EEC is materialistic conception. The issues which resemble idealistic notions, first of all the phenomenon of consciousness, appear in this conception due to one of its peculiar features: the whole world is treated as

one of physical systems satisfying the quantum laws (contrary to the usual practice of natural sciences to consider only restricted systems).

#### 4. Mathematical scheme for describing synchronicities

The considerations outlined in Sect.3 may be illustrated with the help of mathematical formulas characteristic for quantum mechanics. For this aim we shall use the simplest mathematical instruments proposed in the preceding papers, namely *postcorrection* (Mensky, 2007b) and *preference projector* (Mensky, 2011). Of course, usage of simple mathematical formulas for very complicated psychic processes cannot take account of many details, but it supplies an additional illustration for the principal features of the phenomenon of synchronicity and underlines the connection of it with important notions in quantum mechanics.

##### 4.1 Formulas for preferences and postcorrection

The preferences used by super-consciousness may be mathematically described (Mensky, 2011) by a projecting operator (projector) acting in the state of spaces of the world. This operator projects the whole space onto the subspace of those states which are preferable (in respect to the criteria chosen by consciousness).

Denote by  $P$  the projector on the states which are preferred. Then for any state  $\Psi$  of the world (which is a superposition of many classical alternatives) the state  $P\Psi$  contains only preferred alternatives. Let the state of the world at the moment of time  $t=0$  is  $\Psi(0)$ . Then the state at the time moment  $t$  is equal

$$\Psi(t) = U_t \Psi(0)$$

where  $U_t$  is a (unitary linear) evolution operator (the evolution of the whole world is meant). Then the action of super-consciousness, or managing subjective reality, can be described as follows.

At the moment  $t=0$ , when the world is in the state  $\Psi(0)$ , consciousness chooses a criterion of preferred states and composes such a query for super-consciousness which is based on this criterion. This query is expressed by the *preference operator*  $P$  which projects on the preferred states of the world.



Then super-consciousness looks for those states of the world which correspond to the preference (i.e. do not vanish under the action of the projector  $P$ ). Let in time  $t$  the state of the world satisfies this criterion. Super-consciousness makes use of this information to change the state of the world  $\Psi(o)$  with the help of the operator of postcorrection<sup>6</sup>  $P_t = U_t^{-1} \cdot P \cdot U_t$ :

$$\Psi'(o) = P_t \Psi(o) = U_t^{-1} \cdot P \cdot U_t \Psi(o).$$

The process of postcorrection is now finished. In the resulting state of the world  $\Psi'(o)$  only those alternatives are present which guarantee realizing favorable alternatives at time  $t$ . Indeed, evolution of the state  $\Psi'(o)$  during time interval  $[0, t]$  is described by the evolution operator  $U_t$ , and therefore the state of the world at time  $t$  is

$$U_t \Psi'(o) = P U_t \Psi(o).$$

This state is already projected onto the preferred subspace, hence it contains only favorable alternatives.

#### 4.2 Formulas for a synchronicity

Let us show how this procedure may produce a synchronicity. Consider for example events associated somehow with the given word or idea. We shall make use of the formalism of bra- and ket-vectors, because this formalism is convenient for explicit formation of the preference projector.

Denote the word which the observer is interested in, by  $a$  (this may be, for example, the word “fish”, then  $a = \text{“fish”}$ ). Let this word correspond to the state of brain  $|\chi_a\rangle$ . This means that if the observer thinks at the moment  $t_0$  about this word (or the corresponding image is in his head), the world at this moment is in the state

$$|\Psi(o)\rangle = |\chi_a\rangle \cdot |\Psi'(o)\rangle$$

(the two factor comprising this vector present correspondingly the brain of the observer and the rest of the world).

In future world, evolving according to the natural laws, may again occur in a state

which is associated in the observer's head with the word  $a$  (of course, the probability of this may be minor, but it is non-zero). If/when this happens, the state vector of the world will again include a factor  $|\chi_a\rangle$ . There are a number of states of this form, say

$$\begin{aligned} |\Psi_1\rangle &= |\chi_a\rangle \cdot |\Psi'_1\rangle, \quad |\Psi_2\rangle = |\chi_a\rangle \cdot |\Psi'_2\rangle, \quad \dots \\ |\Psi_n\rangle &= |\chi_a\rangle \cdot |\Psi'_n\rangle. \end{aligned}$$

It is evident that in our case the projector expressing the preferences (choosing the states associated with the word  $a$ ) is

$$P_a = |\chi_a\rangle \langle \chi_a|.$$

If the idea of the word  $a$  attracted (by some reason or another) attention of the observer, his consciousness may form the corresponding query to super-consciousness, and this query will be expressed by the projector  $P_a$ . If then consciousness retreats from the idea of the word  $a$ , super-consciousness begins to work with this idea, making use of the projector  $P_a$ .

