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Title: Consciousness cannot be separated from the structure-determines-function principle

Abstract: A foundational axiom of evolutionary biology is that structure determines function. Call this the 'SDF axiom'. According to the SDF axiom, the morphology of any biological tissue is the key to its physiological function. Daniel Dennett, et.al. argue that our phenomenological experience of the world is intimately intertwined with cognitive processes such that "consciousness cannot be separated from function" (Cohen and Dennett, 2011). Others contend that phenomenology is so rich that it "overflows" the limited resources of cognition while dissociative theorists propose that cognition is at most involved in accessing and reporting conscious experience. By "consciousness cannot be separated from function" Dennett means more than just the reporting of experience – he contends that cognitive functions are essential for "one's personal awareness" and for "explaining the full scope of consciousness". Subsequent debate about this matter has tended to focus on whether the richness of phenomenal experience is or is not outside the scope of scientific inquiry (Cohen, et al., 2016). We propose here to reorient the discussion to one addressing a more fundamental question – how is it possible that we experience something (be it rich or sparse) rather than nothing at all? This, we argue, requires us to attend to the structures (neural circuitry) that underlie and explain cognitive functions, including the capacity for phenomenological experience. Recognising the importance of the structure-determines-function principle creates the possibility of understanding where in the brain consciousness is generated, and settling this question is the first step towards determining whether or not phylogenetically distant species are capable of phenomenal experience.

References:
Cohen, M.A. and Dennett, D.C., 2011. Consciousness cannot be separated from function. *Trends in cognitive sciences, 15*(8), pp.358-364.
Cohen, M.A., Dennett, D.C. and Kanwisher, N., 2016. What is the bandwidth of perceptual experience?. *Trends in cognitive sciences, 20*(5), pp.324-335.

Bio[1]: Assoc Prof Deborah Brown is Associate Professor of Philosophy at the University of Queensland and Director of the UQ Critical Thinking Project. She has worked in both the philosophy of mind and history of philosophy, with a special focus on early modern philosophy. Her 2006 book, Descartes and the Passionate Mind was published by Cambridge University Press and she and Professor Calvin Normore (UCLA) have a forthcoming book with Oxford University Press: Descartes and the Ontology of Everyday Life.

Bio[2]: Brain Growth and Regeneration. One of the most psychologically and physically devastating injuries for humans is one involving the BRAIN. The brain is our most precious entity—it is what defines each of us as unique individuals. Unfortunately the brain is not particularly adept at repairing itself. Unlike the skin that either heals naturally from lesions or can be repaired with skin grafts, the brain has a limited ability to do so and brain grafts, as yet, have not proven to be a practical solution.

Thankfully there is one region of the nervous system - the olfactory system (the neurons we smell with) - that is unique in its ability to regenerate. These neurons are dying all the time and are being replaced with stem cells that reside in the nose. These neurons then regenerate their connections with the brain to ensure our sense of smell is maintained throughout life. If we could harness this unique regenerative power of the olfactory system and apply it to other regions of the brain then we would have exciting and new opportunities in therapies for brain injury.

My lab is studying the olfactory system during GROWTH and REGENERATION in order to understand the underlying cell and molecular mechanisms that could be applied to BRAIN repair.

Being able to regenerate the brain is just one part of the story. As in the design of computers or telephone services, the wiring of the BRAIN during GROWTH and REGENERATION needs to be very precise. My lab is therefore studying the cell and molecular mechanisms of brain wiring during growth and regeneration. For this research we turn to animal models with simple wiring patterns, the zebrafish and Xenopus frog. Our goal here is to understand the 3-dimensional arrangement of cues used in the construction of the brain circuitry and to use this information to assist in the repair of regenerating circuits.