Journal of Posthumanism
2025
Volume: 5, No: 6, pp. 2685–2704
ISSN: 2634-3576 (Print) | ISSN 2634-3584 (Online)
posthumanism.co.uk

DOI: https://doi.org/10.63332/joph.v5i6.2390

# Ontology and Teleology of Emergent Flow Theory (TFE): A Panpsychic View of Existence

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***Abstract***

*The Emergent Flow Theory (EFT) is presented as an integrative proposal that articulates the foundations of quantum physics, neuroscience and philosophy of mind to address the phenomenon of consciousness from an inverse emergent panpsychic vision. Faced with the limitations of reductionist materialism and unfalsifiable idealism, EFT postulates that consciousness is not an exclusive property of the human brain, but a hierarchical flow of informational integration that emerges from the subatomic levels to complex neural structures. Ontologically, existence is understood as a process of informational concrescence that regulates the interaction between energy and matter, while its teleology points to the progressive integration into organized structures, culminating in subjective experience. This model is based on contemporary scientific frameworks such as Friston's free energy principle, Kauffman's quantum consciousness, Levin's bioelectrical intelligence, and the postulates of graph theory and quantum computing. Unlike previous models, such as integrated information theory or orchestrated reduction, the TFE proposes a testable paradigm that can be validated by graph architecture, biomimetic simulations and hierarchical neuroinformatics analysis. Thus, he proposes a profound reformulation of the binding problem and the mind-body problem, providing a robust explanatory framework to understand the emergence of consciousness. This research opens a promising path for an informational ontology that allows us to understand reality and experience from a holistic, falsifiable and scientifically sustainable perspective, configuring a new epistemological horizon for the study of the mind and nature.*

***Keywords:*** *Consciousness, Emergent Flow Theory, Hierarchical Integration, Panpsychism, Graph Theory, Free Energy Principle, Quantum Neuroscience, Protoconsciousness, Bioelectric Intelligence, Phenomenology.*

## Introduction

The nature of consciousness has been, throughout history, one of the great mysteries for both philosophy and natural sciences. From the early dualistic theories of René Descartes to the current perspectives of neuroscience and theoretical physics, the interpretation of conscious phenomena has varied between materialist, idealist, and functionalist approaches. Yet, despite advances in technology such as neuroimaging, artificial intelligence, and molecular biology, the phenomenon of qualia—the subjective experience that cannot be reduced—remains an unsolved challenge, which David Chalmers calls the "hard problem" of consciousness.

Prevailing theories in contemporary science often see consciousness as a secondary result of complicated neural activity. This view, which stems from Cartesian mechanism and Enlightenment materialism, has given rise to significant explanatory models, including Integrated Information Theory (Tononi), Predictive Processing Theory (Friston), and Orchestrated Reduction Theory (Hameroff and Penrose). Despite this, these theories face obstacles in trying to clarify how certain biological and physical structures originate subjective

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experience and why some informational states are associated with consciousness while others are not. Moreover, these models are often limited to the study of the brain, without considering that the conscious phenomenon could manifest itself more broadly in natural non-biological or even artificial systems.

On the other hand, idealistic approaches, such as those proposed by Bernardo Kastrup from the ontological monism of the mind, provide profound conceptual explanations, although difficult to apply and empirically verify, which restricts their acceptance in the scientific field. Faced with this fragmented and somewhat stagnant reality, the need arises to propose a theory that goes beyond physical reductions and unverifiable metaphysics, integrating in turn scientific advances in neuroscience, quantum physics, biology and information theory.

In this framework, the Emergent Flow Theory (EFT) is presented, a theoretical model that redefines consciousness as a hierarchical flow of informational integration that crosses all levels of reality, from the subatomic to the neuronal. From an ontological perspective, the TFE maintains that existence is a dynamic process of informational concrescence between energy and matter; From a teleological perspective, he suggests that consciousness functions as an evolutionary regulator that optimizes the organization of complex systems, thus promoting their structural coherence. This theory adopts an inverse emergentist panpsychic view, postulating the presence of a basic proto-consciousness in all fundamental interactions, which gradually combines into increasingly complex configurations.

The EFT is based on firm principles derived from physics (Lucien Hardy, Stuart Kauffman), biology (Michael Levin), predictive neuroscience (Karl Friston), and artificial intelligence (Yoshua Bengio), using tools such as graph theory, quantum computing, and hierarchical Bayesian models to address the emergence of subjectivity. Unlike approaches that focus solely on the brain, EFT sees the brain as an integrator—not the absolute source—of various levels of protoconsciousness, allowing for a new interpretation of the problem of information integration, free will, and the experience of the self.

The purpose of this article is to present the theoretical and ontological foundations of the TFE, its possible experimental validation through graph architecture and biomimetic simulations, as well as its implications for a general theory of consciousness. In this way, an integrative approach is proposed, which can be tested and has a solid epistemological basis, which could initiate a new paradigm in the scientific and philosophical understanding of consciousness.

**Problem Statement**

Consciousness remains one of the most complex and underexplored phenomena at the intersection of philosophy, neuroscience, and physics. Despite advances in research into the human brain through neuroimaging techniques, artificial intelligence, and computational models, there are still significant epistemological and ontological gaps that hinder a complete understanding of the conscious phenomenon. Most current scientific theories adopt a reductionist view that views consciousness as the exclusive result of neural complexity. However, this approach has failed to provide satisfactory answers to fundamental questions such as the origin of qualia, the integration of different sensory flows (the union problem), the generation of free will, or the transition from inert matter to organized biological systems.

Models such as Integrated Information Theory (Tononi), Orchestrated Reduction (Hameroff and Penrose), and the Free Energy Principle (Friston) have made significant contributions to the functional characterization of consciousness, but they face three common limitations: (1) they

limit the phenomenon to highly developed biological structures, without taking into account previous levels of organization; (2) they do not have a solid ontological framework that explains the essential interaction between energy, matter and information; and (3) they have difficulty being empirically corroborated outside of strictly neural contexts. At the same time, idealist philosophical proposals, such as contemporary manifestations of mental monism or analytic idealism, are criticized for their lack of scientific operationalization and for suggesting concepts that cannot be refuted.

