Chronometry-Based Approach to Consciousness and a Possible Role of Tachionic Representations
Alex Levicev, PhD, Boston University, Department of Mathematics

The goal of this message is to indicate new possibilities to model consciousness. They arise due to the Chronometric Theory which has been developed by Irving Segal (MIT, he passed away in 1998).

In my survey article [Le-95] I was justifying the claim that "Segal’s chronometric theory is the crowning accomplishment of special relativity". Go to “Chronometry.dvi” file on http://math.bu.edu/people/levit to learn about the Theory.

Accordingly to quantum mechanics each object is described by its wave function. In general, the latter is neither numerical- nor vector-valued. Rather, it is a section of an induced vector bundle. The respective Hilbert space is thus determined (essentially, uniquely) since the very notion of an induced bundle pre-supposes the action of the symmetry group. The entire construction will be below referred to as a representation; each object is described by a certain representation. It is an acknowledged way of modern theoretical physics to describe elementary particles and their interactions in terms of induced representations. Here I only mention about three distinctions between conventional quantum mechanics (QM) and its chronometric counterpart CQM:

1) the "underlying" spacetime (the Minkowski world \( M_0 \)) of QM can be canonically embedded into Einsteinian \( M \) of CQM;
2) the symmetry group \( P \) of \( M_0 \) is a subgroup of the symmetry group \( G \) of \( M \);
3) chronometric energy of an object in a given state is always greater than (or equal to) its conventional energy in that state.

The characteristic feature of a typical chronometric representation is its indecomposability. As a consequence, one has to distinguish (see [Le-95, Sect. 6.1]) between an exact particle which is represented by a section (= state) of a respective induced bundle, and a reduced particle, a theoretical entity obtained by formation of quotient representations. The latter correspond to conventional representations.

The ”exact object” is described by the evolution of its state (= vector in the representation space) in the upper level (BEFORE factorization), whereas the object’s conventional quantum mechanical state belongs to the space of the factor-representation. Certain amount of information about an object is lost as the result of that factorization.

The above construction is applicabale both to “live” as well as to “dead” matter (“spirit” below is a substitute for “live matter”; simply “matter” is used for “dead matter”). A “tachion” is the (widely used) name for a superluminal particle. Most of experts (me included) are highly sceptical about existence of tachions. However, in his book [D-90] Prof. R.Duthel pursued an idea to model consciousness in terms of tachions (he has not been using the representation theory).

A few years ago A. Levicev has suggested to view the presence of tachionic “components” as the defining characteristic of live matter. Worded differently, such an object is defined by an unstable representation of the conformal group \( G \) (which is larger than the conventional Poincare group \( P \)). Unstable, or tachionic representations, are mathematically quite common; there is neither lower nor upper bound on eigenvalues of the Hamiltonian. Such a property on that ”higher level” (that is, in the representation space of the exact object) does not directly contradict to the causality in Special and General Relativity.

The chronometric (= global) Hamiltonian differs from the conventional (= relativistic = local) one. A purely mathematical question thus arises: are there such unstable representations of \( G \) which become stable when restricted to \( P \)?

The following is an (oversimplified !) description of an energy recharge mechanism: a (live) object \( O \) feels tired (which is an indication that \( O \)’s global energy approaches the energy level of the pure matter which physically constitutes \( O \)), \( O \) gets itself at rest (physically), thus permitting the tachionic component of its state to freely wonder in the tachionic representation space; that journey results in the drop of that component
to an eigenstate with a negative eigenvalue (which is large by its absolute value); upon “awakening”, however, it is only the absolute value which matters (being large!).

References