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To identify all the relevant factors is to explain feeling

Response II to Commentary on [Reber](#) on *Origins of Mind*

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Abstract: Several additional comments on Reber (2016a) have appeared. Like those addressed in Reber (2016b), they reflect points of agreement and disagreement on various elements of my Cellular Basis of Consciousness (CBC) model. Some, however, seem to have missed key points. I'm willing to take some responsibility for this. Perhaps I was not clear about some of the more radical points of the model. Hopefully the case-by-case review here will help.

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Morsella & Reyes seem to approve of my primary move, that single-cell species possess a rudimentary form of consciousness. I agree with them, of course — having spent a half-century studying the processes underlying implicit learning (see Reber, 1967, 1989, 1993) — that understanding how conscious and unconscious processes play themselves out in the human brain is a key goal in understanding human cognition. But these concerns aren't relevant to the issues raised by the CBC model.

If, as I am arguing, a primitive form of consciousness or sentience is a property of the simplest living organisms, then there are, *a fortiori*, mechanisms through which these subjective states are modified over evolutionary time to fit within the growth in complexity and function seen throughout speciation.

Take, for example, the issue of individuality (Godfrey-Smith, 2016; Pradeau, 2016). Here, mechanisms emerged that gave rise to individuals as distinct entities rather than a collection of cells, each of which was/is also a distinct entity. As species became more complex and evolved an ever-wider variety of forms and functions, they constantly underwent these kinds of changes. The CBC simply assumes that they were accompanied by the emergence of more complex forms of sentience.

Ng is concerned that my "requirement of 'a sensitivity to its surrounds' may make the axiom or statement a tautology if 'sensitivity' requires subjectivity." The direct entailment is correct. It is tautological. While a tautology is generally viewed as a weak rhetorical device,

I've embraced it. In the CBC, adjectives like *subjective*, *sentient*, *sensitive*, and *phenomenal* and their nominal and adverbial forms share overlapping linguistic privileges of occurrence.

Ng notes that conscious species have flexible behaviors. I agree. Single-cell species do *have* flexible behaviors. They move; they approach some objects; withdraw from others; incorporate still others. Ng's stance is that such behaviors do not require conscious decisions. But, in the CBC framework, to withdraw from something that is sensed as having negative valence *is* a decision — a pretty simple one but certainly one that is accompanied by a subjective state. The whole point of the model is to emphasize the evolutionary continuity of function. That a behavior is (relatively) hard-wired does not entail that it inhibits phenomenal experience.

And, in passing, I never said it was "... better to go beyond brains to the level of primitive organisms." I said it was a good research strategy that has a high likelihood of success. I am all for studying brains.

Where I suspect that **Ng** and I may have a fundamental disagreement is over this comment (p. 3):

"... a more immediately important problem is to know with high and increasing degrees of probability which species of animals are capable of affective sentience. For nonsentient species, we do not have to care about their welfare, as they do not have any welfare."

Since the position of the CBC is that even the simplest of organisms have "affective sentience," it follows that all organisms have "welfare." It behooves us to not cause pain or suffering when it can be avoided or is not balanced by other considerations. In Reber (1997), the first paper on this topic, I wrote:

It began innocently enough. I was watching this small green caterpillar munching on one of my new basil plants. Having become ... an easy-going soul who doesn't feel he has the right to extinguish life, I resisted my initial impulse to flatten [it]...With this sense of the integrity of (relatively benign) life forms guiding me, I spent some time with my herbal interloper, gauging its behavioral assault on my basil.

I still stand by that. The CBC model is also a framework for examining issues in bioethics. I hope to undertake such an exploration in the future.

Safina claims that I have kicked the can down the road. He is right. I have. I am not a molecular biologist and have no solution to the question of how subjectivity is created in single-celled organisms. I merely claim that it is so created.

The point of the target article was to encourage a redirection in thinking and research, to promote a reductionist position where biologists would focus attention on the problem and philosophers of mind could be deflected from framing topics in ways that obfuscate rather than clarify. It was to encourage a broader sense of the scope of mental life.

I have no concrete solution to my version of the "hard problem," only words of encouragement to others. But I am pleased that **Safina** appreciates my writing.

Broude seems to have misunderstood my position. I certainly never claimed that evolution of sentience occurs "without gradual accretion and quantitative change with nothing novel added." Of course, novel functions, forms, processes and mechanisms are added. *Homo sapiens* has semantic memory, *Aplysia californica* does not. But both species share fundamental biological operations that allow cells to encode representations of events experienced. The consciousness of birds, octopuses, chimpanzees and us are all vastly different from that of the eukaryote, but they share a common foundation.

Nothing in the CBC entails an abandonment of qualitative change or argues that evolution can be captured by models based only on quantitative shifts. Both **Woodruff** (2016) and **Ristau** (2016) commented on this issue of saltationist processes and in my earlier reply (**Reber**, 2016b) I agreed, noting that "pure continuity here is not a requirement."

Similarly, the CBC approach does not, as Broude suggests, neglect the complex interactions between genetic changes and the resulting forms and functions. Her statement that "A gradual change in the genome does not guarantee a gradual change in, say, the brain. Nor does a gradual change in the brain necessarily lead to a gradual change in mind or behavior" is presented as a criticism of the CBC. It isn't. I concur. In fact, these operations are implicitly embodied in the CBC.

Last, **Broude** seems to invite (if not embrace) the dualism of Chalmers (1995) when she states that what's missing from my analysis is "*feeling*." I rather thought Nagel cleared this one up years ago. We cannot know what, for example, fish-pain feels like. Only a fish does. But we have several routes to getting a handle on this issue. There are behavioral indicators like withdrawal and future avoidance, physiological measures like tissue damage and repair mechanisms, and evolutionary considerations like those implicated by the CBC model.

My stance is that of a strict mechanist. To identify all the relevant factors *is precisely* to explain the feeling of pain. A color-blind scientist can come to understand the nature of color vision without ever experiencing the distinction between red and green. I don't know what a 22-kHz tone sounds like to a dog; I don't know what a cheese sandwich tastes like to **Broude** but I'm content to have a full, scientifically sound description of them and that will have to do.

What I'm trying to avoid is falling into the dualist's trap that somehow there is something more here, some aspect of subjective experience that cannot be "explained" by an exhaustive analysis of physical factors. Down this road lies mysterianism.

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