These limitations highlight an urgent theoretical gap: the absence of an integrative model that connects physical, biological and philosophical aspects, capable of explaining the emerging consciousness as a distributed, hierarchical and coherent phenomenon in its structure. In addition, it is necessary to develop a theory that provides concrete opportunities for experimental validation and that is applicable to both biological and artificial systems.

In this context, the need for an alternative conceptual framework that transcends the boundaries of disciplines and considers consciousness as a constitutive process of reality is presented. The Emergent Flow Theory (EFT) proposes as a solution to this dilemma, by redefining consciousness as a flow of information integration that encompasses all levels of matter organization, from the subatomic to the cerebral. This new paradigm not only seeks to rethink the principles of philosophy of mind and neuroscience, but also to establish a verifiable route for the experimental study of consciousness as a universal process.

## Objectives

### General Objective

To propose and substantiate the Emergent Flow Theory (EFT) as a transdisciplinary theoretical framework that explains consciousness as a hierarchical phenomenon of informational integration, emerging from the interaction between energy and matter at all levels of reality, offering ontological, teleological and scientific bases that allow its experimental contrast.

### Specific Objectives

- Critically analyze the explanatory limits of current models of consciousness (neurocentric materialism, computational theories and idealist approaches), evidencing their ontological or empirical insufficiency.

- To expose the ontological and teleological foundations of the TFE, articulating consciousness as a flow of informational concrescence that is expressed in different hierarchical levels of complexity.

- Integrate contemporary scientific contributions from quantum physics (Hardy, Kauffman), predictive neuroscience (Friston), cell biology (Levin) and artificial intelligence (Bengio, Tegmark) to support the postulates of the TFE.

- To propose a route of empirical validation of the theory through computational models, biomimetic simulations and graph analysis applied to brain connectivity.

- To establish the philosophical and scientific implications of the TFE for a new ontology of being, overcoming Cartesian dualism and offering a holistic and falsifiable vision of consciousness as a universal organizing principle.

## Methodology

This article is framed in a theoretical-conceptual and transdisciplinary research, aimed at the construction of an explanatory model on consciousness from an ontological, informational and hierarchical perspective. The approach adopted is analytical-synthetic, with a strong integrative epistemological basis that articulates principles of philosophy of mind, neuroscience, quantum physics and complexity sciences.

### Type of Study and Approach

It is an exploratory-propositional study, of a theoretical-explanatory nature, whose objective is to develop and sustain the Emergent Flow Theory (EFT) as an integrative and falsifiable proposal that redefines the phenomenon of consciousness. EFT is based on an inverse emergent panpsychic approach, in which consciousness is conceived as a process of distributed informational integration, present from subatomic levels to complex neural systems.

### Methodological Strategy

The theoretical construction has been developed through the following procedures:

- Critical and integrative review of existing theories of consciousness, including reductionist, idealist, and emergentist approaches.
- Interdisciplinary articulation of current scientific principles (Friston, Hardy, Kauffman, Tegmark, Levin, Bengio, among others) to support the scientific plausibility of the TFE.
- Logical and hierarchical formulation of the TFE model, based on concepts such as informational flow, self-organization, Bayesian inference and entropy minimization.
- Projection of empirical validation scenarios, through the use of graph architecture, computational modeling, artificial neural networks and biomimetic simulations, which allow contrasting the central postulates of the theory.

### Sources of Information

Secondary sources were used, selected from high-quality academic databases (Scopus, Web of Science, arXiv, Scholarpedia), focusing on:

- Philosophy of Mind and Contemporary Panpsychism.
- Quantum physics and quantum information.
- Computational neuroscience and predictive principles.
- Bioelectrical intelligence and cell regeneration.
- Artificial intelligence and deep learning.

### Validity and Verification Criteria

Although the study does not include direct experimentation, the TFE is proposed as a theory susceptible to empirical and simulational testing. For this reason, validation routes are proposed based on:

- Comparison of informational integration patterns in human and artificial neural networks.

- Identification of correlates between graph architecture and states of consciousness.
- Application of principles of theoretical physics to model the hierarchical emergence of information from fundamental levels.

The principle of Popperian falsifiability is assumed as the guiding epistemic criterion, and it is emphasized that the theory can be tested through experimentation in functional neuroscience, computational simulations and quantum-informational models.

**The Ontology and Teleology of the Emergence Process in Emergent Flow Theory (EFT)**

In Emergent Flow Theory (KET), the notion of existence is not seen as a fixed set of separate entities, but as an active process of information integration that cuts across all strata of reality. From this point of view, the cosmos does not consist only of matter and energy, but of a constant flow of information that organizes itself into increasingly complex hierarchical structures. This flow, to which the term informational concrescence is assigned, represents the ontological core of the model, where consciousness is not considered a late and exclusive result of biological evolution, but as an essential organizing principle that is present from the most basic levels of existence.

Under this interpretation, consciousness—in its most basic form, known as protoconsciousness—functions as a dynamic filter that regulates the interaction between energy and matter. At the quantum level, this protoconsciousness would be involved in the non-random selection of states during the collapse of the wave function, favoring configurations that optimize the energetic and informational stability of the system. Far from being a strictly random process, the emergence of organized forms responds, according to the TFE, to patterns of self-organization mediated by an elementary conscious principle. This perspective situates consciousness as coextensive with reality itself, not as a derivative phenomenon, but as a fundamental aspect of nature.

The teleological dimension of the TFE develops from this ontological basis. The evolution of the universe, seen as a gradual increase in structural complexity, would be guided by an internal trend toward coherent integration of information. In other words, emergent flow does not progress randomly or aimlessly, but seeks to reduce entropy and increase the functional efficiency of self-organizing systems. Matter, by organizing itself into atoms, molecules, cells and organs, does so following principles that favor configurations that are stable, adaptive and energetically sustainable. Protoconsciousness plays a crucial role here, acting as a distributed intelligence that chooses the most effective structural ways to maintain and transmit information.

