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Articles

Synchronicity: An Unfinished Journey

Alessandro Sergi ^{1,2*}, Concetto Mario Giorgianni ³, Maria Laura Giacobello ⁴, Gabriella Martino ⁵

Abstract

Jung and Pauli found a link between the psyche and quantum mechanics by formulating the idea of Synchronicity. Synchronicity provides a conceptual acausal framework for both meaningful coincidences of life and random physical events of the quantum world. These two geniuses also tried to generalize Synchronicity to become the organizing principle of matter and psyche. Their work could not be completed because of growing disagreement between them. In this work, we briefly retrace the genesis of synchronicity and discuss the concepts that precede it. Upon considering the quantum-classical nature of the physical world and the wave function's collapse of quantum mechanics, we conjecture that a further extension of the meaning of Synchronicity is given as an acausal organizing principle of quantum-classical phenomena. Additional analysis is required to validate this conjecture.

¹ Department of Mathematics, Computer Science, Physics and Earth Science, University of Messina, Italy

² Institute of Systems Science, Durban University of Technology, Durban, South Africa

³ Department of Biomedical, Dental and Morphological and Functional Imaging, University of Messina, Messina, Italy

⁴ Department of Ancient and Modern Civilizations, University of Messina, Messina, Italy

⁵ Department of Clinical and Experimental Medicine, University of Messina, Messina, Italy

E-mail corresponding author: asergi@unime.it



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1. Introduction

Much has been written on the interaction between Jung and Pauli and Synchronicity. Surely, this is a topic of undying fascination for at least two reasons. First, Jung and Pauli's work was not completed. Secondly, both Archetypes (Jung, 1981, 2003) and quantum mechanics (Ballentine, 2001; Pauli, 1980; share, because of different motivations, a halo of mystery. The

idea of Synchronicity involves many areas of knowledge. Of course, among these, there is Clinical Psychology (Di Giuseppe et al., 2024; Di Giuseppe & Lingiardi, 2023; Castonguay et al., 2021; Lo Coco, 2018; Epifanio et al., 2018; Myles & Johnson, 2023) and Quantum Physics (Ballentine, 2001; Griffiths, 1995; Pauli, 1980; Stapp, 1972; Weinberg, 2013).

One of the objectives of this paper is to investigate possible ordering principles of reality. Reality is a rather ambiguous word. For example, hard sciences must first objectify the world through its quantification before beginning any investigation (Schrödinger, 2012). Heidegger pondered the question of this form of thought (Heidegger, 1968, 1977). The psyche is the fundamental condition for perceiving the world as an object. Generally, Western culture does not acknowledge this truth as it should be, except for rare exceptions. Hard sciences bring with them the threat of reducing human thought only to calculating thought (Haidegger, 1968, 1977). The objectification of the external world risks canceling soul, quality, feeling, and emotions, finally resulting in the dehumanization of man (Boyle, 2000; Hoyland, 1945). However, the intrinsically probabilistic nature of atomic dynamics requires a paradigm change in our worldview. Where classical mechanics constrains reality with the unbreakable chains of determinism, Quantum Mechanics (Griffiths, 1995; Pauli, 1980; Weinberg, 2013) introduces a certain degree of freedom and surprises (Smolin, 2014). Quantum Mechanics uses probabilistic laws to describe a random world (Ballentine, 2001; Griffiths, 1995; Pauli, 1980; Stapp, 1972; Weinberg, 2013). While single events are completely random, the possibility of doing science in a random world arises because collections of events taking place under identical conditions exhibit statistical distributions with symmetries. The theory of Quantum Mechanics allows scientists to calculate the probability describing those statistical distributions (Ballentine, 2001; Griffiths, 1995; Pauli, 1980; Stapp, 1972; Weinberg, 2013). Although the psyche and quantum material reality cannot be reduced to each other, they can be in harmony much like Leibniz monads (Cambay, 2005; Leftow, 1989; O’Leary-Hawthorne & Cover, 2008). Jung’s concept of Synchronicity (Jung, 1993) was heavily influenced by Leibniz (Cambay, 2005; Leftow, 1989; O’Leary-Hawthorne & Cover, 2008) and Schopenhauer's ideas (Beebe, 2005; Cambay, 2005). Hence, following the Hermetic principle “as above, so below” (Atkinson, 1908), the psyche in the world ‘above’ can be synchronous with the atoms in the world ‘below’, realizing the sacred ‘coniunctionis’ of the Unus Mundus (Jung, 1976).

