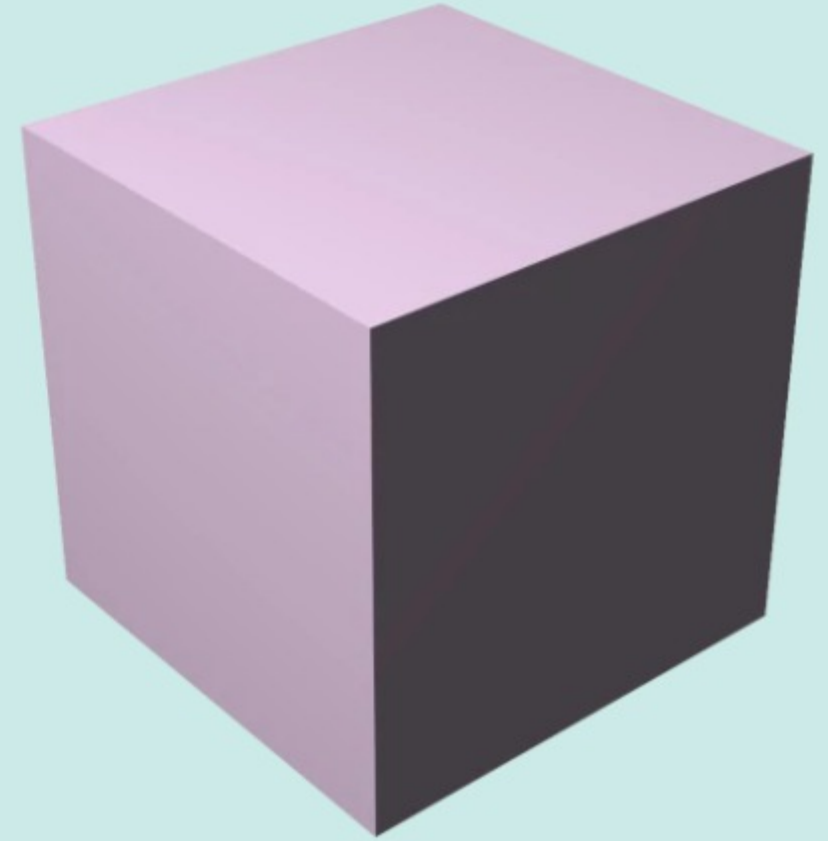


Form as an extra ingredient



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The Challenge

"YOU NEED AN EXTRA INGREDIENT"

David Chalmers, TSC Tucson 1994

This paper is unashamedly physicalist in its approach

Can physics be 'extended' in a way which provides an extra ingredient, one which unlocks the path to a scientific explanation of consciousness?

To understand how subjective experience arises, perhaps we need to look at the world a little differently



This paper

- 1 Introduces a framework which starts with 4 assumptions
- 2 Considers, in the context of these assumptions, what might be happening in visual perception, where the brain/body engages with a physical object
- 3 Looks at where feeling (widely understood to be intertwined with core consciousness) might fit in
- 4 Shares some thoughts on subjectivity

The approach taken is a conceptual one, focusing on fundamental principles only

Assumption 1

CONSCIOUSNESS ARISES FROM A PROCESS OF SOME SORT

Conscious, subjective experience is not a thing in itself

Even if consciousness were a fundamental property of nature, it must manifest through a process. How otherwise would it switch off when we fall into dreamless sleep?

That process, for humans and many species, has something to do with brains and neurons. For us in particular there is very strong evidence for this

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Assumption 2

BRAIN, BODY AND LOCAL ENVIRONMENT ALL HAVE A ROLE TO PLAY

Whatever the underlying principles/mechanisms involved, the *brain* is essential for (human) consciousness - a neuroscientific fact, not an assumption

The *body* is the brain's 'interface' with the outside world. And the brain/body system plays a key role in the generation of feelings/emotions

Without an *environment* of any sort, without a world of objects, how could there be any *contents* of consciousness? And it is questionable how the brain, and intellect, could develop

