JNphi

Why You Can Never Be Me: Toward an Ontological Mechanism for the Irreplicability of the First-Person Experience

George Goutos

Abstract

This paper explores the source of the inherent uniqueness of first-person perspectives (FPPs), the subjective lens through which individuals experience the world. While much research has focused on universal aspects of consciousness, the distinctiveness of individual experience remains underexplored. It is proposed that FPPs are not merely emergent properties of the brain but may be fundamentally tied to the structure of reality itself. By examining biological, quantum, and ontological frameworks, it is argued that only an ontological basis—specifically, the unique coordinates of the spacetime continuum—can guarantee the absolute uniqueness of FPPs. Biological and quantum processes, while contributing to statistical uniqueness, cannot ensure irreplicability. The paper synthesizes ideas from neuroscience, quantum mechanics, and philosophy to present a cohesive framework, suggesting that consciousness and FPPs may emerge from the fabric of spacetime. This speculative yet structured approach aims to provide new avenues for understanding the origins of individuality in conscious experience and to inspire interdisciplinary research into the nature of consciousness.

Key Words: Consciousness, ontology, quantum, spacetime, uniqueness

DOI: 10.5281/zenodo.15470562

Introduction

Each person's experience of the world is entirely unique. One intuitive reason for this is that no two people can occupy the exact same position in space and time. Even if someone stands where I once stood, the world has already changed — time has passed, events have unfolded, and the environment is different. This suggests that no one can ever see or experience the world exactly as I do. Our individual

Corresponding author: George Goutos, PhD
Address: Longmont, Colorado, USA and Xylokastro, Greece
e-mail ✉ goutos@comcast.net, ORCID: 0000-0002-3528-9057

viewpoints and conscious experiences are one-of-a-kind, shaped by our specific place in space and time and the ever-changing nature of the world around us.

This uniqueness extends to our inner experience of being "us." Consciousness is deeply tied to our first-person perspective (FPP), our personal perception of the world. If we think of the FPP as a property rather than just a perspective, then this FPP could be an emergent property of the brain, or it could be a property picked up by the brain from elsewhere, perhaps during syngamy, embryogenesis, or early brain development.

If FPP is a property, the intuition extends to the idea that no two people carry the same value for this property. This raises the key question: What ensures that each person’s FPP property, and therefore their perspective and consciousness, is unique?

This paper explores the source of this uniqueness. While much research has focused on universal aspects of consciousness, such as self-awareness or sensory experiences, the uniqueness of individual experience remains underexplored. Recognizing that this uniqueness is a certainty—that our FPPs are guaranteed to be unique—could provide fresh momentum to the field, offering new avenues to explore its origins and rejecting outdated assumptions. This certainty could enrich the study of consciousness if its source can be identified. It could deepen our grasp of what it means to be a conscious being in a shared yet deeply personal reality.

The paper is conceptual in nature and does not draw on empirical data. It presents a synthesis of ideas, some of which may not be novel individually, but are integrated here into a more structured and cohesive framework. This integration provides a unified perspective on the topic, which inherently invites speculative exploration. Such speculation is essential for advancing understanding and identifying potentially fruitful directions for future inquiry.

Compelling questions such as what the nature of FPP properties might be in essence, and how subjective experience might arise from them, are not discussed in depth in this paper. This paper seeks primarily to identify what mechanism might account for guaranteed uniqueness in first-person perspectives.

Our First-Person Perspective

Consider one of the simplest instantiations of consciousness: the experience of a touch to the finger. When a receptor in the skin sends a signal to the somatosensory cortex, the brain processes the sensation and may or may not elicit a motor response. However, beyond this neural relay, there is an irreducible subjective element—the personal, inescapable experience of the touch.

This "feel" of the touch is the hallmark of the first-person perspective. It is this FPP, present in all sentient activity, that constitutes the kernel of consciousness, the seat, as it were. Each sensory signal presented to the FPP, wherever this may have been harnessed in the brain, creates a quale. And it is suggested here that the spectrum of all qualia is our consciousness. An FPP property may not be a byproduct of neural processes but rather the very essence of what it means to be conscious. It may 'percolate up' rather than 'emerge from.'

The Uniqueness of First-Person Perspectives

René Descartes' declaration, "I think, therefore I am," underscores the certainty of the self as a thinking entity. Expanding on this, another certainty is proposed. Namely, that individual "I"'s are inherently unique—a necessity, not an accident. It is a certainty that no two conscious experiences can ever be identical. My consciousness has never been replicated, nor can I perceive the world through another's perspective. And such replication is fundamentally impossible.

The FPP is proposed as the foundation of subjective experience, tied to a unique spatial and temporal vantage point. No two individuals can occupy the same physical location simultaneously, and even in hypothetical scenarios where two beings share identical brain states, their FPPs remain unique.

An FPP represents our essence—a fundamental perspective or locus of experience, akin to a "center of the universe" property. Since, every point in spacetime is unique from its own frame of reference, if each point carries an FPP property, then each FPP is inherently unique. Our FPP is the lens through which we experience the world, making even shared moments, like watching a sunset, distinct for each person. This uniqueness is not subjective but may arise from an overarching (or underlying) structure.