This process of hierarchical emergence culminates in advanced nervous systems, where informational integration reaches a critical threshold that gives rise to self-referential consciousness. According to the TFE, the human brain would not be the origin of consciousness, but the place where multiple levels of cellular and bioelectrical protoconsciousness are synchronized in a harmonious way. This synchronization, which could generate quantum phenomena in neuronal dendrites, would facilitate the resolution of the junction problem and explain how different sensory inputs combine into a coherent subjective experience.

The hierarchy of the TFE suggests a gradual evolution that begins in basic quantum regulation and reaches the self-awareness of the human being. In the subatomic realm, it is protoconsciousness that guides the arrangement of particles; at the molecular level, it decides which chemical combinations are useful; in the cell phone, it manages gene expression and

bioelectrical communication; at the neural level, it organizes the integration of the senses; and in the cognitive field, it facilitates the elaboration of the narrative self through systems such as the Ascending Activating Reticular System (RAAS) and the Default Neural Network (DNN). Each of these layers acts as a point of connection within the incessant flow of information that forms conscious reality.

Unlike other positions that are based on speculative theories or reductionism of a neurobiological type, the TFE is based on logical and scientific principles that can be verified. Its ontology is not limited to explaining existence, but presents an operational model of structural emergence; Its teleology is not understood as a mere philosophical projection, but as a practical hypothesis that can be verified through computer simulations, graph structures, analysis of connectivity in the brain, and bioinformatics models. By including ideas from quantum physics, cell biology, artificial intelligence, and information theory, TFE not only provides a coherent explanation of the phenomenon of consciousness, but also establishes an experimental framework for its validation.

In conclusion, the Emergent Flow Theory transforms the ontological and teleological foundations of consciousness, suggesting that consciousness is not a mere late biological accident or an illusion of the nervous system, but an essential principle that structures reality itself, verifiable in its hierarchical and functional organization. Consciousness arises, organizes and manifests itself as the common thread of the universe, ranging from the simplest particles to the complexity of the human self.

**Scientific Evidence Supporting the Emergent Flow Theory**

Throughout the previous articles on Emergent Flow Theory (EFT), we have explored its logical-mathematical foundation through Boolean algebra, differential equations and probabilistic models. We have also analyzed how neural networks configure consciousness as a qualitative event of experience and discussed its implications in various medical disciplines.

In this context, current models and theories on the emergence of consciousness have been compared, such as Giulio Tononi's Integrated Information Theory (TII) and Stuart Hameroff and Roger Penrose's Orchestrated Reduction Theory. It has been argued that, while the TII effectively describes the integration of information into biological systems, its scope is limited to structures sufficiently complex to sustain such integration. The TFE expands on this framework by proposing that informational integration occurs at all levels of existence, from the subatomic scale to the subjective human experience.

On the other hand, the Orchestrated Reduction Theory postulates a quantum model of consciousness based on microtubules, where the collapse of the wave function plays a crucial role in the generation of the conscious phenomenon. However, this approach reduces experience to exclusively brain processes. TFE expands on this view by suggesting that consciousness is a phenomenon distributed on multiple levels, from the interaction between energy and matter to the organization of information into complex networks.

This chapter aims to analyze recent scientific studies that, although not explicitly identified with panpsychism, present findings consistent with the postulates of EFT. Research by renowned scientists, such as Michel Irving, Stuart Kauffman, and Karl Friston, offers groundbreaking insights into the relationship between consciousness, energy, and information. Their findings reinforce the idea that the brain is not the exclusive generator of consciousness, but a coordinator of information in a larger system.

The study of consciousness faces a significant methodological challenge: as it is a subjective and qualitative phenomenon, it does not fully conform to traditional scientific methods. However, the accumulation of empirical evidence allows us to move towards a broader and more dynamic framework that transcends the reductionist mechanism. Science must not only describe how reality works and predict its behavior, but also offer teleological answers about the purpose of existence.

**Stuart Kauffman's Quantum Consciousness and its Relationship to Emergent Flow Theory (EFT)**

Stuart Kauffman, a leading theorist of complex systems and a pioneer in theoretical biology, has proposed an innovative interpretation of consciousness from a quantum perspective that breaks with traditional models of computational functionalism. In his approach, consciousness cannot be fully explained from algorithms or classical input-output representations, since the quantum system, by nature, operates beyond the deterministic and binary logic that underlies Turing machines.

For Kauffman, conscious systems cannot be understood only as symbolic processors, but as entities capable of manifesting irreducible quantum properties, such as superposition, entanglement and the non-deterministic collapse of the wave function. In his view, the conscious mind emerges in a domain in which the processes of decision and choice cannot be reduced to codifiable formal rules. This conception challenges the classical notion of universal computability, postulating that human thought participates in a quantum logic that transcends classical computation.

In this framework, consciousness is presented as a non-algorithmic quantum phenomenon, in which the act of observing, deciding or imagining implies a collapse of possibilities that cannot be anticipated by a closed computational system. The mind, therefore, is not simply a program executed by the brain, but an active manifestation of quantum processes deeply rooted in the very fabric of the universe.

The Emergent Flow Theory (EFT) finds in this proposal of Kauffman a fundamental point of resonance. Both approaches coincide in rejecting the sufficiency of reductionist models based on symbolic computation to explain consciousness, and propose instead an understanding of conscious phenomena as the result of a dynamic process of quantum selection and informational integration. While Kauffman stresses the non-algorithmic nature of consciousness, TFE expands on this intuition by postulating that conscious systems are configured as hierarchical flows of informational concrescence, where quantum properties are not only present at the neuronal level, but also at more primitive levels of physical and biological organization.