Having access to every alternative reality at every time moment, super-consciousness may analyze the corresponding state vectors of the world. Since at the moment  $t=0$  the word  $a$  was in the head of the observer (and for some reason or another his attention was strongly attracted to the idea connected with this word), then, after consciousness is turned off, super-consciousness may search for the alternatives connected with this word.

Let at time  $t$  the state of the world become

$$|\Psi(t)\rangle = U_t |\Psi(o)\rangle = |\chi_a\rangle \cdot |\Psi'(t)\rangle + |\Psi''(t)\rangle.$$

The action of the projector  $P_a$  on such a state gives non-zero vector, therefore the state of the world at time  $t$  satisfies the criterion of preferences. Then, forming the operator of postcorrection  $[U_t]^{-1} \cdot |\chi_a\rangle \langle \chi_a| \cdot U_t$  and applying this operator to the present (at the moment  $t=0$ ) state of the world, super-consciousness projects this state in the following way:

$$|\Psi'(o)\rangle = [U_t]^{-1} \cdot |\chi_a\rangle \langle \chi_a| \cdot U_t |\Psi(o)\rangle.$$

Now the action of super-consciousness (expressed by the operation of postcorrection) is over. In the initial state of the quantum world those alternatives which lead to the preferred state in the future, are selected. Indeed, due to the time evolution of the

<sup>6</sup>Remark that projecting of the state of the world does not change this state arbitrarily but only selects preferred alternatives from all alternatives consisting this state. Moreover, this projecting does not change the objectively existing state of the world, but selects the subjectively perceived alternatives.



subjectively chosen state  $|\Psi'(o)\rangle$ , the state of the world at the moment  $t$  will become

$$U_t \cdot |\Psi'(o)\rangle = |\chi_a\rangle \langle \chi_a| \cdot |\Psi(t)\rangle = |\chi_a\rangle \cdot |\Psi'(t)\rangle$$

so that the event  $\Psi'(t)$  associated with the world  $a$  will happen (more precisely, will be subjectively perceived by the given observer).

We have shown therefore how the action of the preference operator and postcorrection operator can mathematically present the action of super-consciousness, described earlier in a purely verbal way.

## 5. Concluding remarks

We showed that the phenomenon of synchronicities, first described by Carl Jung, can be naturally explained in the framework of quantum mechanics, more concretely - in the so-called Extended Everett Concept suggested by the author. The explanation of this unusual phenomenon is especially hard since the events forming a synchronicity look as if they are caused by an idea in the head of the observer rather than by anything material.

This special nature of the phenomenon hints that a theory that could explain it, cannot be purely materialistic. This is why this phenomenon was often commented by philosophers and psychologists. However, this seems insufficient because natural sciences pretend to explaining everything that is observed. From the very beginning Carl Jung tried, in collaboration with Wolfgang Pauli, to explain synchronicities on the basis of quantum physics. Attempts to look the solution of the problem in this direction are continuing up to now. To the best of my knowledge, such attempts are restricted by the analysis of possible quantum phenomena in brain. This also seems insufficient because the phenomenon of a synchronicity includes events occurring somewhere outside the observer's body but look as if they are caused by the state of his/her brain.

The version of quantum mechanics which is called EEC is appropriate for the explanation of synchronicities because one of

the conclusions following from this theory is that an observer can influence on the "subjective reality", choosing (from all parallelly existing alternative classical realities) the variant of reality he/she prefers to perceive in his/her subjective experience. Thus, synchronicities are explained by a materialistic theory (quantum mechanics)? This is not evident because EEC explicitly includes the notion (or phenomenon) of consciousness which traditionally is regarded as belonging to spiritual sphere.

We argued nevertheless (Sect.2.4) that Everett's form of quantum mechanics and EEC are materialistic theories provided that we understand broadly enough what is materialism. The following features of EEC, essential for the explaining synchronicities, do not contradict, to our mind, to the materialistic character of the theory: i) not only restricted systems, but also the whole world may be considered as one of the quantum systems (this is accepted for example in quantum cosmology), and ii) the choice of the subjective reality is described as a certain set of "Everett's scenarios" which realizes "life principle".

The above mentioned features of EEC, as well as the concept of "parallel realities" accepted in EI, which allowed to explain synchronicities, go beyond the scope of quantum phenomena in brain. The whole world has to be considered as a quantum system, with the brain as a subsystem and without violation of quantum coherence. Contrary to this, more routine ways of consideration of quantum phenomena in brain (which is a restricted system) seem to be insufficient for explaining synchronicities.

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