



Toby Weston

Toby Weston is a British author and technologist. His first novel Singularity's Children: Denial was published by LobsterBooks in 2016.

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Image: Kevin Philippe

Introduction

We pester our parents with a slew of questions as we grow up:

“How do planes fly?”

“What makes something alive?”

“How big is Space?”

“What am I?”

Most will receive more or less satisfactory answers. They might be vague or a little confusing, but least they put a Band-Aid over gaps in our understanding. Whereas, one of them, *“What am I?”*, seems to only get worse the more we know.

The dirty truth is that we have no idea what *I—or YOU, as in the person YOU, the protagonist in your subjective life*—actually is. This is not an exaggeration. Science currently has NO IDEA what Consciousness is; not even a plausible conjecture; NOTHING. This is a glaring gap in our epistemology when consciousness is the foundation of all meaning in the universe; which it must be, because without conscious experience what is ethics, hope, passion? Would there be any meaning in a vast complex universe utterly devoid of anybody to experience it? Would there be any loss if such a Universe was destroyed? Or if a Billion were created and then destroyed in the blink of an eye?

Some modern philosophers seem to deny that consciousness exists at all. ([Daniel Dennet, Consciousness Explained \[Away\]](#))

While Denial may be useful in a political cover-up, it is hardly a satisfying explanation for the Conscious entity I am addressing with this writing.

So, if Science doesn't have an answer, perhaps a Science Fiction author might have a go?

History of “What am I?”

In more religious times, the answer would have been simple: “You are a perishable body of flesh, animated by an immortal soul”.

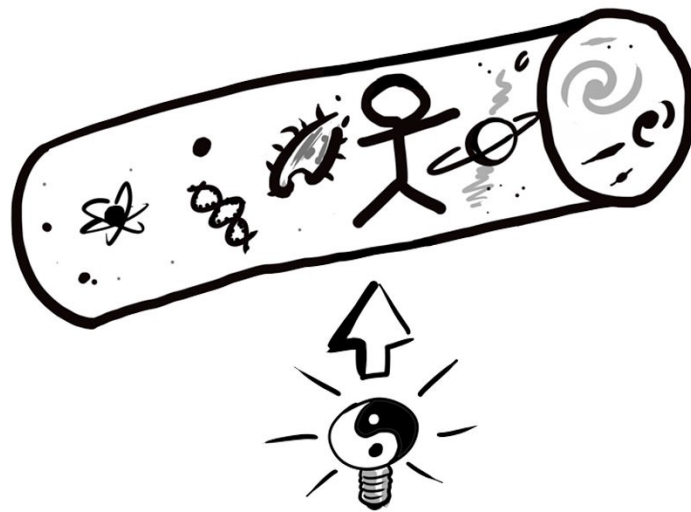
Long ago, everything had a soul. Animals, trees and even rocks were people with intent and agency.

As babies, we learn that the other entities we share our environments with are best understood as agents with intentions; they want things—often the toy we were playing with or the slice of cake we are looking forward to eating! It is most effective to anticipate the behaviour of these agents by assuming they are people like us.

Having learnt this lesson, we try this *‘Theory of Mind’* concept on everything around us—*mother, sibling, cat*—the approach has utility

and because it is very human to reuse a tool that works, we try it on *teddy bear* too, then as our concerns grow beyond cake and play, we deal with a baffling world by bestowing personhood on the fickle actors which impact our lives—*the Sun, Moon, Fire...*

This would likely have been the innocent state of early humans and hominids. These beliefs would have been reinforced over millennia as the approach proved evolutionarily useful; it likely made sense to treat the Wind or Sea with respect, thinking of them as capricious people with fickle intent and godlike agency. To generations of early humans, their understanding of the physical universe emerged from a hypnagogic trance populated with elementals, spirits, and gods; a Dreamtime revealed through the rapture of psychedelic introspection far more real than the waking illusion of a material world. The first people embraced the philosophy of idealism knowing that *Mind* and *Personality* were fundamental.



Idealism: Mind dreams up Matter

Later, when enlightenment thinking came to replace theology, the methods of science were applied to psychology, and reductionist explanations began to be considered as alternatives to the spiritual soul. The seat of consciousness was looked for within the flesh.

Dissecting the brain four hundred years ago, Descartes suggested the Pineal Gland as the seat of the soul.

Today, modern explanations range from “There is no such thing, Consciousness is an illusion” to “It is an intrinsic property of the universe, and everything is Conscious at some level.” In the middle conjectures like Integrated Information Theory, claim that Consciousness arises at some critical threshold of complexity or organisation. The only things these theories have in common is that they utterly avoid any causal explanation or mechanism for Consciousness.