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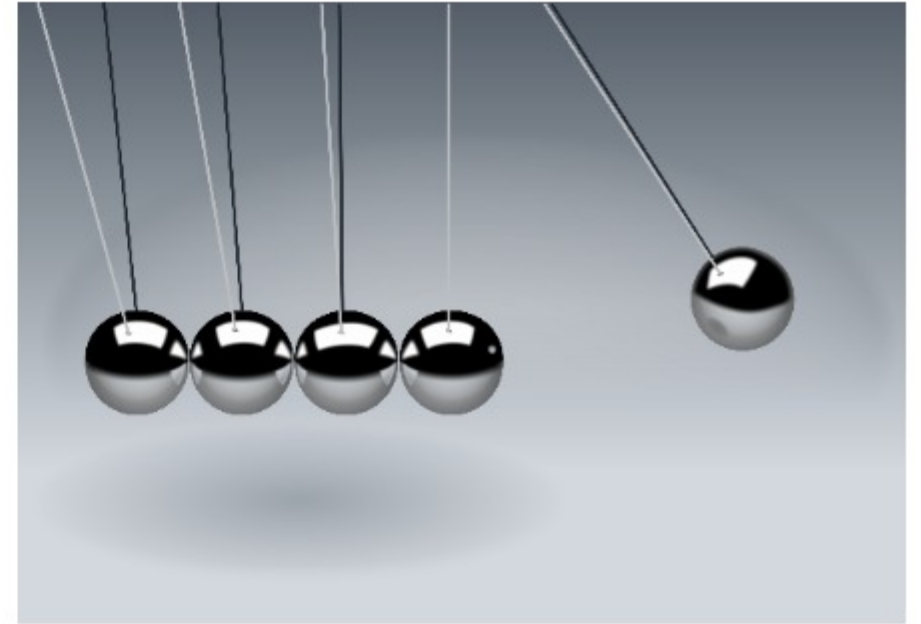


Assumption 3

PHYSICAL OBJECTS EXIST INDEPENDENTLY OF ANY OBSERVER

From the perspective of physics, the objective study of matter, energy, force and motion, physical objects exist in their own right *a priori*

This paper takes that perspective and considers the world at the scale of biological cells (neurons) and above



Assumption 4

THE (CONSCIOUS) MENTAL WORLD IS A WORLD OF FORM

Form might be a bridge between physical and mental - an "extra ingredient"

The form of an object is physical (and objective) yet has abstract (and, when perceived, subjective) qualities too

Aristotle said "Perception is the reception of form without matter"

If form were fundamental, a property or dimension like mass or electric charge, this might provide a means to unify 'mental' with 'physical'

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Visual Perception (1)

