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The Observer's Now, Past and Future in Physics from a Psycho-Biological Perspective

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Abstract:

The observer in physics makes observations and transforms them into fact and physical laws. Observations are based on perceptions and their transformations, which are influenced by biological and psychological functions. As argued by the philosopher Peirce, one might distinguish between extra-mental reality and its mental representation. An observer creates with his mental functions a mental representation of extra-mental reality due to perception based on specific sense organs. Extra-mental reality and its mental representation exist simultaneously, but are not always in direct contact with each other and can therefore diverge. Only during the NOW, the observer is through his sense organs in direct physico-neural contact with extra-mental reality. After interruption of this contact, observations belong to the past and the observer transforms with mental functions regularities of past observations into physical laws, which can be extrapolated into the far past and future. During the NOW, observations have precise time coordinates, but after interruption of the direct contact, memorized observations undergo transformations into abstract and often timeless concepts in classical and in quantum physics. In normal life, time is the perception of duration and its boundaries. In physics, time is reduced to the relation of its boundaries between different systems or can be completely discarded in timelessness. Whereas the NOW is a direct connection between extra-mental reality and its mental representation, past and future represent pure mental representations based on memorized NOWs. After their transformation, mental representation can predict future potentiality, which does not always correspond to extra-mental reality. Due to this reality-potentiality gap, physical laws created in mental representation need verification in a new experimental NOW, which alone assures direct contact to reality.

Keywords: physical observer; physical now; past; present; future; mental representation; extra- mental reality; time unreality; timelessness; Mc Taggert.

Time is generally experienced or conceptualized as consisting of a “now” "past" and “future.” The philosopher McTaggart (1908) distinguished between three series of time, the A-series as past, present and future, the B-series as earlier or later and the C-series as the order of events. However, he considered time as unreal and wrote "It may be the case that... the distinction of past, present and future -- is simply a constant illusion of our minds" (McTaggart, 1908, p.457). Einstein, came to similar conclusions:

“The distinction between past, present and future is only an illusion” (Einstein 1955).

Some theorists have argued, based on Einstein’s theorems of relativity (Einstein 1905a,b,c, 1907, 1910, 1961), that the past, present and future overlap and exist simultaneously but in different distant locations in the dimension known as space-time (Joseph 2014). Experiments on quantum entanglement and what Einstein (1930) called “spooky action at a distance” all call into question the causal distinctions between past, present and future. Time may not even exist, except as a function of perception and the nature of consciousness which imposes temporal sequences on experience (Joseph 2011).

Contemporary physicists like Zeh (1998) also ague that time does not exist: "The quantum theory requires that paths can fundamentally no longer exist. Then any parameter of paths, such as the role of time ... cannot exist either." (Zeh, 1998, p. 15). Then what is time? Do clocks measure time, or is time a manifestation of clocks which are built according to the rules imposed by the conscious mind to account for the experience of change?

As demonstrated by Einstein and others, the experience of time and the dimension described as time-space, are effected by velocity and gravity. However, is what is experienced, time, or velocity and gravity all of which can effect even atomic clocks? The astronomer Barbour (2009, p. 1). writes "Duration and the behavior of clocks emerge from a timeless law that governs change" and Rovelli (2009, p. 1) that "... the best strategy for understanding quantum gravity is to build a picture of the physical world where the notion of time plays no role at all."

Thus, there is a general claim from philosophers, astronomers and physicists, that time does not exist and that the experience of time may be only an illusion of our minds imposed on the quantum continuum by consciousness.

“I regard consciousness as fundamental. I regard matter as derivative from consciousness” (Max Planck, 1931).

The “future” and the “past” are shaped and affected by consciousness which can effect events just by observing them; as illustrated by “entanglement” and Heisenberg’s well established Uncertainty Principle (Heisenberg 1927). The Uncertainty Principle holds that we cannot know velocity, position and mass of any particle simultaneously. Moreover, uncertainties propagate into the future; that is small uncertainties becomes larger as distance from the present increases. Consciousness, therefore, is entangled with the quantum continuum (Joseph 2014).

The role of an observer is an essential part in quantum physics. Von Neumann included the observer as a quantum system (Zeh, 2013, p. 98). Wigner (1962) proposed an active influence of consciousness on the physical world. Zeh (2013, p. 99) himself insisted that the observer always had an essential role, since he performs all observations with physical instruments. In these theories, the observer is only a passive bystander for collecting observations. The recent form of quantum Bayesianism attributes to the observer a more active role, when he makes probability assignments to express his expectations (Fuchs et al. 2013).

However, if consciousness plays an active or passive role is debatable. Quantum physics, as exemplified by the Copenhagen school (Bohr, 1934, 1958, 1963; Heisenberg, 1925, 1927, 1930), like Einsteinian physics, makes assumptions about the nature of reality as related to an observer, the “knower” who is conceptualized as a singularity (Joseph 2014). As summed up by Heisenberg (1958), “the concepts of Newtonian or Einsteinian physics can be used to describe events in nature.” However, because the physical world is relative to being known by a “knower” (the observing consciousness), then the “knower” can influence the nature of the reality which is being observed through the act of measurement and registration at a particular moment in time. The same principles must be applied to time. Time is effected by observation.