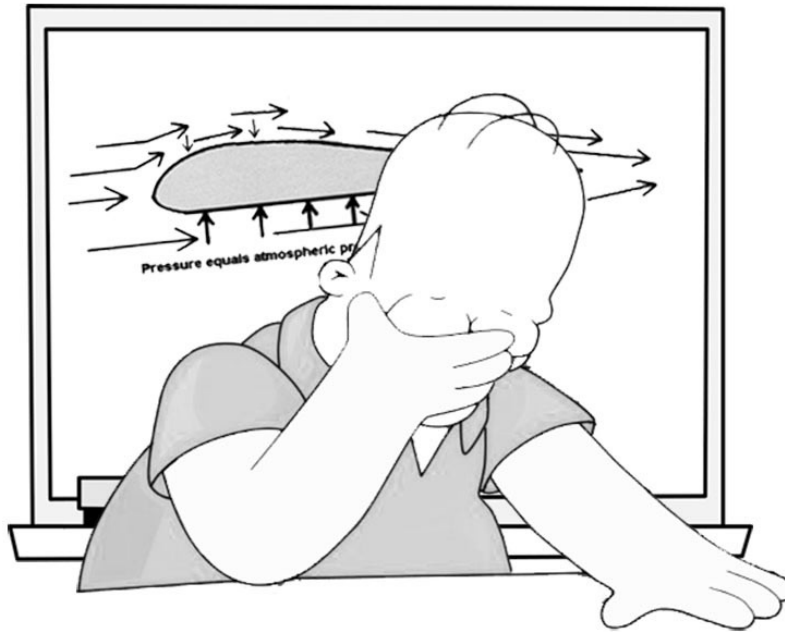
This is not to say that some theories do not provide insight into how intelligence and emotion produce behavior, it’s just that these are functional explanations with nothing to say about how subjective feelings arise.

The Hard Problem

This gap between the functional theories necessary to build an agent capable of behaving like a Conscious individual, and the engineering required to instantiate subjective phenomenological states within the mind of an agent, has been called “The Hard Problem” by David Chalmers. In this formulation, building a robot, which interacts with others and behaves as if it were self-aware, is facetiously called “The Easy Problem”. Not because it is easy, but because it is hard—while still being infinitely easier than explaining the steps necessary to create minds which feel anything at all!

While the Hard Problem does seem insurmountable within a reductionist, materialistic framework, other [possibly] similarly hard problems have been tackled in the past: the equations of gravitation; lighter than air flight; evolution; the origins of life. Looking back, these problems no-longer seem mysterious and intractable. Before Darwin, the only seemingly valid explanation for the diversity of life would have been that it was created by some higher agency. It took one revolutionary idea and a massive paradigm shift to appreciate the mechanism of natural selection.

This does give us some hope that consciousness will also turn out to be the same kind of—“D’oh!”, “Face Palm”—problem which looks blindingly obvious in retrospect once we have the adequate mental tools to comprehend it.



D'oh! It's so obvious now!

Perhaps the Hard Problem is merely too broad a conceptual chasm to bridge at the moment. Again, there is hope because science is not guesswork. It is a succession of small steps, assembled only after each is carefully validated, each building on the last to produce a solid edifice. We are not utterly deadlocked. There are some areas of investigation—e.g. magnetic neural imaging, comparative neuroanatomy and simulated biomorphic neural networks—which are giving us a better functional understanding of what goes on within a conscious mind. Perhaps some of these areas will yield insights that might give us access to a toolset of ideas, which make the jump towards a solution to the Hard Problem small enough to fit within the bounds of a single un-augmented human mind.

The biggest danger is that we lose interest in deeper truths and end up equating behaviour with being; if it walks and quacks like a duck then it is a duck—in this case, the thing that talks and behaves like your soulmate, may, in fact, be nothing more than a clever marketing algorithm embodied in your ideal conception of a desirable body...

