Corrigendum to the Elementary Process Theory

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To fully resolve Theseus' paradox in the framework of the Elementary Process Theory, this paper corrects its formalism and axiomatization.

Theseus' paradox is the following. The ship of Theseus lies in a harbor. Of course, it remains the ship of Theseus when one bolt is replaced. But suppose that after years of maintenance, *all* material of the ship has been replaced. Can we then still say that it is the ship of Theseus?

This paradox plagues the framework of the Elementary Process Theory (EPT). Here all massive particles, e.g. electrons, alternate between a particlelike and a wavelike state [1]. These states, however, are constantly created and destroyed in discrete transitions. So the question is: if we have a *new* state, is it then *the same* electron?

Despite the addendum [2], this question turned out to be still not adequately answered in the framework of the EPT. This paper is to settle the issue for once and for all; this requires, however, an addition to the language and a change in the axiomatization of the EPT.

1. To Def. 3.1.1.1 on p. 708 of [1], we add the following 2×1 set matrices to the constants of the language:

- $p(x,k)$ constants $\begin{bmatrix} \psi_h^x \\ \overline{\psi}_h^x \end{bmatrix}$ for every constant $\begin{bmatrix} {}^{EP}\phi_k^x \\ {}^{EP}\overline{\phi}_k^x \end{bmatrix}$

2. To Table 1 on p. 709 of [1], we add the following interpretation rule:

- the symbol $\begin{bmatrix} \psi_h^x \\ \overline{\psi}_h^x \end{bmatrix}$ designates the component of the universe of the EPT, consisting of the states of being of the h^{th} monad at the x^{th} degree of evolution in the world (ψ_h^x) and in the antiworld ($\overline{\psi}_h^x$).

3. Axiom 3.1.3.18 on p. 718 of [1] becomes a definition:

Definition 1 (Binads):

$$\forall x \in Z_N \forall k \in S_{\omega(x)} \left(\begin{bmatrix} \beta_k^x \\ \overline{\beta}_k^x \end{bmatrix} = \begin{bmatrix} {}^{EP}\phi_k^x \\ {}^{EP}\overline{\phi}_k^x \end{bmatrix} + \begin{bmatrix} {}^{NW}\phi_k^x \\ {}^{NW}\overline{\phi}_k^x \end{bmatrix} \right)$$

So this merely defines the symbol on the left hand side as an abbreviation of the sum on the right hand side.

4. The following axiom is added to the EPT:

Axiom 2 (Elementary Principle of Binad Composition):

$$\forall x \in Z_N \forall k \in S_{\omega(x)} \exists \sigma \in P \exists p \in Z^+ \left(\begin{bmatrix} \beta_k^x \\ \overline{\beta}_k^x \end{bmatrix} = \begin{bmatrix} \psi_{\sigma(1)}^x + \ldots + \psi_{\sigma(p)}^x \\ \overline{\psi}_{\sigma(1)}^x + \ldots + \overline{\psi}_{\sigma(p)}^x \end{bmatrix} \right)$$

This axiom thus says that the binad β_k^x is always, for some integer p, an aggregation of p states of being of monads.

5. This fully solves Theseus' paradox. We will show this for an electron. Suppose that, by the chain of discrete transitions, the k^{th} process from the x^{th} to the $(x+1)^{\text{th}}$ degree of evolution is succeeded by the l^{th} process from the $(x+1)^{\text{th}}$ to the $(x+2)^{\text{th}}$ degree of evolution. Then consider two instantiations of Ax. 2 with $p=1$ and $\sigma(1)=h$, so that

- $\beta_k^x = \psi_h^x$
- $\beta_l^{x+1} = \psi_h^{x+1}$

where the integer h refers to an *electronic* monad: the symbols ψ_h^x and ψ_h^{x+1} then designate successive states of *one and the same* electron. We can derive $\beta_k^x = {}^{EP}\phi_k^x + {}^{NW}\phi_k^x$ and $\beta_l^{x+1} = {}^{EP}\phi_l^{x+1} + {}^{NW}\phi_l^{x+1}$ from Def. 1; substituting this in the above equations and using the interpretation rules of the EPT then yields that the successive states ψ_h^x and ψ_h^{x+1} of *one and the same* electron are made up of *different* particlelike and wavelike phase quanta. In other words, the state of being is *new*, but it is *the same* electron. Another example would be a deuterium nucleus, in which case $p=2$ with $\beta_k^x = \psi_m^x + \psi_n^x$ for some m and n; the ψ's then refer to the states of the proton and the neutron.

Key words. Elementary Process Theory; Theseus' paradox

References

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