What is observed or measured at one moment can never include all the properties of the object under observation, and this includes the perception of time. In consequence, what is known vs what is not known becomes relatively imprecise (Bohr, 1934, 1958, 1963; Heisenberg, 1925, 1927). Moreover, as dictated by the “uncertainty principle” energy and mass can be time-independent (Heisenberg 1927, 1958). This is illustrated by evidence of entanglement where effects may occur simultaneously with causes, and take place at faster than light speeds (Francis 2012; Juan et al. 2013; Lee et al. 2011; Matson 2012; Plenio 2007). One might conclude, therefore, that if consciousness plays a passive or active role, time remains an illusion and there is no past, present, or future, as all are merely aspects of the quantum continuum which become subject to the passive or active observation of consciousness which perceives all experience in terms of temporal sequences (Joseph 2011).

From a psychological viewpoint, the observer has a much greater influence, since besides the observation of information, he also affects a transformation of information. Both functions are essential for the establishment of physical laws and are differently influenced by present, past and future. The present is essentially required for observation, the past for memorized observations and their comparison for detecting regularities and the future consists in the extrapolation of past regularities, which are then considered as general physical laws with validity from the past to the future. Thus, the observer's present, past and future exert a special role during the constitution of physical laws, which will be analyzed by distinguishing between the extra-mental reality and its mental representation, which is responsible for the transformation of regularities from past observations into general physical laws. Extra-mental reality concerns all physical factors outside the body and all biological factors within the body, like respiration or heart beats, whereas mental representation has the function to represent the extra-mental reality in the human mind. The NOW is only present when both are in direct contact, whereas the past and the future are pure mental representations no longer linked to the extra-mental reality and require verification in a new NOW.

2. Physical Reality and its Mental Representation

As summed up by the philosopher CS Peirce reality exists independent of the time "... it is out of the mind, is independent of how we think it, and is, in short, the real." (Hookway, 2013, paragraph 3.1). In the same way mental representation could be distinguished from extra-mental reality as different independent entities. Extra-mental reality would comprise all physical events outside the body and all biological events inside the body, whereas mental representation concerns sensation, perception and cognition. The only connection between both realities are sense organs permitting direct physico-neural contact for representing the extra-mental reality within mental representation.

Humans lack the sensory perceptual capability to perceive X-rays, radioactivity, radio waves and others. In the same sense, blind and deaf people have a different representation of the extra-mental reality which is shaped by their sensory experiences. Certain animal species possess additional sense organs permitting a richer representation of extra-mental reality. Pigeons have sense organs for the detection of magnetic fields (Wu & Dickman, 2012), bees perceive ultra-violet light (Frisch, 1963) and some fish species can feel electric fields (Pusch et al. 2008). For these reasons, the representation of extra-mental reality is necessarily incomplete and can therefore only be considered as a model representation.

In addition sense organs only detect a small part of the universe and the finite memory only retrieves part of all encoded observations. The view of the human eye is limited by a perspective, not allowing to see objects at long distances with precision. Hearing and smelling are also limited to certain distances. Nevertheless, science allowed indirect knowledge on imperceptible physical events by transforming them to perceptible manifestations, for instance a radio can transform inaudible radio waves into audible mechanical waves. Thus, the extra-mental reality is necessarily different from its mental representation and can only be modeled with respect to the information provided by sense organs.

Since the mental representation can be different from the extra-mental reality, it has to be verified. David (2009, p. 1) described the correspondence theory of truth and defined that "... truth is a relational property involving a characteristic relation (to be specified) to some portion ofreality ...". The correspondence may not always be evident for events lying beyond the perspective of sense organ at physical scales not directly accessible. However, if the correspondence is not verified, one could believe in physical laws established in mental representation, which after extreme extrapolation into the far past or the final future may no longer correspond to their extra- mental reality.

3. Present, Past and Future in Natural Science

Corballis (2014) and Tulving's theory (1983) argue that memory serves not only to remember and reconstruct the past but also creates the future by planning for or anticipating the future episodes all of which contributes to the subjective sense of time. Memory, therefore, serves consciousness by providing a foundation for the perception of time as consisting of a future, past, or present. Memory, however, is therefore subject to observation and observation may effect memory; and which may explain why so many people remember things differently, even eye-witnesses to a crime (Joseph 2014).

The philosopher McTaggart (1908) argued that "We perceive events in time as being present, and those are the only events which we perceive directly. And all other events in time which, by memory or inference, we believe to be real, are regarded as past or future".

Zeh (2013,) argues that "... The observer has always played an essential role in the empirical sciences, simply because they are based precisely on observations performed by humans by physical means."

The acquisition of knowledge through observation by an observer is subjected to its position in time: the present, past and future. The present allows acquiring new knowledge, the past is limited to knowledge already acquired in a former present, whereas the not yet existing future can only be imagined with uncertainty by projection of past regularities into the future. Regularities found in observations allow the conception of physical laws under three basic conditions dependent on present, past and future:

- a) observations in the present are the bases for all physical laws (section 3.1),

- b) memorized observations of the past are transformed into abstract regularities (section 3.2),

- c) abstract regularities are extrapolated into the far past and future (section 3.3).

Although physical laws seem to possess universal validity from the past to the future, the initial acquisition of information by an observer was only possible in a limited present, but the past and future have still important consequences, which will be discussed.

3.1 The "Now" or the Present.

Observation consist in a mental perception of information provided by all sense organs communicating by physico-neural contact with the extra-mental reality. Information from extra- mental reality comprises physical events outside the body as well as physiological events inside the body.

