Review of: "Archetypal Resonances Between Realms: The Fractal Interplay of Chaos and Order"

Olga Chernavskaya[1]

1 P.N. Lebedev Physical Institute of the Russian Academy of Sciences

Potential competing interests: No potential competing interests to declare.

This work is rather reminiscent of a popular-science article, or even a philosophical-artistic essay. Indeed, the representation of the play of “chaos & order” is fascinating. It’s amazing how strict dynamic laws, when repeated many times on different scales, lead to visible chaos, and vice versa, how slender harmonious patterns can emerge from a complete “mess”. In relation to a purely scientific article, one could expect the usual paper organization, such as: Introduction, Main idea, Confirmation, Conclusion. However, these rules are not obligatory for an essay. Despite the apparent unusualness, the article is interesting and impressive.

However, I would like to warn against excessive romanticization and animation of Quantum Mechanics (QM). It is indeed a very elegant tool for describing the “*invisible and unrepresentable*”. This applies mainly to atoms, elementary particles, *quarks*, etc. When (many years ago) I studied at the Physics Faculty of Moscow State University (Department of Quantum Field Theory), they used to say about QM: “Students at first don’t understand, but then get used to it”. Note that many of them begin to attribute magical properties to QM. In my opinion, the deepest thing in QM is Heisenberg's “*uncertainty principle”*, which is not so often remembered and talked about as *Schrödinger's cat* (which reads: “on small scales you can know exactly only the speed or position, but not both together”). In a sense, it is an analogue of Gödel's incompleteness theorems in mathematics. In essence, both of these postulates mean the *impossibility* of a *complete* description of the world using any *strict* dynamic laws. At some stage, a so-called “*mixing layer*” appears as an island of chaos,

which leads to a *new order*. But the recent tendency to explain *all* mysteries as the “intrigues” of QM is at least not serious. For example, the impression of a true masterpiece (such as the “Last Supper” or “Mona Lisa”) differs significantly from that produced by ordinary painting, while QM has nothing to do with it, these are already *games of consciousness*.

As for the relationship between QM, chaos & order, and the concept of “consciousness” ¾ this is a much more complex and profound question. It is not for nothing that there is still no clear, generally accepted definition of the concept of “consciousness” in cognitive science. More precisely, there are many different options in the literature, from the philosophically-vague “*reflection of reality*” to the everyday medical understanding of “being conscious.” Recently, the question “what is consciousness” has become particularly acute in connection with the discussion about whether the Large Language Model (LLM), in particular the Generative Pre-trained Transformer (GPT), has it. In general, can artificial systems be conscious? A positive answer to this question immediately gives rise to a lot of ethical, legal, etc. problems. Therefore, the definition of this concept should be treated very carefully.

I didn’t quite understand what the authors consider consciousness to be. Yes, both *feedback loops* and the *fractal organization* of the brain play important roles in understanding the concept of mind. These paradigms are already used, e.g., in Deep Learning neural networks, as well as in the model NCCA that we are developing (see, e.g., DOI 10.2139/ssrn.4593718 and DOI 10.1016/j.cogsys.2020.10.007). But what exactly do the authors imply by the term “consciousness”?

My particular attention is drawn to the phrase “*In a way, consciousness can be seen as emerging from intricate, re-entrant feedback loops, where inputs are continuously weighed against internal models, memories, and predictions.*” What does it mean exactly?

Moreover, it’s strange that I didn’t see anything about *emotions* in the authors’ reasoning,

while when talking about human perception of something, and especially about the formation of *mental archetypes*, it's impossible to avoid them.

Nevertheless, I myself would be very interested to know what definition of the concept "consciousness" the authors can offer.