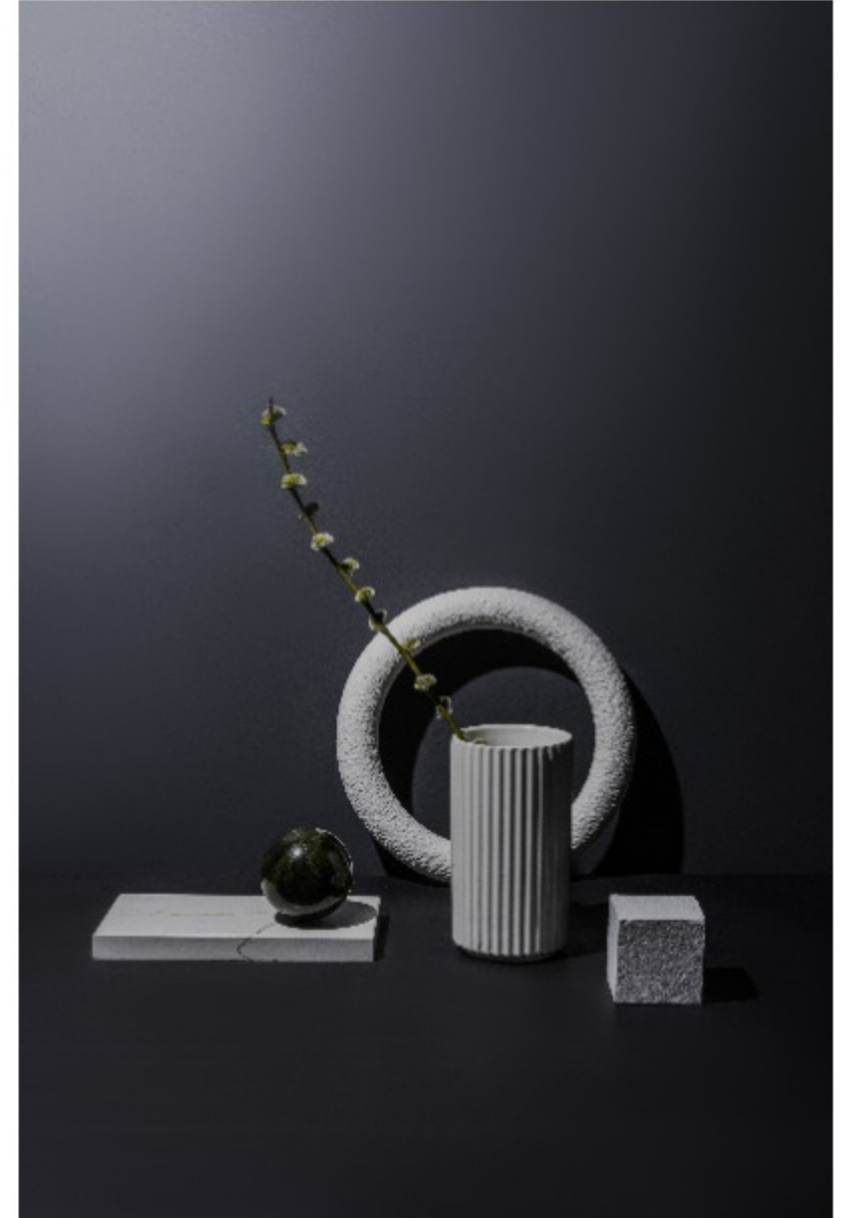
ENGAGEMENT BETWEEN TWO PHYSICAL OBJECTS

Consider the brain/body as a system, an "intelligent object", as it engages visually with a physical object in its environment

Several stages of information processing by the brain, including colour, edge and shape discrimination, motion detection, and even initial object recognition, are understood to be unconscious in nature

At these stages, before consciousness comes into the frame, *the interaction is one between two physical objects*

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Visual Perception (2)



WHERE OBJECTS AS PERCEIVED ARE LOCATED

Given the initial interaction between the brain/body and a physical object is an unconscious one between two physical objects, in considering the transition from unconscious to conscious perception it might not be unreasonable to postulate that *conscious perception is of the physical object out there in the world*

If this is the case, real physical objects, as interpreted by the senses and brain, will be part of the contents of consciousness; there will be no internal imagery in the head (and hence no separate mental & physical worlds). Even for the predictive brain, (unconscious) error correction will be against a world of physical objects

And if, with visual perception, the brain is creating a "3D virtual world", that aspect of the perceived world which is truly virtual is *the experience of the object(s) from the perspective of the body (together with a perceived 'self' object)*

Visual Perception (3)

BRAINS AS RELATIONSHIP MACHINES

According to this framework, the process which gives rise to conscious visual perception is enabling the brain/body to interpret & directly interact with a world of objects, a world of form. There's no "image in the head"

Rather, during object recognition, the brain would be mapping the *relationship* of the object to the body, with the neural map encoding the object's shape, perceived/relative size, orientation, & motion. Other (internally-stored) attributes which provide *meaning* would be linked with the neural map, such as whether the object is liked/disliked or is a threat