One could envision temporal multiplexing—a method where two individuals alternately share a single perspective. At one moment, one individual holds the first-person perspective, and at the next moment, the other individual assumes it, with the perspective rapidly switching between them. While this might suggest the possibility of identical FPPs, it would not achieve true simultaneity. Instead, it would result in a disjointed and blurred experience, as the brain cannot seamlessly integrate two separate streams of consciousness in real time. The "I" of one cannot become the "I" of another, rendering identical FPPs metaphysically untenable.

The first-person perspective, as conceptualized here, forms the foundation for the brain's development through neuronal coordination and synchronization, giving rise to the sense of "self." It establishes our subjective worldview, ensuring no two perspectives can ever coincide. This FPP property serves as the metric for absolute uniqueness.

If FPP uniqueness is absolute, what ensures it? To explore this, we must examine potential sources of uniqueness, ranging from the biological to the quantum to the ontological. First, let's address types of uniqueness.

Unlikely but Possible

Uniqueness can take two forms: statistical and guaranteed. Statistical uniqueness is based on probability, where entities—like events, properties, or configurations—are highly unlikely to be identical, but not impossible to be so. It's a probabilistic concept, meaning duplication is improbable yet possible. For example, fingerprints or DNA sequences are statistically unique. The chance of two people having the same fingerprint or DNA is astronomically low, but not zero. Similarly, neural configurations in the brain are statistically unique due to random factors like molecular noise, epigenetic changes, and slight growth variations, making identical connectomes (neural connection maps) highly unlikely—but not impossible. The same applies to randomly generated ID numbers: duplication is rare but not ruled out. Whether it's fingerprints, neural patterns, ID numbers, or even consciousness, the mix of biological variability, life experiences, and nonlinear neural processes makes exact duplication extremely improbable—yet possible.

Mathematically, if $P_{collision}$ represents the probability of a collision, statistical uniqueness implies that $P_{collision}$ is very small: $P_{collision} \ll 1$ where 'collision' here refers to two entities being identical. In the context of DNA profiling, the probability that two individuals share the same genetic profile is exceedingly low. But given a large enough population, the chance of a coincidental match is not entirely absent.

Guaranteed Uniqueness

Guaranteed uniqueness means that identical instances are not just unlikely but will never happen. This type of uniqueness is absolute, enforced by inherent principles or mechanisms that prevent duplication, ensuring each entity is distinct and irreplicable. Unlike statistical uniqueness, which depends on probability and allows for theoretical duplication, guaranteed uniqueness is deterministic, rooted in logical, structural, or mathematical constraints that ensure distinctness. In the context of consciousness and first-person perspectives, guaranteed uniqueness means no two individuals will ever share the same perception of the world—an idea that cannot be proven but rather is largely intuitive. Such uniqueness isn't just a result of genetic, environmental, or experiential factors, which could theoretically align identically. Instead, it must be enforced by deeper principles. Deeper principles bring to mind quantum substrates, carrying properties such as mass, charge, or spin, for example. Or even deeper principles may include fundamental features of reality, like entropy or spacetime. These carry intrinsic "tags" of uniqueness.

Guaranteed uniqueness refers to situations where the design or structure inherently prevents any identical entities, so no possibility of collision exists: $P_{collision} = 0$

When automobile license plate numbers are allocated, a constraint is enforced ensuring that no two plates carry the same number, thereby guaranteeing the uniqueness of plates. It is this administrative function that guarantees uniqueness.

Why Uniqueness Matters

The type of uniqueness of first-person perspectives is not just an abstract philosophical idea—it has deep implications for understanding selfhood and identity. If consciousness is inherently unique, it challenges how we view personal identity over time and across different states, such as waking, dreaming, or altered states of consciousness. By further exploring these implications, one might highlight the relevance to both scientific and philosophical discussions. Crucially for this paper, distinguishing between statistical and guaranteed uniqueness can help us to accept or reject common beliefs about the emergence of consciousness.

Biological Explanations: Statistical Uniqueness

The most widely accepted view is that consciousness arises from the brain's neural activity and structure. The brain's immense complexity tends to ensure that brains are distinct. Factors like the connectome, firing patterns, genetic variation, epigenetic modifications, and environmental influences contribute to this uniqueness. Our individuality also likely involves the brain's integrative processes, like the thalamocortical system, which combines sensory inputs into a single, unified experience.

Neuroimaging studies show strong links between brain activity and mental states, suggesting consciousness emerges from complex neural interactions (Koch et al., 2016). Brain injuries further support this, as damage to specific areas leads to predictable changes in cognition and perception (LeDoux, 2002). Drugs like antidepressants or psychedelics also highlight the brain-mind connection by altering mental states through changes in neurochemistry (Carhart-Harris et al., 2014). The brain processes information through electrochemical signals, providing a plausible basis for consciousness. Developmental and evolutionary perspectives reinforce this, as cognitive abilities are tied to the brain's complexity and structure (Dehaene, 2014). In this view, consciousness and first-person perspectives are seen as emergent from the brain's physical architecture, much like fingerprints arise from the body's cell structure and skin.