Hard sciences reduce the complexity of reality to those symbolic structures that can be measured and put about numbers. The thoughts presented here might favor the integration of humanities and natural sciences (Giacobello, 2012, 2020, 2021; Giordano, 2021; Guenon, 1953).

The paper has the following plan. In Sec. 2 we give an intuitive and sketchy picture of the basic features of Quantum Mechanics. In Sec. 3 we discuss Jung's Archetypes and Synchronicity. In Sec. 4 we write about Jung and Pauli's meeting and how Pauli's ideas influenced Jung. In Sec. 5 we write about their collaboration aiming at the generalization of Synchronicity. Finally, in Sec. 6 we present our conclusions.

2. Quantum Mechanics

Quantum Theory describes microscopic matter using probabilistic laws (Ballentine, 2001; Griffiths, 1995; Pauli, 1980; Stapp, 1972; Weinberg, 2013). Probability had already become the object of physical laws before the formulation of quantum mechanics through the work of Boltzmann, Maxwell, and Gibbs (Callen, 1991; Huang, 1987). Quantum Theory assigns a complex function called wave function to every dynamical system. The wave function is defined in a mathematical space that, *e.g.*, in a condensed matter system is specified by the positions of the molecules. Hence, the wave function is different from waves occurring in physical space as it happens, *e.g.*, for electromagnetic waves. The modulus square of the wave function only determines the probability that dynamical variables assume well-defined values. At the same time, the Schrödinger equation determines the wave function's dynamics, generally producing an oscillating behavior. Wave functions associated with independent events can be superimposed, providing the appearance of terms in the probability distribution absent in classical calculations. Such "interference terms" recall the interference of physical waves. Moreover, whenever stationary wave functions are confined to a limited region of their domain of definition, physical variables only assume discrete values (Ballentine, 2001; Griffiths, 1995; Pauli, 1980; Stapp, 1972; Weinberg, 2013).

Entanglement is a peculiar feature of the quantum world (Aczel, 2004; Jaeger, 2009). It describes a high correlation level in measuring results over an ensemble of particles. The correlation would also be present in a classical ensemble of particles but could never reach the level observed in a quantum ensemble. Entanglement implies a form of non-local synchronization between far-away parts of the same ensemble of particles (Aczel, 2004; Jaeger, 2009). Quantum Synchronization (or Quantum Coherence) of large numbers of particles can explain both superfluidity (Legget, 2011) and Superconductivity (Altland & Simmons, 2010). Quantum Synchronization (also termed quantum coherence) does not have a mechanical origin. It is substantially acausal and follows the probabilistic laws of Quantum Mechanics. Synchronization can occur at any temperature, but its probability is extremely high when systems are close to absolute zero temperature (Callen, 1991; Huang, 1987). Notably, the Synchronization of statistical systems cannot be explained by Classical Mechanics.

Novel approaches attempt to describe brain functions using quantum synchronization (Ballentine, 2001; Sergi et al., 2023a). Synchronized Waves have a time-constant phase difference. Since electroencephalograms routinely observe brain waves (Nunez & Srinivasan, 2006), quantum coherence might be key in brain studies (Ballentine, 2001; Sergi et al., 2023b).

3. Jung's Archetypes

Jung identified Archetypes (Jung, 1981, 2003) as the foundation of a particular psychological structure, common to all humankind, called the Collective Unconscious (Jung, 1981). Archetypes are “forms”, expressions of the psyche organized as constellations of symbols (Jung, 1981, 2003). Archetypes manifest as similar ideas across ages and cultures. The intrinsic characteristic of Jungian Archetypes is their dual structure (Guenon, 2001, 2004; Jung, 1976; Low, 2015; Scholem, 1965).

A materialistic intellect would like to find a solid explanation of Archetypes using the usual categories of hard sciences. The species *Homo Sapiens* displays a well-defined brain physiology (Bear et al., 2020), which is expected to have been conserved throughout evolution. Despite neuroplasticity (Bear et al., 2020; Costandi, 2013; Kandel et al., 2000), brain physiology (Bear et al., 2020; Costandi, 2013; Kandel et al., 2000) could constrain the formulation of ideas to belong to specific constellations. From a materialistic perspective, the Psyche is a ‘product’ of brain functioning. Hence, if brain physiology (Bear et al., 2020; Costandi, 2013; Kandel et al., 2000) is relatively conserved and ideas are constrained, then the Psyche must have certain *a priori* preserved forms. Such a priori forms would constitute Jung's Archetypes. Upon defining the domain of existence of Archetypes as the “Collective Unconscious”, Percival provided a materialistic explanation for Jung's theses (Percival, 1993). By analogy, keeping in no consideration their specific manufacturing, one could consider all clarinets in the world. The instruments' sounds would be remarkably similar, nevertheless. The conceptual repository of these sounds would be analogous to Jung's Collective Unconscious.

