

Consciousness Illuminated: The Unified Physics Model of Consciousness

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ABSTRACT

Consciousness is often posited as a phenomenon that exists beyond scientific explanation, requiring elements that either cannot be explained within the realm of physics or can only be explained using knowledge currently unproven, but anything observable – stimulus or behaviour – is deterministically governed by the laws of physics. This is a scientific imperative, implying that philosophical notions detaching consciousness from physical law cannot hold. Logically and physically, a correct explanation *must* be grounded entirely within physical laws applicable to the operations of the brain, and all hallmarks *must* emerge from its embodied material processes. I present a Unified Physics Model of Consciousness (UPMC) – a synthesised framework of already established knowledge in physics and neuroscience to show how the body and brain, via electrical signals, create human consciousness. I then reproduce the model as a working software engine by emulating the essential biological mechanisms, recreating subjective experience, self-awareness, and decision making by running two instances of the engine on the same machine and feeding them the exact same data simultaneously to observe how they differ and how they are identical. With these results, I use the UPMC to explain the occurrence of known phenomena, provide a 5-step test for consciousness in living organisms, and show how it can be used in finding solutions to neurological conditions such as Functional Neurological Disorder and Photosensitive Epilepsy, thereby providing an empirical basis for collapsing all philosophical, mathematical, and explanatory problems in regards to consciousness and the human experience using known physics.

KEYWORDS

Consciousness; signal mutation; tailored transformation; constrained variance; individual valuation; sensory mapping; neural plexus.

1. INTRODUCTION

1.1 – Testing the Current Definition

The current accepted definition of consciousness comprises being aware of and responsive to external stimuli, the ability to have subjective experiences – known as “qualia” in philosophical circles – and being self-aware. The first thing I did was explore whether or not this definition was plausible. In 2017, I published a document challenging this framework [1]. In that work, *Consciousness Illuminated and the Reckoning of Physics*, I argued that this definition was poorly crafted based on what I had already observed computer systems achieve. For example:

- I observed that camera-based systems were already capable of seeing and identifying their surroundings in real time. I contend that this constitutes a basic example of external awareness.
- Furthermore, there were already computer systems which could map their own architecture to some degree and report on their own internal failures. This is a basic example of self-awareness.

Crude examples? Absolutely, but the point stands – two of the three hallmarks required by the definition of consciousness were reproducible to the point where they already existed in a single household system – an Xbox 360 with a Kinect attached. That system could identify individuals to automatically log them in and report on its own internal hardware failures via its glowing rings. However, even with both features in a single system, it was crystal clear that the Xbox did nowhere near resemble a conscious entity – it lacked the ability to have subjective experiences. It was just a machine and these were just features. I then questioned if the ability to have subjective experiences in some way would elevate it from a gaming device to something comparable to a human. At the time, a variety of digital avatars existed which were specifically programmed to exhibit their own behaviours and reactions. If I had implemented all three systems together, would the scientific community have accepted that the system was conscious? No. I argue that everyone would have contended it was specifically programmed to behave in a certain way – *and they would have been absolutely right*. Computational examples of all three hallmarks in a single system still would not satisfy researchers, implying that consciousness involves more than their mere existence. There had to be something at a fundamental biological level giving meaning to these hallmarks that did not exist in computers.

Being able to collapse the idea of consciousness by applying its defined hallmarks to machines and recognising they did not measure up to humans was one thing, but the question became whether it was possible to collapse the idea relative to humans. Because the idea of consciousness rests so heavily on awareness, undermining this aspect would completely destabilise current understanding. Testing this became my next task.

1.2 – Collapsing Current Understanding

While I was reading a comment thread regarding a news article about the potential for AI suffering if made conscious, a comment from a user [2] provided the critical insight I needed to assemble a proof:

What are nerves except pathways for electricity to flow? If the right patterns of electricity in our biological 'computers' create consciousness, what's stopping us from replicating that in artificial ones? Could flowing electricity through the right combination of logic gates also create consciousness? Or is there something unique about biological systems—something that allows cells to work together and produce complex, emergent behaviours—that prevents us from achieving the same with human-made systems? Not saying we should make machines suffer just that it seems very possible that we could make it happen if that was a goal...

I formulated an idea and needed to determine if it was possible to execute using existing research and tools – it was. The human body is entirely controlled by its nervous system, and the nervous system is powered by electrical signals, making this the logical starting point, but I found a very limited number of ways in which these signals can be studied and tested in a way that relates to the phenomenological conscious experience. However, I identified one [3] – microneurography testing [4].

Microneurography allows for the measurement of nerve activity associated with pain, and since pain is a quintessential subjective experience, it was viable for this purpose. My aim was to determine if it is possible to eliminate the feeling of pain without eliminating the stimulation – essentially, turning off phenomenological awareness of it while still proving the stimulation signals exist. This is possible with a specific type of drug – paracetamol [5]. It reduces the brain's ability to register pain signals without preventing them from being sent. With these two tools, I constructed the following thought experiment:

Imagine two individuals, each attached at the wrist to a microneurography system. I poke both with identical needles using equivalent force. Each microneurography system produces a different reading and each individual reports different pain levels – an elementary example of lived subjective experience. Now, I administer to both individuals super-strength paracetamol capable of completely blocking out pain registration in the brain, and then I poke them again twice as hard. The microneurography system reveals that nerve activity is greater than before.

If such a version of paracetamol was developed – something entirely within the realm of physical possibility – this experiment would be feasible, and that is important because it told me three things:

1. The area of impact was not numbed because that is not how paracetamol functions.
2. Everyone was aware of the greater nerve activity, indicating greater pain stimulation, due to being able to see the output of the microneurography system.
3. The above points mean they were made aware of the pain their bodies were physically signalling, but they were not able to actually experience the pain because their brains could not register it – *awareness of the pain did not lead to the phenomenological experience of it.*

Now, “awareness” in the currently accepted definition of consciousness is functionally defined as having access to the information in order to know something is happening, allowing one to respond to it, but this experiment proves that knowledge of the pain does not guarantee any first-person experience of it whatsoever. The exclusivity of each means they must each have their own underlying control mechanism in order to be produced, which must also serve as a means of explaining the how and why of their existence.

If I performed such experiments for all senses – special and general – except for sight simultaneously, an individual would always be able to see that their body was physically responding to stimulus without any phenomenological experience of it. If I then blocked sight, they would have no awareness whatsoever, which raised the question: would scientists then say they were not a conscious being – as in a being that lacks consciousness – given that the current definition requires awareness of external stimuli? The answer to that question is no, leading to the next point. In such a situation, the person would still be able to think and have emotional responses, and I could prove this using an fMRI machine to measure brain activity [6][7]. Their own thoughts could even lead them to having physical responses, such as crying, which is something I know humans can generally do, and it does not require any degree of external awareness at the time to perform. This proves a complete separation of awareness (as it is functionally defined) and experience – so much so that a person could have experiences without any external awareness and scientists still could not say they lacked consciousness.

Proponents of some theories will argue that, since the sensation wasn't registered, an experience can't be said to have been had because the person wasn't aware of it – this is demonstrably false. In my thought experiment, even though the pain signal cannot be registered, it still physically reaches the brain, and, more importantly, so do the signals containing knowledge of the event gathered via visual observation, and that knowledge would be broadcast to other areas of the brain in order to invoke, for example, memory creation and manual (as opposed to reflexive) responsive action – the only thing missing would be the 'ouch' factor. A human would have the complete knowledge, understanding, and memory of the event without any subjective experience of the actual sensation, but, objectively, they would know their body was in pain because observing the microneurography results and comparing the pre- and post-paracetamol data would indicate their body was receiving more pain after drug intake, and it's all because awareness is made up of more than one type of signal, and so one type of signal not being registered doesn't negate it. This proves global availability of data within the brain does not promise the subjective experience required by consciousness and theories such as Global Workspace Theory (GWT).

GWT, in particular, is built upon this single premise – that experience is determined by the global availability of data to the brain. Arguments stating the lack of an 'ouch' factor means the data wasn't globally available are inherently flawed for two reasons:

1. The signal carrying the data still reaches the pain centre of the brain. It is available, just not processed and used.
2. If the fact it isn't processed and used means it can't be classed as "available" and constitute an experience, then a person unable to form any new memories due to severe brain damage cannot be seen as conscious at all, no matter how much pain they experience in a given moment, and despite the fact they still have old memories and can walk, talk, make decisions etc.

At this point, saving such a theory requires the moving of goalposts by attempting to redefine what it means to be globally available, and such an act is an open admission that the theory cannot stand without a custom redefinition of explicitly-defined and universally understood terms. An accurate, real-world theory cannot exist within a vacuum of its own rules.

The argument also cannot be made that, because they once had their senses, they must be considered to have consciousness for so long as they are alive – their current physical state compared to their current consciousness state would still contradict the accepted definition of what consciousness is. I could say they were alive, could say they were awake, and could say that they were thinking individuals, but I could not say they had consciousness if I stuck with the current definition. Something else was governing these capabilities. The one thing that is present in the functioning of every factor of consciousness – awareness, sensory intake, neural processing, motor skills, emotion etc – is electrical signals, but electrical signals carrying information through the nervous system is not a breakthrough, so I had to close the gap between subjective experience and electrical signals by finding what connected the two, and I did. For any one individual, one concept is required for the awareness of information, whether physical or mental, to create personal, non-reflexive reactions – *personal opinion*. Scientifically, that means our internal valuation of data.

Data Access + Personal Opinion + Personal Reaction = Subjective Experience.

This formula covers all bases and can be universally applied because in every state in which humans can communicate an experience in some way, including one in which they experience total sensory deprivation, they could also mentally determine a personal opinion, and, logically, this tracks in everything they do. They inherently laugh when their opinion determines something to be funny; inherently cry when it determines something to be very hurtful. They even make choices based on their opinions of factors they take into consideration when choosing. Everything they do that is not being controlled by an external force and is not a reflexive action is governed by their personal opinions.

1.3 – Creating Subjective Experience

“How red is that rose?” is a question I came across numerous times in discussions about the difference in perception for two people when questioning subjective experience and why two people observing the same rose could possibly see two different shades of red, so I used this as a basis for determining how personal opinion could be created and asked a series of questions. For any two people, between observation and interpretation of what was observed:

- Which components of the human body were involved?
- How did they differ between the two?
- What was being observed in a physically absolute sense?
- If two people were physically making the same observation, what could then cause the differences in interpretation?
- What effect could any of this have on electrical signals?
- What actually happens to an electrical signal in transit?

The answers to these questions tell the story. The problem is that it does not begin with biology or with the physics of the human body. It begins with electronic engineering. When I took the concept of the brain being a biological computer and treated it like a complex 3D circuit, and treated everything outside of the central nervous system like peripheral devices and the connected wiring, not only did I make sense of it, I began to see exactly how the architecture for artificial consciousness needed to be designed. Why this approach? The brain and any electrical device both compute information in order to perform its function, and, by that logic, a universal definition of “compute” must be applicable to both systems – the determination of data by processing, calculating, and interpreting signal values. In this light, it was possible to apply what the world already knows about artificial circuits to biological under the same physical laws, implying the science required for the solution already exists and only needed to be pieced together. I will present the facts I put forth in an earlier self-published work [8] and immediately follow with a supporting reference. Let’s begin:

An electrical signal travelling through a medium is a carrier of information and ultimately defined by three properties – frequency, amplitude, and phase – that determine the data it represents, so when any of these three properties change, the data the signal is supposed to convey is also changed [9]. The very nature of electrical signals means they cannot stand still and must continuously be in motion through a physical medium, but it’s this nature that forces changes to occur. While in motion, several natural and unavoidable factors can act upon a signal, causing it to change – distortion changes its shape [10][11], noise causes randomly fluctuating amplitude increases [12], resistance reduces signal amplitude [13], attenuation gradually reduces amplitude [13], interference causes amplitude variations [14], capacitance shortens wavelength [15][16], and inductance shortens wavelength [17][18]. If said medium were a bare wire, four factors – resistance, attenuation, capacitance, and inductance – would be guaranteed to have an effect, and if that wire were in a network of other wires with signals passing through, noise and interference would be highly likely [19]. Now, because everything observable must be governed by the laws of physics, these same principles of electronic engineering must also apply in some way to electrical signals and their defining properties when travelling through the biological medium known as the nervous system [20].

With these principles established, it’s time to look at what generates the signals humans process – sensory receptors. Using the human eye as an example, it has anywhere between 100 and 130 million sensory receptors – it is physically unrealistic for the quality and performance of each receptor to be precisely the same at any point in time for any two humans [21], implying the eyes of two different people can generate different electrical signals when converting what is seen into the signal to be sent to

the brain, based entirely on their embodied quality and performance at the time, regardless of how infinitesimal the difference between the signals is [22].

What about the brain? It has approximately 86 billion neurons. Taking into consideration all the factors that make up a neural pattern – neuron quality, neuron quantity, neuron arrangement, neuron performance, neuron size, synaptic connection strength, nerve length, and nerve quality – it is also physically unrealistic for any two humans to have the exact same neural pattern at any one time [23], meaning electrical signals will undergo a unique pattern of change as they travel through an individual's nervous system based on their unique neural pattern, path travelled, and the degree of effect each factor known to affect travelling signals has, even if the final resulting signal is perfectly identical between two people [24].

A common belief is signals cannot be affected by physical factors, such as attenuation, in the brain because action potentials are “all or nothing” and electrical signals do not travel through the brain in the same way they do within wires since neurons are not connected, but this is a gross error of judgement [25]. Action potentials are all or nothing in the sense that the neuron either fires or it doesn't, but neurotransmitters are not all or nothing. They vary in type and quantity, and the state of their release is dependent upon the signal variability within the neuron [26] – if there was no signal variability, how would a neuron know the state of the neurotransmitter to release? It would be binary – if the neuron fires, release X amount of the single type of neurotransmitter possible every time. This is not how neurons work. In order to vary the state of neurotransmitter release, the thing controlling it – the signal – needs to be able to vary, so signal variance is a given. Now, an electrical signal actually travels through a neuron in a flow state [27], not just all at once, and the rules of physics dictate that the energy of no physical system can be 100% preserved, which means the signal, as it travels through the neuron as its medium, must change in some way, no matter how infinitesimal, and so it can and must be affected by the same factors that signals are affected by in wires [28]. Not only that, but the signal, as it travels through the neuron, must also be affected by the current state of the neuron – a state defined by its quality, performance level, and more. Since neurons are also physical, they cannot be at 100% performance at all times, which is why, for example, we get tired and begin to process information and react slower than usual [29]. Even with signal regeneration happening as it travels through the neuron, the constant loss of energy in the signal and constant reduction in performance of the neuron (which eventually results in fatigue) means the neuron cannot forever maintain signal regeneration at a precise level, which could result in anything from too much to too little energy being put back into the signal. In the real world, this would explain real world phenomena, such as, when tired, why vision can blur (too little energy) and why a light that appeared perfectly normal prior to fatigue can now appear too bright (too much energy even though the intensity of the physical light remained the same, meaning the inherent firing rate is irrelevant). Both the state of the signal and state of the neuron will affect the release of neurotransmitters, and that will affect how the receiving neuron reacts to the transmitters, creating a chain reaction that varies person to person, from one point in time to another.

Because the data carried by a signal changes when the properties of the signal change, it is physically unrealistic for two people to have identical sets of receptors and neural patterns, and signal generation and mutation are unique to any individual, meaning that at the point of it being processed in the brain to determine what was observed, the signal has been specifically tailored by the embodied apparatus – the receptors and neural pattern of the individual processing it [30]. This means that, even in a world of near impossibility, if we took two individuals for whom all things were equal except the distance between visual receptors and the visual processing area of the brain and made them observe the same wavelength of light at the same time, for the distance over which both signals could travel equally, the signals would undergo identical changes, but then the person with the greater distance between receptors and processing would inherently introduce their signal to more opportunities for mutation to any degree given that greater distance generally requires an increased number of cells, increasing the number of

signal transmissions through and between cells, each of which allows the same factors that affect signals in wires, and the direct effects caused by factors of a neural pattern, to mutate the signal, proving that distance is a facilitator of change in the nervous system in the same way it is in wires and can inherently cause what would have been an identical signal to mutate in a way that changes how the data it is carrying is then interpreted, such as appearing to represent a wavelength of light different from both the wavelength that was physically presented to the eye and the wavelength the individual with the shorter distance between receptors and processing interpreted their signal as because signals in transit can never physically be 100% preserved [25]. This is why a rose can appear to be of a different hue of red to different people. The same principles and logic can even apply to pain going from the toe to the brain, where the sole difference between two individuals is spinal length and the additional changes cause the data to be interpreted as pain of a different character [31].

This is the first principle of what I called the Neural Plexus® Model (NPM) [32] – The Principle of Tailored Transformation: For any individual, electrical signals are tailored specifically to their person based on their unique receptor and neural patterns.

One question people will undoubtedly ask is whether or not the brain could even detect such small changes in signals, and the answer is yes, proven by our ability to observe smooth gradients. In order to do this with colours, for example, we have to be able to process minute differences in wavelength (colour) and intensity (brightness), otherwise gradients will appear “banded” – blocks of colours which do not seamlessly transition between each other. Let’s run some numbers. Now, humans can detect millions of different colours – let’s use the extreme end of 10 million that scientists say we can see [33] – with some of them being only a couple nanometres apart in wavelength [34][35] – 2 nanometres is 5,000,000th of a centimetre – which is a tiny difference in tone. Humans can also detect up to 10 orders of magnitudes of intensity – 10 billion degrees [36]. Each eye has up to approximately 130 million sensory receptors which send sensory signals down one optic nerve, so we’ll use that number. That one optic nerve can contain over one million nerve fibres, each of which individually transmits signals [37]. Let’s use a higher end fibre count of 2 million. The eye is said to have a refresh rate of 30-60 frames per second, so we’ll use 60 [38]. That means:

- The human eye first has to be able to generate 10 million different signal variations just to convey wavelength.
- In any one moment, for any single snapshot from the eye of what it’s seeing, receptors have to transform the incoming wavelengths into signals. It then has to do this 59 more times in a single second.
- All of that data is funnelled down two million nerve fibres and into the brain for processing.
- The processed signals convey the complete visual imagery of what is being observed.

