

This chapter as also other chapters about the notion of time appearing in books about TGD inspired theory of consciousness should be taken as stories about how ideas developed through many tortuous twists and turns. In this abstract I only summarize the outcome and leave the description of the tortuous path to the chapter.

The identification of the experienced time t_e and geometric time t_g involves well-known problems. Physicist is troubled by the reversibility of t_g contra irreversibility of t_e , by the conflict between determinism of Schrödinger equation and the non-determinism of state function reduction, and by the poorly understood the origin of the arrow of t_g . In biology the second law of thermodynamics might be violated in its standard form for short time intervals. Neuroscientist knows that the moment of sensory experience has a finite duration, does not understand what memories really are, and is bothered by the Libet's puzzling finding that neural activity seems to precede conscious decision.

These problems are discussed in the framework of Topological Geometroynamics (TGD) and TGD inspired theory of consciousness constructed as a generalization of quantum measurement theory. In TGD space-times are regarded as 4-dimensional surfaces of 8-dimensional space-time $H=M^4 \times CP_2$ and obey classical field equations.

The basic notions of consciousness theory are quantum jump and self. Subjective time as originally identified as a sequence of quantum jumps, which somehow integrate to form single coherent entity, self. Self has as a geometric correlate a fixed volume of H - `\blockquote{causal diamond}`-defining the perceptive field of self. This picture leaves however open two key questions. How the arrow of time and localization of contents of sensory experience emerge and what self do really mean? This chapter discusses several approaches to the problem.

The most recent and one might hope also the final proposal involves no ad hoc

assumptions and relies on the recent formulation of quantum TGD using zero energy ontology (ZEO) and the understanding of both nature of time and self reduces to a more precise view about what happens in state function reduction in ZEO.

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\item The imbedding space correlate of self is so called causal diamond (pair of future and past directed light-cones) which is 8-D sub-manifold of the imbedding space rather than space-time sheet.

\item In ZEO state function reduction can occur at both boundaries of CD but can occur repeatedly at given CD boundary. In the repeated reduction the already reduced positive/negative energy state remains the same just as the state function remains invariant in ordinary repeated state function reduction. Second boundary of CD corresponds to a wave function in the moduli space of CDs and changes: since the distance between the tips of CD is one particular modular degree of freedom, the average value of this distance tends to increase just as the distance of particle diffusing inside cone increases during diffusion. This gives rise to the experience flow of geometric time identified this temporal distance.

\item Self can be understood as a sequence of repeated state functions at the same boundary – the original identification was as sequence of all quantum jumps. The arrow of geometric time changes at some level of self hierarchy when quantum jump takes at the second boundary of CD and could correspond to volition, act of free will.

\item The notion of negentropic entanglement also leads to a model for self model to be carefully distinguished from self.

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