4. The meeting of two geniuses

Wolfgang Pauli was one of the second-generation architects of Quantum Mechanics: the genius behind the prediction of the neutrino and the discoverer of the Exclusion Principle bearing his name (Pauli, 1980). The very existence of the universe as we know rests on the validity of this principle. To clarify, the Exclusion Principle must be obeyed by electrons, protons, and neutrons (*e.g.*, all matter particles and their odd-number combinations) otherwise the universe would only be an unstructured particle 'soup' without any structure.

However, Pauli's life was painful. His mother had committed suicide. After his mother's death, his father caused Pauli pain. The woman his father had married had turned out to be very unpleasant and Pauli had nicknamed her "The Wicked Stepmother". Pauli's marriage had also foundered amidst his wife's various betrayals. Thus, the world-famous scientist let his dark side loose at night. Trying not to get lost in the *Tartarus* of his painful mind and the vices it led him to, Pauli contacted Jung who entrusted him to one of his collaborators for a long psychotherapeutic treatment. Pauli's dreams were particularly rich in symbols and mathematical/geometric motifs. In these, Jung found the expression of the Archetypes he had invented (Jung, 1987). Indeed, "Psychology and Alchemy" (Jung, 1968) contains many of Pauli's dreams (Halpern, 2020).

Jung and Pauli soon recognized their respective genius and decided to collaborate to find a regulating principle for psychological and physical phenomena (Pauli, 1980). Pauli interpreted quantum events using the idea of Statistical Causality (Pauli, 1980). Causation is still valid; however, a random flavor is added to the laws of Nature (Jung & Pauli, 1955) by establishing that different effects can follow equal causes according to predictable probabilities (Ballentine, 2001; Griffiths, 1995; Pauli, 1980; Stapp, 1972; Weinberg, 2013). Pauli's perspective on natural phenomena fostered the interaction with Jung. Pauli made Jung appreciate Quantum Mechanics as a theory of 'forms', *i.e.*, wave amplitudes dictating the symmetries of the probability distributions of events. In classical mechanics, causation requires time-retarded propagation of physical signals (these are transported by quantities such as energy, momentum, angular momentum, and so on). Instead, Statistical Causality allows for the existence of non-local correlations. These latter are not founded on the propagation of physical variables and, as such, are acausal (Atmanspacher & Fuchs, 2014; Lindorff, 2009; Jung, 1993; Meier, 2014). Such non-local correlations can also exist when the system is spread out in regions so distant that no physical interaction can explain them while respecting Special Relativity. Instead, they can be interpreted upon introducing the concept of quantum entanglement (Aczel, 2004; Jaeger, 2009). Quantum correlations also manifest whenever synchronous molecular motion appears. For example, in a superfluid system, there is a non-zero probability (which grows as one lowers the temperature until a critical temperature is reached where this probability becomes one) that each molecule starts to dance in synchrony with the others. Such synchronization can only be explained in terms of Statistical Causality.

Statistical Causality is by no means limited to Quantum Mechanics. For example, one can consider a collection of classical atoms at room temperatures enclosed in a box with constant volume. Because of interactions, atomic motion is correlated. Correlations keep track of many possible random system's initial conditions. Generally speaking, classical correlations disappear,

and the initially correlated system's configuration is quickly forgotten. On the contrary, quantum correlations can show a wavy behavior, with continuous oscillations.

5. Synchronicity: An Unfinished Tale

Similarly to how Pauli used Statistical Causality in the quantum world, Jung considered random coincidences in the world of the psyche. According to Jung, the meaning of life's events was to be found in random coincidences. A particular anecdote can give an idea of the original meaning of Synchronicity (Jung, 1993), as elaborated by Jung, and its therapeutic aim (Eisold, 2002). Jung reports that one of the patients had a recurring dream about a scarab beetle. By chance, during a therapeutic session, one beetle hit the room's window many times. This event made the patient stop his over-rationalizing. This fact illustrates the therapeutic effects of Synchronicity (Jung, 1993): there was no causal relationship between the oniric beetle and the physical beetle, however, such acausal coincidence was meaningful to the patient. The lives of Jung's patients were improved due to the therapeutic power of meaningful coincidences: analytical psychology had discovered Synchronicity as an organizing principle of the psyche (Jung, 1993). This particular anecdote also clarifies one key point of our reasoning: The events considered by Jung necessarily occur in the classical world. We have already noticed that the experimental 'observation' (e.g., the measurement) of quantum systems also produces classical events (Griffiths, 1995; Pauli, 1980; Stapp, 1972; Weinberg, 2013; Wick, 1995).

