



Feeling of being

Dimensionality of consciousness

On measuring experience

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Abstract

Modern developments ...

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Chapter 1

Introduction

Consciousness remains an elusive concept despite extensive scrutiny from many traditions (Van Gulick 2017). Philosophy of mind, neuroscience, psychology and - recently - computer science have been prodding the concept from a plenitude of angles.¹ This endeavour is paramount to understanding the human condition, but raises unavoidable and highly intricate existential questions (Amodei et al. 2016; Soares and Fallenstein 2016).

Since the 19th century developments within neuroscience are rapidly increasing our understanding of the cognitive processes that partake in the construction of consciousness (Atkinson, S.C. Thomas, and Cleeremans 2000).²

The advances and sheer amount of details neuroscience and neuroimaging techniques led Atkinson, S.C. Thomas, and Cleeremans (2000) to call for more detailed theories that identifies *neural correlates of consciousness* (NCC) (Atkinson, S.C. Thomas, and Cleeremans 2000). That call was answered by a plethora of theories that attempted to infer frameworks, on which novel understandings of consciousness could be based.³

Simultaneously to the advances in neuroscience, computational theory increased its efforts within artificial intelligence (AI) (Nilsson 2009), and matured to a point where many of the neurophysiological properties can be replicated in silicon (Tononi 2004; Schmidhuber 2015; Walter, Röhrbein, and Knoll 2015).⁴ The computational prowess of modern digital systems has been shown to grow with a staggering exponential speed (Moore 1965) - - a development that has proven to hold since 1965 and that shows no intention of halting (Moravec 1998; Kurzweil 2001). If the complexity of the brain can be assumed to be finite, this growth will soon catch up with the human equivalent. Apart

¹The Stanford Encyclopedia of Philosophy offers an overview of many of the disciplines and approaches involved in the quest to explain consciousness so far (Van Gulick 2017).

²Some philosophers require consciousness to include metaphysical properties (Van Gulick 2017) (dualism). This essay eludes the question by focusing on falsifiable and positivistic theories, in the hope that they can bring us closer to the truth - whether that entails dualism or reductionism.

³There are far too many relevant and interesting papers to list here, but to just mention a few influential examples, see Baars 2005; Block 2007; Crick and Koch 2003; DAMASIO 2003; Dehaene and Naccache 2001; Kouider et al. 2010; Tononi 2004; Zeki 2008; Van Gulick 2017; Schmidhuber 2015; Nilsson 2009.

⁴Other technologies show promising advances in forming computational substrates such as molecular biology and quantum computing, but have yet to reach the complexity of digital electronic computers.

from the obvious existential dilemmas, these advancements puts further emphasis on the location of NCCs. The exact reason for this relates to the definition of computation where a formally defined input is required before any meaningful output can be given (Nilsson 2009; Schmidhuber 2015) (see also glossary on page 4).

(Dennett 2017).

what for how come

disclaimer: idea that covers many complicated concepts (Van Gulick 2017).

In this essay consciousness will exclusively relate to the *hard* problem of inner experience as coined by Chalmers 1995, also known as phenomenological consciousness.

1.1 Vectors and dimensionality

1.2 Alternative approaches

Common for each contribution is a fundamental desire to deepen the understanding of both consciousness as a concept, and the principles partaking in the creation of the concept. Guided by years of academic training and tradition, each discipline have approached this top-down by, in abstract terms, describing or bottom-up (Van Gulick 2017), : either constructing abstract frameworks (Block 2007; Kouider et al. 2010) or

top-down *and* bottom-up (Dehaene and Naccache 2001; Baars 2005)

1.3 Convergent theory

Glossary

artificial intelligence Artificial intelligence (AI) covers the broad discipline in computer science that is concerned with replicating intelligent behaviour in computational systems. The exact definition is controversial for historical reasons (Nilsson 2009). . 2

bottom-up Bottom-up approaches in this article refer to the combination of many smaller concepts to form a greater whole. This approach is typical for the natural sciences. An example of such a bottom-up approach to understanding consciousness is Tononi's idea of an information integration measure (Tononi 2004). 3, 4

computation Computation refers to any process (in any substrate) that can deduce new information based on old information. In this is manifested as computing instructions.. 2

consciousness Consciousness pertains to the feeling of being alive and attentive. This circular definition covers over the fact that consciousness is an old and multifaceted idea that covers many complicated concepts (Van Gulick 2017). In this essay consciousness will exclusively relate to the *hard* problem of inner experience as coined by Chalmers 1995, also known as phenomenological consciousness.. 2

NCC Neural patterns or constructions that somehow correlate with consciousness. See (Atkinson, S.C. Thomas, and Cleeremans 2000).. 2, 3

top-down This essay employs top-down as a higher-order approach to a solution or approach to a problem. An example of a top-down approach to understanding consciousness is the global workspace theory by (Baars 2005) or the framework presented by Francis Crick and Christof Koch (Crick and Koch 2003). While both contain elements of neurobiology (bottom-up) they are explicitly trying to offer an explanation on what consciousness is.. 3

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