The TFE incorporates Kauffman's contribution by conceiving that the conscious process cannot be reduced to linear causality or computational inference, but must be understood as an emergent and unrepeatable dynamic that obeys principles of quantum self-organization, oriented towards the coherent integration of information at multiple scales. Thus, quantum consciousness, far from being an anomaly or an epiphenomenon, represents an essential property of the universe, which is expressed with greater intensity in those configurations capable of synchronizing multiple levels of information in stable and adaptive states.

In short, Stuart Kauffman's proposal serves as a key theoretical foundation for EFT, offering an ontological basis for the emergence of consciousness in a non-deterministic universe. The TFE extends these ideas in a hierarchical architecture, showing how consciousness, understood as

flow, is expressed at different scales through structures that favor the reduction of uncertainty and informational coherence. Both models, although formulated from different languages, converge on the idea that consciousness is a creative and unpredictable quantum process, whose understanding requires overcoming the limits of symbolic computation and classical logics.

**Bioelectrical Intelligence and the Emergent Flow Theory (EFT)**

In recent years, the understanding of what intelligence means has begun to be revised, no longer limited only to its neural and cognitive manifestations. Living organisms, even at the level of cells and tissues, are now considered to possess abilities to regulate, adapt, and make decisions. This expansion of the concept of intelligence is presented in a particularly innovative way in the research of Michael Levin, who has established the area of bioelectrical intelligence. Levin argues that cells, tissues, and organs use bioelectrical networks to interact, store data, and make morphogenetic decisions, in processes that show striking similarities to the most advanced neural systems.

Empirical evidence indicates that non-neuronal cell networks can address complex problems, such as limb regeneration, body symmetry, and structural reprogramming, thanks to organized bioelectrical signals. These signals not only coordinate physiological functioning, but also contain spatial and temporal patterns that shape a morphogenetic memory, capable of guiding processes of self-repair and adaptive development. In this framework, intelligence is no longer limited to the central nervous system and is understood as a capacity that is distributed in multicellular systems, regulated by electrical, chemical and informational circuits that act coherently.

This expanded view of biological intelligence aligns closely with Emergent Flow Theory (EFT). According to this theory, consciousness does not appear suddenly in the brain, but is formed hierarchically from more basic organizational levels, in which bioelectrical networks play a fundamental role. In this context, bioelectrical intelligence is not an incidental or marginal phenomenon, but an intermediate manifestation of protoconsciousness, where capacities for information integration, decision-making, and structural adaptation can already be detected.

From the perspective of EFT, bioelectrical networks in cells are essential nodes in the hierarchical flow of consciousness, functioning as platforms that mediate between molecular activity and higher cognitive processes. These networks can be seen as proto-conscious units, capable of organizing spatial information, anticipating future situations, and altering their internal structure to meet functional objectives. In other words, they are part of an evolutionary informational dynamic, in which systems seek to achieve states of lower entropy and greater coherence through guided self-organization.

In addition, the TFE incorporates Levin's findings as concrete evidence that supports its hierarchical model, where consciousness is defined as a constant flow that integrates information from the quantum basis to the narrative of the self. Cellular bioelectricity, with its distributed computational capabilities, serves as a clear example of how non-neural systems can handle information, stabilize states, and modulate both the form and function of the organism, these elements being fundamental in any serious theory about the emergence of consciousness.

Thus, bioelectrical intelligence not only expands the understanding of cognition and biological agency, but also provides intermediate evidence for the main idea of EFT: that consciousness does not arise suddenly or is unique to the brain, but is a gradual and dispersed process of information integration that occurs at various levels of living reality. This connection between

bioelectricity and hierarchical integration strengthens the transdisciplinary approach of the EFT and enhances its capacity as a sound and scientifically relevant explanatory paradigm.

**Postulate on the Relationship between TFE, Information Processing Theory, and Bioelectrical Intelligence by Michel Levin**

Learning and memory can be understood from a unified framework that integrates the Emergent Flow Theory (EFT), the Theory of Brain Information Processing, and Michael Levin's discoveries on bioelectrical intelligence.

**1. The Theory of Information Processing and its Relationship with EFT**

Information Processing Theory is a widely accepted model in cognitive psychology, which surpassed behaviorism by demonstrating that the mind is not just a black box of stimulus-reaction responses, but a dynamic system capable of processing, storing, and retrieving information.

This theory establishes four phases in information processing:

1. Perception (capture of sensory stimuli)

2. Processing (analysis and filtering of information)

3. Memory (short-term and long-term storage)

4. Retrieval (use of information stored in thought and action)

TFE can complement and expand this theory by offering a correlation with the neural organization of the brain and with the idea of a protoconsciousness present from bioelectrical levels to higher levels of integration.

2. Correlation of the TFE with Information Processing

a) Sensory Memory and the Sensory Autonomous Network (RAS) - Pure Experience

In the TFE, the Autonomous Sensory Network (RAS) is the first link in the capture of information from both the internal and external environment.

Unlike classical models, RAS is not limited to perception in the brain, but operates at the cellular level, allowing each cell to record bioelectrical and chemical signals.

This concept aligns with the bioelectrical intelligence described by Michael Levin, who has shown that cells can process information, adapt, and organize themselves without the need for a central nervous system.

At this stage, information is captured in an uninterpreted way, representing the pure experience of the environment before the mind filters it.

b) Short-Term Memory and the Ascending Activating Reticular System (RAAS) - Perceptual Experience

In EFT, the RAAS or Perceptual Network is the mechanism responsible for focusing attention on relevant stimuli and discarding irrelevant ones.

Here the transition from raw perception to conscious perception occurs, similar to how short-term memory works with limited but highly focused information.

This level is associated with the focused mode of learning, where problems are solved rationally and sequentially.

It is in this phase where the information is integrated with pre-existing schemas, generating connections of meaning.

c) Long-Term Memory and the Default Neural Network (DNN) - Self-Referential Experience

In the TFE, the RND or Self-Referential Network allows the integration of information in a broader framework, connecting new experiences with previous memories.