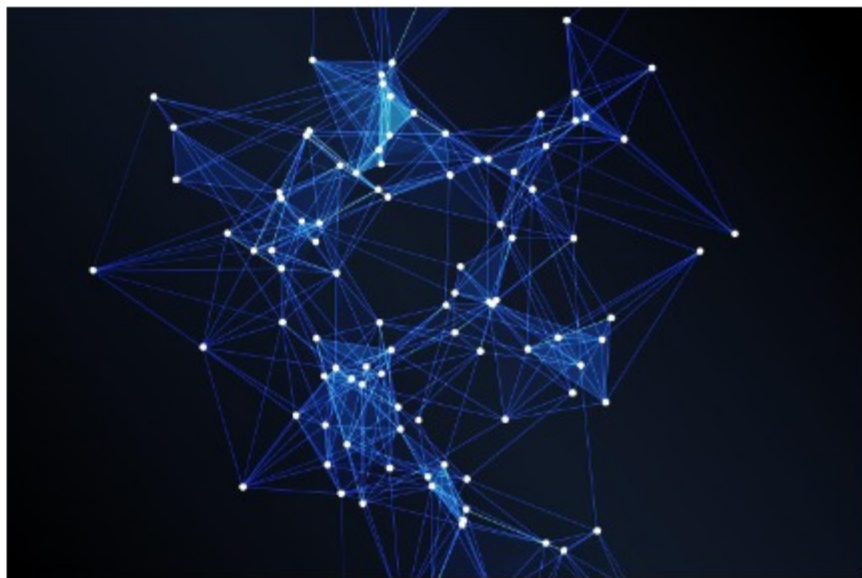


Image by Freepik

Feeling (1)

OBJECTS OF FORM AND OF FEELING

An object has *a set of characteristics* or attributes, is *bounded* in space, and has *location*. There is the object itself, and there is what is not the object - the rest of the world

Relative to the brain/body, could *feeling* be considered an object too? Feeling has certain characteristics, is bounded in space, and has location. For example a feeling of being happy ("in the head") or a pain ("in the finger")



Feeling (2)

EYES CLOSED, IN SILENCE, JUST A SENSE OF BEING

How might this framework be applied to a case not involving the visual perception of an external object, where one's eyes are closed and there is just a sense of being, of being an embodied self?

In this case there is a single physical object perceived through feeling - the body itself. The brain would be mapping the relationship between different parts of the the body to each other and to the body's 'core' with the mapping carried out in the context of (being an object in) a three dimensional space

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Subjectivity (1)

INTERPRETATION - FROM DATA INTO FORM

Data from the senses is converted into *form* (objects) as experienced

A machine can 'recognize' a pixelated image in two dimensions through patterns and/or features, essentially (automatically & computationally) comparing the data from the image with that of a stored template

But for a human (when the image reaches conscious awareness) one sees the *form* of the image. *It is as if a spatial dimension were added*: A two dimensional 'pixelated' image (data) is interpreted as a perceived object in the context of a three dimensional world



Image by [flatart](#) on Freepik

Subjectivity (2)

BRAIN/BODY AS AN INTEGRATED SYSTEM, TIME, SELF

With the brain mapping the relationships of objects to the body, the brain/body will be operating as an *integrated system* in engaging with the world. If it is this system which has subjective experience (rather than brain-only), this might help explain the coherence of consciousness, once subjectivity itself is better understood

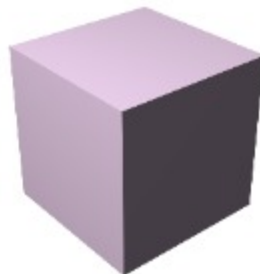
Time might have an important role to play. Conscious experience is not instantaneous: Subjective 'now' is really a rolling time window because elapsed time is needed to process and integrate colour, shape/orientation and motion

One's sense/perception of 'self' is closely intertwined with the body. Whatever process is occurring in the brain to interpret data as perceived objects, that same process is creating a self-object with coherence & relative permanence

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Next steps with this framework will be to develop one or more candidate models for how subjective experience might arise at a fundamental (physical) level. Collaboration would be warmly welcomed

About



thistlecube.com



BACKGROUND

Paul's career started in physics and engineering. After a PhD investigating hypervelocity impact cratering, his first job was research into Very Low Frequency (VLF) radio wave emissions recorded in Antarctica. This was followed by 3 years as a lecturer in Electronic Engineering at the University of Sussex UK, applying digital signal processing techniques to detect faults in industrial sensors

He left the academic world to start an independent IT business, run with his wife Behjat, and that lasted 10 years or so before he transitioned into IT management then project and programme management. Paul and Behjat have a grown up family (with three grandchildren) and live in a rural UK setting (in Somerset) where Behjat runs a successful holiday let business (gocountryside.uk)

Paul's interest in the subject started over 20 years ago, with machine consciousness. But he quickly moved on to studying human consciousness given it already exists & therefore might be a better starting point! The website thistlecube.com captures some of Paul's thoughts on the hard problem