The acknowledgment of the role of chance in their respective disciplines led Jung and Pauli to search for an organizing principle for both psychological and physical reality. Pauli influenced Jung to generalize the concept of Synchronicity so that it could also be applied to physical phenomena (Halpern, 2020). In other words, Jung and Pauli's Synchronicity orders all phenomena through acausal coincidences. In general, coincidences can occur in both the classical and quantum worlds. Classical coincidences can also belong to a subjective psychological life. Subsequently, the psychological component was deemed unnecessary for Synchronicity and was only defined in terms of classical or quantum acausal correlations of events. We can conclude that Jung's Synchronicity reflects the quantum-classical nature of the world (Aleksandrov, 1981; Joos et al., 2003; Sergi, 2015; Sergi et al., 2018; Grimaldi et al., 2021; Grimaudo et al., 2023; Sergi et al., 2023a, 2023b; Uken & Sergi, 2015; Zurek, 2003).

In time, Jung and Pauli started to interact less and less. Pauli suffered increasingly negative judgment from his peers because of his almost mystical interests, arising from his interaction with Jung (Lachman, 2010). Some colleagues of Jung had also been using the concept of synchronicity to venture into the occult (Lachman, 2010). Newton's Hermetic philosophy had long been forgotten (Dobbs, 1991). Even the founding fathers of quantum mechanics had

wandered in the field of philosophy and esoteric thought. Bohr, Oppenheimer, and Schrodinger were famously fascinated with Vedic texts and Upanishads (Bohr, 1987; Pais, 2006; Schrödinger, 2012). Heisenberg was an anti-realist, imbued with Plato's philosophy (De Haro, 2020). Einstein was inspired by Spinoza, who had always been considered an undercover exponent of Jewish mysticism despite his rationality (Astora, 2016; Randall, 1969; Ihrl, 2009; Stooshinoff, 2018). However, the tide had changed, and quantum physicists' second generation did not indulge in philosophy anymore: Feynman is an example of such an attitude (Mehra, 1994). The milieu of the time and the 'orthodox' physics community had a rather negative opinion about this type of inquiry (Halpern, 2020). Even leaving aside every suspicious mystical view and although its physical effects are analogous to the appearance of quantum coherence, Synchronicity was little considered by the community of quantum physicists. Surprisingly, mainstream psychology also rejected Synchronicity. Jung also became keen on UFO phenomena (Jung, 1987), casting an even worse aura over him. The topic of UFOs is still taboo nowadays, while in some cases it verges on extreme occult positions (Rose, 2004; Wilson & Weldon, 1978). Both this social stigma and his illness might have contributed to pushing Pauli away from Jung in his later years, leaving the work on Synchronicity unfinished (Halpern, 2020).

6. Synchronicity and the Quantum-Classical World

According to Jung, Synchronicity is the psyche's organizing principle. In turn, the psyche is the "condition sine qua non" for the subject interaction with the classical world. Quantum Mechanics also deals with the classical world because a mapping from the quantum to the classical world must exist. The theory must describe experimental measurements performed by observers who can only recognize classical quantities.

The requirement that measurements must realize a transition from the quantum to the classical world is the infamous "measurement problem" (Ballentine, 2001; Jaeger, 2009; Stapp, 1972; Weinberg, 2013; Wick, 1995). Quantum theory is expressed through linear equations that cannot describe such a transition. The problem is solved simply by postulating that the measurement provokes a probabilistic phenomenon. We are referring to the "Projection Postulate" stating that whenever a measurement is performed the wave function changes abruptly and becomes one of those wavefunctions associated with the symmetric states of the dynamical variable being measured (Ballentine, 2001; Jaeger, 2009; Stapp, 1972; Weinberg, 2013; Wick, 1995). Such changes occur according to predictable probabilities. The experimental values that can be measured can only be those associated with the symmetric states of the dynamical variable under scrutiny, and they are known as eigenvalues.

Non-linear modifications of the Schrödinger equation could solve the measurement problem (Bialynicki-Birula, & Mycielski, 1976; Bugajski, 1991; Cazenave, 1983; Gisin, 1990; Hammad, 2007; Minic & Tze, 2002; Nattermann, 1997; Reinisch, 1994; Waniewski, 1986; Wodkiewicz & Scully, 1990; Yasue, 1976; Yasue, 1978; Zidkov, 2003; Zloshchastiev, 2011; Znojil et al., 2017). However, they are not free from problems (Chen & Zhang, 2006; Gähler et al., 1981; Levi, 1989; Jordan, 1990, 1993; Weinberg, 1989a, 1989b; Zhang et al., 2009).