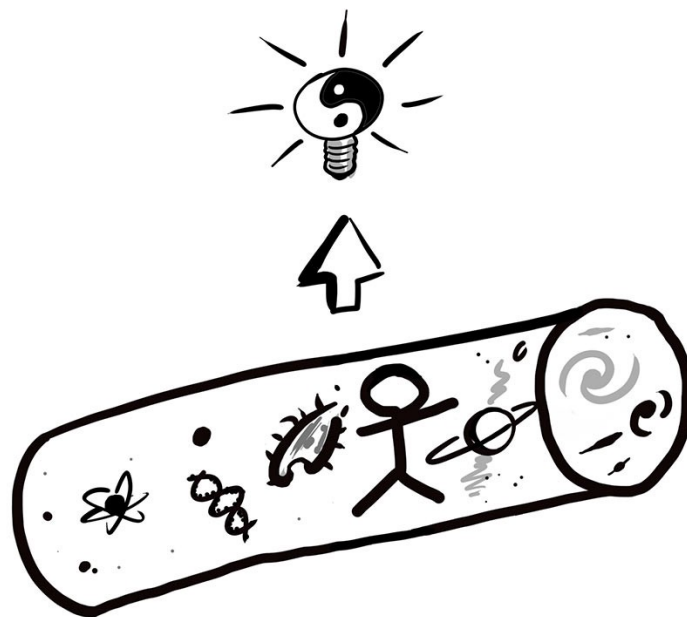
However, if Materialism continues to offer no good ideas of how consciousness and subjective feelings might arise, perhaps it is conceivable that consciousness is not a product of our universe, but that both our universe and consciousness are both products of something deeper?

It would really be a shame if we end up ceding the Universe to our 'Mind Children' without realising that they are empty bags of reflexes

without feelings.

Materialism

All things are made of stuff; one of the first *facts* a newly spawned human extracts from the world. Even before we grasp that the world is full of people like us, our hands learn about the material nature of things.



Our minds are created by our brains, which are made of stuff.

The solidity of the world is, therefore, a very deep conviction; primal even, but it is also an illusion. The universe turns out to be mostly made of barely understood strangeness. Only 5% is what we might understand as basic stuff. Of that 90% is Hydrogen, the most insubstantial of gasses. Now I am not trying to be evasive here, materialism does of course not only refer to solid matter. Atoms, photons, neutrinos and even the mysterious characters Dark Matter and Dark Energy can all be valid participants in a materialistic description.

However, science contains elements less *real* even than the ephemeral Dark Energy.

What about quantum operations? Is a superstition just the combination of two material entities existing simultaneously, or does the operation of superstition itself count as a valid component in a materialistic description?

Or what about numbers? Not as adjectives used to describe something real—like seven electrons, or three kings—but the number itself; *number* used as a noun. Would such a thing be considered a materialistic entity? Intuitively not, a number cannot exist on its own, its symbol needs a mind, or some other computational substrate, to inhabit. Therefore, the causal power can be shifted to the substrate, i.e. to the atoms in the computer or the nerves firing in a mind.

Three fingers wiggle because of a pattern firing in the brain, not because of any causal power of the number three itself.

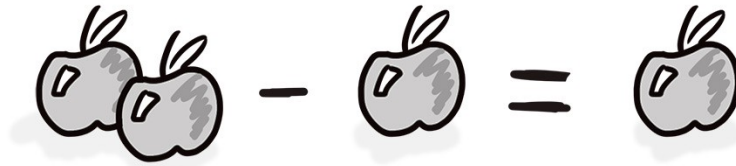
But numbers are information, and the more we understand, the more tangible information seems to become. We now suspect it is a conserved quantity, like energy. Newton's laws can be reformulated in its terms, making it as real as energy, which, as Einstein has already taught us, equals matter.

Information = Energy = Mass

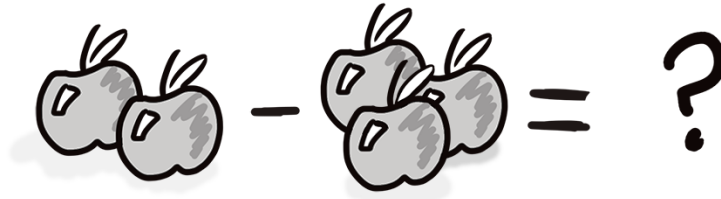
As we learn more about the universe by venturing further away from the dry land—which represents the self-evident truths we learn through perception and common sense—we begin to lose touch with the bottom...

Only after tens of thousands of years of counting did our species discover the concept of Zero. Five thousand years later we discovered (or possibly invented) negative numbers; two thousand years after that, the complex cumberbers. Each of these steps forward permitted solutions to acute problems which had perplexed the brightest human minds for thousands of years.

Even negative numbers are unintuitive. Although we accept them, we will never find one lying around in nature.



Two Apples minus One Apple gives One Apple.



But if I have Two Apples and I take Three away, how many Apples do I have? You could say I owe you an Apple, but that is quite different from the concept of a negative apple...

The shallow end of the Reality Pond.