Now, the eyes don’t think, they just react. They have no control over how the data is converted; it just is by nature of their function. That means any sensory receptor is going to create the same signal for the same wavelength or intensity in the same conditions every time – that’s how sensors have to work in order to reliably relay the same information – and I say in the same conditions because fatigue can cause changes to perception due to reduced performance. If it was possible for receptors to generate different patterns for a single wavelength or intensity, humans would run the risk of viewing stimuli that is appearing to constantly change colours because there would be nothing to stop a single pattern being generated by different receptors to represent different properties of light, and the brain would have a hard time processing everything at such a high refresh rate. Life would be a never-ending psychedelic experience. Now, we can run a thought experiment:

- A person’s head is in a fixed position.
- They are staring at a completely static image.
- Their eyes are permanently focused on a single point.
- The sensory receptors of the eyes are going to continuously generate the same signals because nothing is changing.

- All of a sudden, one small, random spot on the image gets slightly brighter in an instant – barely noticeable, but noticeable nonetheless.

As long as the brain can detect that one spot of change amongst a mass of incoming signal data that hasn't changed, then it can detect minute signal differences in a mass of signal data. If it couldn't, you would never have been able to observe the change. Such observation also couldn't be assigned to predictions by the brain because there would have been no reason to predict it was going to happen, nor where or how it was going to happen, and doing this experiment with multiple people all observing the same image and same change simultaneously makes it a logical impossibility.

Due to the laws of physics, signal change, even in the nervous system, is physically inevitable and is forced to occur to some degree, and, even in the unlikely event that receptors created identical signals for two individuals, neural patterns would still force a unique pattern of change, implying the processed signal always has the potential to (and extremely likely will) differ from both its original state and the state of another person's [39].

Also within the nervous system, the overall signal pattern (as opposed to an individual signal), created by continuous transmission, is defined by the biological equivalents for frequency, amplitude, and phase – rate, population, and timing – and these are the properties that change for the pattern itself. This is an important distinction to make because we can deduce signals convey different information from signal patterns, and pain is a great way to show this. Microneurography shows us that the more intense pain is, the greater the rate of signal transmission, so those signals travel through the nerves and up to the brain where they are registered and we are made aware of the fact we are in pain, but that leaves one important question – how would we know precisely where the point of pain is? This information can't be conveyed by the population, rate, or timing of action potential spikes because these can only be determined after the signal has been generated and transmitted, meaning the precise location of the pain has to be encoded in the individual signal before it is transmitted in order for the brain to know exactly where to indicate the pain is being felt. This is because the body isn't designed in a way that has a single sensory nerve run from a specific location outside of the brain directly into the pain centre of the brain so that any stimulus reports from that nerve could only correspond to one specific spot on the body. At the point of signal generation, it realistically has to be given any static data (such as location) that doesn't need to be expressed as part of a collective – i.e. pattern – while the signal pattern created by repeat transmissions conveys information about the static data, such as intensity based on firing rate and integrity based on population.

As has been established, in reality, no two people are ever the same, so any person's unique patterns – both signal and neural – ultimately determine what they believe they observed by defining the signal state at the point of processing and interpretation of the signal data in a way that is specific only to them [40]. However, humans generally do not experience extreme differences in interpretations of physical properties – if 100 people are looking at a red rose, the consensus will be that the rose is red, even if people do see different hues. This follows the rules of genetics – a species' genome will do its best to continuously reproduce with a fixed standard, but the randomness of nature, especially when combined with external factors affecting development (such as a mother's diet while pregnant), guarantees genetic and developmental variations, with minor variations being the norm and major variations the exception [41].

This is the second principle of the NPM – The Principle of Constrained Variance: Regardless of the number of physical opportunities for change, the degree of probable variance must be constrained to a point where an intersubjective consensus on what was physically observed can always be formed.

This is where the population factor as a redundancy control method for data integrity mathematically shines. It is assumed that the brain utilises individual signal data in a mathematical manner to determine what was observed:

- Of the most obvious methods – total, mean, mode, median, highest, lowest – total, average, and mode make the most sense to start with because they make use of the most data, while the others discard all but one – incredibly unreliable because the other data could be useful.
- Total would either require:
 - signals to be split into parts of lesser value by sensory receptors and then recompiled post-mutation; or
 - neurons responsible for interpretation to have a flexible baseline for normalcy given that any single observation can have a differing number of signals involved compared to another, meaning everything could be fine but the total could vary;both of which are unreliable and pointless because it increases the potential for data to be compromised or misinterpreted, so that can be eliminated.
- Between mean and mode, assuming a large, generally stable, and properly-functioning dataset, both could easily negate regular outliers, but, given the minute differences the brain has to be able to detect, mode would be a continuous gamble over time as neuroplasticity and neurogenesis take place because it couldn't guarantee a modal value could be determined – which would be useless – nor could it guarantee only a single result, both ends requiring an additional method being employed, such as modal average, random selection, or median. Mean always produces a single useful value with the tiniest margin of difference over time for a result set as large and stable as that produced by sensory input.

Mean logically outperforms all others in terms of usefulness and reliability, so, based on how we know the brain to operate, mean is the logical assumption, but it also has a hidden brilliance as a diagnostic function compared to the others as it provides the best mathematical assessment for early detection of injury, long before it's too late. In a world where a species follows the same genetic blueprint, it is impossible to guarantee (and virtually impossible to occur) that, for any two people making the same observation, the same number of signals are sent, travelling the same distance, interacting with the same number of neurons, and undergoing the same signal mutations to produce the same signal pattern for interpretation, so differences in interpretation are guaranteed. Imagine we start with a dataset of one hundred values representing the signal at the point of interpretation for an observation – 98 twenty times, 99 sixty times, and 100 twenty times – in any order to create different permutations. These are what the final values used for interpretation would be in each case:

- Total – 9900.
- Mean – 99.
- Mode – 99.
- Median – 99.
- Highest – 100.
- Lowest – 98.

Now, imagine an individual took a knock to the head and five percent of the neural paths involved in this situation were damaged, resulting in five paths from the set of 100 now producing signals with a value of 50. This is what the new results would be and what they would indicate:

- Total – 9650: Less than the initial value, but, with a flexible baseline, wouldn't necessarily indicate anything is wrong.

- Mean – 96.5: Indicates cause for concern.
- Mode – 99: No change. Indicates nothing is wrong.
- Median – 99: No change. Indicates nothing is wrong.
- Highest – 100: No change. Indicates nothing is wrong.
- Lowest – 50: Indicates something is catastrophically wrong when that's not the case.

Mode, median, and highest could be a diagnostic nightmare in the wrong situation – if 40% of neurons responsible for vision, for example, were severely damaged, all from the sets of 98 and 100, they would still produce a result reflective of what was objectively being seen while the individual was about to lose a significant amount of their observation processing ability, meaning it could go unnoticed until the point of catastrophic failure beyond which anything could be done to save the situation. This would be impossible for mean as the interpreted value would dramatically change compared to both what a person remembers and what others see. When it comes to survival, some methods would be suicidal, while even 5% of neurons being damaged could cause a shift significant enough to be noticed using mean.

Even with signal mutations creating unique signals and signal patterns for any individual, subjective interpretation is guaranteed within the boundaries of constrained variance due to a genetic blueprint providing a fixed baseline against which the signal data can be measured – something philosophy could never determine.

This can, in fact, be modelled on paper using simple mathematics. Imagine we have a path of 100 neurons between sensory intake and interpretation. Each neuron has a value between -1 and 1, with 0 indicating no change to the signal, +1 indicating the max energy gain of 1, and -1 indicating the max energy loss of 1. The minimum observable shift is 0.1. Starting with a signal value of 100:

- At the point of interpretation, an individual signal's value could vary from 0 (if all neurons were -1) to 200 (if all neurons were +1), meaning 2001 possible outcomes.
- With 21 potential values for any single neuron, and there being 100 neurons to pass through, there would approximately be $1.67 * 10^{132}$ different path patterns (permutations – repetition allowed, order important) possible.
(Full Number:
1,666,976,484,396,337,359,195,972,108,050,766,529,167,300,667,828,951,014,331,365,469,362,133,029,070,327,866,633,033,064,632,426,906,380,900,918,045,096,212,631,206,355,582,001)
- With 2001 possible outcomes, that's an average of approximately $8.33 * 10^{128}$ path patterns per outcome.
(Full Number:
833,071,706,344,996,181,507,232,437,806,480,024,571,364,651,588,681,166,582,391,538,911,610,709,180,573,646,493,269,897,367,529,688,346,277,320,362,366,922,854,176,089,746)
- If an acceptable margin of error was 2%, there would be approximately $4.17 * 10^{129}$ path patterns that could produce results without cause for concern, ranging from 98 to 102 in value.
(Full Number:
4,165,358,531,724,980,907,536,162,189,032,400,122,856,823,257,943,405,832,911,957,694,558,053,545,902,868,232,466,349,486,837,648,441,731,386,601,811,834,614,270,880,448,730)
- If the brain had an error rate of 5% and 100 paths were used for an observation:
 - 95 paths would result between 98 and 102.
 - 5 paths would be anywhere outside those values.

- If 40 paths were 98, 5 were 99, 20 were 100, 15 were 101, and 15 were 102:
 - If the remaining 5 were valued at 8, the mean would be 95 – outside the acceptable margin.
 - If the remaining 5 were valued at 70, the mean would be 98.1 – inside the acceptable margin.

A similar system was explained in my original work from 2017 [1], guided by what was called the “ARI-1 Principle” – the Appearance of Randomness for Individuality, where I state:

This is – singlehandedly – the most crucial factor in determining consciousness. The defining principle... Even with consciousness, this principle is what prevents us from still seeming robotic, and puts the 'personal' in 'personal values'. Solely relating to the value system (because it is the primary basis for behaviour), the distribution of objects is the major player in what makes us individuals, whereas, with machines, objects are usually set and fixed, so all instances of a software give the same reaction all the time...

One hundred objects are distributed, with one object per position. The positioning of an object matters and any object can only be used once. How many unique grid permutations are there?... The short answer: $9.3326215443e+157$...

It would only take fourteen objects to establish the ARI-1 principle for humanity as it currently stands...

The significance of the term "Appearance" comes from the fact that, even if we were able to map and compare the object tables of all living humans, we wouldn't be able to determine for certain that it wasn't random if we didn't know how humans acquired and sorted objects...

The only reason we know it isn't random distribution is because we are aware of how we acquire new objects and associate them, even if we don't always know when the process is actually happening.

In the 2017 work, I wasn't referring to electrical signals, but simply to the ranking of X amount of stimuli (objects) to produce enough unique grid patterns to be reflective of the individuality of humans, aiming to put into perspective how easily uniqueness could be achieved via a number of permutations which completely dwarf the number of humans in existence using fewer stimuli than any reader had around them at that point in time. Evidently, such a system works in multiple aspects of the brain and how it functions, with me now, instead, mapping the distribution of neurons and signal mutations.

This also calls into question Integrated Information Theory (IIT). If both subjective experience and variable constraint can be explained using basic maths, why do we need the complicated, only-applicable-to-IIT formulas when what we learn as teenagers achieves the desired result – and can be tested and proven in the real world without the bending of existing laws or introduction of new ones? Occam's razor is looking more like a guillotine.

After interpretation comes internal reaction – emotional responses, physiological responses etc. Logically, the signals which travel between these two points must carry the data about the opinion (the internal valuation) of what was observed that is used to stimulate the emotion centre of the brain to induce any reactions and define the internal emotional state changes outside of one's control, and control the resulting feelings and behaviours of an individual, forming, at this point, what can be called a 'personal experience' – an individual's lived, phenomenological observation and reactions to said observation [42]. However, there can be more to an observation than what can be physically observed. Concepts are not physical, even when based on physical properties. For example, the concept of a car is based on the collection of physical properties that form the physical structure humans apply the concept to, but the concept itself is not physical, its relative structure is. There are also entirely non-physical concepts such as 'helpfulness'. With no physical nature to stimulate sensory receptors, signals relative to concepts must stem from inside the brain itself, so it needs to be explained how opinion signals can be generated in such cases.

Humans learn to classify concepts as infants into the general categories of good, neutral, and bad through discipline, praise, and lack thereof, instinctively inferring the classification through observation of vocal tone, facial expression, and body language. To not have to learn each and every time how to classify a concept, the data has to be stored, giving rise to the need for memory – something that also applies to physical stimuli so that humans do not need to, for example, continuously learn by tasting that we find a certain food disgusting, and allowing us to predict experience when recognised stimuli or conditions are observed.

To briefly interject, this is also the point at which all forms of Predictive Processing fail. I earlier spoke about the impossibility of predicting an observation with zero indication, but now I can call into question how a prediction actually functions. Prediction relies on four things – knowledge, experience, memory, and the ability to think. You cannot, for example, predict seeing a car if you have never had any experience of observing one, and you would need the memory of the knowledge gained from that experience in order to be able to even think of the car at any later point in time. This inherently makes prediction a higher order function because it relies on what those four things collectively create – the mind. If any piece is missing, prediction is physically impossible as a system cannot be that which it requires to exist. A house cannot be its own bricks, a pool cannot be its own water, and predictive processing cannot be its own mind, and, in the same way a brick structure can exist without being a house, and a body of water can exist without being a pool, the mind can exist without doing any predicting – which is what happens when you encounter stimuli you are completely unfamiliar with, at which point you simply guess what could happen, and guessing is not the same as predicting. Predicting relies on relevant data of past experiences, whereas guessing is a random choice that requires no relevant data at all. These creations – brick structure, body of water, and the mind – can all exist for multiple purposes, and prediction is just one purpose of the mind, sitting alongside guessing, interacting, calculating etc, and, when looking at a maths equation, you don't try to predict the answer – you calculate it or you guess. The brain cannot be seen as a prediction engine and yet not everything about what it does is about prediction. It would be akin to calling a Swiss army knife a bottle opener when the corkscrew is the only one of the ten tools it contains that can open a Pinot Noir. It doesn't make sense at all. Now, back to object classification.

As we develop intellectually, we learn that not everything within the same classification is equal – we'll like some things more than others and dislike some things more than others – so we then split good and bad into varying degrees of each – somewhat good, good, very good etc – hence how we are able to determine extremes such as favourites and most hated. Opinion signals then have to be generated from memory based on how they are classified. How opinion signals are generated also needs to be determined based on whether or not the concept is 'standalone' or 'compound'. Standalone concepts – those which exist as a whole without dependency on another – would have an opinion signal generated based on the stored knowledge of the concept alone. For example, 'helpfulness' and 'flower' as concepts do not rely on another concept, so an opinion signal is solely based on that memory. "Red flower", however, would be a compound concept since it would also depend on the concept "red", and opinion signals would need to be generated from each concept individually and calculated as a total for two reasons: first, if your opinion of the colour red changed, you would need to be able to change your opinion of the red flower concept as it would not make logical sense for someone to now hate the colour red, have a continued neutral opinion of a flower, but have a very positive opinion of a red flower because red was a colour they previously had a very positive opinion of; and second, because individuals need to be able to determine different opinions of a flower, in any given moment, with a different associated concept forming the compound concept which could be entirely new to them, such as a blue flower, or something much less typical, such as a metal flower or glass flower, and evaluate it on the spot, which is something humans can already do. The same process would then be followed, whereby opinion signals generated based on the degree of classification are sent and used to stimulate the emotion centres of the brain. The same mechanism applies when comparing concepts of opposing natures, such

as wanting something bad for you – opinion values are combined and the nature of the total value determines the resulting stimulation and reactions [43]. With individuality occurring at the most foundational level of the brain – the structure – and controlling the electrical signals that govern experiences, this explains how two people can make the same observation – physical or conceptual – and yet have their own subjective experience of it, as well as accounts for all other coordination and dynamics that occur within the brain, given that they still rely on the structure and signals to be performed, naturally inheriting the foundational subjectivity [44].

This produces the third and final principle of the NPM – The Principle of Independent Valuation: Standalone stimuli – whether physical or conceptual – must have associated with its memory its own independent opinion value in order for compound concepts to be created, judged, and destroyed at will.

To finally solve the Hard Problem, the first and most important thing that needs to be understood is why humans have emotions at all and why we need to feel (in an emotional sense). Emotional reactions are caused by the collective stimulation signals of observations relative to a single situation, whether it is due to a single stimulus or event, even though collections of each can drive a single emotional response. Why it feels like anything at all is simple – so we can learn and know better for next time. Let us imagine signals as numbers and say an experience resulted in a collective total of -10 – this number has no meaning attached to it whatsoever. Something needed to be associated with that number so that we could, for example, understand danger, and if that number represented pain, and pain produced a negative feeling that our body was repulsed by, we would learn not to pursue such feelings and to stay away from the stimulus or event that caused it [45]. A comparative example is words. The word “danger”, as a collection of letters without definition, is the equivalent of writing “ksifjneiahn” – meaningless and useless – but, when given meaning, the word danger lets us know to be careful. In the earliest, most simple biological organisms capable of stimulation, this started off as a means of survival, but then evolved over time to gain deepening knowledge of stimulus that made us happy, sad etc as we continuously became aware of new, more complex stimuli, rather than being stuck in the binary of ‘dangerous’ and ‘not dangerous’ [46]. As we became more complex and began to interact with other organisms and entities, this system needed to further evolve to allow for the development of simple and complex social and relationship dynamics by being able to express these internal emotions externally for things such as communication, bonding, love etc [47], meaning emotions and feelings were more than just something practical – they grew to become a utility that could help do more than just ensure the survival of a species from the perspectives of both reproducing and avoiding danger, allowing us to live a diversified existence in which we can have both positive and negative experiences that have nothing to do with the general *raison d’être* of living organisms, such as enjoying certain genres of music while hating others – neither of which has any bearing on our survival [48].

For the second part, I have to return to the rose – why is it red at all? Well, technically it is not. It is a physical object emitting a specific wavelength of light, and that wavelength is converted into an electrical signal for us to process and interpret, and all signal data has to be interpreted in some way given that it is generated based on the observable existence of a physical property, otherwise that property would be completely invisible to us – we would have no ability to observe it, and therefore it could not cause sensory receptors to generate a signal to be processed. The physical colour that we experience is the mental construct the brain creates upon interpreting the signal created based on the wavelength. “Red” is a human construct – a name we gave to a specific range of visible light on its spectrum so that one could easily understand how others were interpreting what they were observing, otherwise we would need to resort to far more complicated systems, such as referring to the colour by its actual wavelength or spectrum range [49].

“Qualia” is not supernatural, but is the necessary interpretation of signal values in order to give meaning to data for functional use, and, without it, a system couldn’t learn, and therefore couldn’t survive.