Sense organs are an intermediary to extra-mental reality, in which physical stimulation of the sensory surface followed by sensory transduction lead to perception in mental representation (O'Callaghan 2012). For vision, physical factors such as photons are directly transmitted to the retina of the eye, where they activate light sensible neurons by depolarization in a bottom-up direction to specialized brain regions. The ear receives mechanical waves, which induce neurological activations transmitted to other specialized brain regions. Heat activated skin receptors also transmit their information by neurons to the corresponding brain regions. Thus in the present, there is a direct physico-neural information influx between the extra-mental reality and its mental representation in the brain. However, as soon as sense organs interrupt the direct physical contact, for instance by closing the eyes or the ears, any communication with the extra-mental world is broken, whereas the already obtained observations are partially encoded in the episodic long-term memory and after retrieval

represent the past.

The direct contact of extra-mental physical factors with biological sense organs lead to sensory transduction with transmission to specific brain regions, where mental representation takes place and explains why this physico-neural contact can only be found in the present. The notion of "NOW" could be psychologically defined and describe time as duration limited by boundaries and unified by a common aspect, which can be extremely short, when hearing the thunder of an unexpected lightning, but can also take minutes to hours when seeing a film or reading a book. It corresponds always to a physico-neuronal information influx, in which extra-mental reality and mental representation are in direct contact. However, when thinking on physical laws, the physico- neural contact can be interrupted. Time is then reduced to its quantitative aspect as relation between boundaries, whereas its qualitative aspect as psychological duration disappears. In the general relativity theory, time is conserved as relation with respect to a reference frame.

3.2 Perception during the NOW

In contrast to pure elementary sensation, during the construction of mental representation from extra-mental reality by perception (O'Callaghan 2012), top down activities are simultaneously activated. They allow binding of the information from different sense organs into a unified multi-modal experience (Lycan 2012), such as simultaneously viewing a fire in the chimney, hearing its sound and feeling its heat. Other cognitive activities are categorization such as grouping animals into classes (Pothos, 2011) or reactivation of visual entities from long-term memory when perceiving faces. In neuroscience visual mental imagery with pure top-down activation mechanisms has to be distinguished from visual percepts including bottom-up mechanisms, which explains why people in general do not confuse visual percepts with visual mental images (Ganis & Schendan, 2008). Mental imagery with pure top down activation no longer necessitates direct elementary sensation from extra-mental reality.

Corballis (2014) distinguishes the psychological present and the past with the concepts of anoetic consciousness, as awareness of the present and noetic consciousness as semantic memory, representing events not tied to the immediate environment and allowing mental time travel between the past and the future. Finally autonoetic consciousness allows episodic memory containing events already experienced by the self and later reminded as the past.

3.3 The Past as Memorized Observation

The NOW allows direct contact by observation between extra-mental reality and its mental representation, which is then encoded in an episodic long-term memory and can later be retrieved as the past. Encoding is an automatic by-product of attending to or processing a stimulus and therefore differs according to the level of attention and processing (Craik & Lockhart, 1972). As soon as observations are memorized, they already represent the past. Thus, immediately after the break down of direct physico-neural contact between extra-mental reality and mental representation, characterized as elementary sensation with sense organs, a partial copy of the prior observations remains. Thereby observations in the present are not lost and can be used for further analyses with cognitive functions. Past observations have the great advantage of preserving copies from multiple observations, which allow their comparison for exploring regularities.

Thus, only the past containing multiple memorized observations allows comparisons, although it is disconnected from any direct physical contact with the extra-mental reality. This complete detachment of memorized observations also allows the transformation of information. In contrast to unchangeable "elementary sensations" in the present, mental cognition is able to modify information of past observations through: 1. association, 2. dissociation or 3. modeling. Besides the representation of extra-mental reality as past observations, their cognitive transformation allows a total independence of mental representation from extra-mental reality. This kind of representation could be called “potentiality” or “possible worlds” as claimed by philosophers like Dennett (2004). Thus, there is in mental representation a gap between its representation of observed reality and its representation of imagined potentiality (i.e. Reality Potentiality Gap or “RePoGap”). This gap is permanently experienced by everybody, when one's imagination does not correspond to one's observation of extra-mental reality.

3.4 Transformation of Past Observations

There are three main transformations of past observations : association, dissociation and modeling. A first transformation by the observer with his cognitive functions is the association of interpretations to perceptions, similar to the model of perception from Bruner (2011). The sun is daily perceived as rising in the east and setting in the west. Although the corresponding interpretation of geocentrism was believed for many centuries, more precise information imposed a different association with the interpretation of heliocentrism for exactly the same perceptions. Thus, insufficient information may induce incorrect interpretations, which have to be changed after more detailed information becomes available.

A second transformation by cognitive functions is the dissociation of certain properties from the complexity of memorized observations. In Galilee's (1638) experiment on the inclined plane, repetitive time measurements had to be compared, but only the relations of the boundaries of time could be used in mathematical calculations and time as duration was dissociated from the relation of its boundaries. Physical laws thereby become invariant with respect to the observed individual time measurements. Thus, our knowledge on the whole universe can be considered as relational and only allows correlations between different systems (Baird, 2013). When only one aspect of highly complex past observations is under study, the other aspects are discarded. Thereby, complexity becomes reduced and looses all other properties, which are not under study.