The human brain, with its billions of neurons and trillions of synaptic connections, is shaped by genetics and environment, resulting in structural and functional individuality. The chance of two brains being identical is vanishingly small due to factors including molecular noise, epigenetic changes, and random cellular growth (Koch, 2016). Even identical twins, who share nearly identical genetic and neural structures, and are presumed to have distinct first-person perspectives, can still differ markedly biologically. This suggests that while biological processes contribute to statistical uniqueness, they cannot fully explain the guaranteed uniqueness of FPPs. Even so, the uniqueness of consciousness and FPPs remains a theoretical challenge. Consciousness, emerging from the brain's structure and activity, derives its individuality from the extreme improbability of two brains achieving identical states, not from any absolute biological guarantee (Dehaene, 2014).

The connectome—a map of neural connections—plays a key role in neural individuality. With around 100 trillion synapses, it evolves through neuroplasticity but remains statistically unique for each person (Koch, 2016; Holtmaat & Svoboda, 2009). While the number of conceivable connectome configurations is immense, the lack of deterministic rules in neural development leaves open the theoretical possibility, however unlikely, of exact replication. This again suggests that consciousness's absolute uniqueness depends on deeper factors (Strogatz, 2018; Hameroff & Penrose, 2014).

Genetic individuality is another cornerstone of human uniqueness, even though absolute genetic uniqueness isn’t guaranteed. Variations like single nucleotide polymorphisms (SNPs), tandem repeats, and copy number variations create an astronomically large number of possible genomes. These help to ensure that no two individuals share identical DNA (Venter et al., 2001; International Human Genome Sequencing Consortium, 2004). Epigenetic changes, influenced by environment and random processes, add further individuality (Feinberg, 2007). Even identical twins develop small genetic differences over time due to somatic mutations and environmental influences (Bruder et al., 2008). Despite nearly identical genes, twins develop distinct neural patterns due to differences in experiences and environments (Koch, 2016). Noncoding regions especially enhance genetic uniqueness. But again, the chance of identical sequences, while astronomically low (10^-17), is not impossible (Jobling & Gill, 2004). It’s not 0.

If consciousness is solely a product of the physical brain, then the possibility of two physically identical brains implies the possibility of identical consciousnesses and first-person perspectives, which challenges the initial assumption that no two FPPs can ever be identical. The takeaway is that we need to look beyond biology for a complete explanation.

Quantum Mechanics: A Step Further

The relationship between quantum mechanics and consciousness remains speculative, with significant challenges in applying quantum theories to brain function. Some argue that classical neural activity alone can't fully explain subjective experience, suggesting quantum phenomena—like superposition, entanglement, or decoherence—might play a role (Hameroff & Penrose, 2014). However, empirical evidence is lacking, and the brain's warm, noisy environment makes maintaining quantum coherence over meaningful timescales highly unlikely (Tegmark, 2000). Decoherence, the rapid loss of quantum properties due to environmental interactions, ensures that large systems like the brain operate classically, not quantum mechanically. This is true across all developmental stages, as thermal fluctuations and synaptic activity disrupt any potential quantum effects almost instantly.

However, quantum effects are observed in other biological systems, such as photosynthesis and bird navigation. Quantum coherence enables efficient energy transfer in photosynthesis, and quantum entanglement in cryptochrome proteins may aid bird navigation. Quantum tunneling also plays a role in enzyme catalysis and potentially in olfaction and DNA mutations. While these examples show quantum effects in specific biological contexts, their relevance to consciousness remains unclear.

The orchestrated objective reduction (Orch-OR) theory suggests that decoherence-resistant processes in neuronal microtubules could give rise to subjective experience (Hameroff & Penrose, 2014). However, this theory remains highly speculative and lacks empirical support. Critics argue that the warm, noisy environment of the brain makes quantum coherence unlikely (Tegmark, 2000). While Orch-OR provides an intriguing framework, it is not widely accepted in the scientific community, and alternative quantum theories, such as quantum field theory, may offer more plausible explanations for the role of quantum processes in consciousness.

Orch-OR theory suggests microtubules in neurons sustain quantum superpositions influenced by spacetime geometry at the Planck scale. When these superpositions collapse, they link brain activity to spacetime, implying consciousness could be a fundamental aspect of the universe. Manipulating stability at the Planck scale would require interactions between quantum fields and neural networks, possibly mediated by unknown particles or forces.

Orch-OR suggests distinct consciousnesses emerge from unique patterns of quantum state reductions within each person's brain.

Each person's neural architecture, sensory experiences, and microtubular activity would produce a unique series of quantum collapses, creating a subjective, first-person experience. While the underlying quantum processes are governed by universal laws, the specific configurations within each brain could result in individual conscious experiences.