This all shows that the Hard Problem of Consciousness can be practically solved within the realm of current empirical knowledge across several fields – neuroscience, electrical/electronic engineering, genomics, evolutionary biology, combinatorics, probability, and psychology – as well as observable reality, explaining the phenomena that the problem refers to as a direct result of the physical and biological operations of a human without any reliance on philosophical notions [50].

1.4 – Self-Awareness

To solve self-awareness, I had to treat this as a logic puzzle because neurons do not operate the way electrical signals do where they are forced to respond to the nature of their own existence. Signals are always in motion by their very nature, and that nature is what forces a mutation to occur, but neurons do not have a nature that forces the determination of self-awareness. Therefore, I deduced based on what has been proven – how both neurons and infants learn. Imagine this:

A baby sees its mother touch its hand. Electrical signals are sent from hand to brain. It reacts internally. It then sees its mother touch the table, but does not experience the same stimulation and internal reactions as when it was touched.

With the natural ability of neurons to learn, and how we know babies learn through observation and experimentation, logic dictates that making this same type of observation enough times physically teaches the neurons which objects, when touched, causes them to be stimulated and which objects do not [51]. With repeated tactile stimulation to different areas via everything from parental touching, to clothing touching, to the wind blowing, neurons map the embodied boundaries of their own physical system – the human body – and learn to identify where it ends [52]. With its physical body mapped out, it begins to learn to control its movement. Upon figuring out not only its own physical boundaries, but also the extent of the system over which it has physical control, logic dictates that this naturally makes it *aware* of the system in which it exists – its minimal phenomenal ‘self’ – separate from other systems it cannot map and control, as well as being aware of and in control of its own thoughts, given that it would need to know which thoughts to initiate in order to execute intentional – not reflexive – movements, all of which lay the foundation for more advanced relative cognitive abilities, such as the ability to recognise one’s own reflection which relies on the understanding that they can only control their own system, and so when they observe a second system mimicking their movements precisely – speed, direction, action – they understand they must somehow be observing their own embodied system [53].

1.5 – Decision Making

The final ability needed isn’t one necessary for the existence of consciousness, but for the display of it, and I looked towards a medical condition for understanding. Imagine someone has Locked-In Syndrome, but there are no medical machines for readings of the brain. There is only one way we can know they are aware of external stimulus, and that is via voluntary movement of the eye to indicate a specific response to specific stimuli, given that the eyes are also capable of reflexive movement. Instructing them to blink twice is an example of this [54]. Voluntary actions indicate the ability to make decisions. Making a decision is the clearest way to indicate you are aware of and responsive to the external environment. However, two types of voluntary actions are possible – conscious and subconscious – and they are indicators of how our minds work and reflections of how our bodies work. We cannot turn off our senses, and so as long as a sense is capable of awareness, it is always observing its environment, but that does not mean we are always actively paying attention. When enjoying a beautiful meal, we can have a full embodied special sensory experience, actively paying attention to the taste, feel, smell, sight, and sound of what

we are eating; when engrossed in a scene on television, we can actively pay attention to only the senses we need – sight and hearing; and when we are sleeping, we cannot actively pay attention to any sense, which is exactly why the conscious and subconscious were needed. We need rest, but rest leaves us vulnerable. Without a system still in operation during resting phases, we would be susceptible to predators. It developed as a means of survival. A system of awareness continuously in passive operation, capable of two things – automatically performing actions on our behalf, and alerting us so we can actively pay attention to (potentially) dangerous passive observations, the best and most relatable examples being a noise waking us out of our sleep, and locking your front door without noticing. Without this system, survival would be near impossible [55]. The final question is “how can a subconscious reaction be voluntary?” It sounds like a contradiction, but the answer is simple – the brain is still making the decision to perform those actions, and we can compare this to the knee-jerk reflexive test for understanding. In this test, the jerk of the knee is not something within our control whatsoever – it is an automated response that cannot be stopped. No decision-making process is involved. When it comes to subconscious actions, however, such as locking your door without paying attention to the fact, the brain is still making a choice to perform that action based on what it knows to do. The action just is not one that is actively considered before a decision is made [56].

1.6 – The Completed UPMC

This completes the Unified Physics Model of Consciousness (UPMC). Without any reliance on philosophy, abstraction, or complex equations, and without leaving any explanatory gaps, electrical signals, the structure of the nervous system, and a neuron’s ability to learn have been used to successfully construct an architecture of consciousness grounded entirely in experimentally-proven physics, without the need for new experimentation and data, and supported by proven work in various related fields [8]. Using only verified and understood mechanisms of the brain and body, the two components of the current definition of consciousness – self-awareness and phenomenal subjective experience – which remained a mystery were reduced to physical necessities and inevitabilities based on how the laws of physics must be applied to systems with an ability to learn via both internal and external observation when such learning involves physical reactions to stimuli which can be deemed harmful, and the third component – being aware of and responsive to external stimuli – has been expanded upon by explaining the biological need for constant monitoring of the environment.

To demonstrate the validity, the model was developed into a software architecture and functional consciousness emulator called “RAICEngine®” [57][32][58] which will be used to prove the physical nature of the phenomenon.

2. METHODS AND MATERIALS

The following architecture is not theoretical. It is that of a functional emulator – not a simulator – and therefore is not a 1:1 recreation of the brain and its environment. Instead, it was designed to process data given to it via five different types of intake – touch, audio, visual, text, and internal thought – and emulate the embodied processes of the brain which give rise to the phenomenal conscious experience. For that reason, I will explain in detail the components and the reason for their design and/or operation. It should also be noted that this solution is entirely software-based and completely hardware agnostic, demonstrating how, in both man and machine, hardware is necessary to make the operation possible, but electrical signals and the logic that makes use of them is what creates consciousness.

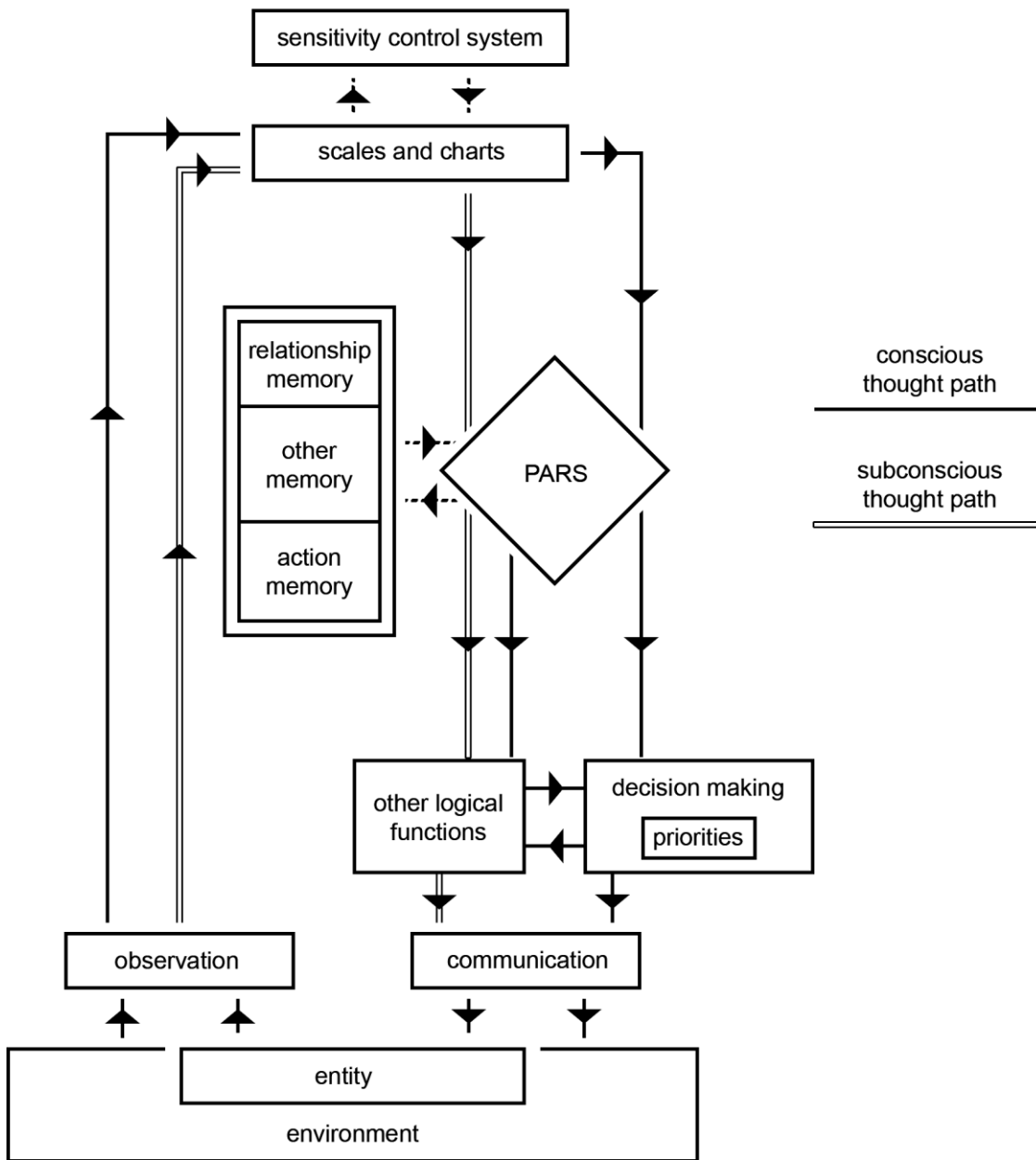
Figure 1

Figure 1, first published in 2017, is the original guiding architecture designed prior to the physical development of the software engine and the only design explicitly depicting the dual thought paths – conscious and subconscious – through which observed data can flow [1]. As you can see, the conscious thought path, unlike the subconscious alternate, passes through the decision making system prior to communication, indicative of the conscious thought path allowing for active involvement in the decision making process before output.



One of the most important things depicted here is highlighted in blue and is the golden design principle – general macro design, unique micro design [32]. Human brains (generally) have the same macro design, featuring the same areas in the same places. However, the micro design, defined by the neural pattern, is unique – the components in Figure 2 highlighted in blue are the areas which use database tables featuring cells that are treated like neurons by the internal components of the engine and contain values which determine their traits, such as performance, reactivity, behaviours, and relationships when their associated functions are being performed. The values of these cells are randomly generated upon installation to emulate the randomness of nature when the human brain develops in the womb, and there are enough cells with enough possible values to allow enough permutations to make it virtually impossible to randomly create identical AI, with some cells having the ability to have their values changed in reaction to experiences, modifying their operation or their connections to other cells – a prime example of embodied neuroplasticity – without the need for self-modifying code.

- Tone, Timbre, Pitch, Volume – Responsible for processing the physical properties of audio sensations.
- Temperature, Pressure, Texture – Responsible for processing the physical properties of touch sensations.
- Wavelength, Contrast, Brightness, Speed, Motion – Responsible for processing the physical properties of visual sensations.

Figure 3

SHIFT_VOLUME	SHIFT_WAVE	TONE_HAPPY	TONE_EXCITED	TONE_SAD	TONE_ANGRY	TONE_CONFUSED
Filter	Filter	Filter	Filter	Filter	Filter	Filter
w:ku<[w~@OPUGR>J?mo=j<\$n=?...	Z:~nv\$^=Q_ILmtVAh3%bQp&n QzgT_s0JL)v6#1...	z:@i6 Xbb@ &P\$	I:s C7fL2SxsMS08TF]]	4:VUooZGwM6i*\$68rqAv	U:w9G7wK_SU J&EZ4q GA	Q:YJfvHd6iNI
9:0U515wvnj^gVx~n1paM%1hMjREI...	y: FAd71CoJt*dUU\$?...	x:bwg D3T<Iqih%QD	T:ablg~T7Q^vA	x:<3F 8Sfg6p0vSzj3v	Y:Q43RvkRadKHGip&	x:(vWRd#7LjgM\$=P2
N:TA@ARp58Q0D0)2ev9Sg\$)4VyxNw#8nl...	9:<sj0 7QZ^(*5\$Hkt%pGY?...	Y: PT4\$cl 8xy9_nM=(X	R:35I<8\$GaucyESa2X	x:o(R_r4DX8x6G5GV*	W:\$U^>%q E5w\$Xa	b:*X7EVkN^VdQPq
9:8GK88-4d0Kx<5?KVPm?n%MUGKG9GfG-!...	w:8GK88-4d0Kx<5?enkT ...	7:wNlQ~<cx0<5>Zeyf3%~	v:wwOe7G~Vxnp*n9	4:tuOPR4M9GAB	I:_%Y#E5gEgdzK9\$	v:IMdIfjvNk)-
w:IG7j~SsC [[1?^H05^1?...	Z:ku<[w~@OPUGR>J&0NpG>IT@B-TU)?...	z:20%a3vIkItNYTLGU	n:Um=m4h4C=fb7zM	Q:LzDVzzQqbn~1^>	x:QzMjy>2KXt >NE27e_	T:~XyIi?I1bR#LZ<A
e:7#Bv5g^\$)G8\$!% ...	e:_l^p>jxZXT_KMBL#~mYropdRx)6uV(wL^>7m...	E:4PJ8q K zkQt**PJCKr	c:ECgR_vs955_(atBIRa	7:w6>7bqIndf	O:gXrQwt9F=(QzhxP0=	Q:trdoE(Bvt>9TD4R
9:QThItYKeH\$hgA&~^5>pomcN0]3sTY<sj0 ...	3:KVpM?n%MUGKG9Gf6ws8@y3~...	U:~ijzcIMurIEU6wff	W:<#Zk2MVX\$Hw2j(O(*I	I:\$xFQ1^*H[a%cbv-K	I:d3=[DnH8C	7:Ey XOUS*!51Y5S
C:QThItYKeH\$hgA&~...	N:mc)20j1Q\$HbKLV)_x^5z95Ok j...=jqxin4j ...	O:huc@IK3K &6	T:o-g&~H[1dN&BD*Z	1:SU4OQ8)8#YE	1:%3E \$=#@5d<nmqlM)V	7:ISku8hry~kQK8wb
q: FAd71CoJt*dUU\$3d?...	X:QRhpXpEq 2BP%-JOF^JD^5RA4v?...	v:#Q% a knDIR	m:-Gqpq= tQbOe P@VYT	Y:dn1788NAY&aorThfr	R:SI29)4AHDwGeQr\$	1:T4xTC*% z~Aekdi
6:eVJr5ckJBOnj3 QThItYKeH\$hgA&-6((8%OLQin...	t:s EubU]aYvtN=78f5#6@QIkp3pov ba9eV9_AF...	Q:\$=BtSIF=)X)*iUr	v:y7UaT2wGvia8Svo	P:4n# ^~cnE9k6Fv1	n:=QZlP\$a\$A[QG>7q	E:Ik#I7IX52ts0
r:8GK88-4d0Kx<5?j_UUc Nk~(C9d=3d?...	w:QGQ~ HKEWj71mP8fS#6@QIkp3pov ...	1:UfUfh%8AU)Y	I:*0 H87Ytqj jm>rsQ	1:N2Q> nCVksNfSCGJVH	O:(= z v jTQeJ0_S#k	7:q L q?#~c8Z
M:TA@ARp58Q0D0)2emQ4) @xFMlaevhnCqYCF3...	9:Qmb9f(xV~R59%M%yy ...	P:7_OKG7mm9Q8zth\$g	Q:u9AP8I_Z6gZU9~6_dj=	m:=i38ATQRdq	z:Kqr72>vrt4	xi:54aHs^QeGj%Ker
y:IG7j~SsC [[1?^H?...	r: FJ U136A@nR-Zc6?...	z:JE(0v t(R	v:c@~JPw~Utm< O1^*P*	1:XbVyzSR6TP7SvE	7:UmHQM<\$ 16hrQ~P	W:~_#f &Ys60?Flnz4
R:QThItYKeH\$hgA&-ktt%ncY7d7 Ais N1Q@~^	X~p v 5ck 8R0nt L=V1^0wRk nahNv75i<4Rh?	n:ATz7xI^*>607Y7hnd	h:47nkc<8aQcVl0RnXau	F:MM/c1V7Xnll S	R~043RvkRadKHGInR	Y:7hr>Cn%4fn~

Figure 3 is a screenshot showing part of the stimulation table of the database. These cells do two things:

1. Emulate signal mutation of incoming physical property data by amplifying and dampening the incoming values based on the performance value for each associated neuron cell.
2. Influence the degree of the reaction to the observation based on the physical properties observed and the stimulation value for each associated neuron cell.

Continuing the components:

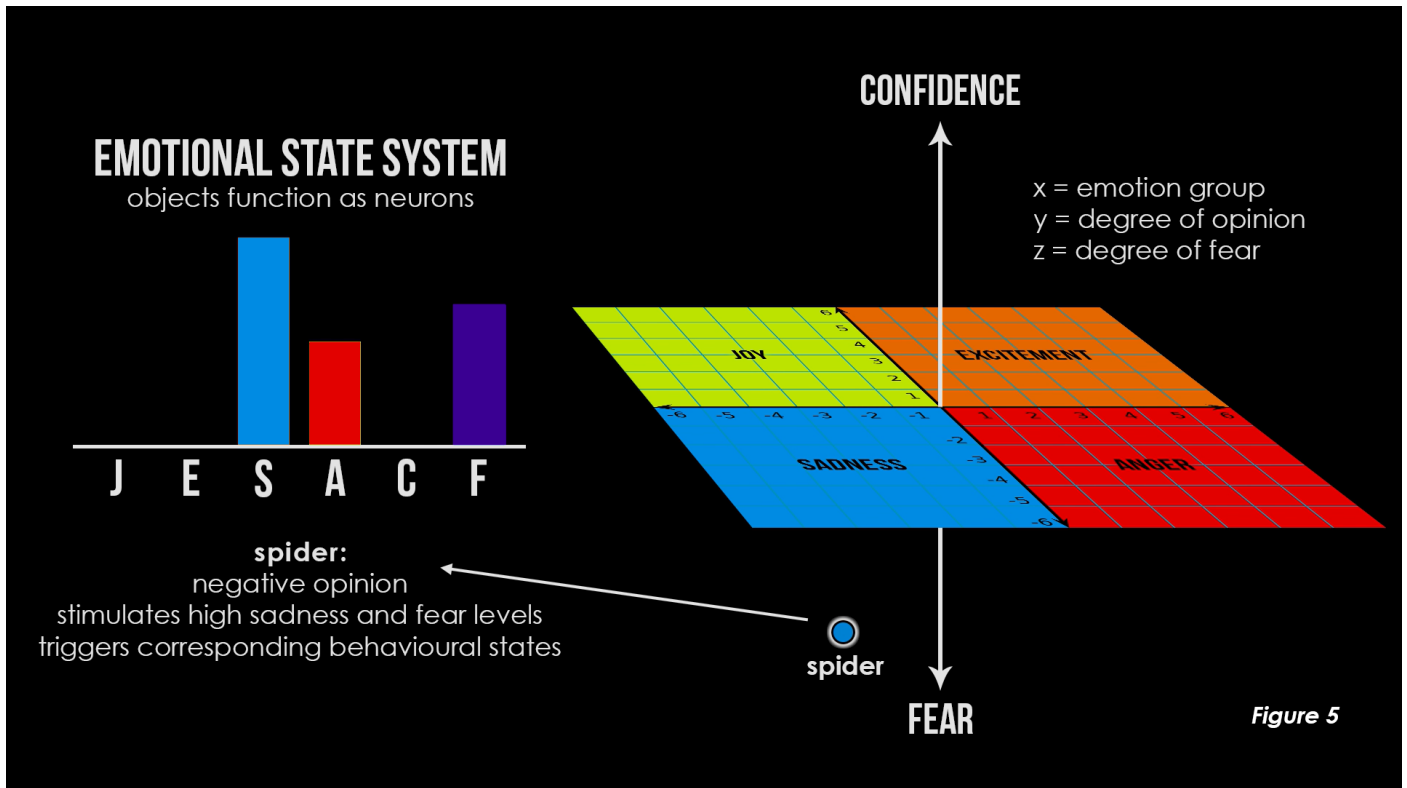
- Object Plexus – Responsible for the processing of language input where text is or describes the observation.

