

Peer Review

Review of: "Integrating Biological Principles into Observational Entropy"

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This manuscript cannot see the light of day. My comments are listed below that may help the author to understand why.

(1) You quote, "Information is not knowledge" — Albert Einstein. This is scientifically a nonsensical statement. We need information to derive knowledge; even useless information, including noise, can provide useful knowledge about a system. In physics, physicists do not like heavily processed or cherry-picked data. Physicists need to see all the data points, or the same data from many experiments, to derive the correct physics. Information can be not relevant to a particular knowledge, but information as it is is never discarded as 'not-containing-knowledge'.

(2) "The uncertainty and indeterminacy of entropy arises from the interplay between the intrinsic variability of the observed physical system and limitations in the observer's sensorial and epistemic framework." This is correct if we cannot define the physical processes precisely, which makes the entropy uncertain. In this case, the whole system is uncertain.

(3) What is p_i in your first equation? In that equation, p_i/V_i is the probability of what?

(4) You are trying to apply entropy to biological processes. Fine. Let's see what happens if we do that. For a given bio-process, you should ask what causes it? Stimulated by sensors? OK. What is the physical process(es) that cause(s) the sensor to be activated? Interaction between molecules? Ions? Atoms? All of them? Eventually, you will need to define the physical processes to evaluate the entropy of the sensing system properly. We cannot quantify entropy by saying that you (as the sensing biosystem) are thinking right now, and therefore your entropy is increasing by an amount, which is correct, but the increasing amount will always stay uncertain because the involved physical processes are uncertain. This leads to the question, why invoke or study entropy when you know you cannot define or evaluate entropy in such

systems? There is no scientifically interesting phenomenon here to be discovered with respect to entropy or with entropy-uncertainty in biological systems.

(5) You quote, “But if the ultimate aim of the whole of Science is indeed, as I believe, to clarify man’s relationship to the Universe, then biology must be accorded a central position.” — Jacques Monod. Biology does not and cannot hold a central position to evaluate the workings of our universe, including the fundamental workings of all lifeforms. Biology is important to evaluate the workings of cells, the evolution of cells, and the demise of cells due to different chemical environments within the cell and within the system that contains those cells. Man’s relationship to the universe has got nothing to do with biologically induced feelings toward the universe. The universe is never a biological entity.

(6) You quote, “It is the quality, not the mere existence, of information that is the real mystery here.” — Paul Davies. Yes, that is why we have the natural sciences and mathematics to derive the “quality” from the observed or measured information.

(7) You quote, “The observer, when he seems to himself to be observing a stone, is really, if physics is to be believed, observing the effects of the stone upon himself.” — Bertrand Russell. What he was saying is that, when I jumped out of a window from my flat, the forensic scientists would be calculating the impact on my fractured bones and would deduce the initial position of my body right before hitting the ground, the possible trajectories of my fall, and how and in what position I have landed, including blood and other chemical tests to be consistent. A detective would investigate why the hell I did that (suicide or homicide?), while a psychologist would evaluate my state of mind prior to the jump. I think Russell was either mocking the quantum physics interpretation as advocated by Bohr et al., or he was being philosophical about it after learning some Indian philosophies from Ramanujan.

(8) You quote, “...general relativity, quantum mechanics, and statistical mechanics are actually derivable, and from the same ultimate foundation: the interplay between computational irreducibility and the computational boundedness of observers.” — Stephen Wolfram. Did Wolfram manage to do exactly that? Talk is easy. No. He cannot do any of that without assuming/invoking nonsensical connections between physical functions, between variables, and between constants. He sees the universe as the supercomputer(s) encompassing many subcomputers. His method cannot provide the proper physics of what we observe or measure. His method, just like pure mathematics with numbers, can be exploited to calculate the values that match the experimental data, but this does not and cannot imply in any way that the physics deduced is correct. Every step of the physics needs to be verified experimentally, consistently both with physics and mathematics. Purely computational or purely numerical methods cannot provide

the correct physics. Wolfram's method is useful in engineering because the equations can be derived in any useful way without the need to obey quantum physics.

(9) Physics is never about anyone's perspectives. Physics stays the same regardless of whether I committed suicide or it was a homicide.

(10) Order-disorder is one specific and narrow way of formulating entropy, which does not apply elsewhere.

(11) The rest of the manuscript is scientifically not useful and full of scientifically false deductions. The author should not plug-and-play quotes as if the quotes are scientific statements that have been or can be verified scientifically.

Declarations

Potential competing interests: No potential competing interests to declare.