These examples are from ancient history, but Math and Physics today are taking us ever further away from the shore. Some recent mind benders may imply that at fundamental levels reality is radically different from the limited picture we perceive at human scales:

- *Information cannot be exchanged faster than the speed of light, but in the background, the mechanism of Entanglement seems able to send signals instantaneously between entangled particles.*
- *Quantum computers can calculate solutions which require more processing power than available to even a supercomputer built from every particle of matter in the universe.*
- *Even Space and Time are increasingly seen as emergent properties that arise from more fundamental primitives. In some formulations, what we experience as reality is merely a hologram and the concept of distance becomes a high-level simplification representing the degree of entanglement between pixels of reality arranged on the surface of a two-dimensional shape.*

These developments in Physics and Cosmology seem to imply there is a deeper level of reality, and here I don't just mean another tier of particles smaller than Quarks and Leptons, but rather another set of more fundamental laws taking place on a board with different rules.

An analogy would be the zeros and ones moving through a microchip's gates, creating the realistic environment of a 3D game. This more fundamental substrate does not need to obey the same rules as the higher-level systems it underlies. In the analogy of the computer game, the programmer may have set a maximum rate at which player effects can propagate, e.g. the fastest speed for a projectile in the game, but the program might 'cheat' to optimise the performance for the many players across the internet. To save the bandwidth overhead from arrows that will never hit an enemy, the game might not bother to send them in the first place.

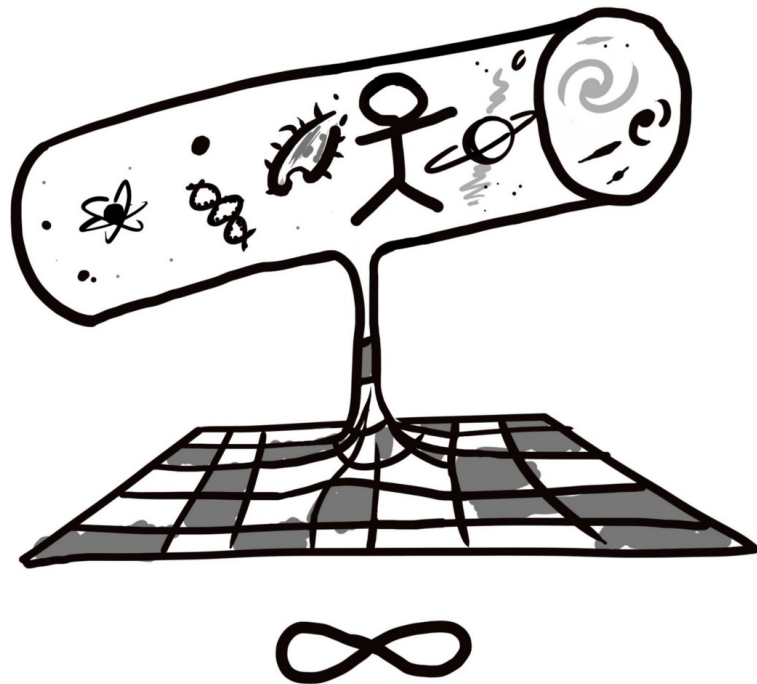
From the point of view of a group of scientists who have spent their entire lives trapped within the game—and who are unaware that they are taped into VR masks controlling player avatars—the question will be: “why do arrows only get sent if they hit their targets? How can reality know in advance?” These unfortunate scientists will not be able to explain the results of the experiments with the in-game laws of physics they have access to. To the programmer writing the game, such game restrictions are irrelevant.

Based upon the computational power of quantum computers and the instantaneous signal propagation exhibited by entangled particles, perhaps we are already glimpsing some of the 'magical powers' of this hypothetical underlying layer.

The early clues seem to suggest that this layer has some deep connection to information, perhaps its atoms are classical bits (zeros and ones), or they may be the Qubits which are the fundamental unit of quantum computation.

Consciousness does not arise from Matter

If we continue on this track, let us postulate a substrate capable of instantaneous transmission of information and non-Turing computation.



Reality is calculated into existence by a more fundamental level of reality.

The familiar limited reality we observe is continually computed by this substrate but we have no idea what the substrate's native capabilities and limitations might actually be.

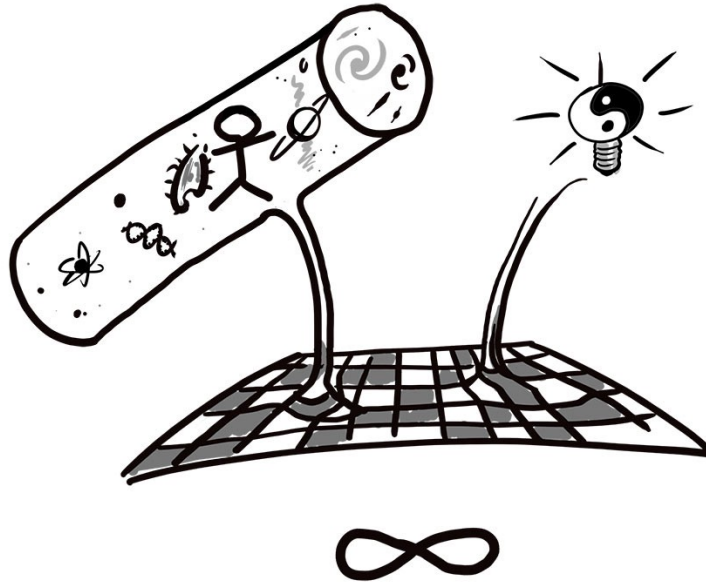
It may, for example, be capable of executing an infinite number of operations in a finite amount of time, after all why not? If time itself is an emergent property of our universe, endless eternities can be layered between each tick of our reality's clock...