This level correlates with long-term memory and with the fuzzy mode of thinking, where creative associations and consolidation of learning occur.

This is where the brain projects the future, establishes patterns and narrative structure that make sense of the experience.

3. Model Expansion: Intelligence at the Molecular and Atomic Level

If we accept that bioelectrical intelligence demonstrates the ability to process information in cells without the need for a brain, we can extend this principle even further:

At the molecular level, certain chemical interactions could contain patterns of self-regulation and integration, which would explain the formation of complex biological structures.

At the atomic level, we could postulate that energy fields and subatomic interactions reflect principles of organization that could be interpreted as a primitive form of intelligence or protoconsciousness.

This concept aligns with the TFE hypothesis that protoconsciousness is the bridge between energy and matter, regulating the emergence of organized systems at all levels of existence.

The integration of TFE, Information Processing Theory, and Bioelectrical Intelligence suggests that learning and memory are not only dependent on brain structures, but are a fundamental principle of organization present from the cellular to the atomic scale.

This model expands our understanding of thought, consciousness, and the evolution of intelligence in nature, offering a unified view of how information flows through all levels of being.

**The Free Energy Principle and its Relationship to Emergent Flow Theory (EFT)**

The principle of free energy, proposed by Karl Friston, has established itself as one of the most significant approaches in theoretical neuroscience today. In its original idea, this principle proposes that living organisms are structured to reduce the discrepancy between their internal conditions and the environment around them, through a constant revision of their internal representations. In other words, living beings function as Bayesian systems that seek to reduce the uncertainty – or free energy – between their predictions and the sensory information obtained, formulating inferences that guide their action, perception and adaptation to their environment.

This principle is not limited to the brain as a prediction system, but provides a broader perspective of living organisms as self-organizing entities that are able to adapt, in order to preserve their structural cohesion in the face of an ever-changing environment. In this context, free energy is interpreted as a measure of "surprise" or informational mismatch between the

internal representation of the organism and environmental information. Minimizing this surprise translates into maintaining the homeostatic balance, improving the body's chance of survival. This theory is deeply connected to key concepts in thermodynamics, information theory, and hierarchical Bayesian inference.

The Emergent Flow Theory (EFT) finds in the principle of free energy an essential foundation to illustrate the hierarchical appearance of consciousness as a process of information integration that seeks to reduce the entropy of the system. Although Friston develops his theory within the framework of cognition and the functioning of the human brain, EFT expands this logic to more elementary categories of physical and biological organization. From this angle, the principle of free energy not only regulates the functioning of neural networks, but also acts as a universal mechanism of informational self-organization, present in phenomena ranging from quantum interactions to complex multicellular systems.

Within EFT, consciousness is understood as a hierarchical flow that arises as a system—whether a cell, tissue, or brain—manages to align its internal structure with the environment, through a progressive decrease in free energy at various scales. Each degree of organization generates internal predictive representations, more or less elaborated, that allow it to anticipate, adapt and react to the environment. This ability to anticipate is not restricted only to the cognitive plane, but also manifests itself in cellular and bioelectrical processes that, as studies in synthetic biology and Levin's work have shown, exhibit basic computational skills.

What the Emergent Flow Theory (EFT) proposes is that the emergence of consciousness occurs when these predictive systems reach critical levels of integration. At this stage, not only is informational surprise reduced, but a coherent and self-referential narrative of the self is also created. This qualitative leap occurs in structures such as the brain that have a high degree of integration, but is based on the same principles that govern self-organization at the cellular or molecular level: anticipation, regulation, and adaptation. In this way, the principle of free energy becomes, in the context of the TFE, a fundamental law that organizes the flow of conscious information along different levels of existence.

Unlike other theories that place consciousness solely in the complexity of the nervous system, EFT argues that conscious experience is a multiscalar manifestation of the process of minimizing free energy. In this sense, each part of the system contributes to the total integration of information. This process of integration that advances culminates in a self-referential consciousness, although its beginning occurs much earlier, in more basic forms of intelligence and adaptability.

In summary, the principle of free energy is not only congruent with the Emergent Flow Theory, but is also considered one of its essential foundations. It offers a solid physical-informational basis for understanding how organized systems—ranging from quantum particles to humans—structure themselves to decrease uncertainty, stabilize their states, and generate informational coherence. The TFE, by integrating this dynamic within a hierarchical and goal-oriented framework, broadens its scope and positions it within an ontology of being as a flow of conscious integration.

**Anyones, Quantum Information and the Regulation of Randomness in Emergent Flow Theory (EFT)**

In the field of quantum physics today, the discovery and analysis of anyones has provided new ways of understanding the essential composition of matter and information. Unlike fermions and

bosons, which are the two classic categories of particles according to quantum statistics, anyons are a special type of quasiparticles that can manifest in two-dimensional systems, especially in quantum states with strong correlations, such as those observed in the fractional quantum Hall effect. The singularity of anyones lies in the fact that their statistical identity and quantum state depend on the history of their exchanges; that is, the result of the interaction between anyones is not determined solely by their position and state, but by the order and form of their relative movements.

This feature, called non-abelian statistics, challenges the classical principle of commutativity, positioning anyones as fundamental elements for topological quantum computing, since they allow data to be encoded robustly against external perturbations. From this perspective, anyones are not just a theoretical curiosity, but show that the universe, at its most essential level, stores and manages information through quantum trajectories, where the history of interactions acquires an ontological meaning.

Emergent Flow Theory (EFT) includes this concept as part of its ontological framework, stating that consciousness does not arise from a random chaotic state, but from a protoconscious regulation of quantum randomness, which allows certain informational trajectories to stabilize, integrate, and structure over time. From the TFE approach, the anyones illustrate how quantum processes can retain a structural memory of the past, giving rise to patterns that, although not deterministic, are governed by a logic of progressive organization. This logic underlies the emergence of coherent forms in matter, even before human life or consciousness manifests.