A third transformation of memorized observations is modeling of past observations with visual models from the macrocosm, such as atoms as billiard balls or with mathematical models by following Galilee. Mathematical models can be of a different nature, either describing, or simplifying or approximating past observations. Galilee's mathematical models directly described the behavior of bronze balls on the inclined plane. Statistical methods simplify the behavior of multiple individual events by calculating one virtual mean value and its standard deviation (sigma) with arbitrary confidence levels such as 95%. In quantum physics probability estimations approximate the characteristics of the behavior of elementary particles. According to the mathematical model applied, past observations are more or less precisely represented by mathematical models.

As expressed by the Heisenberg uncertainty principle (Heisenberg, 1927), the more precisely one physical property is known the more unknowable become other properties. The more precisely one property is known, the less precisely the other can be known and this is true at the molecular and atomic levels of reality (Bohr, 1934, 1958, 1963). Heisenberg's principle of indeterminacy focuses on the relationship of the experimenter to the objects of his scientific scrutiny, and the probability and potentiality, in quantum mechanics, for something to be other than it is. Einstein objected to quantum mechanics and Heisenberg's formulations of potentiality and indeterminacy by proclaiming "god does not play dice."

According to Heisenberg (1925, 1927, 1930), chance and probability enters into the state and the definition of a physical system because the very act of measurement can effect the system. No system is truly in isolation. No system can be viewed from all perspectives in totality simultaneously which would require a god's eye view (Joseph 2014). As summed up by Joseph (2014) "Only if the entire universe is included can one apply the qualifying condition of "an isolated system." Simply including the observer, his eye, the measuring apparatus and the object, are not enough to escape uncertainty. Results are always imprecise. Heinsenberg puts it this way:

> "What one deduces from an observation is a probability function; which is a mathematical expression that combines statements about possibilities or tendencies with statements about our knowledge of facts....The probability function obeys an equation of motion as the co-ordinates did in Newtonian mechanics; its change in the course of time is completely determined by the quantum mechanical equation but does not allow a description in both space and time" (Heisenberg, 1958).
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> "The probability function does not describe a certain event but a whole ensemble of possible events" whereas "the transition from the possible to the actual takes place during the act of observation... and the interaction of the object with the measuring device, and thereby with the rest of the world... The discontinuous change in the probability function... takes place with the act of registration, because it is the discontinuous change of our knowledge in the instant of registration that changes the probability function." "Since through the observation our knowledge of the system has changed discontinuously, its mathematical representation has also undergone the discontinuous change and we speak of a quantum jump" (Heisenberg, 1958).

The same principles can be applied to the experience of time by the conscious mind (Joseph 2014). The mental transformation of past observations through association, dissociation and modulation, shows that memorized past observations can be completely transformed by cognitive mental functions into virtual concepts, corresponding only partially to the initial observations. Then, the mental representations of physical laws could only be considered as models for extra-mental reality.

3.5 Timelessness of Past Observations

As detailed by Joseph (2014): The wave function describes all the various possible states of the particle. Rocks, trees, cats, dogs, humans, planets, stars, galaxies, the universe, the cosmos, past, present, future, as a collective, all have wave functions. Waves can also be particles, thereby giving rise to a particle-wave duality and the Uncertainty Principle. Particle-waves interact with other particle-waves. The wave function of a person sitting on their rocking chair would, within the immediate vicinity of the person and the chair, resemble a seething quantum cloud of frenzied quantum activity in the general shape of the body and rocking chair. This quantum cloud of activity gives shape and form to the man in his chair, and is part of the quantum continuum, a blemish in the continuum which is still part of the continuum and interacts with other knots of activity thus giving rise to cause and effect as well as violations of causality." As summed up by Joseph (2014) "in a quantum universe all of existence consists of a frenzy of subatomic activity which can be characterized as possessing pure potentiality and all of which are linked and entangled as a basic oneness which extends in all directions and encompasses all dimensions including time (Bohr, 1958, 1963; Dirac, 1966a,b; Planck 1931, 1932, Heisenberg 1955, 1958; von Neumann 1937, 1955). The act of observation be it visual, auditory, tactile, mechanical, digital, is entangled with the quantum continuum and creates a static impression of just a fragment of that quantum frenzy that is registered in the mind of the observer as length, width, height, first, second, and so on; like taking a single picture of something in continual motion, metamorphosis, and transformation. That is, the act of sensory registration, be it a function of a single cell, or the conscious mind of a woman or man, selects a fragment of the infinite quantum possibilities and experiences it as real, but only to that mind or that cell at the moment of registration."

Kubs et al. (1998) demonstrated the direct interaction of instrumental observation on the behavior of elementary particles, when an increasing "which-way detector " changed the interference pattern of electrons. Stapp (2004) conceives an active observer, who has the freedom of choice and intentionally prepares experimental actions, some of which lead to a wave like behavior and others to the particle structure of elementary particles. His theory is based on the interpretation of von Neumann, who included the observer in the quantum system and the collapse of the quantum system was considered as a psycho-physical parallelism (Zeh, 2013 p 98). The observer collects information by observation, thereby inducing the wave function to collapse. Wigner also suggested a participation of consciousness in the physical world (Wigner, 1962). According to Everett, the subjective observer may simultaneously exist in various versions in his multi-world theory. Zeh extended this theory by including the mind of the observer as an essential factor in his multi-mind theory (Zeh, 1970). Besides Stapp, these theories considered the observer as a passive collector of information. Fuchs et al. (2013) gave the observer a more active role by creating with probability assignments a belief in future experimental outcomes and Stapp proposed that the observer by his freedom to choose experiments actively interfered with physical reality (Schwarts et al 2005).