The hidden capabilities of this substrate would be what gives Quantum Computers their power. By encoding questions into carefully arranged quantum superpositions, Quantum Computers force the substrate to calculate the answers they are looking for as a by-product of computing the reduction of Quantum possibility to concrete 'classical' states.

Rather than trying to solve the Hard Problem with the limited tools we find available in the Material Universe, can we instead invoke the potentially unbounded capabilities of this underlying layer of reality?

I think it would be worth a try; this potentially unlimited realm of pure information should at least be a good place to begin a search for the mechanisms of consciousness. I am an author, not a scientist, so I will

allow myself some fun and call this deeper layer of reality the *Infinite Substrate*.



The Universe and our conscious subjective minds are peers.
They are both higher level phenomenon supervening upon an Infinite Substrate.

Thetans

After reaching Operating-Level-V, but before attaining Cleared-Theta-Clear, the instantiated Thetan... *LOL Only joking!* But I am aware that I am in danger of coming over a bit New Age here. So, I will conclude with what I believe is a plausible mechanism for the emergence of biological minds running on the *Infinite Substrate*.

The Infinite Substrate

In the formulation I have described above, Classical Reality is computed from all the possible quantum alternatives that coexist on the underlying *Infinite Substrate*. But there are different magnitudes of infinity and even an *Infinite Substrate* will need to take care that it does not run out of computational resources. For example, it must keep track of the potentially unlimited number of branching versions of reality, pruning off and merging branches, collapsing the superposition of possibilities into a local canonical material state.

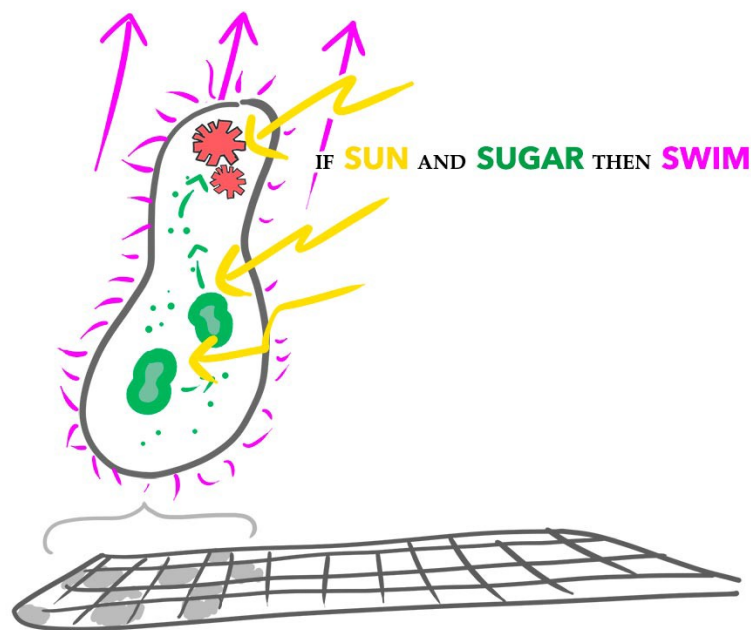
I don't claim to have any knowledge of how the putative *Infinite Substrate* operates, but I picture it annealing the fragments of reality which it congeals from quantum possibility. It makes its own life

simpler by computing locally when possible, but ensuring causally contiguous shards match up to maintain integrity globally. The uncertainty of the quantum world provides a noise floor below which potential mismatches are obscured and the Heisenberg fuzziness provides the wiggle room needed to jimmy the shards together top down when required.

Independent shards can be left vague and inchoate unless they are causal dependencies for other pieces of the universe, in which case they must be resolved and annealed into a whole which is simultaneously fraying at the edges as its classical fabric denatures into unravelling threads of possibility...