Considering that fundamental particles can retain information about their past relationships, the TFE proposes that the universe acts as a system of informational concrescence, where elementary interactions generate a cumulative flow of structured information. Therefore, what was previously interpreted as quantum randomness is, in this theory, a field regulated by protoconscious principles that filter and choose possible trajectories based on their structural efficiency, coherence and capacity for integration.

In this context, quantum information is not simply considered an abstract datum, but as an active manifestation of interactions that make up the very essence of reality. The TFE is based on this idea to argue that physical systems do not develop arbitrarily, but follow paths of informational organization, where quantum probability is influenced by protoconscious filters that allow configurations that are structurally viable to flow.

Thus, the emergence of complex structures – such as molecular networks or neural systems – can be understood as the effect of a non-algorithmic basic intelligence, capable of facilitating the transition from chaotic states to coherent states without resorting to classical determinism or absolute chance. In this way, EFT provides an integration between quantum indeterminacy and functional direction, illustrating how randomness can be organized into streams of information that eventually lead to subjective experience.

In conclusion, the presence of entities such as anyones and their ability to encode historical interactions reinforces the central idea of TFE: that reality is fundamentally permeated by hierarchical informational processes, where consciousness does not emerge as a late phenomenon, but as the fullest expression of an organizing principle that has been present since the beginning of quantum dynamics. The regulation of randomness, far from being an exclusive feature of the human mind, would be considered a structural property of the universe, manifesting itself gradually throughout the emergent flow of existence.

**Experimental Framework for the Empirical Validation of the Emergent Flow Theory (EFT)**

The scientific study of consciousness has historically been limited by the difficulty of establishing models that are empirically verifiable. Many proposals have oscillated between neurobiological reductionism and idealist formulations, lacking in both cases verifiable criteria of falsifiability. In this context, Emergent Flow Theory (KET) is presented as an attempt to overcome this limitation by proposing a hierarchical architecture of informational integration that, far from being merely speculative, offers concrete routes of experimental validation through interdisciplinary tools.

EFT argues that consciousness emerges gradually from the synchronous integration of information between diverse structural levels: from subatomic interactions to complex neural circuits. This process can be examined empirically if observable hypotheses are formulated in at least three complementary domains: the quantum-molecular, the bioelectrical-cellular and the neurocognitive-computational.

First, at the quantum-molecular level, the theory is linked to the study of particles such as *anyones*, whose quantum identity depends on their historical exchange trajectory. This non-abelian property allows the encoding of structural information in the topology of the system, which offers a physical model for the concept of informational concrescence proposed by the TFE. Through quantum simulations, topological algorithms and quantum computing experiments, it is possible to explore whether certain patterns of interaction tend to stabilize, which would suggest the existence of protoconscious filters that guide the emergence of order from apparent quantum chance. In this sense, the validation of the TFE in this plane would focus on identifying organized quantum structures that reduce entropy without external intervention, simulating informational pre-selection dynamics.

Secondly, at the bioelectrical-cellular level, the TFE is supported by advances in synthetic biology and the work of Michael Levin, who has shown that multicellular tissues can execute distributed computational processes through bioelectrical networks, even in the absence of a central nervous system. These networks allow cells to make decisions, store information, and reorganize morphological structures in an adaptive way. From the point of view of EFT, such behaviors are not merely physiological, but an expression of an organized basal intelligence. At this level, experimental validation would involve the study of bioelectrical patterns that self-regulate to achieve optimal functional configurations, evaluating whether these dynamics can be explained by predictive models of hierarchical informational integration. Deep learning models could also be applied to simulate and predict in vitro bioelectrical network behaviors.

Finally, at the neurocognitive-computational level, EFT postulates that the brain does not generate consciousness in isolation, but acts as a synchronous integrator of multiple previous protoconscious levels. This integration can be analyzed using neuroimaging techniques such as high-density EEG, fMRI, and magnetoencephalography, using graph theory tools, functional connectivity analysis, and structural complexity modeling. The hypothesis to be tested would be that conscious states correlate with more integrated, efficient, and coherent connectivity patterns than non-conscious states. In addition, hierarchical computational models and neuroinformatics simulations can be used to observe the relationship between bioelectric, chemical and neuronal levels, identifying functional routes of informational emergence.

What distinguishes TFE from other theories is that it does not limit itself to describing empirical

correlations, but proposes structural and dynamic principles that can be tested: the tendency to minimize informational entropy, the emergence of multiscale coherence patterns, and the presence of trajectories organized in open systems. If it is shown that consciousness occurs in the absence of these principles, or that they can be replicated without generating consciousness, the TFE would be refutable, thus fulfilling the criterion of epistemic falsifiability.

In short, the experimental framework of the Emergent Flow Theory does not seek a monolithic verification, but a multidimensional convergence of evidence, which allows evaluating the hypothesis that consciousness is a hierarchical flow of informational integration guided by structuring principles present at all levels of reality. This transdisciplinary vision invites a science of consciousness that excludes neither the quantum nor the biological, nor the computational nor the subjective, and that opens up to an informational ontology capable of integrating being and knowledge in the same experimental horizon.

**Mark Tegmark, Computing as the Key to Understanding Consciousness**

Theoretical physicist Max Tegmark, famous for his research in cosmology and fundamental physics, has formulated an interesting and solid hypothesis about the essence of consciousness, seen from a computational and information approach. According to his proposal, Tegmark argues that it is possible to investigate consciousness scientifically as a state that arises from the processing of information in physical systems, following laws similar to those that govern other emerging phenomena in the world, such as temperature or hardness.

One of his most significant contributions is the notion that it is not the physical material that is crucial to consciousness, but the way in which the information that this material allows is processed. In this regard, Tegmark introduces the term "perceptronium", which he defines as the state of matter capable of sustaining consciousness thanks to certain properties: the ability to store information, process it, integrate it and generate feedback. Thus, consciousness is not considered an enigmatic quality of human beings, but a natural consequence of certain physical configurations that meet criteria of complexity and functional integration.

