

Review of: "The Case for Conscious Experience Being in Individual Neurons"

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The paper by Edwards and Somow deals with a highly contentious approach to perhaps the greatest mystery and still unsatisfactorily explained phenomenon within the realm of the neurosciences, i.e. the origin and nature of conscious experience and the role of the brain and (individual) neurons therein. Judged by the comments of other colleagues, the subject, as is well known, never fails to raise emotions.

Invited to review this paper, as a molecular and cellular neuroscientist/neuropharmacologist I do not trust that I have enough theoretical knowledge or experimental experience to adequately judge the validity of the line(s) of thought and the claims made by the authors. As a general remark on the style of the paper, however, although enthusiastic about the question and answer form used by the authors, I am somewhat irritated by the recurring use of the, in my view, unsubstantiated claim that "it makes much better sense.....", or equivalents thereof. To me, an uninformed but interested colleague, this is not so clear cut as it apparently should be. It might work better to help lead such readers to this kind of conclusion instead of imposing them on them as a matter of course.

Then to the content. As a materialist/physicalist cellular neuroscientist/-pharmacologist, for a number of reasons (e.g., organisational structure and cellular morphology; effects of anesthetics) it makes good sense to look for the basis of conscious experience in the brain and in particular in its neuronal components and the connections between them. Indeed, each neuron, metaphorically speaking, could be conceived as a who, that both listens to the input signals from connected neurons (and other brain cells), translates and integrates these with its own (hi)story, the net updated form of which it then shares with the other cellular/neuronal elements belonging to its network in the form of electromagnetic coupling and/or release of specific chemical mediators. For the purpose of listening, translating and integrating I agree with the authors that neuronal membranes and cytoskeletal elements are likely to play an essential role. However, how this all links to conscious experience or events of individual neurons, in my view, deserves and requires a more elaborate treatment than provided in the paper in order to even start convincing the non-believers. I suggest that first the authors should expand on their ideas and evidence of this in more detail, instead of the few casual remarks in the current version of the manuscript. Secondly, although certainly no expert on this topic, I would also like to draw the attention within this context to ideas outlined by the Finnish biophysicist Arto Annala concerning the character of consciousness approached from thermodynamics (Front. Systems Neurosci., 2016; vol. 10, article 27). As I understand parts of his arguments relevant to this discussion, individual neurons as systems undergo flows of energy and act as energy transducers which inevitably leads them to have unique experiences which per definition differ from those of any other neuron and could be

considered as an elemental form of consciousness/sentience. This would then also be able to account for the subjectivity of conscious experience (every neuron has its own (hi)story), which is one of its defining characteristics. Perhaps such a more holistic approach incorporating an integrated treatment of individual neurons as energy transducers and neuronal signals like action potentials etc. as manifestations thereof, might provide a more tangible/physically convincing inroad towards a theory/explanation as to why conscious experience is in individual neurons.