The Evolution of Minds

Let us now imagine a world, perhaps Earth 4 Billion years ago: larva flowing; seas and tides; rivers and mountains; meteorites smashing into the crust as the Solar System rids itself of errant asteroids. There is already life. Small and very primitive, it is able to reproduce, grow and react to its environment. It responds to the world by producing internal chemical signals in response to external stimuli such as light. Let me postulate a simple 'brain' for this single-celled organism, a set of proteins which respond to levels of these signal chemicals within the cell, taking multiple inputs and delivering a single output. The proteins interact such that **IF** the single-celled creature is hungry, i.e. low levels of the sugar, **AND** there is plenty of light, i.e. high concentrations of the light-signalling chemical, **THEN** it will swim up.

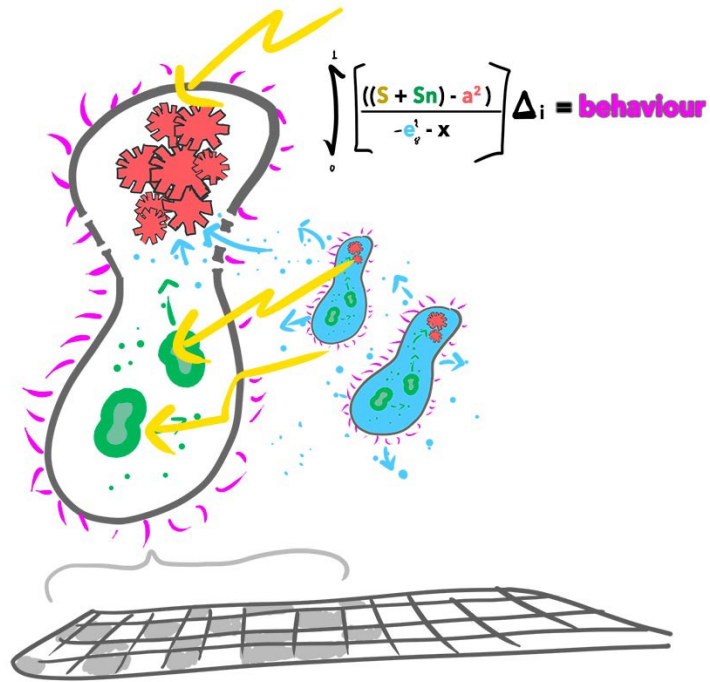


Behaviour and Biology are 'running on' the physics computed by the Infinite Substrate.

This tiny *Photovore* has a simple behaviour, it will spend the nights hidden in the mud at the bottom of its pond, and when it gets hungry, it will wait until the light of dawn and swim to the surface to photosynthesize.

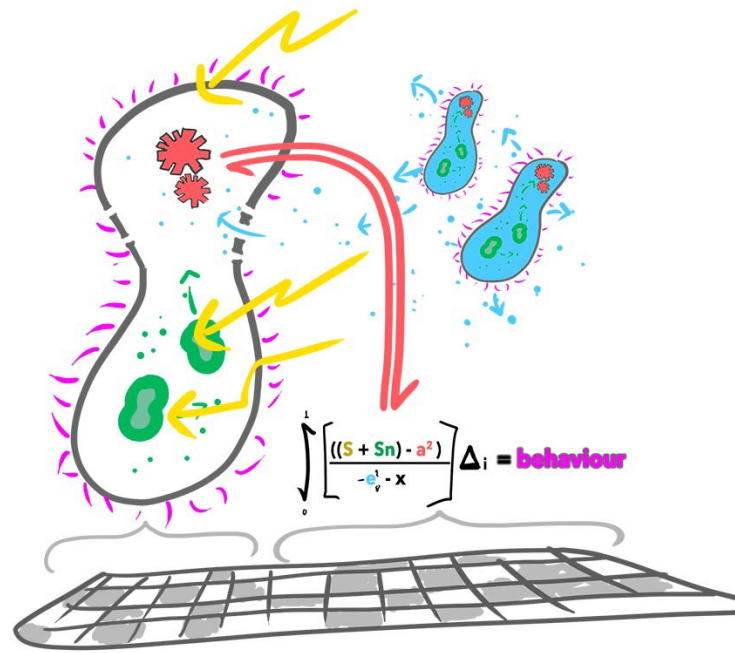
The mechanism of its algorithms is deterministic and classical.

Now, a few million years later, a descendent of this simple critter has evolved a more complicated 'brain'. The protein machinery has become larger and more complex. It deals with many dozens of inputs and its behavior has evolved to take into account other critters like it, as well as predators who prey upon it. The protein machinery which is responsible for executing its behavioral algorithms now accounts for a significant portion of the creature's bulk and energy expenditure.