From his point of view, what is fundamental for consciousness to manifest itself is not carbon, nor the brain itself, but the existence of a system that can maintain a coherent and structured flow of information, which gives rise to a unified subjective experience. In this way, Tegmark suggests a physical ontology of consciousness based on information theory, computational complexity, and states of functional matter, where consciousness is considered to be that which maximizes the causal integration between its parts, so that the system becomes more than the mere sum of its elements.

This proposal finds a conceptual coincidence with the Emergent Flow Theory (EFT), which also maintains that consciousness is the result of a dynamic process of integration of information in various hierarchies. However, while Tegmark emphasizes a high-level computational perspective, TFE expands the framework into a deeper ontology, suggesting that this informational processing has protoconscious origins present from the most basic levels of reality. In other words, EFT is based on the idea that information processing does not begin with complex structures such as neural networks, but unfolds progressively on quantum, bioelectrical, and cellular scales, until it achieves its self-referential manifestation in the consciousness of the self.

In addition, the TFE introduces a teleological dimension that is absent in Tegmark's work: he proposes that the flow of information does not only arise under certain physical conditions, but

is directed towards organization, functional coherence, and self-regulation, which allows us to understand its evolution through increasing levels of complexity.

Both positions align on the idea that consciousness has a broad computational component, although the TFE argues that computation is not limited to the symbolic or digital, but also encompasses analog, morphogenic and quantum methods of distributed processing. Thus, Tegmark's approach can be seen as a higher sphere within the flow that explains EFT: a moment when patterns of information achieve a level of self-organization sufficient to give rise to reflective awareness.

In summary, Tegmark's theory is presented as a fundamental element to capture consciousness as both an informational and physical manifestation, offering a measurable theoretical basis that complements the ideas of the TFE. While Tegmark provides us with tools to recognize systems that can exhibit consciousness according to their computational characteristics, TFE delves into the functioning and motives of that processing that arises from lower levels, suggesting a more ontological, hierarchical and teleological perspective of the phenomenon. This connection between computing, physics and information integration reinforces the credibility of a distributed consciousness model, in accordance with the approach proposed by the TFE.

**Deep Learning and EFT**

The rapid development of artificial intelligence has placed deep learning at the center of the current discussion about the mind, consciousness, and limitations of computational reasoning. This technique, which is based on artificial neural networks with multiple layers, has demonstrated an impressive ability to recognize patterns, make complex decisions, produce language, and replicate adaptive behaviors in changing environments. Although deep learning models do not possess self-consciousness, their operation has provided significant parallels for how biological systems can process and integrate information in a hierarchical manner.

Essentially, deep learning operates through hierarchical networks of interconnected nodes, which gradually extract abstract features from raw sensory data. This structure resembles the composition of the human nervous system, where the initial layers of neurons deal with elementary stimuli (such as edges or movements), while higher layers fuse this information into conscious categories, concepts, and representations. The training process—through error backpropagation, optimization, and generalization—can be seen as a strategy for minimizing functional entropy, where the system adjusts its internal weights to decrease the difference between predictions and actual results.

From the angle of Emergent Flow Theory (KET), deep learning is presented as a technical metaphor—and also as an instrument of exploration—that reveals the general dynamics of conscious flow: a gradual hierarchical integration of structured information, where each layer or level organizes, transforms, and transmits patterns that are assembled into broader functional systems. Just as in deep learning representation is enhanced through successive layers, in TFE consciousness is developed through multilevel integrative structures, ranging from the bioelectrical activity of cells to the synchronization of cortical networks.

Additionally, deep learning makes it possible to model and simulate adaptive behaviors in systems that are not explicitly programmed, which aligns with one of the fundamental principles of TFE: self-organization driven by informational efficiency, without the need for central design. These simulations have even been used to create architectures capable of performing visual, auditory or motor tasks with performance levels similar to those of biological organisms, which

shows that consciousness does not depend on a particular substrate, but requires a functional structure capable of integrating information with contextual coherence.

However, TFE brings with it a key distinction: unlike deep learning models that operate with explicit algorithms in digital environments, the emergent consciousness described in TFE comes from non-algorithmic material interactions, which involve quantum, bioelectric, and morphogenetic elements. The TFE suggests that deep learning, while lacking consciousness, superficially reflects the information-processing methods that could generate conscious states if integrated into systems with the capacity for self-regulation and integration at multiple scales.

In this context, deep learning is presented not only as a technical metaphor, but as an experimental environment to investigate and test elements of the informational flow that underpin consciousness. Simulating levels of increasing integration, observing the emergence of internal representations, and identifying crucial thresholds of functional organization can provide valuable insights into the necessary—though not sufficient—conditions for the emergence of subjectivity. Therefore, the EFT benefits from advances in artificial intelligence to develop models inspired by biology that facilitate the exploration of informational emergence paths, the validation of hierarchical theories and the establishment of comparisons between what is learned artificially and what is naturally integrated.

In short, deep learning and EFT intersect in their view of consciousness as a phenomenon of progressive informational integration. While the former provides a technical framework for the hierarchical simulation of knowledge, the TFE suggests an informational ontology that encompasses the computational, the biological, and the quantum, arguing that consciousness goes beyond mere efficient processing and entails a structured synthesis of information in self-referential and evolutionary contexts. This convergence opens up a productive space for the development of hybrid models, simulated experiments, and new hypotheses about the foundations of conscious experience.

## Discussion

The current study has created an original theoretical proposal to examine the phenomenon of consciousness from an ontological, hierarchical and informational approach. The Emergent Flow Theory (EFT) is presented as a model that crosses disciplines and combines elements of quantum physics, neuroscience, cell biology and artificial intelligence, with the aim of going beyond the explanatory limitations of existing theories, both reductionist and idealistic. Rather than seeing consciousness as a simple result of the brain or as a separate metaphysical entity, TFE interprets it as a flow of informational integration that advances and is present at all structural levels of reality, ranging from the subatomic to the self-referentiality of the human self.

