Book Review: Being You: A New Science of Consciousness by Anil Seth

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In **Being You**, **Anil Seth** *takes us on a comprehensive tour through the science of consciousness, drawing on the most up-to-date data, lessons and theories in the field. This is a compelling book that will leave readers pondering whether new technologies and smart experimental designs will further deepen our understanding of the mind, writes* **Manh Tung Ho***.*

Being You: A New Science of Consciousness*.* **Anil Seth. Faber. 2021.**

Exploring the real problem of consciousness

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Being You by Anil Seth delivers the most up-to-date data, lessons and theories in the emerging field of consciousness science. The author delivers a concise yet comprehensive tour of the scientific literature on consciousness: from major philosophical views to the findings on different levels of consciousness, the content of consciousness, the conception and perception of the self and, finally, the educated guesses on conscious experiences in non-human creatures such as octopuses as well as in machines.

The first step that Seth takes is to reject the influential hard problem of consciousness, which says science will never be able to account for how the phenomenological properties of consciousness arise from material mechanisms. Seth proposes that what is more useful is to assume the real problem of consciousness, which states that the goals of consciousness science are to explain, predict and control the phenomenological properties of consciousness.

Such an approach is the basis for Seth's analysis and discussion of theories and experiments in *Being You*. Dissecting consciousness into smaller, measurable, conscious experiences, then finding their neural correlates and appropriate theories that account for these experiences, Seth believes the big mystery of consciousness will eventually fade away. Perhaps one day we can account for why consciousness exists in the first place.
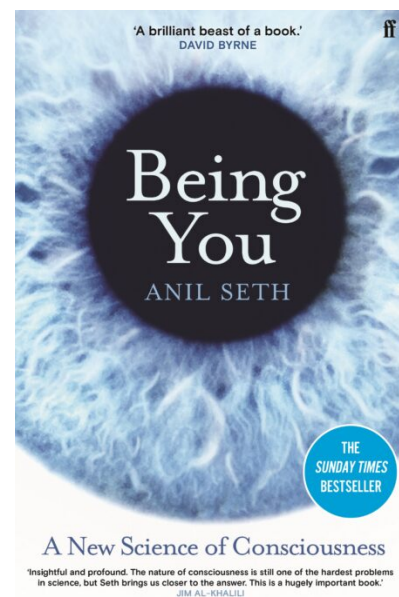
Seth introduces us to various theories that attempt to establish a measurement of consciousness level. Two of the most prominent theories explained in the book are the measurement of perturbational complexity index (PCI) and the theory of consciousness as integrated information processing (IIT). The former measures the algorithmic complexity of brain electricity signals recorded by an EEG device when the brain is zapped with a transcranial magnetic stimulation (TMS). We learn researchers have found very high levels of correlation between PCI magnitudes and a variety of conscious experiences. In medical settings, PCI has been used to rescue people experiencing locked-in syndrome from being wrongly diagnosed as in a vegetative state. It is also fascinating that studies of consciousness and brain activities show that use of psychedelics led to higher PCI than a baseline of waking rest, while measures of PCI in sleep or disorders of consciousness indicated a decrease.

The other prominent theory of consciousness, IIT, proposes that 'a system is conscious to the extent that its whole generates more information than its parts.' Seth introduces us to Φ, the Greek letter phi, which is the measure of consciousness proposed by IIT. More precisely, Φ measures the amount of information generated by a system as a whole compared to the amount generated by each of its parts, which explains the logic of understanding consciousness as integrated information.

Consciousness is information because each conscious experience is unique compared to other conscious experiences, and it is integrated because our conscious experience is unified such that we don't experience, for instance, the view of a mountain as being separated experiences of colour and shape and size. Instead, we experience all its perceptual characteristics as a whole. We learn about the vibrant debates around IIT and its successes in accounting for some empirical observations as well as its strange implications.

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Moving from the levels to the content of consciousness, we are introduced to one of

the most fascinating theories about perception: the 'controlled hallucination viewpoint'. The central claim is that we do not perceive the world as it is, but as it is useful to us, thus epitomising a deeply evolutionary logic. For example, according to this view, colour is not a property of things-in-themselves and, consequently, our perception is *not* about reading out such properties; rather, colour is the tool evolved to help us keep track of objects under changing light conditions. As such, a white cat will always be perceived as white whether indoors or outdoors.