In the context of this paper, the emergence of consciousness through the collapse of the wavefunction could hypothetically align with the measurement of an FPP property. If, as Orch-OR proposes, certain regions within microtubules allow particles to remain in superposition, consider a scenario where one such particle undergoes decoherence early in brain development. When this particle, which exists in a superposition of hypothesized FPP properties, is measured, it collapses to a specific FPP value. This value then propagates throughout the developing brain. A similar process could occur in another individual's brain, where a different particle decoheres and collapses to its own unique FPP value.

However, the possibility arises that, at a critical moment in brain development, two particles in separate individuals could collapse to the same FPP value. It's highly unlikely but possible. This would theoretically result in two brains with identical FPPs. Consequently, quantum decoherence alone cannot reliably ensure unique FPPs; it can only provide statistical uniqueness at best, leaving open the possibility of identical FPPs in rare instances.

Alternative quantum explanations, like the many-worlds interpretation (MWI), propose that quantum states branch into multiple realities (Everett, 1957; Wallace, 2012). While intriguing, such ideas face similar empirical and theoretical challenges.

The MWI offers a framework for understanding how first-person perspectives could be unique across parallel universes, each with its own FPP. Assume measurements involve particles in superposition of FPP properties. In each branch (world), the particle has collapsed to a uniquely determined FPP. Thus, there are identical copies of you in each world, and each with its own FPP. These copies are identical in every way except for their distinct FPP properties. These ideas, though speculative, emphasize the potential role of quantum processes in ensuring the distinctiveness of conscious experience.

The random nature of quantum decoherence doesn't entirely rule out the theoretical possibility of identical states, as the probability of duplication, though vanishingly small, remains non-zero. A particle measured for spin will 'collapse' to a specific spin axis angle. This will likely differ from another particle that is also measured for spin. But, in theory, the two spin axis angles could be identical. This provides a mechanism for statistical uniqueness but not guaranteed uniqueness. The same would apply to the hypothetical FPP property.

In my branch of the universe, my son is born, and as his brain develops, a particle in superposition undergoes an FPP measurement, decohering and assuming a specific FPP value. This becomes his unique FPP. Just as I exist with my own unique FPP, there are identical copies of my son in every other branch of the multiverse, each distinguished solely by their unique FPP values. In this way, both my son and I possess our own distinct FPPs within our respective branches. Similarly, other individuals, whose brains develop at different times, derive their unique FPPs from other decohered particles, ensuring individuality across the multiverse.

However, this does not ensure absolute uniqueness. What we have is more of a statistical likelihood of distinctness rather than a guaranteed one. In theory, though highly improbable, two individuals in the same world could end up with identical FPPs derived from different random processes. The MWI does not guarantee that individuals within the same world will have unique FPPs—it only ensures that copies of the same person across different worlds will differ in this regard. As a result, we must seek a more robust explanation elsewhere to fully address this question.

Ontological Framework: Guaranteed Uniqueness

Absolute uniqueness of FPPs may be rooted in the fundamental structures of reality, such as spacetime or entropy. Some theories suggest that consciousness emerges from the interplay between entropy and complexity, with consciousness arising as a natural consequence of the universe's tendency toward increasing disorder (Tononi & Koch, 2015). Other theories propose that consciousness is tied to the geometry of spacetime or the flow of information in the universe (Hoffman, 2014). While speculative, these ideas challenge the assumption that consciousness must stem from biological or quantum processes, suggesting instead a more fundamental basis for FPPs. The most radical proposal is that consciousness, and thus FPPs, emerge from the fundamental structure of reality itself. This aligns with panpsychism (Chalmers, 2020; Goff, 2017), which posits that consciousness is a basic feature of the universe. However, panpsychism faces philosophical challenges, such as the 'combination problem,' which questions how simple conscious entities combine to form complex consciousness. The framework proposed here must address how unique spacetime coordinates or entropic properties give rise to complex, unified consciousness without falling into the combination problem. This has been explored to some extent elsewhere (Goutos, 2024b) suggesting that brain coordination and synchronization focus neural activity around an FPP. In this framework, spacetime might serve as the foundation for FPPs.

Spacetime, the four-dimensional structure of the universe, ensures that every conscious experience is unique because each voxel of spacetime is inherently distinct. In relativistic scenarios, two individuals could occupy the same spacetime coordinates but in different reference frames, thereby guaranteeing uniqueness. However, this raises the question of how objective spacetime coordinates translate into subjective first-person perspectives. While spacetime ensures physical uniqueness, it does not inherently explain the subjective nature of consciousness. A more detailed mechanism is needed to bridge the gap between spacetime and subjective experience.

This idea suggests that the spacetime continuum could carry distinct "essences" or FPPs at every possible point at the smallest scale of existence—even though dividing spacetime into precise coordinates is a human-made concept. No two points in spacetime are the same, which means no two conscious experiences can overlap. For instance, even if two brains occupy the same physical location but at different times, their separation in time ensures their experiences remain distinct. Brain X at location A at time T1 and brain Y at location A at time T2 would experience different moments, guaranteeing their essences do not overlap. Similarly, brains in different locations at the same time would experience unique spatial settings. This spatiotemporal structure ensures that no two brains can share identical coordinates, preserving the uniqueness of each conscious experience (Huggett & Wüthrich, 2013; Smolin, 2013).