Reducing individual observations only to one property, such as time, space, weight, height or others, allows the elimination of other properties not under study. Besides others, time coordinates can be eliminated, which leads to partial or total timelessness. Partial timelessness can be represented by astronomical constellations only requiring time as relations. The Antikythera Mechanism, a mechanical computer for the calculation of astronomical positions, was used by the ancient Greeks already in the first century BC (Price, 1975) and indicated the positions of the sun, the moon and the planets Venus and Mars. A modern planetarium fulfills the same function, but with a digital computer. Such mechanisms can be turned forwards but also backwards in time for other astronomical positions relative to another time point. Thereby the time arrow is no longer represented and only time relations indicate the corresponding positions of planets. Thus, already classical physical formalism concerning the relation between planets could reduce time only to relations corresponding to partial timelessness.

Time is entangled and is affected by consciousness and relative to and effected by the act of observation and measurement--as predicted by quantum mechanics (Bohr, 1958, 1963; Dirac, 1966a,b; Planck 1931, 1932, Heisenberg 1927, 1958; Neumann 1937, 1955). Complete timelessness is found in quantum physics, when time measurements become uncertain, due to variable outcomes under identical experimental conditions. The uncertainty of time relations only allows probability estimations and corresponds to complete timelessness as claimed by physicists (Zeh, 1998). Nevertheless, complete timelessness can also be found in classical physics, when the time relations are without interest, for instance when only variations are calculated. Already in Galilee's experiments the grouping of individual measurements showed a certain variability of outcomes, which corresponds to a timeless concept even in classical physics.

When timeless values are represented in a graph, they could be interpreted, as if they were in superposition or obtained at an identical virtual time point. Although the physical formalism is completely different, the general idea of superposition of values in classical physics for an identical virtual time point might be seen in analogy to superposition of wave structures in quantum physics. The principle of superposition was applied in the mathematical formalism of the wave function with complex amplitudes by Schrödinger, which differs from weighted sums in classical theory. The wave function also proved to be a better model for human decision making (Pothos & Busemeyer, 2009) and could be interpreted as a superposition of mental functions. Thereby superposition in quantum mechanics seems to be isomorphic to superposition of cognitive mental functions (Jansen, 2008, 2011b).

Highly varying observations can only be extrapolated into the future as timeless group values with their means and variations, but not predict individual time coordinates. Nevertheless, in new measurements, extrapolated mean values will necessarily acquire new individual outcomes with their time coordinates. Since for irregular outcomes only their group behavior is predictable, individual behavior appears to be indeterminist. Thus, the extrapolation of timeless values into the future will acquire new precise time coordinates in new observations.

3.6 The Future as Extrapolation from the Past

Comparison between multiple observations can only be obtained with memorized past observations, since present observations are not finished and future observations are not yet existing. The only way to have a guess of the future is the projection of past events into the future. Patients with a bilateral medial temporal ablation of the brain for the reduction of epilepsy are unable to look neither into the past nor into the future (Berlucchi, 2014). However, the future is of great importance for normal life, and imagining the past is probably not so essential for life as projecting the future (Corballis, 2014). The scientific aim for prediction of the future could be realized by a "physical theory of everything", which covers the past, the present and the future and can be established with past regularities under the condition that they are also reliable in the future. In physics, this could be achieved by the extrapolation of mathematical formalism obtained from the past and projected into the future.

The reliability of any projection from the past into the future essentially depends on the regularity of past events. The revolution of the earth around its axes providing the time unite of one day with 24 hours is highly regular. In contrast, irregular weather conditions in the past projected in the future remain extremely hazardous. Nevertheless, even the extrapolation of apparently regular events, like the revolution of the earth, can also lead to errors at the long term, due to tidal forces of the moon rendering the revolution of the earth more slowly, although only significant in billions of years. Thus, any extrapolation from past events after a relatively short time of observation into the far future of billions of years may become doubtful. The extrapolation to the far past is also uncertain. Under the condition that physical laws are constant, one can calculate that the Big Bang occurred about 14 billion years ago. However, how can the constancy of physical laws and constants be verified over such long time periods of billions of years ? The opposite hypotheses that physical laws could have changed, especially during the first periods after the Bib Bang, would allow another interpretation of the anthropic principle, which indicates that the actual fine tuned universe seems to be required for allowing life to emerge. Magueijo (2004) proposed a change of the speed of light during the early universe, which is in opposition to Einstein's constancy of the speed of light. If physical laws had changed in the past, the actual fine tuned universe could have been obtained through evolution, whereas with constant laws, a fine tuned universe seems to need a prior design.

3.7 Projection of Irregular Outcomes into the Future

Only for extremely regular past observations in classical physics, like ocean tides, individual outcomes will be precisely predictable for the future. The situation is different for the extrapolation of highly varying observations grouped around means with timeless values, which can only predict mean future values. However, in new experiments timeless values necessarily acquire new time coordinates, which could not be predicted with timeless extrapolations. In classical physics mathematical equations do not take into account the variability of experimental manipulation errors and only calculate theoretically modeled outcomes. Thereby the precise practical outcomes induced by manipulation errors are unpredictable. Thus, already in classical physics, there is a limited uncertainty for practical outcomes, although it remains relatively small, not producing practical problems. However, in biology variations can become considerable and sometimes threaten an unambiguous interpretation. The chaos theory based on small initial variations might explain some of such variations.