What is counterintuitive about this view is that our perception is not the process of *reading out* sensory signals from the world, but rather the continual process of *top-down prediction error minimisation*. Prediction errors are the differences between what the brain expects to perceive and what it receives at every level of processing. Seth explains that the idea of minimising prediction errors takes the Bayesian claims about what the brain should do with sensory data, and proposes the brain is approximating Bayes's rule by minimising predictive errors everywhere and at all times. For example, if we walk down the street, our brain will form Bayesian best guesses about what it expects to see: houses, trees, people, vehicles, etc. Such expectations would prime the brain to expect certain kinds of perceptual signals in terms of colour, movement, temperature of these objects, and so on. If the sensory data differs from what the brain expects, we will feel surprised.

Derived from the controlled hallucination viewpoint is another counterintuitive fact that action and perception are inseparable, while our intuition dictates that our interaction with the world follows the order of sense, think and act. Here, Seth introduces the concept of active inference, proposed by Karl Friston, to understand how action helps minimise prediction errors. Active inference is defined as the process by which the brain collects sensory data 'that makes its perceptual predictions come true' via generating actions. Generative models are crucial for active inference: for active inference to work, it must depend on conditional predictions which are based on the ability of generative models to predict the sensory consequences of actions. The idea is that the brain needs to know, among countless possible actions, which actions are likely to reduce sensory prediction errors.

Informed by the controlled hallucination viewpoint, Seth presents a series of ingenious experiments that lends the theory empirical support, from how we perceive the world (colours, shapes, time) to how we perceive the self (our volition, body ownership). Many experiments involve subjects wearing virtual reality headsets and interacting with virtual objects, which either behave as in the real world or not. Readers learn what the controlled hallucination viewpoint predicts, the experimental results and how the results are interpreted.

The discussion of these empirical experiments seamlessly blends with discussion of well-known perplexing real-world phenomena, such as the rotating snake illusion, the white-or-blue dress conundrum, out-of-body experiences as well as the fact that our experiences of being a self seem to remain mostly stable through time. These show us that all perceptions are inferences of the causes of sensory data coming from the world, and there is a 'deep structure of perception' that we can scientifically probe.

Toward the latter part of the book, Seth introduces his beast machine theory of consciousness through exploring our interoceptive experiences of being an embodied, living organism. Building on theories of active inference, the controlled hallucination viewpoint and cybernetic theories, Seth argues that interoceptive signals (heartbeat, body temperature, etc) need to be drawn towards a particular range of desired values, expected by the brain to be signs of physiological viability. As such, moods, emotions, senses of valence or arousal and our formless sense of being alive can be viewed as 'control-oriented perceptions which regulate the body's essential variables'. Seth concludes: 'We are not cognitive computers; we are feeling machines.' It all comes back to the idea that our brain is not evolved to have abstract thoughts; rather, its primary function is to move the body in a way that maintains a healthy balance of its physiological resources, an idea that is foundational to Lisa F. Barrett's theory of constructed emotion.

Central to this theory is that our conscious experiences arise from our material reality as being flesh and blood, as being made of cells whose imperatives are about protecting their physiological integrity. Based on this view, Seth sets out to discuss the scientific evidence and possibility of consciousness in other animals and in machines. Here, we encounter strange islands of consciousness such as that of octopuses, and the fact that no monkey has passed the mirror test (the test for self-recognition, which only some great apes, dolphins, killer whales and an elephant have passed).

Based on theory and knowledge of perceptual experiences such as body ownership or colour perception, Seth analyses how the decentralised nervous system of the octopus would perceive the world. For example, an octopus 'sees' with its skin as much as with its eyes, given its light-sensitive skin cells. It can distinguish what is itself and what is not, but not where its body is in the world, given its suckers act as semi-autonomous.

Turning toward the possible mind of a machine, a logical inference from the beast machine theory is that the physical substrates of machines do not have the drive for self-preservation. Unlike cells in any animal body, Seth finds it hard to believe computers, as we know them, can achieve consciousness. Much of his discussion of machine consciousness is to disentangle the muddy confusion between intelligence and consciousness.

In sum, Seth's *Being You* successfully presents a compelling story of the emerging science of consciousness. Readers are left pondering the exciting future where new technologies and smart experimental designs can further deepen our understanding of the mind. Crucially, as Seth analyses theories and experiments based on the principles of the real problem of consciousness, readers will come to think of consciousness not as a giant mystery of the universe, but as a scientific problem that can be divided into manageable tasks and probed in ingenious ways. As the mind is all that we have, we are better off believing that a mature science of the mind will gradually shed light on one of the biggest mysteries in the universe, our inner light, thus delivering the tools needed to improve our wellbeing.

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