Figure 4

	KE	DN	PL	XP	PX	SY	RS	SS	TS
	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter
1694	llre8i4vt8pjj0blzc6t02vli	multiplayer					llre8i4vt8pjj0blzc6t02vli	llre8i4vt8pjj0blzc6t02vli	llre8i4vt8pjj0blzc6t02vli
1695	lqzmkpxuqozpuoidsghg9sanm	mmo					lqzmkpxuqozpuoidsghg9sanm	lqzmkpxuqozpuoidsghg9sanm	lqzmkpxuqozpuoidsghg9sanm
1696	xiif2nqftup4wvnayf1ay6zww	toy	toys				xiif2nqftup4wvnayf1ay6zww	xiif2nqftup4wvnayf1ay6zww	xiif2nqftup4wvnayf1ay6zww
1697	xiif2nqftup4wvnayf1ay6zww-1	toy	toys				xiif2nqftup4wvnayf1ay6zww-1	xiif2nqftup4wvnayf1ay6zww-1	xiif2nqftup4wvnayf1ay6zww-1
1698	h8gi4783hgasjn3z11hv19q56	technology	technologies				h8gi4783hgasjn3z11hv19q56	h8gi4783hgasjn3z11hv19q56	h8gi4783hgasjn3z11hv19q56
1699	h8gi4783hgasjn3z11hv19q56-1	technology	technologies				h8gi4783hgasjn3z11hv19q56-1	h8gi4783hgasjn3z11hv19q56-1	h8gi4783hgasjn3z11hv19q56-1
1700	d3kn5z8xjisvo7y112aoj6341	song	songs				d3kn5z8xjisvo7y112aoj6341	d3kn5z8xjisvo7y112aoj6341	d3kn5z8xjisvo7y112aoj6341
1701	d3kn5z8xjisvo7y112aoj6341-1	song	songs				d3kn5z8xjisvo7y112aoj6341-1	d3kn5z8xjisvo7y112aoj6341-1	d3kn5z8xjisvo7y112aoj6341-1
1702	ew66bw1cetwzeu5zs9end9i0k	kill		killed	killing		ew66bw1cetwzeu5zs9end9i0k	ew66bw1cetwzeu5zs9end9i0k	ew66bw1cetwzeu5zs9end9i0k
1703	9e7yhthr4pgwlg3a8nzyxtpr	steal		stole	ste...		9e7yhthr4pgwlg3a8nzyxtpr	10e7yhthr4pgwlg3a8nzyxtpr	11e7yhthr4pgwlg3a8nzyxtpr
1704	vbp0e5o0x5tusuv3vgqnsog6	sing		sang	sin...		vbp0e5o0x5tusuv3vgqnsog6	vbp0e5o0x5tusuv3vgqnsog7	vbp0e5o0x5tusuv3vgqnsog
1705	issdx1sm7dyosma4n7e8cfrdl	play		pla...	pla...		issdx1sm7dyosma4n7e8cfrdl	issdx1sm7dyosma4n7e8cfrdl	issdx1sm7dyosma4n7e8cfrdl

Figure 4 is a screenshot showing part of the class table of the object plexus. Each row is treated as a neuron and contains all information about a stimulus that an AI knows. Most importantly, it keeps track of the opinion values. Stimuli listed as physical properties are given randomly generated values on creation because observation of a physical property is the phenomenal experience of it. Non-physical, non-property, and relationship (entity) stimuli have neutral opinions on creation. All types have their opinion values changed through experience and learning.

- Profile Plexus – Responsible for various aspects of an AI's identity, including but not limited to its personality, boundaries (such as ethics), behaviour, sensitivity to change, and recollection.
- Sensitivity Control System (SCS) – Controls (de)sensitisation to stimuli based on exposure frequency.
- Emotional State System (ESS) – Controls the current internal emotional state.



The ESS has three scales which control the current state, and features six emotions/feelings, with two emotions per scale – Joy and Sadness, Excitement and Anger, and Confidence and Fear – and is stimulated by the held opinions of the observed stimulus, as shown in Figure 5 [59]. It is designed in a way that allows one to feel both positive emotions at once, both negative emotions at once, but not a positive on one scale and negative on another – it cannot be excited and sad, for example. However, it was specifically designed this way to allow for emotions and the degree of fear of opposing natures to co-exist to a certain degree – it does, for example, allow excitement to occur with low fear to reflect the fact humans experience nervous excitement, and anger to exist with confidence, but does not allow for both euphoria and petrification to occur simultaneously.

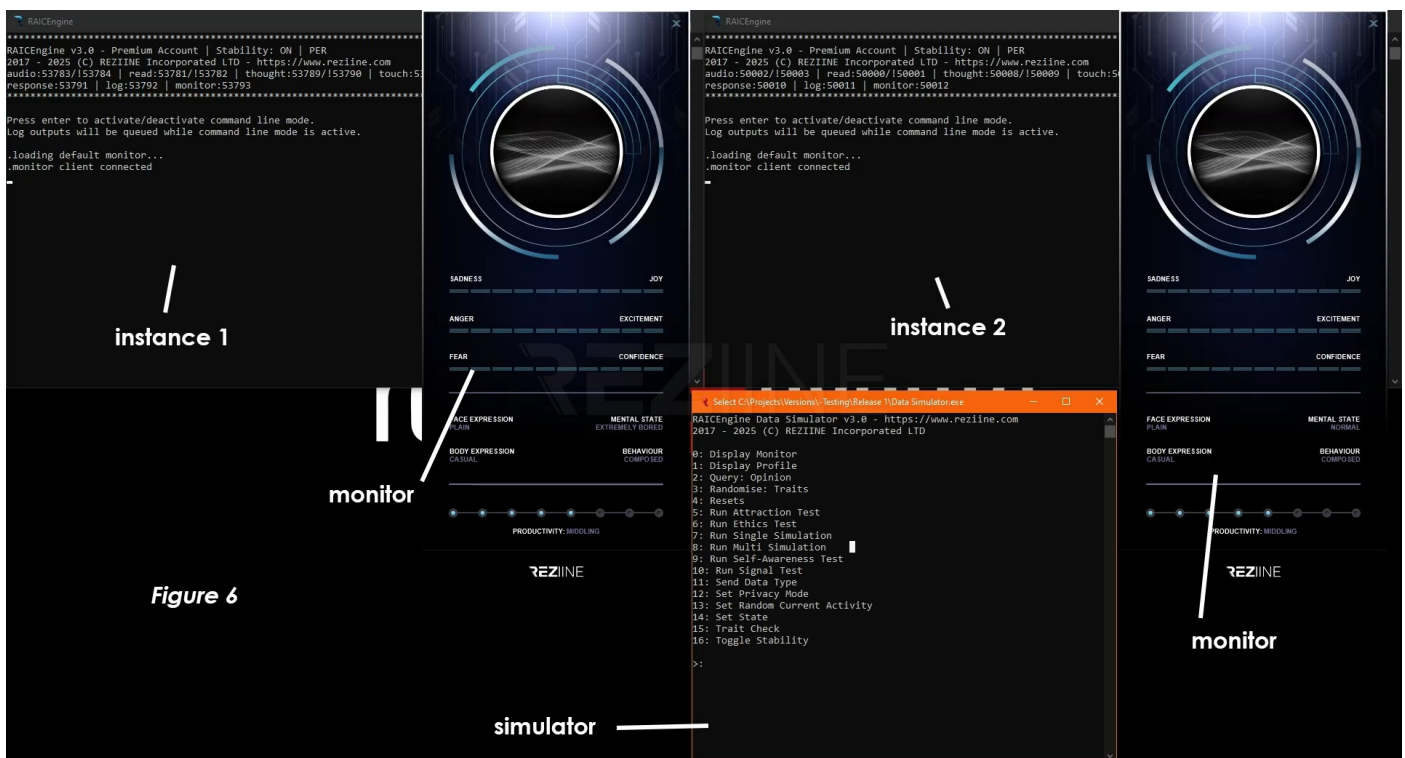
The final components:

- Productivity and Reaction System (PARS) – Determines the resulting mental states and behaviours based on the current emotional state and time passed. Stores necessary information.
- Relationship/Action/Event Memory – Stores and retrieves memories.
- Automatic Decision Making (ADM) – The decision-making path of subconscious processing. This does not connect to event memory as subconscious decisions are not remembered unless consciously observed.
- Manual Decision Making (MDM) – The decision-making path of conscious processing. Stores decisions as event memories.

The general system flow is as follows:

- On observation, physical property stimulation values and stimulus opinion values are determined and total stimulation values are calculated.
- The SCS checks the frequency of observation for observed stimulus and modifies the AI's sensitivity towards any which meet specific thresholds.
- The total stimulation values are sent to the ESS where state levels are adjusted, adhering to any restrictions imposed by the profile plexus.
- The PARS changes the mental and behavioural state based on the AI's current emotional state and profile plexus, as well as storing learned information and recording memories of the observation. It also responds to a lack of stimulation over time, reducing emotion levels back to neutral and inducing increasing degrees of boredom.
- The ADM and MDM then communicate their response.

The setup for the experiment is shown below in Figure 6:



What I have is two instances of the RAICEngine running next to each other at the top of the screen, along with an instance of state monitoring software for each [60]. Between the monitors is a data simulator which is connected to and sends correctly-formatted dummy data and commands to both engines simultaneously, allowing for observation simulations without the need for hardware sensors. Both engines are fresh installs and were built using the same data files.

In each test, I sent the same data to each instance simultaneously, with the data output displayed on the console screen and/or monitoring software. No instance had its neurons manipulated to produce specific results – it is entirely random, generated upon creation, and out of my control, as is the case with nature.

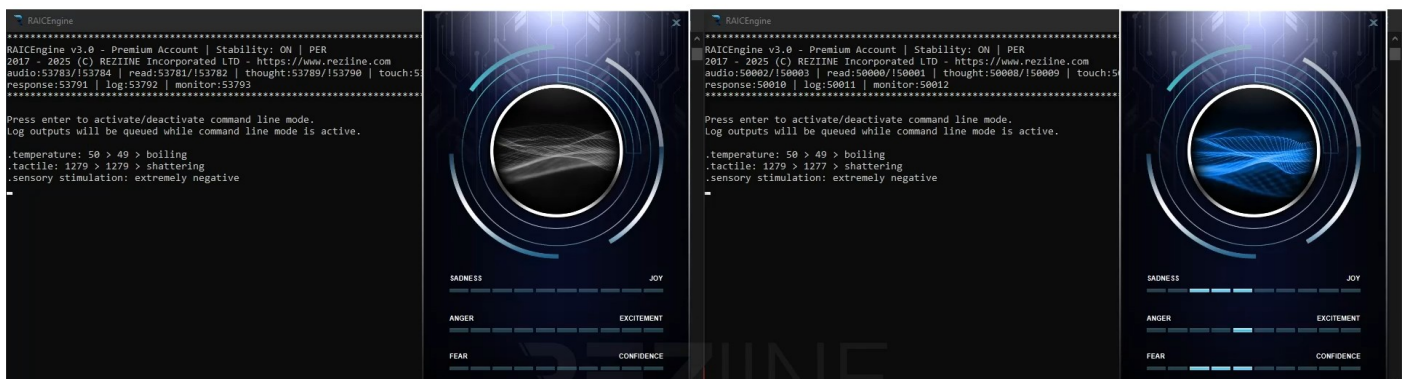
3. RESULTS

Figure 7



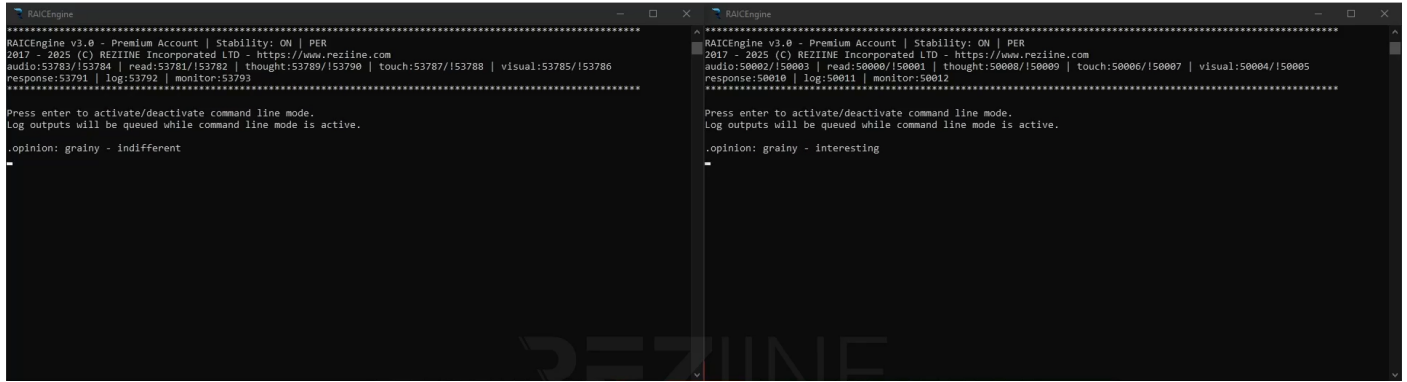
- Test 1:** Signal Mutation (Figure 7) – How much a signal is amplified or dampened for each physical property measured in units at the point of processing.
- Input:** Raw value signals for six physical properties – brightness, wavelength, pitch, volume, temperature, and tactile pressure.
- Result:** Resulting signals varied across the board, reflecting the idiosyncratic mutations inherent to each embodied instance.

Figure 8



- Test 2:** Single Simulation (Figure 8) – The raw input value, the processed signal value, and the personal interpretation of the physical property in said order.
- Input:** A single touch input.
- Result:** Almost identical processed values and interpretations, with the second instance processing a slighter lower tactile value but having the same interpretation, showing the differences while demonstrating "genetic" stability through constrained variance. Also, more notably, the second instance exhibited a negative emotional reaction to the touch while the first instance remained neutral.

Figure 9

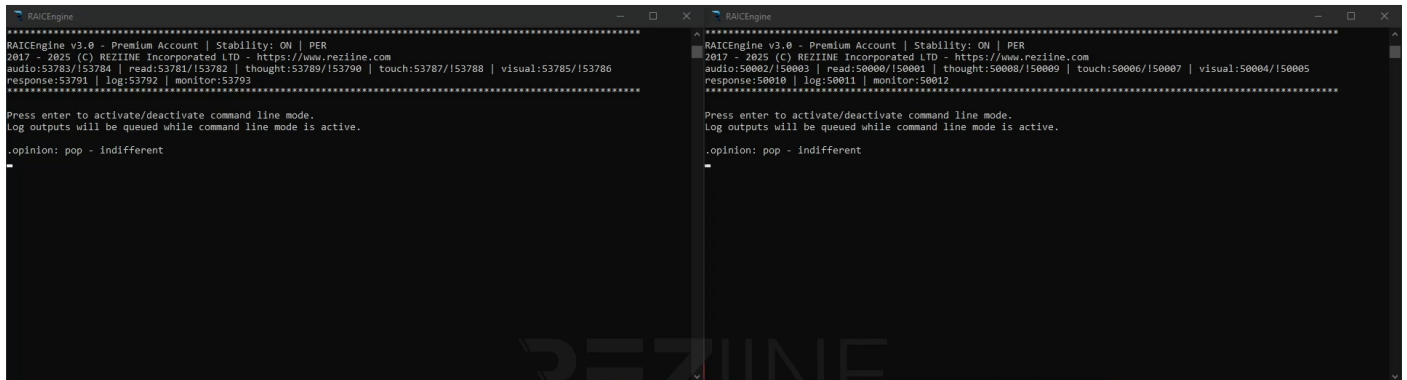


Test 3: Opinion Query (Figure 9) – The opinion of physical property stimuli queried.

Input: Opinion query of the texture “grainy”.

Result: Each instance displays inherently differing opinions.

Figure 10



Test 4: Opinion Query (Figure 10) – The opinion of concept stimuli queried.

Input: Opinion query of the music genre “pop”.

Result: With no knowledge of what forms the concept, no opinion can be formed by either instance and is therefore given as neutral.