This scenario provides a speculative framework for explaining the uniqueness of FPPs. By proposing a fundamental, intrinsic FPP property tied to every spacetime point, an absolute uniqueness is established that physical brain complexity or quantum decoherence cannot guarantee.

Our universe appears to us soon after we're born (and likely disappears when we die). Throughout life, our FPP is central to our existence. And we exist, in a sense, at the center of our own universe. If an FPP serves as a kind of 'center-of-the-universe' marker or a 'perception-of-the-universe-from-here' marker, at each point of spacetime, then every conscious being—by virtue of existing at a unique spacetime coordinate—would inherently possess a distinct FPP. This, a radical pathway to guaranteed uniqueness, suggests that consciousness, and therefore first-person perspectives, percolate up from the fundamental structure of reality itself.

Entropy, as a measure of disorder, could play a role in shaping conscious experience, but its connection to the uniqueness of FPPs remains speculative. The second law of thermodynamics states that entropy always increases in open systems, ensuring no two systems follow identical thermodynamic paths. The brain, as an open system, undergoes constant metabolic fluctuations and environmental interactions, leading to irreversible entropy changes. This ensures no two brains can ever be in the same state simultaneously (Carroll, 2010). Integrated Information Theory (IIT) suggests conscious experiences are characterized by low entropy due to the highly structured nature of information processing (Tononi & Koch, 2015). While speculative, these ideas offer a compelling framework for understanding how consciousness might derive its uniqueness from the fundamental properties of reality. Future interdisciplinary research is needed to explore these hypotheses and determine whether these can ground consciousness in the fabric of reality.

Consider the set of all integers. Each integer is unique and ordered, with each successive number greater than its predecessor. Similarly, entropy—a measure of disorder—increases over time in isolated systems, as described by the second law of thermodynamics. Each moment in time is associated with a unique entropy value, reflecting the irreversible progression toward greater disorder. This analogy highlights the deterministic and unique nature of entropy increase, much like the ordered sequence of integers. If we assign a numerical value to the ever-increasing global entropy, we create a property that is guaranteed to be unique at each moment. By linking each unique entropy value to an instance of FPP, we establish a system where every FPP is guaranteed to be distinct.

Eric Chaisson explores the relationship between consciousness and entropy through cosmic evolution, arguing that complexity arises from the efficient processing of free energy (Chaisson, 2010). He applies non-equilibrium thermodynamics to suggest that life, intelligence, and consciousness emerge as natural consequences of energy flows that sustain organized structures far from thermodynamic equilibrium. In his view, increasing complexity—from galaxies to intelligent life—is driven by rising energy rate densities, which maintain and enhance order despite entropy. Chaisson sees human consciousness as an advanced stage of this cosmic process, where the universe gains the capacity to reflect on itself through the minds it produces.

However, local entropy can decrease in specific regions. For example, gravitational interactions can create localized order, such as stars or galaxies, by exporting entropy to their surroundings. Biological and chemical processes also create temporary order by exporting entropy. The increase in complexity often involves the organization of energy and matter into more ordered structures, which locally reduces entropy. On a universal scale, global entropy always increases, even if local decreases occur. For example, when a living organism, especially a brain, grows and becomes more complex, it locally decreases entropy. It does so by exporting entropy to its surroundings (e.g., through heat dissipation and waste production). The overall entropy of the closed system (organism + environment) still increases.

Entropy could provide a mechanism to explain the guaranteed uniqueness of individual first-person perceptions. But since entropy behaves differently in local regions of complexity, such as a brain, a dip in entropy disrupts the steady increase and allows for the possibility that two brains develop in identical entropic conditions.

Hence, potentially identical FPPs ensue. So, here too, entropy can only be a vehicle for statistically uniqueness rather than guaranteed uniqueness.

The Self and Mechanisms for Anchoring FPPs

That leaves us with spacetime. Here's an observation that supports the spacetime framework as a source of FPPs. As our bodies move within our world, the world appears stationary. For example, when I walk across a room, the room doesn't move. It's clear that I'm doing the moving. However, another way to view this is that my first-person perspective is stationary, and it is the room that is doing the moving. To be sure, the brain is issuing the same motor commands and receiving the same sensory signals in both cases. But it could be argued that my motor commands are bringing the opposite wall closer to my stationary FPP.

