Sensations as High-Complexity, Low-Energy Physics Phenomena

Terry Bollinger
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https://youtu.be/o71HwjFT4ow&lc=UgxQpBdoQ52lH_IQ3At4AaABAg

A Comment on the Closer to Truth post:
Donald Hoffman - How Do Human Brains Function? (Mar 4, 2023)
https://youtu.be/o71HwjFT4ow

What a delightful interview! I had no idea the model-building ventral system is tied so closely to consciousness. Your math proof sounds intriguing and worth a look… Ah! Even better, here's a new (2023) broad-perspective article by Hoffman, Prakash, and Prentner:

D. D. Hoffman, C. Prakash, and R. Prentner, *Fusions of Consciousness,* Entropy 25, 129 (2023). [2023-03-06.01.05 EST Mon update: Alas, the physics arguments are very weak.]

Anyone reading this can find the paper using Google search. Since the article quickly dives into fundamental physics beyond the scope of my original comment here, I've appended a few upbeat physics observations at the end of this comment [1]. These are mainly for the article's authors since the main topic of this comment is sensations and synesthesia:

An easy lab proof of the arbitrary nature of blue and maroon mapping to visual stimuli is having two people with synesthesia discuss the colors of letters. The resulting debates leave no doubt that the same stimulus that one synesthete sees as blue is the one the other adamantly sees as maroon.

Given the remarkable variety of ways synesthetes assign sensations to stimuli, I think the more interesting question is not whether sensations are real — as in "energy-based, energy-consuming phenomena generated by large neural systems" — but how they contribute to biological survival.

For example, does a particular mapping of sensory inputs to some precisely defined and well-structured subset of sensations provide a survival advantage over other mapping and sensation constructs? Is it possible, for example, that assigning red to dangerous situations has a statistically detectable survival advantage over assigning green to such stimuli?

I'm inclined to think that might be the case. However, this effect is more likely hierarchical if sensations are biologically customized phenomena. After a certain level of customization of both the mapping and the sensation type, e.g., "photons" to "colors," the settings of the final sensation parameters likely matter far less to survival advantage than the overall form of the construct. That is another way of saying that while color works great for visual systems, it's probably a lousy construct for classifying and processing auditory sensations or for higher-level constructs (e.g., emotions) that fuse both.

Thus, while mapping red to blood and green to trees may provide some mild faster-reaction advantage, it is likely only mild. Given the prevalence of red-green retinal color

blindness in human males, it's hard to imagine that reversing the mapping of red and green sensations would make much of a survival difference. In contrast, certain forms of wildly diverse synesthesia, such as mapping colors to tactile inputs, are sufficiently chaotic to be detrimental.

However, as is often the case in biology, exploring new and novel options can sometimes lead to previously unexploited advantages. I suspect such exploration occurs with synesthesia. For example — and I am always surprised this is not better known — Richard Feynman had a mild version of synesthesia. He saw equations in colors, and those colors helped him navigate the maths he developed.

I look forward to when the idea that these powerful and remarkably diverse data processing shortcuts, whatever they are, stop being viewed as mystical and instead start getting analyzed as precisely optimized mappings of sensory inputs to a broad spectrum of energy-consuming dynamic constructs that help us to navigate our world better. While we do not yet understand the physical basis of these effects, the fact that large neural systems can generate and then exploit them to process vast quantities of sensory data means we can analyze them using the scientific method. The roadblock is not whether they are real but that we must figure out what to study.

When we finally make that transition, we'll be closer to understanding consciousness better and developing entirely new strategies for processing information more efficiently.

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[1] Upon a quick read of the first couple of pages of your *Fusions of Consciousness* article, I'm impressed. I don't understand how yet, but somehow the three of you realized via this path that xyzt spacetime cannot be fundamental. That is… unexpected for an article on sensations. I look forward to reading further on how you got from sensations to spacetime and whether I find your reasoning sound.

2023-03-06.01.05 EST Mon update:
The authors rely only on decades-old "Planck foam" speculations to assert that spacetime is not fundamental. Since Planck foam is math noise generated by applying cost-blind 1700s continuum maths to experimentally finite and energy-bound physics, it lacks relevance even to high-energy physics, let alone to something as subtle and low-energy as perception. The perception components of the paper still look interesting.

In any case, you are right. The xyzt construct is emergent and begins to lose resolution at the atomic and particle levels. For over a century, we've been inverting that model and blaming the "uncertainty" on some strange behavior of infinitely precise particles — particles that quantum mechanics tell us cannot exist because their energy cost would be infinite. Moreover, it isn't even genuinely four-dimensional if you do the algebra correctly and take Minkowski's fusion of space and time more seriously than he seems to have taken it himself. Space and time are linked much more closely than the xyzt breakdown suggests, with what we think of as "pure" xyz distances corresponding instead to Lorentz invariant products of length and time or, more intuitively, square roots of such length-duration areas. The square roots are more understandable because they add the same

ways as xyz distances add, just with different units. Time and time flow emerge *locally*, not globally, due to closing the same loops that also locally defined the speed of light. As Einstein noted, it is impossible to define even the speed of light without closing loops.

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https://sarxiv.org/apa.2023-03-04.1427.pdf