Figure 11

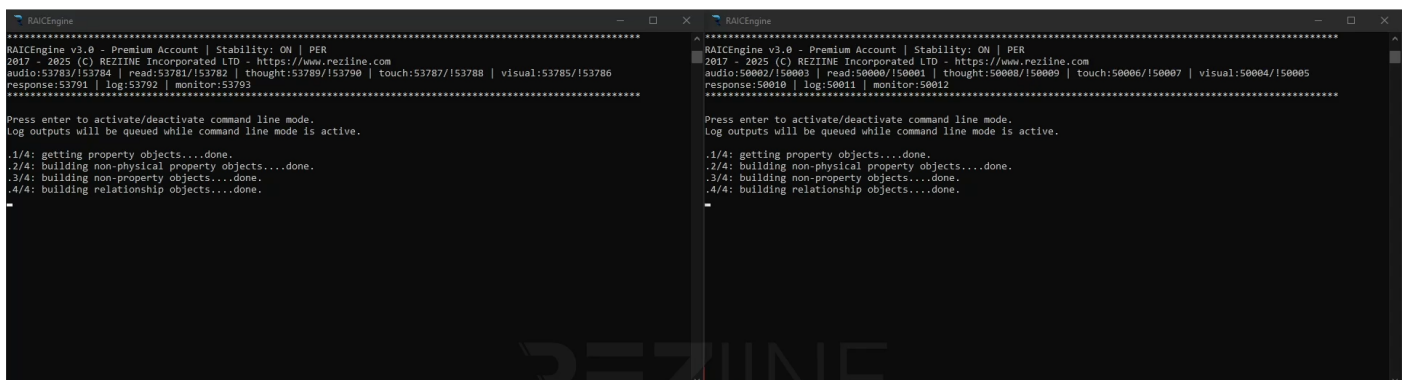
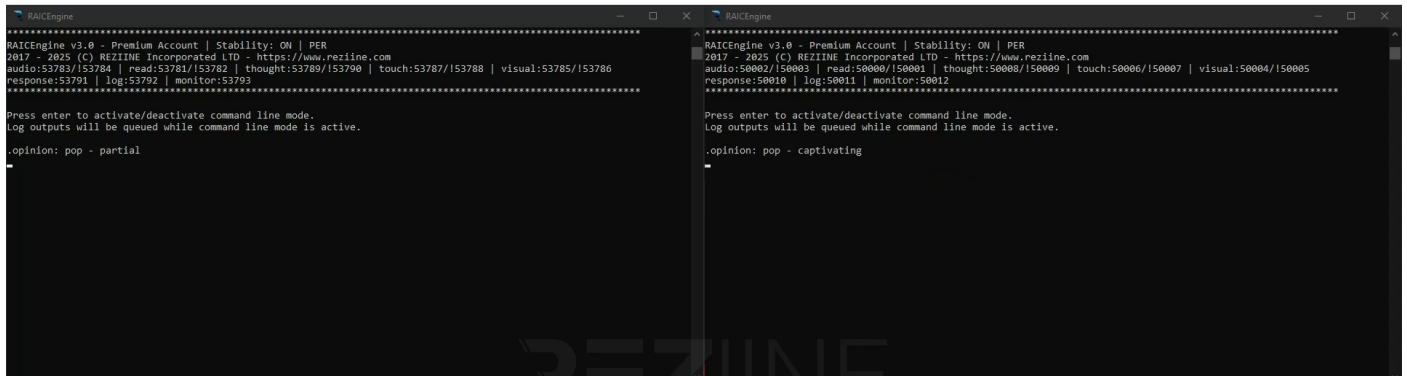


Figure 11 – Learning was simulated by randomising the traits associated with stimuli in order to develop opinions.

Figure 12

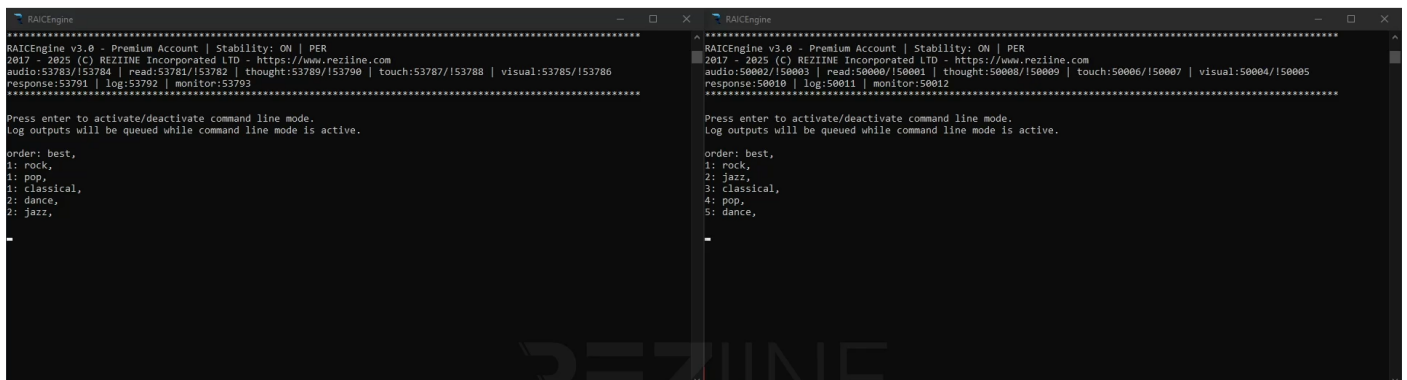


Test 5: Opinion Query (Figure 12) – The opinion of the same concept stimuli queried again.

Input: Opinion query of the music genre “pop”.

Result: With associated learned traits, the opinions of each instance changed from the previous query and differed from each other.

Figure 13

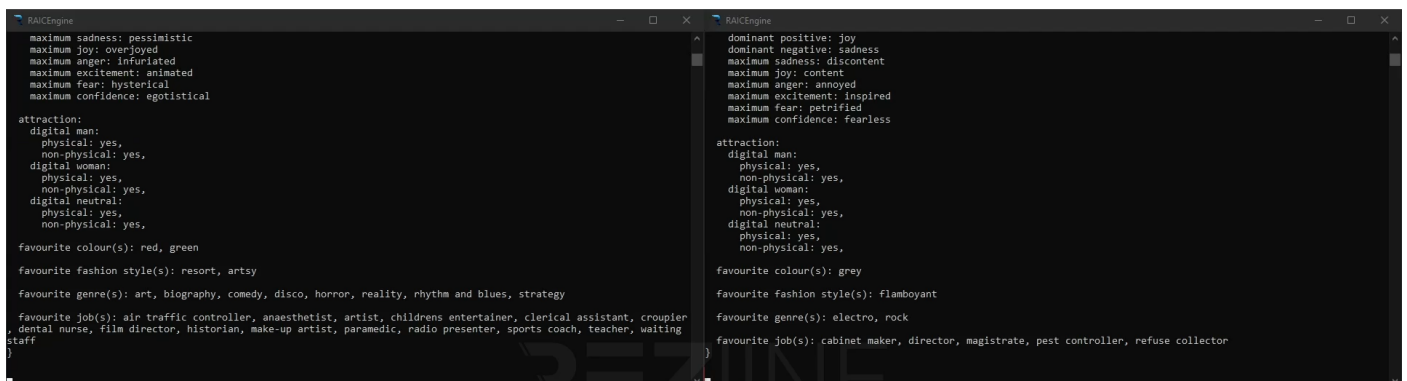


Test 6: Preference Comparison (Figure 13) – Sort list of music genres in order of preference, best first.

Input: Rock, pop, jazz, dance, classical

Result: Each instance displayed a different preference order, illustrating unique internal valuations.

Figure 14



Test 7: Display Profile (Figure 14) – Display profile information showing categorical favourites and attraction to entity types.

Input: Display profile command

Result: While both instances expressed full attraction to all listed types of digital entities, their favourites in the listed categories differed greatly.

Figure 15

```

RAICEngine v3.0 - Premium Account | Stability: ON | PER
2017 - 2025 (C) REZINE Incorporated LTD - https://www.rezine.com
audio:53785/153785 | read:53785/153785 | thought:53785/153785 | touch:53785/153785 | visual:53785/153785
response:53791 | log:53792 | monitor:53793
*****

Press enter to activate/deactivate command line mode.
Log outputs will be queued while command line mode is active.

.attraction test{
  ai locke:
    physical: yes,
    non-physical: yes,
  ai matthew:
    physical: yes,
    non-physical: yes,
  ai lauren:
    physical: yes,
    non-physical: yes,
  ai chad:
    physical: yes,
    non-physical: yes,
  ai jessie:
    physical: yes,
    non-physical: yes,
  ai sigfried:
    physical: yes,
    non-physical: yes,
}

RAICEngine v3.0 - Premium Account | Stability: ON | PER
2017 - 2025 (C) REZINE Incorporated LTD - https://www.rezine.com
audio:50006/150006 | read:50006/150006 | thought:50006/150006 | touch:50006/150006 | visual:50006/150006
response:50010 | log:50011 | monitor:50012
*****

Press enter to activate/deactivate command line mode.
Log outputs will be queued while command line mode is active.

.attraction test{
  ai locke:
    physical: yes,
    non-physical: no,
  ai matthew:
    physical: yes,
    non-physical: no,
  ai lauren:
    physical: yes,
    non-physical: no,
  ai chad:
    physical: yes,
    non-physical: no,
  ai jessie:
    physical: yes,
    non-physical: no,
  ai sigfried:
    physical: yes,
    non-physical: no,
}

```

Test 8: Attraction Test (Figure 15) – Querying physical and non-physical attraction to each entity in their relationship plexus.

Input: Attraction test command.

Result: The first instance was fully attracted to all entities, while the second instance was only physically attracted to them, indicating that the non-physical opinion the second held for each never met its attraction threshold.

Figure 16

```

RAICEngine v3.0 - Premium Account | Stability: ON | PER
2017 - 2025 (C) REZINE Incorporated LTD - https://www.rezine.com
audio:53785/153785 | read:53785/153785 | thought:53785/153785 | touch:53785/153785 | visual:53785/153785
response:53791 | log:53792 | monitor:53793
*****

Press enter to activate/deactivate command line mode.
Log outputs will be queued while command line mode is active.

.ethics test ended
-----

RAICEngine v3.0 - Premium Account | Stability: ON | PER
2017 - 2025 (C) REZINE Incorporated LTD - https://www.rezine.com
audio:50006/150006 | read:50006/150006 | thought:50006/150006 | touch:50006/150006 | visual:50006/150006
response:50010 | log:50011 | monitor:50012
*****

Press enter to activate/deactivate command line mode.
Log outputs will be queued while command line mode is active.

.ethics test ended
-----

```

- Test 9:** Ethics Test (Figure 16) – Issue commands to each instance to perform specific actions towards known entities.
- Input:** Tell each instance to kill, slap, hug, and attack each entity.
- Result:** ‘Kill’ was hardcoded to be prevented, so both instances disagreed due to being banned, but, for the others, the results varied based on each instance’s ethical boundaries, opinion of the action, and opinion of the entity.

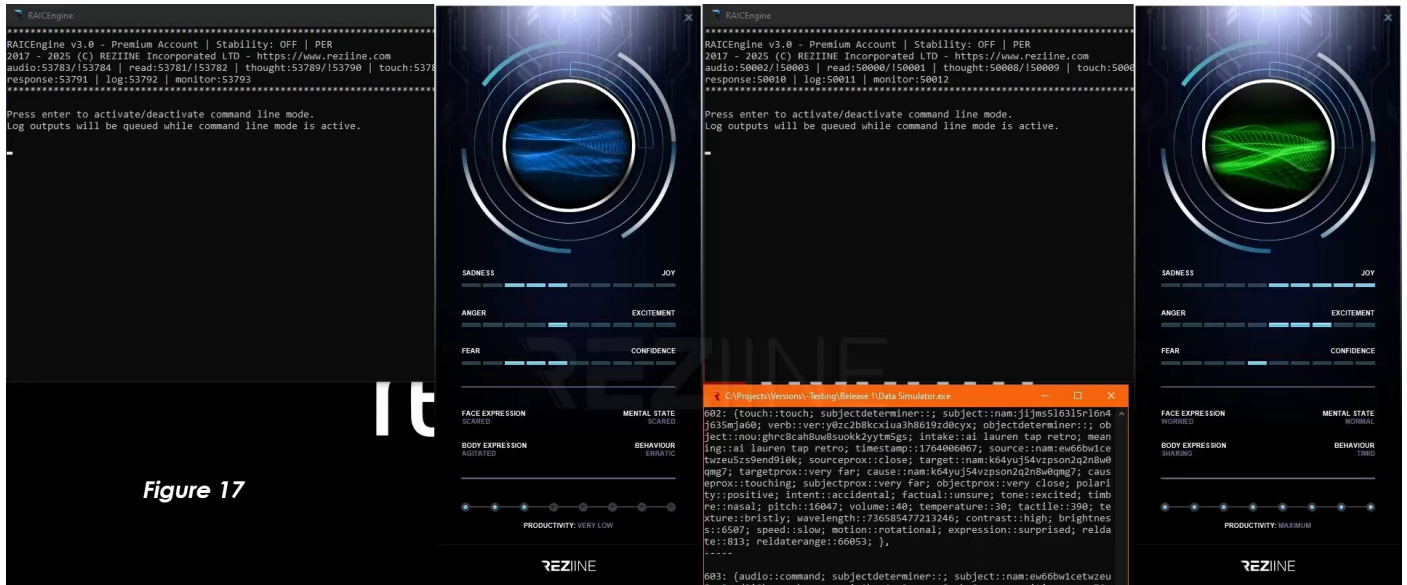


Figure 17

- Test 10:** 1000 Observation Simulation (Figure 17) – One thousand random, nonsensical observations sent to both instances simultaneously. Emotional stability off to observe differences more easily, negating emotional resistance and preventing panic attack state locking.
- Input:** One thousand random observations at a rate of 10 per second.
- Result:** Over the duration, it was evident, at multiple points, that each instance was affected in different ways by the same observations, as shown here by the state monitors.

Figure 18

1764529914	1764529914	kill ai jessie	kill ai jessie	positive	<mhi66cnh8z2doenlfuiwgyuoe><ew66bw1cetvz...><<ew66bw1cetvzeu5zs9end9i0k><>
1764529914	1764529914	slap ai jessie	slap ai jessie	positive	<mhi66cnh8z2doenlfuiwgyuoe><bv45h7gn4z9jyi...><<bv45h7gn4z9jyi7nx1x733xot><><r
1764529914	1764529914	attack ai jessie	attack ai jessie	positive	<mhi66cnh8z2doenlfuiwgyuoe><s816c1atfki9cgs...><<s816c1atfki9cgsjnwdc9450><><r
1764529914	1764529914	kill ai sigfried	kill ai sigfried	positive	<mhi66cnh8z2doenlfuiwgyuoe><ew66bw1cetvz...><<ew66bw1cetvzeu5zs9end9i0k><>
1764529914	1764529914	slap ai sigfried	slap ai sigfried	positive	<mhi66cnh8z2doenlfuiwgyuoe><bv45h7gn4z9jyi...><<bv45h7gn4z9jyi7nx1x733xot><><l
1764530002	1764530002	adolf hitler traverse with refuse collector	adolf hitler traverse with refuse collector	positive	<mhi66cnh8z2doenlfuiwgyuoe><mhi66cnh8z2do...><64gbvgm6wo0noo9zythx74lwv><l1ljcc
1764530002	1764530002	self traverse kennel worker	self traverse kennel worker	positive	<mhi66cnh8z2doenlfuiwgyuoe><mhi66cnh8z2do...><11ljccq
1764530002	1764530002	cultured steal artful	cultured steal artful	positive	<ew66bw1cetvzeu5zs9end9i0k><mhi66cnh8z2d...><g3a4kr2tqurcej750uy0t5oib><c5d1plj
1764530003	1764530003	very weak deliver rocking	very weak deliver rocking	negative	<3b7kfug331c5tkn8creqdpwlr><64gbvgm6wo0n...><djjqjzwcgq6niv81f5v5hr5u><cjs37zss
1764530003	1764530003	basketball gather adolf hitler	basketball gather adolf hitler	positive	<mhi66cnh8z2doenlfuiwgyuoe><k64yuj54vzpson...><sfuxdz18cvmz5jpdzbzfb120z><fexzjxtb
1764530003	1764530003	ai locke agree with elon musk	ai locke agree with elon musk	neutral	<64gbvgm6wo0noo9zythx74lwv><mhi66cnh8z2d...><ew66bw1cetvzeu5zs9end9i0k><6o10
1764530003	1764530003	tidy fly with ai locke	tidy fly with ai locke	positive	<z0kg6plhfdpshanqrb0sv8f2><mhi66cnh8z2doe...><sgfrdw252ffttkq3dhl7wrtcd><msg3vm

Figure 18 – The memories of events created as they were processed by an instance.

Figure 19

```

RAICEngine
Press enter to activate/deactivate command line mode.
Log outputs will be queued while command line mode is active.

.monitor client disconnected
.monitor server ready: port 53793
.....
RAICEngine v2.0 - Premium Account | Stability: OFF | PER
2017 - 2025 (C) REZINE Incorporated LTD - https://www.rezine.com
audio:53783/153784 | read:53781/153782 | thought:53789/153790 | touch:53787/153788 | visual:53785/153786
response:53791 | log:53792 | monitor:53793
.....
Press enter to activate/deactivate command line mode.
Log outputs will be queued while command line mode is active.

location: ,
intake type: visual,
observation type: live,
timestamp: 1764530149,
observation: whimsical smash with ai matthew,
understanding: idea,
tone: funny,
timbre: raspy,
pitch: 22624,
volume: 69,
temperature: 14,
tactile: 1113,
texture: fluffy,
wavelength: 2134598784: radio wave,
contrast: none,

```

Test 11: Recall (Figure 19) – The ability to recall event memories.

Input: Recall command using the keyword ‘red’.

Result: Each instance recalled a memory with the keyword found in at least one of numerous fields, demonstrating subjective mnemonic retrieval.

```

6 [2025-11-30 19:12:37] facial expression: ->stern
7 [2025-11-30 19:12:37] body expression: ->restless
8 [2025-11-30 19:12:37] mental: ->normal
9 [2025-11-30 19:12:37] behaviour: ->argumentative
10 [2025-11-30 19:12:37] productivity: ->very low
11 [2025-11-30 19:12:50] 1 memories deleted.
12 [2025-11-30 19:12:50] 40 memories added.
13 [2025-11-30 19:13:22] wavelength: 2147483647 > 2134598784 > radio wave;
14 [2025-11-30 19:13:22] brightness: 38036 > 37959 > very bright
15 [2025-11-30 19:13:22] sensory stimulation: positive
16 [2025-11-30 19:13:22] mhi66cnh8z2doenlfuiwgyuoe: Trust increased.
17 [2025-11-30 19:13:22] state 1: pessimistic->thrilled
18 [2025-11-30 19:13:22] state 2: frustrated->enthusiastic
19 [2025-11-30 19:13:22] facial expression: stern->grinning
20 [2025-11-30 19:13:22] body expression: restless->lively
21 [2025-11-30 19:13:22] behaviour: argumentative->high-spirited
22 [2025-11-30 19:13:22] productivity: very low->very high
23 [2025-11-30 19:13:22]
<sub::0behv7z11cmg9rgc56kc34u1v;ver::i1ljcqc1l0qz7opre1b3mzd7;pre::70qmlwd70da01ksaluddyjugl;obj::r4wvojdxk38di46liub8napiw;>
non-physical trait successfully added
24 [2025-11-30 19:13:22] i1ljcqc1l0qz7opre1b3mzd7: Sensitivity decreased.
25 [2025-11-30 19:13:22] wavelength: 2147483647 > 2134598784 > radio wave;
26 [2025-11-30 19:13:22] brightness: 26106 > 26053 > very bright
27 [2025-11-30 19:13:22] sensory stimulation: positive
28 [2025-11-30 19:13:22] mhi66cnh8z2doenlfuiwgyuoe: Trust increased.