In quantum mechanics, variations are also considerable, but for different reasons due to Heisenberg's uncertainty principle as well as to instrumental variations. The measurement of location of elementary particles can no longer provide a precise measurement of their velocity and leads to variations. The physical wave function allows the extrapolation of timeless values only as probabilities into the future and the variability of outcomes is mathematically calculated by superposition of timeless values. Even in classical physics, precise time coordinates including manipulation errors cannot be predicted, so that the expected values and their time coordinates remain uncertain. In quantum mechanical experiments the superposition of outcomes cannot be observed, only individual outcomes are found, which correspond to their probable timeless values and seem to appear randomly. Therefore, multiple repetitions are needed for statistically significant outcomes.

Complete knowledge on all past and future events from the initial Bib Bang to the final Big Freeze seems to be achieved by the extrapolation of physical formalism into the far past and the final future. A physical "theory of everything", unifying all physical forces in one unique theory, could be considered as complete knowledge on the whole universe including the whole past and future. Such a view on the universe resembles the philosophical theory of eternalims, already evoked by the Greek philosopher Parmenides and is also called Block-universe (Savitt, 2013). However, the block-universe can only be a model in mental representation and its exact correspondence to extra- mental reality can never be verified for the far past and the final future and necessarily remains a mathematical model with uncertainty.

4. Mc Taggert's Unreality of Time

The philosopher McTaggart (1908) distinguished between the positions in time, the A-series as past, present and future, the B-series as earlier and later and the C-series as ordering of events. The A- series was explained with the example of the death of Queen Anne, which is for an observer first a future event, then becomes a present and finally a past event. Thus, the same event acquires a different character, which seems to be in contradiction with the unicity of the physical event of the death of Queen Anne happening only once. However, an observer can in his mental representation position the death of the Queen with respect to his own NOW. Then the death could be expected in the observer's future, or happening in his present or was already finished in his past. Thereby the A- series of past, present and future comprises in addition to the unique biological fact a relation to the observer's NOW, whereas the B series concerning earlier and later and the C-series considering an ordering are no longer positioned in relation to the observer, but with respect to each other. Therefore the A, B and C series as relations belong to mental representations.

Mc Taggert argues that the A-series is unreal. The notion of “real” is generally considered to distinguish between the extra-mental and the mental representation world. In this sense, Mc Taggert's seems to interpret the A-series as a mental manifestation, which he considers as unreal and thereby an illusion. There is agreement with Mc Taggert, that the A-series corresponds to mental representation and relations to the personal NOW. However, why should mental representation be an “illusion ” ? Mental representation reality in the mind can be considered as real and existent in the same sense as the extra-mental world. Thus, there is no illusion, there are two realities with different properties, but not always corresponding to each other.

In mental representation, the notion of time has two aspects, a more qualitative biological and a pure quantitative physical aspect. In biology, time can be considered as a perception of duration with boundaries (Bergson 1992), which is more qualitative and corresponds to the inner time clock, also necessary in biology for the circadian rhythm (Wearden, 2005) quantitative and corresponds to the inner time clock, also necessary in biology for the circadian rhythm (Wearden, 2005). Time evaluated with the inner time clock can be considered as perception, similar to visual, auditive or temperature perception depending on specialized sense organs. All sense organs are activated by a physical factor, such as seeing by electromagnetic waves, hearing by mechanical waves and heat feeling by molecular agitation. Eagleman (2009, p 1841) proposed a physical factor for time perception: “the experience of duration is a signature of the amount of energy expended in representing a stimulus, i.e. the coding efficiency.” Psychological time perception is opposed to the fixity of physical time and therefore allows a mental time travel between the past, the present and the future (Corbalis 2014).

The physical aspect of time is necessarily only quantitative and therefore restricted to the boundaries of durations, since they can be set in relation to intervals of other systems in extra-mental reality. Thus, the qualitative aspect of time in biology as perception of duration becomes in physics reduced to its boundaries, which can be compared to other time intervals, such as the revolution of the earth, counted as one day with its fractions. The more qualitative biological perception of the inner time clock is not identical to physical relations. For short durations, less than a second, time perception can resemble physical relations, although duration estimations in psychological tests can be shorter or longer than the corresponding physical relations (Eagleman, 2009). This proves that the inner clock is a biological perception of time, which is different from physical relations, but it has biological functions, like the circadian rhythm adapting biological activity to the day and night rhythm. For short durations the inner time clock and physical clocks seem to have good correspondence, but for durations shorter than the flicker frequency or very long in the range of years or centuries, the inner time perception is no longer adapted and only relations to extra-mental systems like clocks can replace time perception in mental representation. The high concentration of information in physical formalism is also unadapted for time representation, however, time reappears, when the abstract formalism of physical laws is applied to new concrete experiments (Jansen 2011, a).

6. Conclusions

The observer creates within his mental functions a representation of extra-mental physical reality. Both exist simultaneously, but are not always in contact with each other and can diverge. Only during the present, the observer is in direct physical contact with extra-mental reality due to “elementary sensation” with physico-neural contact through his sense organs. After interrupting the contact, the observer can with his mental functions transform regularity of past observations to physical theories and extrapolate them to the far past and final future. In the present, during the direct contact with physical reality, all observations have precise time coordinates. Once the direct contact is interrupted, memorized observations undergo important transformations into abstract, often timeless concepts for classical as well as for quantum physics. Thereby, timeless mathematical formalism becomes the bases of physical theories for the prediction of an unobservable past or future. Between the reality of the NOW and the potentiality of the future there is an important gap, the Reality-Potentiality Gap (RePoGap), which can be permanently verified by everybody, when potential projects imagined in mental representation cannot always be realized in extra-mental reality.

