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

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The review below is by Nelson Cowan

This article explores the potential relatedness of quantum physics and the operation of the human mind. The article provides these highlights: (1) Energy information exchange with the environment is based on the resting-state, (2) Perception is a reversible thermodynamic cycle representing psychological spin, (3) High entropy and irreversible activations form up spin, inspiring future orientation, (4) Low entropy with reversible activations and past focus acts as a down spin, and (5) Emotions are cognitive master regulators, the fundamental forces of motivation.

I am a cognitive psychologist who has tried to understand the concepts of quantum physics, not totally without success I believe. The findings of quantum physics and other aspects of modern physics have challenged our understanding of basic scientific concepts such as causality, time, and determinism. It is natural that people would want to see what implications the new findings and concepts of physics have for our understanding of the human mind. The mind and behavior have complexities, such as apparent unpredictability and holding opposite emotions simultaneously, that do seem reminiscent of the new physics.

Despite the possible aptness of the quantum physics domain for describing mental and behavioral phenomena, though, at the time of my reading, this work will not be very useful to psychologists. (This could change if dramatic changes in the writing take place based on my concerns.) In my reading of the manuscript, it felt as if the author was building a bridge and only made it half-way from one side of the divide to the other. To my knowledge, physicists can understand a lot of the terminology that was used. This terminology was, however, not sufficiently explained for the typical psychologist. Moreover, the work was not explicit or detailed enough in showing how the concepts from physics can assist in the investigation of the mind and behavior. It was not clear to me how any finding from the field of psychology could be explained through the physics concepts in a way that would lead to new predictions that could be tested. It was also not clear whether the physics concepts reinforce some of the current theories in the field of psychology or conflict with them.

Let me give a single example of what could be improved. Suppose one views emotions as a superimposed state, such that it is possible to feel happiness and sadness at the same time. In physics, measuring two entangled particles supposedly collapses superimposed states, and measuring the spin of one particle collapses the waveform, ensuring the opposite spin of the other, entangled particle if it is measured at the same angle as the first. How might this apply to humans? Well, perhaps social interactions result in two entangled individuals. In some situations, they might both be happy and sad at the same time. Take the situation in which one of them wins an award (a source of happiness) and the other, a good friend of the first, was equally qualified but did not win it (a source of sadness). If the first person expresses happiness about winning, by contrast it may bring out sadness in the other. If, on the other hand, the first person expresses sadness that they didn't both win, it could bring out a feeling of happiness in the other. I've invented this somewhat contrived situation to illustrate that thinking more about the specifics of the psychological end of this bridge could lead to a more useful application of the physical end of the bridge. It could lead to predictions like this that may make sense but may not have been tested. Even if everything that the current article says is true, the hard work may be in determining exactly HOW the physics concepts apply to the human mind and just WHAT specific predictions for psychological science can be derived from it.

Additionally, the author should work to spot statements that will be mysterious and a bit meaningless to most psychologists. To show a few examples:

"Because the principle of least action in physics ensures a minimal energy conformation when moving in space, intelligent systems increase future freedom of action (Deli, 2020a; Wissner-Gross/Freer, 2013)." – This sentence is impossible for me to understand.

"Furthermore, spontaneous meaning generation and abstract task structure representations (Witkowski et al., 2022), a fundamental character of intellect, are based on the organizing principle of space (Singer, 2021; Deli et al., 2018; Tsao et al., 2018)." – Please explain this too.

"Therefore, various physics frameworks can explain enigmas in cognitive sciences (Deli, 2015; Deli, 2020a,b; Goldenberg et al., 2018; Peters & Kashima, 2015; Jiang et al., 2016; Khrennikov, 2015)." – This doesn't seem to follow clearly from the text preceding it and is not sufficiently explained.