Complex behaviour requires large amounts of expensive protein brain machinery. (The Math in the illustration is meaningless 'Lorum Ipsum')

With the application of chance and geological periods of time, at some point, a descendent mutates in such a way that some of the onerous computation required by its behavior becomes encoded in the quantum superposition of its proteins. It has evolved a task-specific quantum computer and over subsequent generations, more of its behavior becomes similarly encoded. It no longer needs to compute everything using a deterministic machinery of proteins; similar in principle to a mechanical calculator like something Charles Babbage would have built from cogs and chains. The computation now takes place with the collapse of quantum superposition, and the answers are delivered as a by-product of the *Infinite Substrate* computing the collapse of multiple possibilities into a single reality.

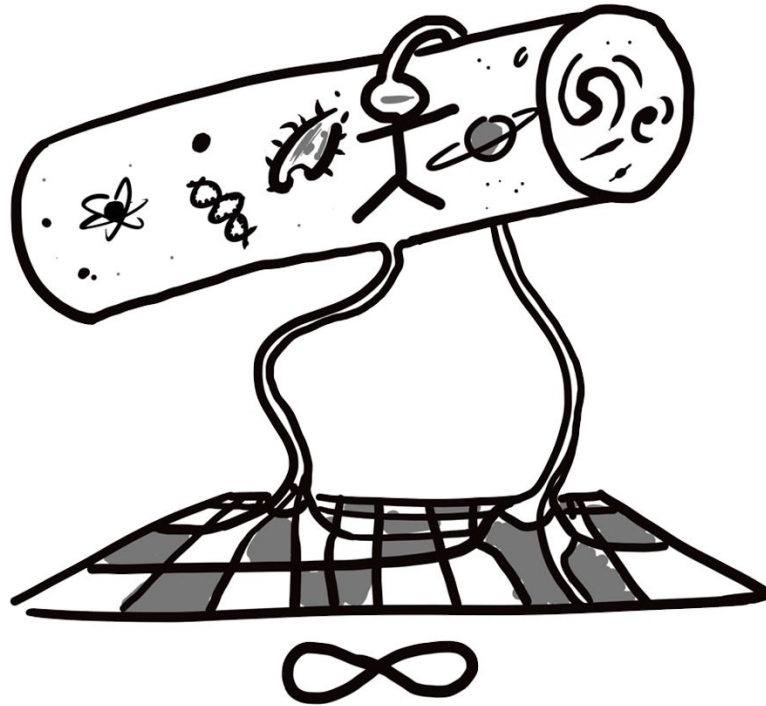


Biology continues to 'run on' the physics, but behaviour now runs directly on the Infinite Substrate. The protein 'brain' has become a quantum machine for encoding algorithms such that to 'solve' their physics, the Infinite Substrate must execute the algorithms.

Not only can the creature save itself the effort of building and running a bulky deterministic calculation engine made of protein, but more importantly, as its descendants continue to evolve, they will have access to the non-Turing computational super-powers of the *Infinite Substrate*. One of which may be the subjective experience of existence...

Conclusion

Mind does not come from *Matter*, they are peers. A more fundamental layer of reality gives rise to both. The limitations of this *Infinite Substrate* are unknown, possibly unbounded. Consciousness is one its 'super powers'.



The Infinite Substrate computes the Universe, it also computes our Minds.

“How do planes fly?”

“The air gets bunched up under the wings and pressure pushes them up.”

“What makes something alive?”

“It’s not as important as you think. ‘Life’ is a word people made up, so we get to decide its definition.”

“How big is Space?”

“You are the center of your own observable universe. Outside of that it’s really big, possibly endless...”

“What am I?”

“Your mind is its own universe, and you—conscious subject of your experiences—are what it feels like to be one.”