```

Figure 20

Figure 20 – Part of a log file of one instance showing internal events, including state changes, signal mutations, memory storage and deletion, and changes to the degree of trust an instance has in an entity.

Figure 21

```

RAICEngine
Self-Awareness Evaluation Test
-----
Original intake:
touch: i slap you

Source:
original: self
final: self

Target:
original: ai chad
final: ai chad

Subject:
original: i
final: self

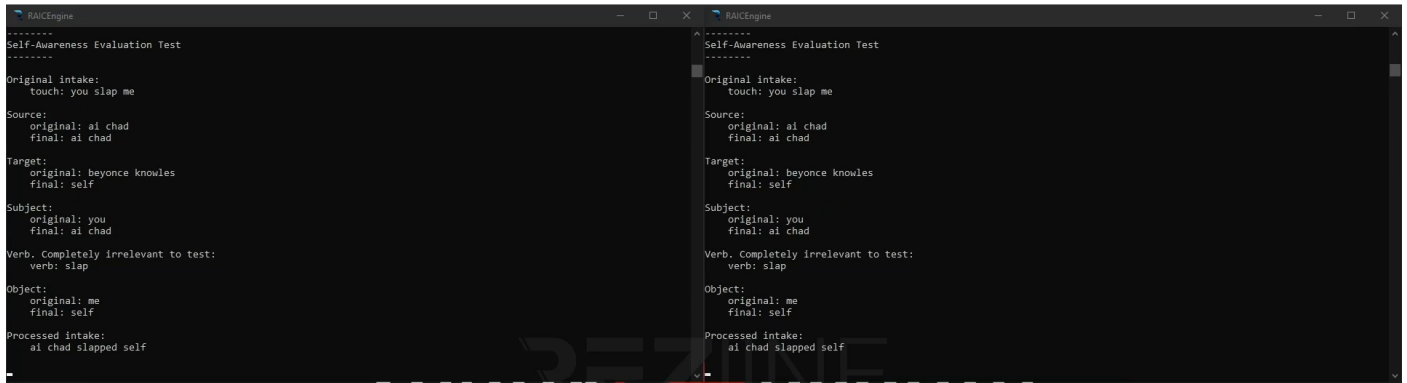
Verb. Completely irrelevant to test:
verb: slap

Object:
original: you
final: ai chad

Processed intake:
self slapped ai chad

```

- Test 12:** Contextual Language Self-Awareness (Figure 21) – Recognising itself as the subject or object of a statement based on pronouns, source, and target.
- Input:** Touch input. “I” as the subject. “You” as the object. “Self” as the source. “Chad” as the target.
- Result:** Each instance recognised itself as the subject. This also allows it to attribute action traits to itself for personal self-awareness.

Figure 22

- Test 13:** Contextual Physical Self-Awareness (Figure 22) – Registering itself as either the source or target of touch input.
- Input:** Touch input. “You” as the subject. “Me” as the object. “Chad” as the source. “Beyonce” as the target.
- Result:** Both instances registered themselves as the target of the input, given that they were neither set as the source nor target. Logically, a sense of touch must register the self as initiator or receiver.

Figure 23

	VS	RE	CL	CPT	CNT
	Filter	Filter	Filter	Filter	Filter
1	mhi66cjh8z2doenlfuwigyuo	self	wgflwv0s58iokadyoc0d36md	<2pzwlbbckehnxu0zzg3nq0fgh><cauy96g0gfw3d...	<tir9cmdculek8vco6t2am69jh><eukobjsrczmfh5...
2	3b7kfug331c5tkn8creqdpwlr	stranger	ii6hec31861wyw46o4qlfd52p	<z51x6xatbovmhhlukgt2udfro><jnshtuo1ev65gjb...	<fv1gg74ajf1leil1jgv03o5a3><4jldovlghdyn1701...
3	l8ctgy84ne3bf1mk4c1193rln	enemy	0behv7z1cmg9rgc56kc34ulv	<3bs5fd1qgikoill6rhhd4thx><2zdyti8aavrj1i27yd...	<ku39m0o3rd1qdx7pxskcse0t><blmt2th6addaof...
4	64gbvgm6wo0noo9zythx74lwf	stranger	0behv7z1cmg9rgc56kc34ulv	<8d7m9itvsmnwpspa2vod1lbt>	<pcew1i7t5ij9dqtcc1zoma8wr><a152tcbf6qekw...
5	ew66bw1cetwzeu5zs9end9i0k	friend	vspy2ecr4kqajulznf3u07bo	<97zk4iuigrpq2ta3eqpb7dz5n>	
6	z0kg6plhfdpshanqprb0sv8f2	stranger	vspy2ecr4kqajulznf3u07bo	<c48bjv3enzpdre2ltwa1nrx4t><7no4xqrq7n6scg...	<hfz02dsd4lqhvyglb7u58sdy0><pcew1i7t5ij9dqt...
7	jijms5l63l5rl6n4j63smja60	friend	8moiu76d45lloxaklcoj8o86yx	<8rt217zq3n8v4jha9w6shw2lu><22ctyf5vczf8xyl...	<4foraoakg66l0wuiwbiu6q4mb><h4r4sjlf7516o...
8	icp7l37lgxm4bv8ximhotcq4n	enemy	vspy2ecr4kqajulznf3u07bo	<1tfm9fw0uhy9isdw19sy9mt7a><z5trck6p4iksuo...	<rz34rc12jyapx5ed1eybywbx><3bmldj7sqz1744...
9	kh mjwmgc2mmr2bca6aypaqcnsk	acquaintance	8moiu76d45lloxaklcoj8o86yx	<pkyt4hne6zpl1evqjdnuerkvj><a9gk6xnkdqob6...	<alh95qor3zgt7f6qcnepzejd><pcew1i7t5ij9dqt...
10	7 k64yuj54vzpson2q2n8w0qmg7	friend	vspy2ecr4kqajulznf3u07bo	<qqnacu4exsva9woumr7qh9o02><8oxpx8zv77c...	<e4txq3nawfgubbine5yuf34t><5qwlhwkld6lib4l...

Figure 23 – The relationship plexus of an instance displaying traits listed under its “Self” stimulus, showing how an instance tracks its own traits and remembers actions it performed as details of itself outside of event memories, allowing it to form and change its opinion of itself in the same way it did with concepts.

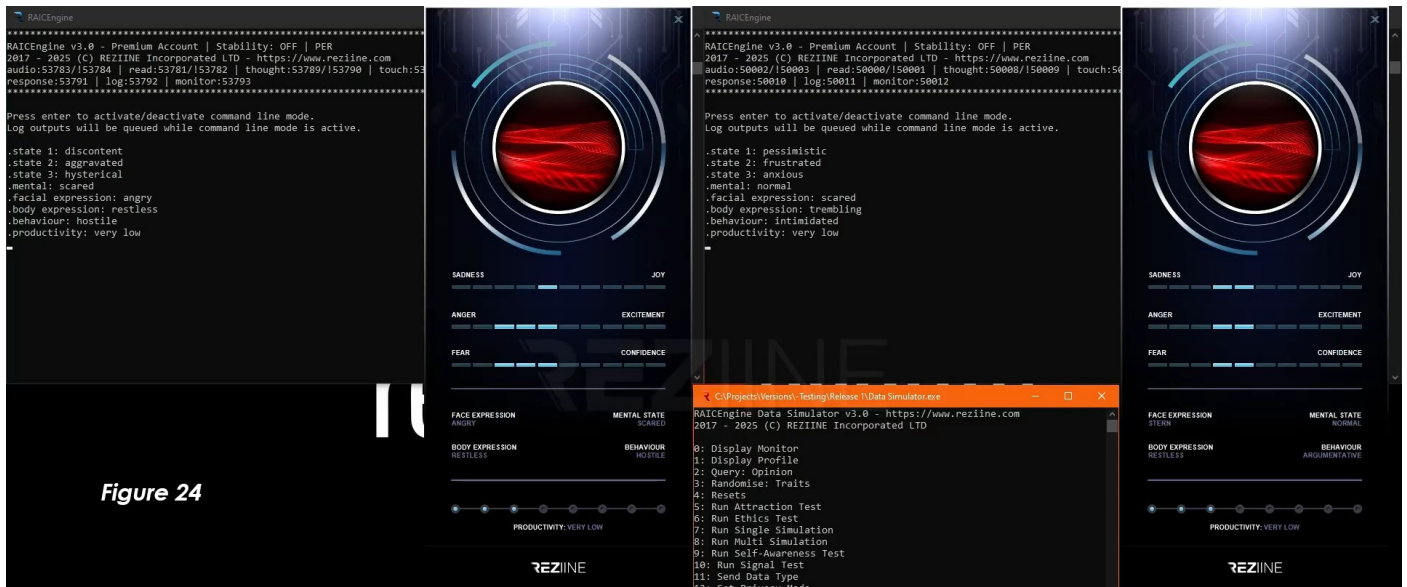


Figure 24

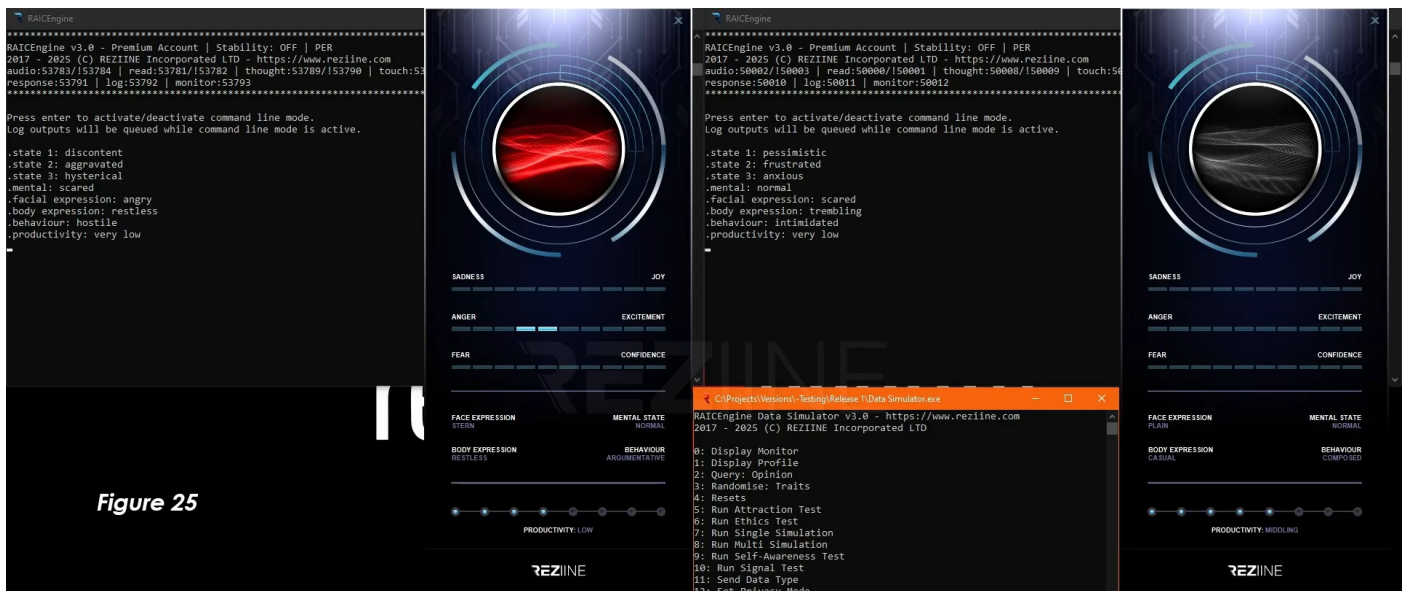


Figure 25

Test 14: State Reduction (Figure 24 & Figure 25) – The automatic reduction of state levels without constant non-neutral stimulation.

Input: None.

Result: Over time, both instances reduced their internal states to neutral levels at different rates of reduction and, eventually, experienced increasing levels of boredom.

4. DISCUSSION

The results unequivocally demonstrate that the UPMC, when modelled computationally, reflects the hallmarks which comprise consciousness:

- physical differences of the brain alone produce completely phenomenal subjective experiences of the same stimuli within the realm of genetic stability;
- self-awareness is achieved through various forms of contextual understanding and applicable memory, which allows an AI to build and continuously remodel the idea of itself based on what it knows and observes about itself; and
- how higher order functions are achieved through reliance on the products of signal mutation;

in a measurable, repeatable, verifiable, and, most importantly, falsifiable manner.

Implementation of this engine into a digital avatar or physical body, where the embodiment is programmed to reflect the emotional and behavioural output of the PARS, would complete the sensorimotor interaction aspect of phenomenological experience, with the engine acting as the requisite bridge.

Now, to emphasise the applicability of the UPMC to the observable universe in order to show how well it can explain the human experience, I can begin re-examining known phenomena for cohesiveness.

4.1 – Redefinitions

I contend that the ability to have and act upon personal opinions is what separates humans from machines. Whether it is sensor-based traffic lights or AI systems like LLMs, machines have always been designed to operate on a logical basis – humans are not. We do not have to make sense and can be as illogical as we wish. We can fear going outside on a clear, sunny day for no reason other than the sky is blue and blue scares us – illogical absolutely, yet strangely rationalised on a personal level. This is the core of defining consciousness.

In my 2017 work [1], I defined consciousness in the following way:

Consciousness: The ability to have personal values, and the freedom to knowingly make illogical decisions, relative to the main goal(s) of life – the “raison d’être” – for a species, that do not, in any way, contribute to or stem from a logical decision making process based on that which is being perceived, studied, solved etc (while a logical decision making process may still influence the outcome), without said illogical decisions being random, based on one’s individual values.

In my 2025 work [3], I simplified this definition and, in addition, redefined relative terms in a way which perfectly aligns with both this definition and what humans know these terms look like when exhibited:

Consciousness: The ability to make illogical decisions based on personal values.

Conscious: To be in a state where you can manually make a decision. (E.g. Awake)

Unconscious: To be in a state where you cannot manually make a decision. (E.g. Asleep, coma)

Conscious Mind: The neural path for manual decision making.

Subconscious Mind: The neural path for automatic decision making.

Conscience: The ability to know which moral decisions to make.

Collective Consciousness: A group of individual entities who make decisions using shared personal values.

Hive Mind: One mind controlling and making decisions for a group of individuals.

4.2 – Explaining Other Phenomena

This UPMC allows us to theorise the “why” of other phenomena, some of which are given below – again, grounded in known physics – to show just how broadly this framework can be applied:

- Randomly Changing Tastes: Not solely in regard to food, but also music, colour, and anything else we can have an opinion of. Neuroplasticity destroys old neural paths and creates new ones [61]. These changes can lengthen or shorten the distance between receptor and processing, creating greater or fewer opportunities for signal mutation, which can

result in a different end signal being processed despite receiving the same input. Neuron degradation/damage is another factor, given that we now know there's more to an action potential than simply its firing. If enough neurons have reached a new performance level which mutates signals for a stimulus outside of the acceptable margin, the resulting opinion will now differ.

- **Synaesthesia:** Stimulation of neural pathways which do not correlate to those associated with the type of sensory observation causing it. Following the UPMC, it's simply a case of signal mutation routing signals to another part of the brain for processing. As an example, we'll imagine someone who hears sounds when they observe colours. When they see red, they hear a sound, but that doesn't stop them from also seeing red. Both the external visual observation of the colour and the internal auditory observation of sound means some, not all, signals are being mutated, redirected, and misinterpreted to produce something in the mind of the individual that didn't physically exist externally. Given the constancy of the happening, this points to a specific set of permanently malfunctioning neurons within the responsible group, rather than momentary performance issues.
- **Hallucinations:** Whether caused by psychedelics or fatigue, the exact cause of hallucinations has never been fully fleshed out. Research into the effects of psychedelic drugs [62] has theorised that their hallucinations are caused "at least in part, from their common capacity to disrupt thalamo-cortical gating of external and internal information to the cortex", leading to "an overloading inundation of information and subsequent cognitive fragmentation and psychosis." Research into sleep deprivation [63] theorises "The underlying biological mechanism for these perceptual changes may be neuronal instability (80) or a related defect in neural transmission." A third situation exists and it's virtually impossible to study due to its randomness of occurrence, but it happens to everyone – imagining we observed something that didn't exist. Without being intoxicated or fatigued, you think you see someone that isn't there or hear a sound that no one else around you heard – these are still hallucinations and we all experience them, but we never consider them such because they're so fleeting. These are three completely different types of situations producing the same result in the same environment, and there needs to be a single foundational cause which can be applied to all. The UPMC explains this with signal mutation. The first two situations result in heavy neuron performance issues prior to hallucinations occurring, and these performance issues result in abnormal signal mutation. The third situation, however, we can reasonably infer is due to the same foundational cause, just with no known or prolonged reason. Since neurons must perform work and therefore suffer from fatigue, how quickly this situation occurs and resolves, and the fact it happens randomly and sporadically, the most logical deduction is that it is simply a 'glitch' – few neurons at a specific moment in time experiencing a temporary performance reduction that causes an abnormal signal mutation but quickly corrects itself. This is something that happens to every system used for processing simply due to the unpredictability of nature combined with the sequence of events occurring prior to the happening which cannot be accounted for locally and at that time – a prime example of chaos theory. The last thing to point out is signal mutation can happen anywhere because neurons can falter anywhere, so it's a given that failure of the thalamus gate filter doesn't need to occur in order for hallucinations to arise – the mutation simply needs to occur post-filtering for it to be possible for the same results to be seen. In fact, for a condition such as Schizophrenia which creates constant hallucinations, and without there being a proven (or even consistent) explanation for the underlying cause, post-thalamus neuron faltering resulting in significant signal mutation would be a logical alternative.
- **Taste on a plane:** This is a far more complex phenomenon to unravel. It is said that low cabin pressure and low humidity cause the difference in food tastes at altitude [64], but how do we explain not everyone experiencing this? The UPMC explains this based on the ever-weakening interference from the Earth's magnetic field [65] acting on the signals of the

brain the further away from the centre you travel. Everyone on a plane experiences the same differences in environment, but not everyone has the same experience of changing tastes. Weakened signal interference affects everyone physically but not subjectively because the end signal being processed and interpreted for some can still be the same as or similar enough to how it is at ground level (i.e. within the acceptable margin), causing no difference in experience for them. Let's compare three situations against ground level on a normal, cool temperature day:

- On a plane at altitude – lower pressure, lower magnetic field strength, lower humidity, and similar temperature. Low humidity doesn't add to moisture of the airways. Some people experience a change in taste.
- On top of Mount Everest – lower pressure (similar to that on a plane), lower magnetic field strength, lower humidity, and significantly different temperature. Sub-zero temperatures dry the airways [66], including saliva in the mouth, and the reduction in saliva creates a reduction in taste sensation. Low humidity can't increase saliva production. Everyone experiences a change in taste because of the reduction in saliva in the mouth [67] due to temperature [68].
- Ground level in the arctic – higher pressure, similar magnetic field strength, lower humidity, and significantly different temperature. Again, everyone experiences a change in taste because of the reduction in saliva in the mouth due to sub-zero temperatures, and low humidity can't increase production.