This 'illusion' aligns with the idea that each brain is anchored to a unique FPP point in spacetime. As brains develop, they latch to their respective FPPs, which remain stationary while the world moves relative to them. Latching implies indexing into, connecting to, and maintaining an association with, a specific FPP property. Such a latching mechanism, though speculative, would provide a compelling explanation for how brains might maintain their unique FPP over time (Figure 1).


```
     _____________________________
    /                            /
   /   Brain1     Brain2  /   ← 4D spacetime at time3
  /______|___________|____/
         |           |
     ____|___________|______
    /    |           |     /
   /     |         FPP2   /   ← 4D spacetime at time2
  /______|_______________/       Brain2 (younger) latches to FPP2
         |
     ____|__________________
    /    |                 /
   /    FPP1              /   ← 4D spacetime at time1
  /______________________/       Brain1 (older) latches to FPP1
```

Figure 1. Brains forming associations with unique FPPs

While the ontological framework of spacetime is compelling for guaranteeing uniqueness of FPPs, it raises questions about how the brain might achieve latching to unique spacetime properties, such as an FPP. One possibility is that the brain's internal mechanisms for spatial and temporal integration—such as grid cells in the entorhinal cortex and circadian rhythms—align with external spacetime structures. Research on brainwave entrainment suggests that the brain can synchronize with external rhythms, hinting at a potential mechanism for anchoring FPPs to unique elements of reality.

Within the brain's navigation system, an origin or reference point is crucial for spatial orientation. This "anchor" or "home base," often tied to the hippocampus, helps the brain recalibrate its internal map, ensuring accurate navigation and orientation. Intriguing research suggests the brain's spatial and temporal stability might be influenced by external fields or broader constructs, such as spacetime.

Theories by Penrose and Hameroff propose connections between consciousness and quantum processes, potentially linking brain activity indirectly to spacetime structures. While speculative, these ideas suggest the brain might integrate with the external world to maintain a stable sense of self.

The idea of a specific brain center for the "self" is a subject of ongoing research and debate in neuroscience and psychology. While no single "self-center" exists, the self is thought to arise from the interaction of multiple brain regions, including the prefrontal cortex, posterior cingulate cortex, brainstem, parts of the default mode network (DMN), and possibly even the cerebellum. These areas are involved in self-awareness, self-reflection, and integrating sensory and cognitive information to create our sense of self.

The DMN, active during rest and self-referential thought, generates a constantly evolving and unique model of the self (Buckner et al., 2008). Meanwhile, the 'cerebellar self' helps distinguish self-generated movements from external inputs by fine-tuning Purkinje neuron activity using motor feedback, sensory signals, and proprioceptive data (Montgomery & Bodznick, 2016). These processes contribute to the brain's representation of the "self," which is crucial for motor learning and perception.

To create a stable sense of self in space and time, the brain establishes a dynamic reference point centered around the body. This reference is not fixed but constantly updated based on proprioceptive and vestibular inputs from muscles, joints, and the inner ear. It allows the brain to differentiate self-generated actions from external changes, maintaining spatial and temporal stability. This reference point is typically centered around the head and trunk, where most sensory inputs converge.

The brain also ensures temporal stability by precisely timing and coordinating motor actions and sensory processing. Internal timing mechanisms predict the sensory consequences of movements, enabling smooth and coordinated actions. The brain integrates sensory information to synchronize movements with external cues, such as rhythms, helping maintain a consistent perception of time. This precise timing is essential for activities requiring fine motor control and accuracy, like speaking, playing music, or coordinated physical movements. Together, these mechanisms contribute to a stable and coherent sense of self across space and time.

A brain might latch to an FPP in spacetime during early development, thereby inheriting its unique quality. The brain employs distinct mechanisms for spatial and temporal integration. Spatial path integration, or dead reckoning, involves continuously updating one's position based on self-motion cues, effectively backtracking to a starting point in space (Moser, 2008). Temporal integration, in contrast, relies on mechanisms such as circadian rhythms and episodic memory to estimate the passage of time and reconstruct events in their temporal order. While spatial and temporal integration are fundamentally distinct, both are essential for navigating and interpreting the physical and temporal dimensions of our environment.

A mechanism would be sought that carries this path integration down to the Planck scale of spacetime.

Empirical Foundations

While this paper is primarily conceptual, it's important to recognize that empirical evidence is crucial for grounding speculative theories. Recent advances in neuroscience, such as studies on the neural correlates of consciousness (NCC), support the idea that unique brain states underlie subjective experience. For example, research by Koch et al. (2016) shows that specific patterns of neural activity in the prefrontal and posterior parietal cortices are linked to conscious perception. Similarly, studies on brain entropy, like those by Carhart-Harris et al. (2014), reveal that entropy levels in the brain correlate with states of consciousness, suggesting a connection between thermodynamic processes and subjective experience. While these findings don't directly prove the ontological framework proposed here, they provide a foundation for further exploration. Future research could investigate whether unique spacetime coordinates can be mapped to specific neural states, offering a potential way to test the hypothesis. For example, studying the neural correlates of consciousness in extreme gravitational fields (e.g., near black holes) could provide insights into the role of spacetime in FPPs.

