

Review of: "The Quantum Character of Perception: The Probabilistic and Reversible Thermodynamic Cycle can Produce Spin-like Attitudes, Thinking, and Behavior"

Ilya Surov

Potential competing interests: No potential competing interests to declare.

The paper makes progress in understanding emotions from the perspective of natural sciences. The novelty is thermodynamic and quantum-theoretic approach, integrating different aspects of natural cognition, usually considered separately.

Weak side of the work is lack of rigor. In its present form, the logic makes steps by broad analogies, not sufficiently backed by experiment or theory.

Example is identification of endothermic and exothermic regimes with basis spin states. To validate this hypothesis, one needs to ensure that space of thermodynamic states is isomorphic to that of spin- $\frac{1}{2}$, which is not shown.

Similarly, the concept of psychological spin is developed on analogy that both have two limiting states (page 11). This logic is superficial (not to say erroneous) as it would also work e.g. for classical bit or linear segment 0-1, trivially representing binary opposition.

In fact, emotion is not limited to positive and negative. It has at least three affective dimensions: evaluation, potency, and activity (Osgood's EPA). Two-dimensional version of it gives circumplex models of emotion (see Russell and Barrett). However, the author's intuition about quantum nature of emotion seems perspective. Recent consideration of this issue (that of myself, but really relevant to the subject) [Surov I. Natural Code of Subjective Experience // Biosemiotics, 2022] might be useful to move the theory forward.

Couple of other approaches to take into account.

First, would be interesting to compare the author's perception cycle with semiotic cycle of perception and action [von Uexküll J. A stroll through the worlds of animals and men: A picture book of invisible worlds // Semiotica, 1992].

Second, consideration of emotional homeostasis by K. Peil [Peil K.T. Emotion: the Self-regulatory Sense // Glob. Adv. Heal. Med, 2014] and L.F. Barrett [e.g. Affect as a Psychological Primitive // Advances in Experimental Social Psychology, 2009] may complement the author's approach.

As a minor comment, some references seems to be out of place. For example, Yih does not discuss representation of intentions in space, as could be expected from sentence on page 11. Next to it, the paper of Basieva and Cervantes is far from discussing crisis in psychology.

Overall, the paper presents a lot of cross-disciplinary connections and ideas which could be developed to testable

predictions. However, this needs improved rigor and mathematical formalization. When accomplished, this may become a useful theory.