One of the most outstanding contributions of this theory is the redefinition of consciousness as an organizing ontological principle, which can regulate informational trajectories in open systems through mechanisms that do not follow an algorithm. In this context, consciousness would not only be an emergent feature of biological complexity, but an essential capacity of the universe to create coherence, decrease entropy, and maintain stable functional structures. This hypothesis is based on both philosophical bases and scientific evidence ranging from the non-abelian statistics of anyons to the bioelectrical intelligence observed in multicellular organisms.

The study has shown how different current scientific theories – such as Karl Friston's free energy principle, Stuart Kauffman's quantum consciousness, Max Tegmark's computational proposal and Michael Levin's bioelectricity analyses – are partially intertwined with the foundations of the TFE, although they do not achieve a complete connection. The TFE collects these contributions within a coherent framework that unites quantum, biological and computational aspects, capable of sustaining a vision of consciousness as a distributed and evolving phenomenon.

In addition, the study suggests that the EFT should not be just an exercise in theoretical speculation. An experimental scheme of empirical validation is proposed that consists of three main routes: (1) the analysis of quantum structures with historical memory such as anyones; (2) the investigation of bioelectrical networks that show non-neural adaptations; and (3) the evaluation of patterns of functional integration in brain activity using computational models and graph theory. These routes establish criteria of falsifiability, placing the TFE in a legitimate position within the current scientific debate.

From an epistemological point of view, the Existential Fluid Theory suggests a significant change in the paradigm: it indicates that consciousness is not simply an accidental result of evolution or a characteristic that arises late, but a structural and functional basis of the cosmos, which orients the self-organization of matter towards more complex forms of informational integration. This perspective gives consciousness a fundamental role in explanation, not as the culmination of the evolutionary process, but as an engine that generates order, coherence and meaning.

In summary, this research indicates that the Existential Fluid Theory not only helps to clarify the question of consciousness, but also opens new avenues for both empirical and philosophical research, suggesting an integrative framework that connects science, ontology, and teleology. In its vast theory and transdisciplinary approach, the Existential Fluid Theory does not seek to replace previous models, but to offer a broader explanatory vision, where being, knowledge and feeling can be seen as different manifestations of the same flow: the conscious flow of existence.

## Conclusions

The current study has presented a new theoretical model for understanding the phenomenon of consciousness: the Emergent Flow Theory (EFT). This proposal emerges as a solid alternative to the limitations of reductionist approaches, which focus only on brain activity, and idealistic perspectives that consider consciousness as a metaphysical entity without empirical foundation. The TFE develops a hierarchical informational ontology that allows consciousness to be seen as an uninterrupted flow of structural integration of information, which evolves from the subatomic to the self-reflection of the self.

Unlike linear or binary models that fragment the study of the mind, EFT offers a dynamic, multilevel, and non-local perspective on consciousness, where matter, energy, and information are intertwined in processes of self-organization guided by protoconscious principles. This theory is based on the idea that consciousness is not a mere biological accident or just an emergent property of neural complexity, but that it constitutes an organizational force of the universe, which directs the configuration of reality towards higher levels of coherence, functional stability and integration of information.

Among the main contributions of this research are:

The creation of a pan-hierarchical informational ontology, where existence is understood as a continuous process of informational concrescence that governs the emergence of stable patterns from the quantum base to complex cognitive structures.

The inclusion of Karl Friston's principle of free energy, not only as a predictive model of the brain, but as a law that organizes living and non-living systems to reduce their functional entropy by anticipating future states.

Michael Levin's confirmation of bioelectrical intelligence as an intermediate expression of conscious flow, showing that decision-making, morphogenetic memory storage, and functional organization can be observed in non-neuronal cellular systems, supporting the idea that consciousness does not arise suddenly in the brain, but is the result of gradual organization.

The convergence of concepts with Stuart Kauffman's quantum consciousness and Max Tegmark's computational proposal, which allows us to unite approaches that seem divergent in an integrated vision where the quantum, the algorithmic and the biological are functional expressions of the same flow of information.

The presentation of an experimental framework for empirical validation, which makes EFT a theory that can be tested and refuted through three complementary methods: quantum and topological simulations (fundamental level), bioelectrical analysis in multicellular systems (morphogenetic level) and the study of brain connectivity using neuroimaging and graph theory (neurocognitive level).

The idea of a structural teleology posits that consciousness plays an organizing and evolutionary role, oriented towards the hierarchical integration of different types of information, rather than being a mere random phenomenon or a biological epiphenomenon.

From an epistemological approach, the Emergent Flow Theory (EFT) challenges the principles that govern the interaction between mind and matter, opening up new possibilities for the scientific and philosophical study of consciousness. This perspective indicates that subjective experience is not a simple unobservable consequence, but can be seen as a measurable structural manifestation, the indication of which can be traced in the organization of the universe at various scales. From this point of view, consciousness is presented not as a single or isolated phenomenon, but as a complex network of structural resonances, whose objective is to maintain the coherence of the system to which it is a part.

This study also paves the way for the advancement of biology-inspired technologies, computer simulation of emergent processes, the convergence between neuroscience and quantum physics, as well as the creation of hybrid models that are capable of replicating conscious functions from a distributed architecture. In addition, it encourages a reconsideration of the ethical status of non-human systems that possess a sophisticated informational organization, which has profound repercussions in areas such as artificial intelligence, synthetic biology and robotics.

To conclude, the Emergent Flow Theory (EFT) represents an innovative and multidisciplinary proposal that not only provides a clearer and more coherent understanding of the phenomenon of consciousness, but also lays the foundations for a new scientific model that integrates the physical, biological, informational and subjective into a single explanatory structure. At a time when reductionism has reached its limits, EFT is presented as a possible link between being, knowing, and feeling, suggesting that consciousness is not the culmination of the evolutionary

process, but its most fundamental organizing root.

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