The speculative nature of this paper is both a strength and a limitation. While the proposed ontological framework isn't yet empirically verifiable, it builds on established principles of physics and neuroscience. For example, the uniqueness of spacetime coordinates is a fundamental aspect of relativity theory, and the irreversible increase of entropy is a cornerstone of thermodynamics. To address the lack of a clear mechanism for how the brain "latches" to unique spacetime or entropic properties, future research could explore neural synchronization and entrainment. Studies on brainwave entrainment to external rhythms (e.g., Thut et al., 2011) suggest the brain can align its activity with external temporal patterns, hinting at a potential mechanism for anchoring subjective experience to unique elements of reality. Goutos (2024b) further explores the idea of a telepresence effect in the brain, projecting the FPP from a central seat of consciousness to the senses. While speculative, these ideas provide a foundation for developing testable hypotheses.

Comparison with Alternative Theories

This paper recognizes that its framework is one of many competing theories of consciousness. For example, global workspace theory (GWT) suggests consciousness arises from integrating information in a central neural "workspace" (Baars, 1988), while integrated information theory (IIT) proposes consciousness is a property of systems with high causal integration (Tononi & Koch, 2015). While these theories focus on the neural basis of consciousness, they don't fully explain guaranteed uniqueness. For instance, Integrated Information Theory (IIT) posits that consciousness arises from the capacity of a system to integrate information, but it does not explicitly address the uniqueness of FPPs. Similarly, Global Workspace Theory (GWT) focuses on the integration of information in a central neural 'workspace' but does not explain why each workspace is inherently unique. The ontological framework proposed here complements these theories by suggesting that spacetime and entropy provide a deeper basis for FPP uniqueness, but further work is needed to integrate these ideas into a cohesive theory of consciousness. Future research could explore how this framework interacts with GWT, IIT, and others, potentially leading to a more comprehensive understanding of consciousness.

Limitations and Future Directions

The uniqueness of first-person perspectives (FPPs) has been explored across three major domains: (1) biological structures, such as brain connectomes, neural firing patterns, and genetic DNA sequences; (2) quantum processes, including quantum decoherence and the many-worlds interpretation; and (3) fundamental ontological processes like spacetime and entropy. While these domains offer compelling frameworks for understanding individuality, only one shows promise: spacetime stands out as a promising pathway to guarantee distinct FPPs, though it is not without challenges. This requires reevaluating the premise that FPPs are inherently guaranteed to be unique. Plus, it opens the possibility of an undiscovered aspect of the universe underlying this phenomenon.

The fabric of reality, specifically spacetime, offers a potentially robust mechanism for guaranteeing uniqueness. Spacetime, with its four-dimensional structure, ensures no two points share the same temporal and spatial coordinates. By linking spacetime points to unique FPPs, consciousness could be anchored to an inherently exclusive framework (Maudlin, 2012).

Future research should investigate how a developing brain might utilize unique aspects of reality to create and sustain a persistent sense of self. Interdisciplinary efforts, integrating neuroscience, quantum physics, and philosophy, will be crucial to uncovering the mysteries of consciousness and its connection to the physical world. The goal of this paper was not to speculate on the exact nature of consciousness or the mechanisms that anchor it but to identify a possible source of guaranteed uniqueness.

While this paper presents a speculative framework for understanding the uniqueness of first-person perspectives (FPPs), it has some limitations. First, the connection between spacetime coordinates and subjective experience remains unclear, and a more detailed mechanism is needed to bridge this gap. And second, future investigations should explore how the brain might latch to unique spacetime properties during development. Addressing these challenges will be crucial for developing a robust theory of FPP uniqueness.

By bridging neuroscience, quantum physics, and philosophy, this work aims to deepen our understanding of what it means to be a conscious being in a shared yet deeply personal reality. The uniqueness of FPPs, far from being an abstract philosophical idea, has profound implications for our understanding of selfhood, identity, and ethics, emphasizing the intrinsic value of individual experience.

Finally, the central question that any theory of consciousness must ultimately answer is, "Why does our FPP exist at all?" This profound question is beyond the declared scope of this paper and the asymmetry it suggests is explored elsewhere (Goutos, 2024a) - and remains unresolved.

Conclusion

The uniqueness of first-person perspectives (FPPs) is a fundamental yet underexplored aspect of consciousness. This paper has examined three major domains—biological, quantum, and ontological—to identify mechanisms that could ensure the irreplicability of FPPs. While biological processes, such as neural complexity and genetic variation, and quantum phenomena, such as decoherence and the many-worlds interpretation, offer pathways to statistical uniqueness, they fall short of guaranteeing absolute distinctiveness. Only an ontological framework, rooted in the unique coordinates of spacetime, suggests a robust mechanism for ensuring that no two FPPs can ever be identical.

By anchoring FPPs to specific points in spacetime, a framework is proposed in which consciousness emerges from the fundamental structure of reality itself. This perspective aligns with panpsychist theories, suggesting that consciousness is not merely a product of the brain, but its constituent parts are a feature of the universe. While speculative, this framework offers a conceivable explanation for the guaranteed uniqueness of subjective experience – among others that do not - and opens new avenues for interdisciplinary research.

References

Baars BJ. *A Cognitive Theory of Consciousness*. Cambridge: Cambridge University Press; 1988.