There could be another perspective on the quantum measurement based on Synchronicity (Atmanspacher & Fuchs, 2014; Halpern, 2020; Jung, 1993; Lindorff, 2009; Meier, 2014).

We have already noted that the formulation of Synchronicity was influenced by Leibniz monads (O'Leary-Hawthorne & Cover, 2008; Cambray, 2005; Leftow, 1989). Yet, at the root of the concept one finds the Arab philosophical school of Occasionalism (Harman, 2016; Weir, 2020), whose main exponent was arguably Al Ghazali (Ghazzali, 2000; Harding, 1993). Once the conclusions of this philosophy are streaked out from their theological intent, it cannot go unnoticed that the work of Al Ghazali (Ghazzali, 2000) is meaningful for quantum theory (Harding, 1993). One can go so far as to state that Al Ghazali's ideas (Ghazali, 2000) predate Pauli's Statistical Causation (Pauli, 1980). After expressing this chain of thoughts, we are ready to state our conjecture: the explanation of the quantum mechanical measurement process is found in the Synchronicity of the quantum-classical world. There are deep scientific reasons (Sergi, 2016; Sergi & Tripodi, 2007) for considering a quantum-classical world of phenomena (Aleksandrov, 1981; Grimaudo et al., 2023; Joos et al., 2003; Sergi, 2015; Sergi et al., 2023a, 2023b; Uken & Sergi, 2015; Zurek, 2003). Further analysis is required to verify if Synchronicity truly explains the measurement processes (Cohen-Tannoudji et al., 1977; Davydov, 1991; Dirac, 1982; Sakurai & Napolitano, 2020; Stapp, 1972; Susskind & Friedman, 2014) is certainly required. If our conjecture were correct, this would have important consequences for quantum biology (McFadde, 2002; Al-Khalili & McFadden, 2014). Both Schrödinger (Schrödinger, 2012) and Jordan (Al-Khalili & McFadden, 2014; Beyler, 1994, 1996) considered connections between the micro and the macro worlds that might be reinterpreted in terms of the generalized Synchronicity that we have conjectured in work. This is especially true in Jordan's case (Al-Khalili & McFadden, 2014; Beyler, 1994, 1996) because Jordan considered the measurement process (Cohen-Tannoudji et al., 1977; Davydov, 1991; Dirac, 1982; Sakurai & Napolitano, 2020; Susskind & Friedman, 2014; Stapp, 1972) as an amplification transferring ordered energy from the quantum world to the statistical macro-world. Jordan's idea about how quantum wave function collapse can steer the dynamics of classical biological systems works in general cases.

It also applies to small systems. This implies that any synchronic wave function's collapse has an important effect on classical phenomena, e.g., the same phenomena perceived by the psyche.

7. Conclusions

In this paper, we have dealt with the role of Synchronicity in describing the phenomenological world. We first considered the genesis of the concept from Jung's work on the psyche and, after Jung and Pauli's meeting, its generalization under the influence of Statistical Causality. The ending of the collaboration between Jung and Pauli, because they disagreed about the research on the mystical side of reality, caused the work on Synchronicity to remain unfinished. Brief considerations about the quantum-classical nature of the world led us to conjecture a further generalization of the concept of Synchronicity. Recognizing the role of Occasionalism and Leibniz's philosophy in the formulation of Synchronicity, we have entertained the idea that Synchronicity can also be at the root of the harmony between the quantum and the classical world but, this time, also considering explicitly the quantum-classical nature of physical reality. We remark that the fundamental quantum-classical nature of phenomenological reality was not fundamentally considered either in Pauli's Statistical Causality or in Jordan's amplification process. Only further work can ascertain whether our conjecture is true. Nevertheless, we believe that this idea is worth knowing even in this primary state. Moreover, applying models where quantum physics and clinical psychology are correlated may bring benefits by promoting health and psychological well-being in important areas of life functioning, including work (Gangemi et al., 2021; Masci et al., 2022; Schabracq et al., 2003; Cardella & Salvatore, 2021; Salvatore & Cardella, 2024).

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any potential conflict of interest.

Authors' contribution

SA and MG made the conception and design; SA performed the acquisition and interpretation of data. SA, GCM, GML, and MG drafted the article. SA, GCM, GML, and MG revised it critically for important intellectual content. All authors equally contributed to the article and approved the submitted version.

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