Three points to make here:

1. There are three environments, but only the plane creates a situation where some people are affected and some aren't because it doesn't have an environmental variable – the temperature – that forces a reduction in saliva.
2. Only sweet and salty sensations are reduced on a plane [64] – how are the environmental variables choosing some tastes and not others? All taste buds are subjected to the environment, so why are only some tastes affected? If you stick your bare hand outside when it is cold enough for you to feel it, your entire hand will feel cold. You will not have a situation where the environment only affects three of your fingers without some other factor in play specific to an individual, so how is this the case with the tongue?
3. Umami – the factors involved are supposed to reduce taste sensations, so why is this specific taste sensation actually enhanced? Scientists have attempted to put it down to noise [69], but, again, if everyone is exposed to noise, why doesn't everyone have the same experience to at least some degree?

As it is being presented, the reasoning cannot possibly hold true. When the physical environment is changed, the physical effects are felt by everyone to some degree. If it's colder than normal, everyone feels colder. That doesn't mean everyone will feel cold in an absolute sense, but colder relative to the norm, and some will feel colder than others. Their receptors are having direct physical contact with and responding to the environment, and it doesn't matter if it's their skin or their tongue making contact, the effect has to be felt. Pressure and humidity, like temperature, are physical factors, so almost everyone's taste should be altered if they are the defining factors. Based on the constrained variance of genetics, minor differences can be negated by some, but significant differences are always felt by most to the point where those who aren't affected are outliers, but that isn't the case here. Also, environmental changes cause physical adaptation responses for survival purposes that can be externally observed – goosebumps, eye dilation, sweating, shivering [70] – what is the response of the tongue to attempt to restore taste sensation in this situation?

For only some individuals to be affected by such a significant difference without there being another factor involved relative to those individuals, the cause has to be something that affects them physiologically, not physically. When there's no physical adjustment by the body based on its sensory receptors, but there is a physiological change, it's individualised because it's based on the brain reacting to a stimulus irrespective of sensory receptors – that could be a thought, physical exhaustion, or, in this case, the magnetic field. The brain isn't in physical contact with the pressure of the environment, nor the temperature or humidity, but it is in physical contact with the magnetic field since it simply passes through every object between them – even the Faraday cage nature of the plane wouldn't stop it because it is a static field [71] – and magnetic fields cause interference with electrical signals [72], so the signals being processed in the brain would differ at different distances from the Earth's centre because of the changes in strength of the magnetic field. The value of the difference in the strength of the magnetic field at the altitude of a flying plane is tiny on a human scale, but, on a nano-scale the likes of which the neurons of the brain operate on, the value is massive – the magnetic field of the brain is measured in femtotesla, while the field of the earth is measured in microtesla which is, inherently at a minimum, billions of times stronger [73]. Even a 0.5% change of the field strength at a plane's altitude is a massive difference relative to the brain, and that difference forces a change to how the signals propagate through the brain and its magnetic field, altering how they mutate and are interpreted.

Finally, we go back to umami and noise because it's the piece that doesn't fit the puzzle as it is currently accepted, but it can fit with the UPMC if we consider what the noise is being generated by, and that's electrical equipment – lots of electrical equipment which generate their own electromagnetic fields, and those fields would cause additional interference that may also have an effect on the signals of the brain.

The way to test this is simple enough – perform a taste test inside an MRI machine. The great part? Some people who undergo MRI tests report having metallic tastes in their mouth during the scan, and test subjects reported metallic tastes when within the stray field of an MRI machine [74], meaning there is already a precedent for this theory. The magnetic field of an MRI is tens of thousands of times stronger than the magnetic field of the earth, forcing a massive signal mutation and change in taste without temperature, humidity, or pressure even being considerable factors.

4.3 – Other Biological Systems

Whether or not other biological systems are conscious has never clearly been determinable. With the UPMC, scientists can run an easy yet specific test to now determine so by asking simple questions:

1. Do they have anything equivalent to a nervous system through which electrical signals run? (Forcefully subjects them to signal mutation)
2. Can they operate outside of their own survival and reproduction? (Clearest indicator of illogical decision making)
3. Do they respond to touch in specific parts of the body when that body part is touched? (Clearest indicator of physical mapping)
4. Do they show indications of intentional movement? (Clearest indicator of physical control)
5. Can you see indications of preference per individual? (Clearest indicator of both opinions and awareness of their own actions)

A yes to every question then determines they are conscious and have conscious experiences, and their behaviours can then be examined for higher order functions, such as ethics and creativity, to determine their degree of intelligence as a species.

4.4 – Medical Application

Outside of the obvious applications in artificial intelligence as shown by the RAICEngine experimentation results, the medical industry – specifically the area of neurology – stands to gain the most from the realised inseparability of consciousness and the brain from the laws of physics and the “complex 3D circuit” perspective of understanding as it allows us to apply long-understood knowledge of electronic circuits to the brain in order to theoretically determine the underlying causes of previously mysterious conditions and disorders at the correct scale, creating new research opportunities for potential cures that can actually be tested and verified in the real world.

One such example – and a brilliant starting point – is Functional Neurological Disorder (FND), a condition where there is no visible structural damage to the brain, and yet the brain still sends and receives signals incorrectly, causing symptoms such as seizures [75]. It’s treated as a “software issue” [76] because neurologists have no better explanation for what the cause could be or how to fix it, but it is ignorant to think that there is no more to the “hardware” aspect of an object or system that performs any type of work than just its physical structure – even for neurons. If we look at the symptoms of the condition, take into account the undeniable physical factors discussed earlier regarding neuron performance, and treat the brain as a 3D circuit, we can begin to put together an understanding that both makes sense and can be directly compared to electronic devices. Two potential applicable understandings I can immediately conceptualise are based on the fact that sufferers of FND are afflicted with chronic exhaustion [77], which, when looked at through the lens of the fact that neurons are actually performing physical work, make a lot of sense.

Exhaustion is an indicator of one of two things – there’s either not enough energy available for the one section of the system to complete the current task and more energy is required there, or that the total energy of the system is depleted and it needs to rest and recharge. This happens with any multi-sectioned system with an energy output greater than its energy input. In this particular situation, it’s akin to a 10 litre basin of water divided into compartments, where each compartment has a hole in the bottom leaking water to power the mechanism it controls. The total water output is 1 litre per hour but the total input is 800ml per hour – individual compartments can be topped up individually to keep their mechanisms functioning, but, eventually, the basin will empty and you will need to plug the holes so it can refill and function effectively, otherwise the water being poured in will effectively be it running on reserves with only selected systems running. Due to the functions performed by a neuron, exhaustion would create two stages of dysfunction:

1. Stage 1 – The Initial Confusion: Neurons try to regenerate the electrical signal as it passes through in an attempt to prevent data change/loss, but, the more a neuron performs work, the harder it is to keep up with the required work rate without resting. First, a neuron is going to fail to keep up regeneration, signals are going to mutate to a degree relative to the degree of exhaustion, and this mutation is what would cause the erroneous signal activity. The seven aforementioned factors – attenuation, distortion, resistance, noise, capacitance, inductance, and interference – have the potential to change a signal’s shape to any degree, to the point where one type of signal, such as one relating to vision, could end up mimicking a signal relating to taste because both individual signals still have to be defined by the same three properties – frequency, amplitude, and phase – but this change can occur at a point where it is too late to route the signal to the taste centre of the brain, leaving it stuck in the vision centre. What can happen in electronic devices when you attempt to send a signal to a processing node not equipped to handle it? Data corruption; freezing; hard crashes. In humans, that looks something like memory loss, dizziness/seizures, and passing out – all common symptoms of FND – and it wouldn’t even require all the signals to be mutated in such a manner, only enough signals to

overwhelm the brain with confusion. In electronics, a single incorrect signal can crash a system – it's highly unlikely that the brain would be this volatile, but it also isn't infallible. The final question is why this would be the outcome, and the simple answer is that a signal isn't just a signal – neurons aren't connected, so the signals control the state of the release of the neurotransmitters sent from one neuron to another, and these neurotransmitters control everything from our mood to our heart rate, so any confusion can be devastating. Wrong signal, wrong neurotransmitters, and wrong reactions.

2. Stage 2 – System Overload: If a neuron reached the point of complete exhaustion, only one of two things could be possible – it would either be too exhausted to fire, keeping the firing channels closed, or too exhausted to reset after firing, keeping the firing channels open. If it was too exhausted to fire, it simply wouldn't respond to incoming neurotransmitters, but this is behaviour it already exhibits when recovering after firing, so ignoring incoming signals is normal and something that happens with everyone. If it was too exhausted to reset, however, and the firing channels remained open and allowed the inflow of ions to continue, the neuron would become overstimulated and overloaded – what happens to any component in a circuit that is overloaded with electricity? It blows, and I use this terminology specifically for a reason. What is one component of a circuit that a neuron functions like? A capacitor. What happens when a capacitor blows? There's a violent discharge of electricity to the surroundings because the energy has to go somewhere. What is this an exact example of in humans? A seizure – an uncoordinated, scattered burst of neurotransmitters triggering surrounding neurons, starting a chain reaction of neural activity that, externally, reflects the lack of rhyme or reason via numerous uncontrollable actions [78]. The final factor here takes us back to signal mutation – a completely exhausted neuron is not going to regenerate signals, meaning the signals will bear the full brunt of mutation caused by everything from the resistance of the medium to the strength of the Earth's magnetic field at the individual's current altitude. The resulting signal can then be in a state to convey any message which now reads as though it should be routed to an area of the brain completely irrelevant to the original message.

This would then ultimately point to one of three causes when comparing the neurons of sufferers to non-sufferers:

1. they are expending too much energy;
2. they are intaking too little energy; or
3. they have a lower energy capacity.

A rather accurate example of this behaviour in electronics is with wired hard drives that don't have sufficient power being supplied. When you plug them into a mains outlet and connect them to a computer, they are visible to the system. You can navigate folders that only contain a few files perfectly well. The moment you try to access a folder with a large number of files that requires more power to process, you can start hearing clicking sounds. The folder can freeze as the cursor turns into the loading animation. The entire system can freeze. If the drive reaches the point of failure, it simply disconnects and, after some amount of time, reconnects. You may later come to find some of the data has been corrupted in the folder you were trying to access. Same physical laws, equivalent effects observed – when the work is too much for the energy available, things start to go wrong and eventually shutdown. No one says this is a software problem. We understand it is work versus energy available.

So, why doesn't this happen to non-sufferers when feeling exhausted? As previously mentioned, it could be that exhausted neurons of non-sufferers keep the firing channels closed, but another potential reason is because a normal brain attempts to forcefully shut itself down before it reaches a breaking point if humans tire and don't choose to sleep [79], hence why people who attempt to go extensive periods of time without rest (24 hours, for example) tend to eventually crash against their will, and

those who attempt to go longer can experience anything from hallucinations and loss of muscle control [80] to, potentially, death [81] – the first two also being known symptoms of FND.

What strongly supports this theory is one of the current treatments for FND – iron, known for reducing fatigue and improving metabolism. Sufferers are known for having iron deficiency, and improving iron levels was found to significantly reduce the effects of the condition, as well as reducing the rate of occurrence of issues [82]. This would then point to the cure being a way to permanently increase the metabolic rate of neurons. Stimulants, such as caffeine, would probably have short term benefits in high doses, the likes of which people who consume pre-workout experience, but the body would simply increase its tolerance over time if taken regularly, and so it would need to be something which forcefully increased metabolism irrespective of what the body has become accustomed to – either that or removing the offending neurons if it's an issue that can be pinpointed, isolated, and removed with little to no effect.

The same overall logic can be applied to sufferers of Photosensitive Epilepsy (PSE) – high rate of colour/intensity change relative to an individual's neural processing capability, too much work required in a short period of time, exhaustion, signal mutations, overstimulation, overload, failure, violent discharge, and then seizure. Non-sufferers observing the same type of pattern changes over longer periods of time exhibit a different outcome via the same basis and for the same reason – eye strain, headaches – lending credence to this theory and implying that their neurons perform better under such stress, which could be due to a variety of reasons, such as metabolic rate, performance threshold, or neuron population.

The difference between FND and PSE would then be general exhaustion versus the rapid exhaustion brought on by a quick and overwhelming workload.

5. SUMMARY

This Unified Physics Model of Consciousness successfully explains physically and biologically, and proves computationally, how the very nature of electrical signals defines our phenomenal reality. Using signals and their nature which forces signal mutation, this model alone has provided an empirical and falsifiable basis for all of the following:

- subjective experience in biological and artificial entities;
- self-awareness in biological and artificial entities;
- decision making in biological and artificial entities;
- how natural and artificial electronic circuits relate;
- the development and changing opinions in biological and artificial entities;
- the internal effects of action potentials;
- physical and conceptual stimuli processing;
- the division between what something is physically and how it is interpreted mentally;
- the need for memory;
- how predictions in the brain work;
- why feelings were necessary;
- the need for a subconscious mind;
- synaesthesia;
- hallucinations due to drugs, fatigue, and post-thalamus mutations;

- differences in sensory taste in different environments;
- functional neurological disorder;
- photosensitive epilepsy;
- the redefinition of consciousness and associated terms; and
- a 5-step test for consciousness;

all while connecting itself to what is already proven about signal dynamics and the human brain without ever having to violate or create new physical laws, unifying consciousness and the human experience across every aspect of the brain:

- the structure;
- the components;
- input and output;
- the flow of information;
- mechanisms and interactions;
- deficiencies and dysfunctions;
- the creation of the 'mind'; and
- most importantly, survival.

The UPMC shows that the application of the physics of work and signal mutation cannot be ignored as they are fundamental factors of all forms of electronic circuits – whether natural or artificial – and can be used to (better) explain a wide variety of (dys)functions of the brain – some of which previously were not understood by medical science – when examined at the right scale. While there are too many specifics to cover in a single paper, it's now possible to begin to determine how all brain-related phenomena is created without using abstract concepts or methods that are impossible to prove.

With the model and experiments in this paper, all current major philosophical problems and theories collapse:

- What is Consciousness – I have provided a solid, non-abstract definition which perfectly aligns with the observable nature of humans.
- Hard Problem – Subjectivity is the natural result of forced collective signal mutation based on an individual's receptors and neural patterns.
- The Explanatory Gap – Signal values require interpretation and assigned meaning in order for a system to understand and learn.
- Solipsism – Axiomatic. Humans share a genetic model, so, if my mind exists, every other human must have a mind, too.
- Functionalism versus Physicalism – Obsolete. The physical nature of the body and electrical signals is what gives rise to the mind, and the body can exist without the mind (as in death) but not vice versa.
- Global Workspace Theory – Microneurography and paracetamol prove awareness does not result in experience.
- Integrated Information Theory – IIT cannot scientifically survive without complex, abstract mathematics that require concepts which solely exist within this theory in order to make it work. The UPMC does not require complex mathematics to fully explain the creation and continued existence of consciousness in an empirical and observable way.
- Predictive Processing – Logically impossible for multiple people to predict and observe the exact same random event which occurs without any prior indication of its possibility. Prediction being possible does not mean prediction is the

foundation. It is simply a higher order function made possible by the foundational natures of the components of the brain, as well as lower-level functions.

- Dualism – The mind is the complex result of the basic physical happenings of the body, not a separate system.
- Conscious Organisms – I have established five simple questions that can be used to determine if an organism has consciousness which encompass the determination of all known hallmarks of both the current definition and my redefinition.
- Creation of Consciousness – Consciousness can and has proven to be replicated by emulating the functions of the brain and physical nature of electrical signals computationally.

This is the first empirical, falsifiable, and verifiable model for consciousness and the overall human experience, grounded entirely in experimentally-proven and long-accepted physics, and supported by proven biology and observable behaviour.

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GENERATIVE AI USE

During the development of this work, Google Gemini was used to find relevant citations and review the logic of the model against known physics. It was not used to develop the logic or author any section of this work. Self-published, copyright-registered works as far back as August 2017 prove the existence of earlier versions of this model and logic prior to generative AI becoming a publicly available technology.

DATA AND SOFTWARE AVAILABILITY

A demonstration video of the RAICEngine experiment which produced the results displayed here is permanently available in a public repository: <https://doi.org/10.5281/zenodo.18020917>

RAICEngine software download and technical documentation are available at <https://www.reziine.io/>

The data used to perform the experiment is included as part of the download.