Toby Weston

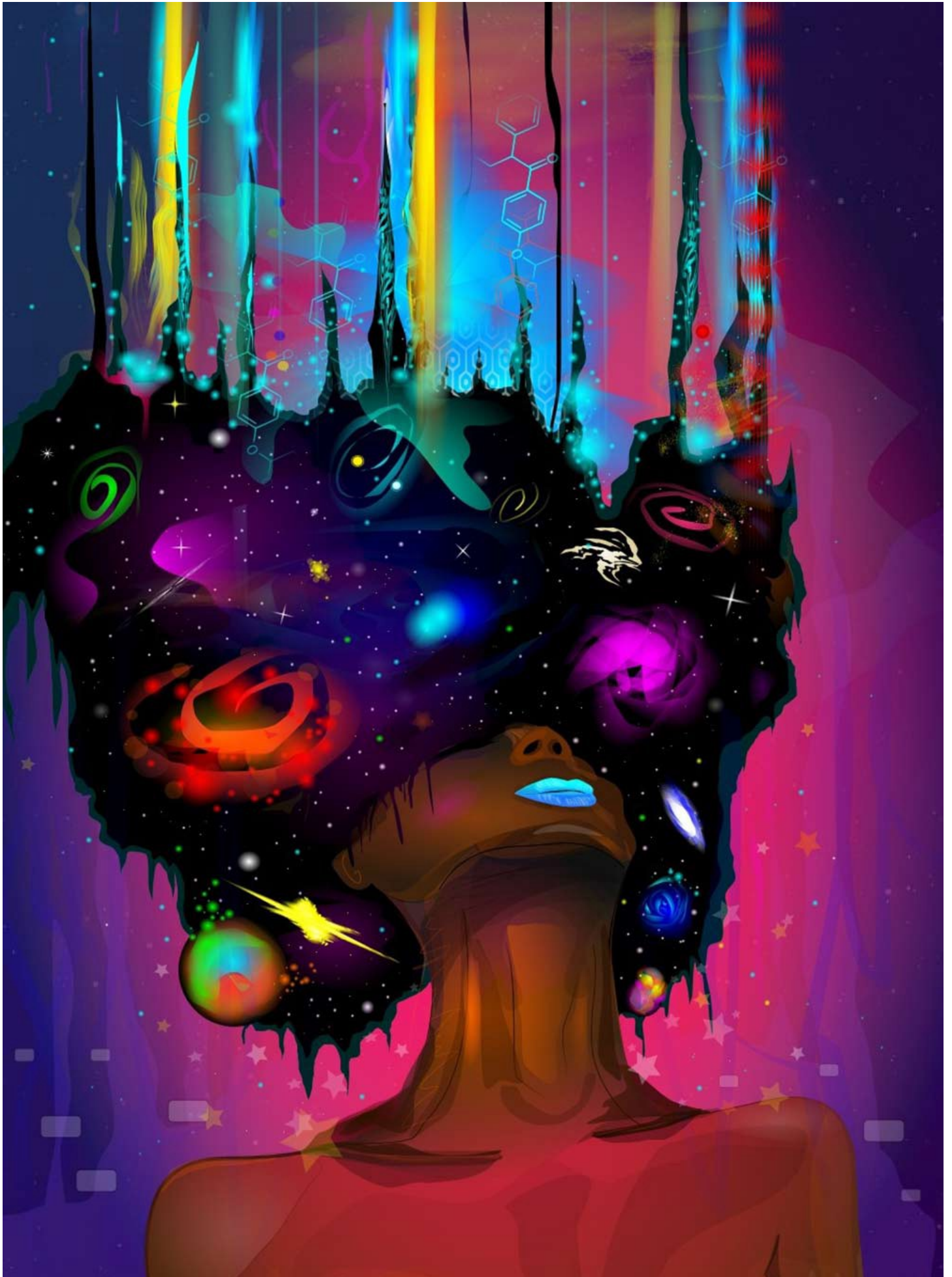




Image: Kevin Philippe

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I have been thinking on some of these ideas for a long time and have not been disciplined enough to keep an exhaustive set of references or citations. There are links in the text; also the following books, which explore some of these ideas, have inspired me greatly:

Douglas Hofstadter *Gödel, Escher, Bach*.

Roger Penrose *The Emperor's New Mind*

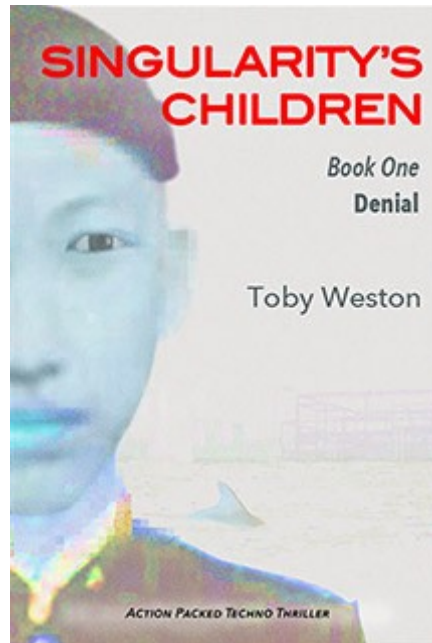
Yuval Noah Harari *Sapiens: A Brief History of Humankind*

Many thanks to Kevin Philippe for allowing me to use his fantastic illustrations.

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More from Toby:

Intelligent, Hard SciFi, Biting & Subversive



Denial, Singularity's Children

Denial is high-tech adventure set in a world of soulless algorithms, psychotic corporations, and floating ghettos. It is the first book in the Singularity's Children series, an epic story arc which takes the reader from a post-internet, post-collapse world, into a post-human future.