Time defined as duration with boundaries exists in both, mental representation and extra-mental reality during direct contact in the NOW. Partial physical timelessness corresponds to the reduction of duration to its boundaries, only considering the relations between systems in physical equations. However, time reappears, when physical laws are again verified in new experiments in a new present. The NOW is the only access of mental representation to extra-mental reality, whereas past and future are only mental representation models for extra-mental reality. Thus, physical formalism for the whole universe can only be considered as a "mathematical model universe".

All physical theories are necessarily based on an observer, who is the only one to collect observations and thereafter to transform them into physical theories. Only when the observer is not considered, a "theory of everything" could give the impression of complete knowledge similar to the philosophical concept of eternalism of Parmenides. However, if the observer is still considered as an important factor in the conception of physical theories, his uncertainty about the unverifiable extrapolation to the far past and the final future has also to be respected. There seems to be a semantic problem with the concept of time. Time perception could only be an illusion, if visual perceptions reduced to physical wave lengths is also considered as illusion. But then every reduction to more basic physical entities should be an illusion and the word losses its original sense. Misinterpretation after unclear sensory experience remains the essential meaning of illusion, whereas any reduction to lower level physical factors should not be considered as illusion. If a future “theory of everything “only considers relations between systems, the notions of present, past and future will disappear in the physical formalism. In this sense Barbour (2009, p.1) might be interpreted when claiming "Duration and the behavior of clocks emerge from a timeless law that governs change". In agreement with Barbour, physical equations essentially consider timeless relations conceived in mental representation, but during the verification of timeless laws in new experiments with a new NOW, time emerges again with duration and boundaries and the behavior of clocks indicates time again.

REFERENCES

Bohr, N. (1958/1987), Essays 1932–1957 on Atomic Physics and Human Knowledge, reprinted as The Philosophical Writings of Niels Bohr, Vol. II, Woodbridge: Ox Bow Press.

Baird, P. (2013). Information, universality and consciousness: a relational perspective. Mind and Matter, 11.1, 21-43.

Barbour, J. (2009). The Nature of Time. arXiv:0903.3489 (gr-qc)

Barbour, J (2008). Youtube, a video on "Killing time " http://www.youtube.com/watch?v=WKsNraFxPwkBergson, H. (1992). The Creative Mind. tr., Mabelle L. Andison, The Citadel Press, New York. translation of "La Pensée et le mouvant" [1946].

Berlucchi, G. (2014). Mental Time Travel: How the Mind Escapes from the Present. Commentary on Michael C. Corballis's Essay. Cosmology, 18. 146-150.

Bitbol, M. (2008). Is Consciousness Primary? NeuroQuantology, 6.1, 53-71.

Bruner, J. (2011) in Alan S. & Gary J. Perception, Attribution, and Judgment of Others. Organizational Behaviour: Understanding and Managing Life at Work Vol. 7Buks, E., Schuster, R., Heiblum, M., Mahalu, D., Umansky, V,. (1998) Dephasing in electron interference by a 'which-path' detector. Nature 391, 871-874.

Chalmers, D.J. (2003) Consciousness and its Place in Nature. in (S. Stich and F. Warfield, eds) Blackwell Guide to the Philosophy of Mind , Blackwell, Oxford, UK. 102 – 142.

Corbalis, M.C., (2014). Mental Time Travel: How The Mind Escapes From The Present. Cosmology, 18. 139-145.

Craik & Lockhart (1972) Levels of Processing: A Framework for Memory Research. J. Verbal Learning and Verbal Behavior, 11, 671-684.

David, M. (2009). The Correspondence Theory of Truth. (Stanford Encyclopedia of Philosophy)

Dennett, D. C. (2004). Freedom evolves. London: Allen Lane.

Eagleman, D. M. and Pariyadath V. (2009). Is subjective duration a signature of coding efficiency? Phil. Trans. R. Soc. B, 364, 1841–1851.

Frisch, C. von (1963). Bees: Their Vision, Chemical Senses, and Language. Vail-Ballou Press, Inc. Cornell University Press, Ithaca, New York.

Fuchs, C.A., Mermin N.D. and Schack R. (2013). An introduction to QBism with an application to the locality of quantum mechanics. arXiv: 1311.5253v1 (quant-ph).

Ganis, G. and Schendan, H. E. (2008). Visual mental imagery and perception produce opposite adaptation effects on early brain potentials. NeuroImage, 42, 1714–1727.

Hamilton, D. L. (1996). The Geophysical Effects of the Earth's Slowing Rotation. The Mind of Mankind, Suna Press, New York.

Heisenberg, W. (1927), "Über den anschaulichen Inhalt der quantentheoretischen Kinematik und Mechanik", Zeitschrift für Physik 43 (3–4): 172–198.

Hookway, C. (2013). Pragmatism. Stanford Encyclopedia of Philosophy.

James, W. (1907). Pragmatism. In: Pragmatism and The Meaning of Truth. Harvard University Press, 1975. Cambridge, Mass.

Jansen, F. K. (2008). Partial isomorphism of superposition in potentiality systems of consciousness and quantum mechanics. NeuroQuantology, 6.3, 278-288.

Jansen, F.K. (2011a). Isomorphism of hidden but existing time in quantum mechanical formalism and human consciousness. NeuroQuantology, 9.2, 288-298.

