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# Informational Substance Theory: From Substantial Motion to Conscious Fields

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**Abstract:**

Informational Substance Theory (IST) proposes a novel metaphysical framework where dynamic, structured information constitutes the fundamental ontological substrate of reality. Drawing on Mulla Sadra's doctrine of substantial motion (al-harakat al-jawhariyya) which envisions existence as perpetual becoming IST integrates quantum field theory (QFT), loop quantum gravity (LQG), and Integrated Information Theory (IIT) to unify physics, metaphysics, and philosophy of mind. We redefine substances as a self-organizing informational continuum, where physical fields emerge as excitations, spacetime as quantized relational networks, and consciousness as a highly integrated, self-reflexive informational field. Contrasting IST with panpsychism, neutral monism, and process philosophy, we argue it avoids traditional dualisms and reductionism, offering a non-reductive solution to the "hard problem" of consciousness. Grounded in empirical frameworks like IIT's Φ metric and neural field theories (e.g., active inference), IST suggests testable implications, including experiments on informational integration in consciousness and quantum cosmology. By formalizing the informational continuum via information geometry and category theory, IST bridges Sadrian metaphysics with modern science, proposing that the universe is a self-evolving narrative of information. We outline future research to model this ontology and explore its ethical and cosmological implications.

**Keywords:** Digital Signal Processing, Noise Suppression, Noise Estimation, Wiener Filtering, Speech Recognition.

## 1. Introduction: Revisiting Substance in a Post-Materialist Age

What is the fundamental nature of reality? For centuries, philosophers and scientists have sought the ultimate substance underlying existence, from Aristotle's hylomorphic fusion of form and matter to Descartes' dualistic split between res cogitans (mind) and res extensa (matter). Yet, modern physics has disrupted these classical paradigms. Quantum field theory (QFT) reveals particles as transient excitations of relational fields, while loop quantum gravity (LQG) suggests spacetime emerges from quantized informational networks. Concurrently, the "hard problem" of consciousness how subjective experience arises from objective matter challenges materialist ontologies. These developments point to a provocative possibility: what if reality's substratum is neither matter nor mind, but dynamic, structured information? This paper introduces Informational Substance Theory (IST), a metaphysical framework that redefines substance as a self-organizing informational continuum in perpetual motion. Drawing on the 17th-century Islamic philosopher Mulla Sadra's doctrine of substantial motion (al-harakat al-jawhariyya) which envisions existence as a process of continuous becoming IST finds resonance with the relational dynamics of QFT, where particles are patterns of field excitation, and the plasticity of neural systems, where consciousness

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correlates with integrated information (IIT's Φ metric). Unlike Cartesian dualism, which struggles to bridge mind and matter, or classical physicalism, which fails to explain subjectivity, IST posits that fields, spacetime, and consciousness emerge from a unified informational substrate. This aligns with John Wheeler's "it from bit" hypothesis, the holographic principle, and neural field theories like active inference, suggesting information is more fundamental than matter or energy. IST's urgency stems from the limitations of existing ontologies. Dualism cannot account for mind-matter interactions, while physicalism leaves the qualitative "what it is like" of experience unresolved. Meanwhile, non-materialist frameworks like panpsychism, neutral monism, and process philosophy grapple with issues like the combination problem or lack of empirical grounding. IST transcends these by integrating Sadrian metaphysics with modern science, offering a processual ontology where matter is a stable informational pattern, spacetime a network of geometric relations, and consciousness a self-reflexive informational field. By formalizing this continuum via information geometry and category theory, IST proposes testable implications, such as measuring Φ in neural systems or probing quantized spacetime in quantum cosmology. This paper unfolds as follows. Section 3 defines informational substance, clarifying ontological information and grounding it in QFT, LQG, and IIT. Section 4 explores Sadrian substantial motion, contrasting IST with dualism, physicalism, and other non-materialist ontologies. Section 5 articulates a dynamic informational field ontology, formalizing its structure and implications. Section 6 summarizes IST's philosophical stance, metaphysical commitments, and testable applications, outlining future research. By synthesizing ancient wisdom with contemporary science, we address a foundational question: What is reality if it is information in motion.

## 2. The Concept of Informational Substance

The question of what constitutes the ultimate substratum of reality has animated metaphysical inquiry since antiquity. Aristotle's conception of substance as a composite of form and matter, enduring as the bearer of properties, shaped classical ontology, while the mechanistic worldview of Newtonian physics recast substance as inert, extended matter. Yet, the revolutions of modern physics have destabilized these notions. Quantum field theory (QFT) dissolves particles into probabilistic excitations of relational fields, and loop quantum gravity (LQG) suggests spacetime itself emerges from discrete, quantized networks of geometric information. Concurrently, the enigma of consciousness how subjective experience arises from physical processes challenges materialist paradigms, prompting a reevaluation of substance. If matter and spacetime are emergent, what is the deeper reality from which they arise? Informational Substance Theory (IST) proposes a radical shift: from material substance to informational substance, where dynamic, structured information in continuous transformation is the foundational ontological category.