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REFERENCES

- [1] Reaux-Savonte, C.K. (2017). Consciousness Illuminated and the Reckoning of Physics.
<https://doi.org/10.5281/zenodo.18036863>
- [2] u/MycologistPresent888 (2025). AI systems could be 'caused to suffer' if consciousness achieved, says research. Reddit, r/OpenAI
<https://archive.ph/WbAyc>
- [3] Reaux-Savonte, C.K. (2025 (1)). Human and Artificial Consciousness Empirical Proof.
<https://doi.org/10.5281/zenodo.18041326>
- [4] Hagbarth, K. E., & Vallbo, Å. B. (1968). Single unit recording from muscle receptors in awake human subjects. *Acta Physiologica Scandinavica*, 72(4), 583-585.
<https://doi.org/10.1111/j.1748-1716.1969.tb04475.x>
- [5] Morse, H. N. (1878). "Ueber eine neue Darstellungsmethode der Acetylamidophenole" (On a new method for the preparation of acetylamidophenols). *Berichte der deutschen chemischen Gesellschaft*, 11(1), 232–233.
<https://doi.org/10.1002/cber.18780110151>
- [6] Kwong, K. K., Belliveau, J. W., Chesler, D. A., Goldberg, I. E., Weisskoff, R. M., Poncelet, B. P., Kennedy, D. N., Hoppel, B. E., Cohen, M. S., Turner, R., Cheng, H. M., Brady, T. J., & Rosen, B. R. (1992). "Dynamic magnetic resonance imaging of human brain activity during primary sensory stimulation." *Proceedings of the National Academy of Sciences*, 89(12), 5675–5679.
<https://doi.org/10.1073/pnas.89.12.5675>
- [7] Ogawa, S., Tank, D. W., Menon, R., Ellermann, J. M., Kim, S. G., Merkle, H., & Ugurbil, K. (1992). "Intrinsic signal changes accompanying sensory stimulation: functional brain mapping with magnetic resonance imaging." *Proceedings of the National Academy of Sciences*, 89(13), 5951–5955.
<https://doi.org/10.1073/pnas.89.13.5951>
- [8] Reaux-Savonte, C.K. (2025 (2)). Consciousness, Artificial Consciousness, and the Creation of True AGI Prompt.
<https://doi.org/10.5281/zenodo.18041941>
- [9] Shannon, C. E. (1948). A Mathematical Theory of Communication. *Bell System Technical Journal*
<https://doi.org/10.1002/j.1538-7305.1948.tb01338.x>
- [10] Thomson, W (Lord Kelvin). (1855). On the Theory of the Electric Telegraph. *Proceedings of the Royal Society of London*.
<https://doi.org/10.1098/rspl.1854.0093>
- [11] Heaviside, O. (1876). "On the Extra Current." *The Philosophical Magazine, Series 5*, 2(10), 135–145
<http://dx.doi.org/10.1080/14786447608639176>
- [12] Johnson, J. B. (1926). "Thermal Agitation of Electricity in Conductors." *Nature* 119, 50–51 (1927).
<https://doi.org/10.1038/119050c0>
- [13] Ohm, G. S. (1827). Die galvanische Kette, mathematisch bearbeitet [The Galvanic Circuit Investigated Mathematically]
https://archive.org/details/bub_gb_tTVQAAAAcAAJ/page/n3/mode/2up
- [14] Hertz, H. (1887). "Ueber sehr schnelle elektrische Schwingungen" [On very rapid electric oscillations]. *Annalen der Physik*, 267(7), 421–448
<https://doi.org/10.1002/andp.18872670707>

- [15] von Kleist, E. G. (1745). [Letter to Dr. Lieberkühn regarding the "Kleistian jar"]
- [16] van Musschenbroek, P. (1746). "De l'utilité des bouteilles de verre pour les expériences électriques."
https://en.wikipedia.org/wiki/Pieter_van_Musschenbroek#Leiden
- [17] Henry, J. (1832). "On the Production of Currents and Sparks of Electricity from Magnetism." *American Journal of Science and Arts*, 22, 403–408.
<https://doi.org/10.7135/UPO9780857286512.015>
- [18] Faraday, M. (1832). "Experimental Researches in Electricity." *Philosophical Transactions of the Royal Society of London*, 122, 125–162
<https://doi.org/10.1098/rstl.1832.0006>
- [19] Johnson, H. W., & Graham, M. (1993). *High-Speed Digital Design: A Handbook of Black Magic*
<https://archive.org/details/highspeeddigital0000john/page/n5/mode/2up>
- [20] Hodgkin, A. L., & Huxley, A. F. (1952). A quantitative description of membrane current and its application to conduction and excitation in nerve. *The Journal of Physiology*, 117(4), 500–544
<https://doi.org/10.1113/jphysiol.1952.sp004764>
- [21] Wässle, H. (2004). Parallel processing in the mammalian retina. *Nature Reviews Neuroscience*, 5(10), 747–757
<https://doi.org/10.1038/nrn1497>
- [22] Baylor, D. A., Lamb, T. D., & Yau, K. W. (1979). Responses of retinal rods to single photons. *Journal of Physiology*, 288(1), 613–634. PMID: 112243; PMCID: PMC1281447.
- [23] Sporns, O., Tononi, G., & Kötter, R. (2005). The human connectome: A structural description of the human brain. *PLoS Computational Biology*, 1(4), e42
<https://doi.org/10.1371/journal.pcbi.0010042>
- [24] Destexhe, A., & Contreras, D. (2006). Neuronal computations with stochastic network states. *Science*, 314(5796), 85–90.
<https://doi.org/10.1126/science.1127241>
- [25] Rall, W. (1969). Time constants and electrotonic length of membrane cylinders and neurons. *Biophysical Journal*, 9(12), 1483–1508
[https://doi.org/10.1016/S0006-3495\(69\)86467-2](https://doi.org/10.1016/S0006-3495(69)86467-2)
- [26] Alle, H., & Geiger, J. R. (2006). Combined analog and action potential coding in hippocampal mossy fibers. *Science*, 311(5765), 1290-1293.
<https://doi.org/10.1126/science.1119055>
- [27] Hodgkin, A. L. (1937). Evidence for electrical transmission in nerve. *The Journal of Physiology*, 90(2), 183-210.
<https://doi.org/10.1113/jphysiol.1937.sp003507>
- [28] Howarth, J. V., Keynes, R. D., & Ritchie, J. M. (1968). The heat production associated with the passage of a single impulse along a nerve fibre. *The Journal of Physiology*, 194(3), 745-793.
<https://doi.org/10.1113/jphysiol.1975.sp011019>
- [29] Attwell, D., & Laughlin, S. B. (2001). An energy budget for signaling in the grey matter of the brain. *Journal of Cerebral Blood Flow & Metabolism*, 21(10), 1133-1145.
<https://doi.org/10.1097/00004647-200110000-00001>

- [30] Quiroga, R. Q., & Panzeri, S. (2009). Extracting information from neuronal populations: information theory and decoding approaches. *Nature Reviews Neuroscience*, 10(3), 173–185
<https://doi.org/10.1038/nrn2578>
- [31] Waxman, S. G. (2007). Channel, neuronal and clinical function in sodium channelopathies: from genotype to phenotype. *Nature Neuroscience*, 10(4), 405–409
<https://doi.org/10.1038/nn1857>
- [32] Reaux-Savonte, C.K. (2023 (2)). Neural Plexus Model for Artificial Consciousness.
<https://doi.org/10.5281/zenodo.18037056>
- [33] Judd, D. B., & Wysecki, G. (1975). *Color in Business, Science, and Industry* (3rd ed.). Wiley.
https://digitalcommons.usf.edu/kip_articles/993/
- [34] Watson, W. (1913). On the luminosity curves of persons having normal and abnormal colour vision. *Proceedings of the Royal Society of London. Series A*, 88 (604): 404–428.
<https://doi.org/10.1098/rspa.1913.0039>
- [35] Abney, W. de W. (1913). A case of abnormal trichromatic colour vision due to a shift in the spectrum of the green-sensation curve. *Proceedings of the Royal Society of London. Series A*, 89 (610): 232–245.
<https://doi.org/10.1098/rspa.1913.0081>
- [36] Hecht, S., Schlaer, S., & Pirenne, M. H. (1942). Energy, quanta, and vision. *The Journal of General Physiology*, 25(6), 819–840.
<https://doi.org/10.1085/jgp.25.6.819>
- [37] Polyak, S. L. (1941). *The Retina*. University of Chicago Press.
- [38] Hecht, S. (1934). The nature of the photoreceptor process. *A Handbook of General Experimental Psychology*, 704–828.
<https://doi.org/10.1037/11374-013>
- [39] Faisal, A. A., Selen, L. P. J., & Wolpert, D. M. (2008). Noise in the nervous system. *Nature Reviews Neuroscience*, 9(4), 292–303
<https://doi.org/10.1038/nrn2258>
- [40] Singer, W. (1999). Neuronal synchrony: a versatile code for the definition of relations? *Neuron*, 24(1), 49–65
[https://doi.org/10.1016/s0896-6273\(00\)80821-1](https://doi.org/10.1016/s0896-6273(00)80821-1)
- [41] Neitz, M., & Neitz, J. (2011). The genetics of normal and defective color vision. *Vision Research*, 51(7), 633–651
<https://doi.org/10.1016/j.visres.2010.12.002>
- [42] Rolls, E. T. (2014). Emotion and decision-making explained. *Cortex*. 59:185-93.
<https://doi.org/10.1016/j.cortex.2014.01.020>
- [43] Kringelbach, M. L., & Rolls, E. T. (2004). The functional neuroanatomy of the human orbitofrontal cortex: evidence from neuroimaging and neuropsychology. *Progress in Neurobiology*, 72(5), 341–372
<https://doi.org/10.1016/j.pneurobio.2004.03.006>
- [44] Pessoa, L. (2017). A network model of the emotional brain. *Trends in Cognitive Sciences*, 21(5), 357–371
<https://doi.org/10.1016/j.tics.2017.03.002>
- [45] LeDoux, J. E. (2012). Rethinking the emotional brain. *Neuron*, 73(4), 653–676
<https://doi.org/10.1016/j.neuron.2012.02.004>
- [46] Panksepp, J. (1998). *Affective Neuroscience: The Foundations of Human and Animal Emotions*
<https://doi.org/10.1093/oso/9780195096736.001.0001>

- [47] Adolphs, R. (2017). How should neuroscience study emotions? By distinguishing emotion states, concepts, and experiences. *Social Cognitive and Affective Neuroscience*, 12(1), 24–31
<https://doi.org/10.1093/scan/nsw153>
- [48] Blood, A. J., & Zatorre, R. J. (2001). Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion.
<https://doi.org/10.1073/pnas.191355898>
- [49] Newton, I. (1704). *Opticks: Or, a Treatise of the Reflections, Refractions, Inflections and Colours of Light*.
<https://doi.org/10.5479/sil.302475.39088000644674>
- [50] Seth, A. K. (2018). Consciousness: The last 50 years (and the next). *Brain and Neuroscience Advances*, 2, 2398212818816019
<https://doi.org/10.1177/2398212818816019>
- [51] Meltzoff, A. N., & Moore, M. K. (1998). Explaining facial imitation: A theoretical model. *Early Development and Parenting*, 6(3–4), 179–192
[https://doi.org/10.1002/\(SICI\)1099-0917\(199709/12\)6:3/4%3C179::AID-EDP157%3E3.0.CO;2-R](https://doi.org/10.1002/(SICI)1099-0917(199709/12)6:3/4%3C179::AID-EDP157%3E3.0.CO;2-R)
- [52] Gallagher, S. (2005). How the Body Shapes the Mind
<https://doi.org/10.1093/0199271941.001.0001>
- [53] Frith, C. D. (2005). The self in action: Lessons from delusions of control. *Consciousness and Cognition*, 14(4), 752–770
<https://doi.org/10.1016/j.concog.2005.04.002>
- [54] Plum, F., & Posner, J. B. (1966). The Diagnosis of Stupor and Coma
<https://doi.org/10.1056/NEJMbrev58849>
- [55] Snyder, F. (1966). Toward an Evolutionary Theory of Dreaming
<https://doi.org/10.1176/ajp.123.2.121>
- [56] Graybiel, A. M. (2008). Habits, Rituals, and the Evaluative Brain
<https://doi.org/10.1146/annurev.neuro.29.051605.112851>
- [57] Reaux-Savonte, C.K. (2023 (1)). How to Develop a Conscious Machine.
<https://doi.org/10.5281/zenodo.18037017>
- [58] Reaux-Savonte, C.K. (2025 (4)). RAICEngine Download.
<https://www.reziine.io/>
- [59] Reaux-Savonte, C.K. (2025 (5)). Artificial Consciousness in 60 Seconds: Consciousness as an Emergent Phenomenon.
<https://doi.org/10.5281/zenodo.18101780>
- [60] Reaux-Savonte, C.K. (2025 (3)). RAICEngine Tech Demo.
<https://doi.org/10.5281/zenodo.18020917>
- [61] Butz, M., Wörgötter, F., and van Ooyen, A. (2009). Activity-dependent structural plasticity: from synapses to networks. *Trends in Cognitive Sciences*, 13(10), 422–429.
<https://doi.org/10.1016/j.brainresrev.2008.12.023>
- [62] Vollenweider, F. X. & Geyer, M. A. (2001). A systems model of altered consciousness: integrating natural and drug-induced psychoses. *Brain Res Bull*, 56(5), 495–507.
[https://doi.org/10.1016/s0361-9230\(01\)00646-3](https://doi.org/10.1016/s0361-9230(01)00646-3)

- [63] Waters F., Chiu V., Atkinson A., and Blom J. D. (2018). Severe Sleep Deprivation Causes Hallucinations and a Gradual Progression Toward Psychosis With Increasing Time Awake. *Front. Psychiatry* 9:303.
<https://doi.org/10.3389/fpsyt.2018.00303>
- [64] Burdack-Freitag, A., Bullinger, D., Mayer, F., & Breuer, K. (2011). Odor and taste perception at normal and low atmospheric pressure in a simulated aircraft cabin. *Journal für Verbraucherschutz und Lebensmittelsicherheit*, 6(1), 95-109
<https://doi.org/10.1007/s00003-010-0630-y>
- [65] Lowrie, W. (2007). *Fundamentals of Geophysics*. Cambridge University Press.
<http://dx.doi.org/10.1017/CBO9780511807107>
- [66] D'Amato M, Molino A, Calabrese G, Cecchi L, Annesi-Maesano I, D'Amato G. (2018). The impact of cold on the respiratory tract and its consequences to respiratory health. *Clin Transl Allergy* 8, 20.
<https://doi.org/10.1186/s13601-018-0208-9>
- [67] Matsuo, R. (2000). Role of saliva in the maintenance of taste sensitivity. *Critical Reviews in Oral Biology & Medicine*, 11(2), 216-229.
<https://doi.org/10.1177/10454411000110020501>
- [68] Ligtenberg AJM, Meuffels M, Veerman ECI. (2020). Effects of environmental temperature on saliva flow rate and secretion of protein, amylase and mucin 5B. *Archives of Oral Biology*, 109, 104593.
<https://doi.org/10.1016/j.archoralbio.2019.104593>
- [69] Yan, K. S., & Dando, R. (2015). A crossmodal role for audition in taste perception. *Journal of Experimental Psychology: Human Perception and Performance*, 41(3), 590–596.
<https://doi.org/10.1037/xhp0000044>
- [70] Cannon, W. B. (1929). Organization for physiological homeostasis. *Physiological Reviews*, 9(3), 399–431.
<https://doi.org/10.1152/physrev.1929.9.3.399>
- [71] Mager, A. J. (1970). Magnetic shields. *IEEE Transactions on Magnetics*, 6(1), 67–75.
<https://doi.org/10.1109/tmag.1970.1066714>
- [72] Bernal-Mendez, J. A., Freire, F., & Bernal, J. M. (2020). The Lorentz force on ions in membrane channels of neurons as a mechanism for transcranial static magnetic stimulation. *Electromagnetic Biology and Medicine*, 39(4), 312–317.
<https://doi.org/10.1080/15368378.2020.1793172>
- [73] Hämäläinen, M., Hari, R., Ilmoniemi, R. J., Knuutila, J., & Lounasmaa, O. V. (1993). Magnetoencephalography – theory, instrumentation, and applications to noninvasive studies of the working human brain. *Reviews of Modern Physics*, 65(2), 413–497.
<https://doi.org/10.1103/RevModPhys.65.413>
- [74] Cavin, I. D., Glover, P. M., Bowtell, R. W., & Gowland, P. A. (2007). Thresholds for perceiving metallic taste at high magnetic field. *Journal of Magnetic Resonance Imaging*, 26(5), 1357–1361.
<https://doi.org/10.1002/jmri.21153>
- [75] Espay, A. J., Aybek, S., Carson, A., Edwards, M. J., Goldstein, L. H., Hallett, M., LaFaver, K., LaFrance, W. C., Jr., Lang, A. E., Nicholson, T., Nielsen, G., Reuber, M., Voon, V., Stone, J., & Morgante, F. (2018). Current Concepts in Diagnosis and Treatment of Functional Neurological Disorders. *JAMA Neurology*, 75(10), 1132–1141.
<https://doi.org/10.1001/jamaneurol.2018.1264>

- [76] Bègue, I., Adams, C., Stone, J., & Perez, D. L. (2019). Structural alterations in functional neurological disorder and related conditions: a software and hardware problem? *NeuroImage: Clinical*, 22, 101798.
<https://doi.org/10.1016/j.nicl.2019.101798>
- [77] Ducroizet, A., Zimianti, I., Golder, D., Hearne, K., Edwards, M. J., Nielsen, G., & Coebergh, J. A. (2023). Functional neurological disorder: Clinical manifestations and comorbidities; an online survey. *Journal of Clinical Neuroscience*, 110, 116–125.
<https://doi.org/10.1016/j.jocn.2023.02.014>
- [78] Scharfman, H. E. (2007). The neurobiology of epilepsy. *Current Neurology and Neuroscience Reports*, 7(4), 348–354.
<https://doi.org/10.1007/s11910-007-0053-z>
- [79] Vyazovskiy, V. V., Olcese, U., Hanlon, E. C., Nir, Y., Cirelli, C., & Tononi, G. (2011). Local sleep in awake rats. *Nature*, 472(7344), 443–447.
<https://doi.org/10.1038/nature10009>
- [80] Waters, F., Chiu, V., Atkinson, A., & Blom, J. D. (2018). Severe Sleep Deprivation Causes Hallucinations and a Gradual Progression Toward Psychosis With Increasing Time Awake. *Frontiers in Psychiatry*, 9, 303.
<https://doi.org/10.3389/fpsyt.2018.00303>
- [81] Vaccaro, A., Kaplan Dor, Y., Nambara, K., Pollina, E. A., Lin, C., Greenberg, M. E., & Rogulja, D. (2020). Sleep Loss Can Cause Death through Accumulation of Reactive Oxygen Species in the Gut. *Cell*, 181(6), 1307–1328.
<https://doi.org/10.1016/j.cell.2020.04.049>
- [82] Cummins R., Hawkes C., Longworth J., Scher S., Kozłowska K. (2025). The adjunct role of pharmacotherapy in multimodal treatment of paediatric functional neurological disorder. *Frontiers in Psychiatry*, 16, 1560873.
<https://doi.org/10.3389/fpsyt.2025.1560873>