Jansen, F.K. (2011b). Isomorphic concepts for uncertainty between consciousness and some interpretations of quantum mechanics. NeuroQuantology, 9.4, 660-668.

Jansen, F.K. (2014). Elementary and memory perception versus cognition with implications for the brain-consciousness problem. Congress : Towards a Science of Consciousness, Tucson AZ.

Joseph (2011). Quantum Physics and the Multiplicity of Mind: Split-Brains, Fragmented Minds, Dissociation, Quantum Consciousness. In Consciousness and the Universed, Penrose, R. (ed). Cosmology Science Publishers.

Joseph (2014) The Time Machine of Consciousness, Cosmology 14, 400-450 Lykan W.G. (2012). Consciousness. in The Cambridge Handbook of Cognitive Science (Frankish K. and Ramsey W M eds) p 213, Cambridge University Press, Cambridge.

Magueijo, J. (2004). Faster than the speed of light: the story of a scientific speculation. Arrow Books, London. ISBN:9780099428084.

McTaggart, J. (1908). The unreality of time. Mind, 17, 457-473.

O'Callaghan, C. Perception (2012) in The Cambridge Handbook of Cognitive Science (Frankish K. and Ramsey W.M. eds) p 76, Cambridge University Press, Cambridge.

Pothos, E. M. and Wills, A. J. (Eds. 2011). Formal approaches in categorization. University Press, Cambridge.

Pothos, E.M. and Busemeyer, J.R. (2009). A quantum probability explanation for violations of 'rational ' decision theory. Proc. R. Soc. B rspb. 2009.0121.

Price, D. J. deSolla (1975) Gears from the Greeks: The Antikythera Mechanism – A calendar computer from ca. 80 BC. Science History Publications, New York

Pusch, R., von der Emde, G., Hollmann, M., Bacelo, J., Nöbel, S., Grant, K., Engelmann, J. (2008). Active sensing in a mormyrid fish: electric images and peripheral modifications of the signal carrier give evidence of dual foveation. J Exp Biol., 211 921-34.

Rovelli, C. (2009). Forget time. arXiv:0903.3832v3 [gr-qc] 27 Mar 2009 (Essay for FQXi). Savitt, S. (2013). Being and Becoming in Modern Physics (Stanford Encyclopedia of Philosophy).

Schwartz, J.M., Stapp,H.P, and Beauregard, M. (2004). Quantum theory in neuroscience and psychology: a neurophysical model of mind/brain interaction. Phil. Trans. Royal Society, B 360(1458) 1309-27 (2005)]

Straulino, S. (2008). Reconstruction of Galileo Galilei's experiment: the inclined plane. Physics Education, 43.3, 316-321.

Trueblood, J.S. and Busemeyer, J.R. (2012). Quantum Information Processing Theory. In: D. Quinones (Vol. Ed.) and N. M. Seel (Ed. in Chief) Encyclopedia of the Sciences of Learning (pp. 2748-2751). Springer, New York.

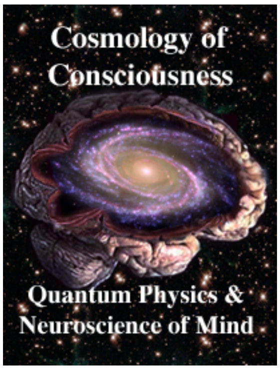
Wearden, J. H. (2005). Origines et développement des théories d'horloge interne du temps psychologique [Origin and development of internal clock theories of psychological time]. Psychologie Francaise, 50, 7 – 25.

Wigner, E.P. (1962). Remarks on the mind-body question. In: Good LG. The scientist speculates. Heinemann, London , 284-302.

Wu, L.-Q. and Dickman, J.D. (2012). Neural Correlates of a Magnetic Sense, Science, 336. 6084, 1054-1057, http://dx.doi.org/10.1126/science.1216567

Zeh, H.D. (1970). On the interpretation of measurements in quantum theory. Found. Phys.1, 69-76 Zeh, H.D. (1998). Über die Zeit in der Nature. In Evolution und Irreversibilität.

H.J. Krug & L.Pohlmann, Dunker und Humblot. Berlin.Zeh, H.D. (2013). The role of the observer in the Everett interpretation. NeuroQantology, 11, 97-105.



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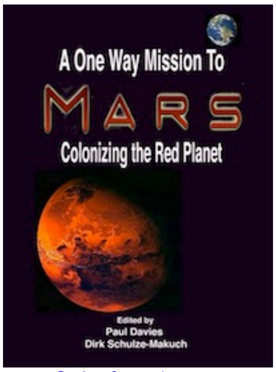

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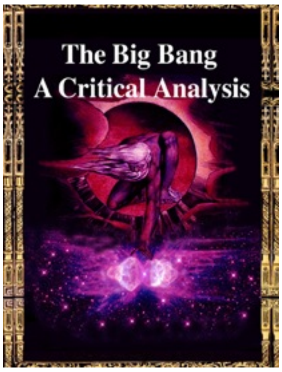

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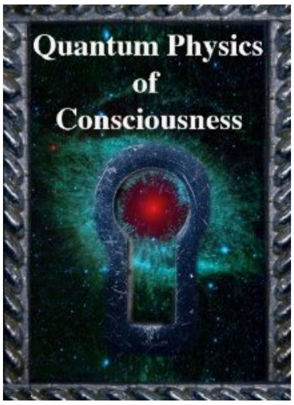

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