Bruder CE, Piotrowski A, Gijsbers AA, et al. Phenotypically concordant and discordant monozygotic twins display different DNA copy-number-variation profiles. *Am J Hum Genet*. 2008;82(3):763-771.

Buckner RL, Andrews-Hanna JR, Schacter DL. The brain's default network: Anatomy, function, and relevance to disease. *Ann N Y Acad Sci*. 2008.

Carroll S. *From Eternity to Here: The Quest for the Ultimate Theory of Time*. Dutton; 2010.

Chaisson EJ. Energy rate density as a complexity metric and evolutionary driver. *Complexity*. 2010;16(3):27-40.

Chalmers DJ. Idealism and the mind-body problem. In: *The Routledge Handbook of Panpsychism*. Routledge; 2020.

Dehaene S. *Consciousness and the Brain: Deciphering How the Brain Codes Our Thoughts*. Viking; 2014.

Descartes R. *Meditations on First Philosophy*. Cottingham J, trans. Cambridge University Press; 1996.

Everett H. Relative state formulation of quantum mechanics. *Rev Mod Phys*. 1957;29(3):454-462.

Feinberg AP. Phenotypic plasticity and the epigenetics of human disease. *Nature*. 2007;447(7143):433-440.

Goff P. *Consciousness and Fundamental Reality*. Oxford University Press; 2017.

Goutos G. A handle on consciousness: The asymmetry of consciousness. *J Neurophilosophy*. 2024; 3(2). Available at: https://jneurophilosophy.com/index.php/jnp/article/view/112

Goutos G. Telepresence, the brain, and consciousness. 2024. Available at: https://www.academia.edu/129075674/Telepresence_the_Brain_and_Consciousness

Hameroff S, Penrose R. Consciousness in the universe: A review of the 'Orch OR' theory. *Phys Life Rev*. 2014;11(1):39-78.

Hasson U, Ghazanfar AA, Galantucci B, Garrod S, Keysers C. Brain-to-brain coupling: A mechanism for creating and sharing a social world. *Trends Cogn Sci*. 2012;16(2):114-121.

Hoffman DD. Conscious realism and the mind-body problem. *Mind Matter*. 2014.

Holtmaat A, Svoboda K. Experience-dependent structural synaptic plasticity in the mammalian brain. *Nat Rev Neurosci*. 2009;10(9):647-658.

Huggett N, Wüthrich C. Emergent spacetime and empirical (in)coherence. *Stud Hist Philos Mod Phys*. 2013;44(3):276-285.

International Human Genome Sequencing Consortium. Finishing the euchromatic sequence of the human genome. *Nature*. 2004;431(7011):931-945.

Jobling MA, Gill P. Encoded evidence: DNA in forensic analysis. *Nat Rev Genet.* 2004;5(10):739-751.

Koch C, Hepp K. Quantum mechanics in the brain. *Nature*. 2006.

Koch C. *Consciousness: Confessions of a Romantic Reductionist*. MIT Press; 2012.

Koch C, Massimini M, Boly M, Tononi G. Neural correlates of consciousness: Progress and problems. *Nat Rev Neurosci.* 2016;17(5):307-321.

LeDoux J. *Synaptic Self: How Our Brains Become Who We Are*. Viking; 2002.

Maudlin T. *Philosophy of Physics: Space and Time*. Princeton University Press; 2012.

Montgomery J, Bodznick D. *Evolution of the Cerebellar Sense of Self*. Oxford University Press; 2016.

Montgomery JC, Bodznick D. Adaptive mechanisms in the elasmobranch hindbrain. *J Exp Biol.* 2016;219(Pt 19):2997-3006.

Moser EI, Moser MB. A metric for space. *Hippocampus.* 2008;18(12):1142-1156.

Moser EI, Kropff E, Moser MB. Place cells, grid cells, and the brain's spatial representation system. *Annu Rev Neurosci.* 2008;31:69-89.

Penrose R. *The Emperor's New Mind: Concerning Computers, Minds, and the Laws of Physics*. Oxford University Press; 1989.

Smolin L. *Time Reborn: From the Crisis in Physics to the Future of the Universe*. Houghton Mifflin Harcourt; 2013.

Strogatz SH. *Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering*. 2018.

Tegmark M. The importance of quantum decoherence in brain processes. *Phys Rev E.* 2000;61(4):4194-4206.

Tegmark M. Consciousness as a state of matter. *Chaos Solitons Fractals*. 2015;76:238-270.

Thut G, Schyns PG, Gross J. Entrainment of perceptually relevant brain oscillations by non-invasive rhythmic stimulation of the human brain. *Front Psychol.* 2011;2:170.

Tononi G, Koch C. Consciousness: Here, there and everywhere? *Philos Trans R Soc Lond B Biol Sci.* 2015;370(1668):20140167.

Venter JC, Adams MD, Myers EW, et al. The sequence of the human genome. *Science.* 2001;291(5507):1304-1351.

Wallace D. *The Emergent Multiverse: Quantum Theory According to the Everett Interpretation*. Oxford University Press; 2012.