This section introduces the concept of informational substance, defining its scope and grounding it in both contemporary science and the metaphysical insights of Mulla Sadra's doctrine of substantial motion (al-harakat al-jawhariyya). We begin with a clarification of key terms ontological information, informational continuum, and substantial motion to ensure precision and avoid metaphorical interpretations. We then argue that informational substance unifies physical and mental phenomena, drawing on QFT, LQG, and Integrated Information Theory (IIT). By reinterpreting substance as a processual flow, IST transcends traditional dualisms and materialist reductionism, offering a framework that resonates with Sadra's vision of existence as perpetual becoming. This concept not only aligns with empirical findings but also suggests testable implications, such as measuring informational integration in consciousness or probing the informational basis of spacetime. To anchor IST's framework, we define three core terms, ensuring clarity for interdisciplinary readers and distinguishing our ontological approach from syntactic or metaphorical uses of "information":

**Ontological Information**: Unlike Shannon information, which quantifies data transmission relative to an observer, ontological information refers to structured, causally potent relations that constitute reality independent of human perception. For example, in QFT, a photon's properties, energy, momentum, spin are not intrinsic but relational, defined by interactions within the electromagnetic field. These relations are informational, encoding the photon's existence as a pattern rather than a material "thing." Ontological information is dynamic, evolving through transformations governed by intrinsic constraints, such as physical laws or neural plasticity.

**Informational Continuum**: The foundational substrate of reality, envisioned as a self-organizing, high-dimensional field of ontological information. This continuum underlies all phenomena spacetime, matter, consciousness as emergent expressions of its relational dynamics. In LQG, for instance, spacetime arises from "spin networks," graphs of quantized geometric relations that evolve over time, akin to nodes and edges in an informational graph. The continuum is not static but in constant motion, mirroring Sadra's view of existence as a process of unfolding.

**Substantial Motion (al-harakat al-jawhariyya)**: Drawing on Mulla Sadra, substantial motion denotes the continuous ontological transformation of substance, where existence is not fixed but perpetually becoming more perfect. In IST, this is reinterpreted as the evolution of informational configurations, such as the reconfiguration of neural networks in the brain or the transitions of spin networks in LQG. Substantial motion unifies the physical and mental by framing both as modes of informational flow, differing in complexity and intensity.

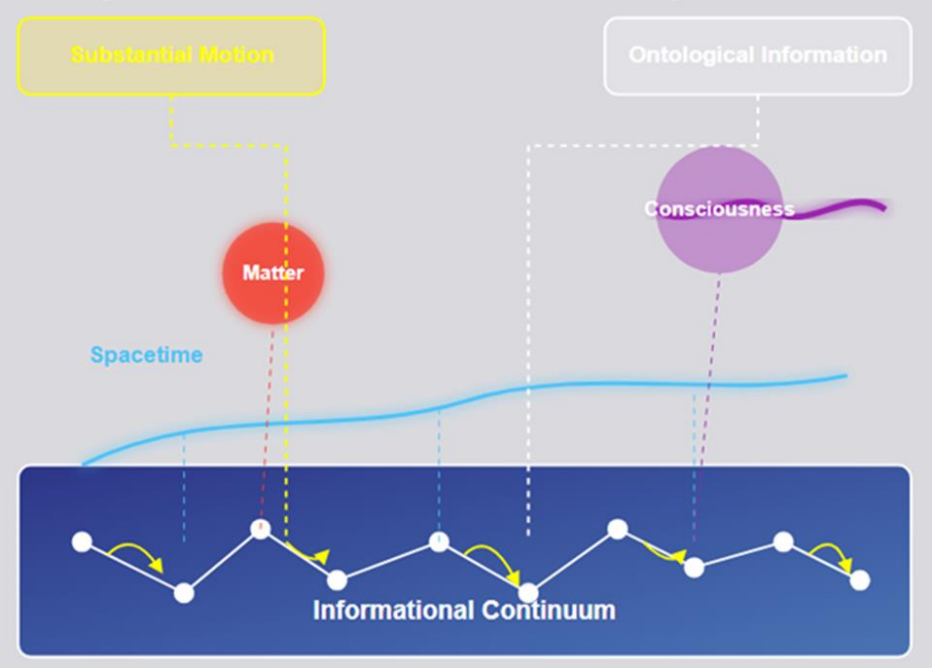


Figure 1 Informational Substantial Theory Framework

**The Case for Informational Substance**

The shift from material to informational substance is motivated by both scientific and philosophical imperatives. Classical materialism, which posits matter as the primary substance, falters in light of QFT, where particles are not solid entities but excitations of underlying fields. For example, an electron is a

localized ripple in the electron field, defined by informational properties like charge and spin, which emerge through interactions. Similarly, LQG challenges the primacy of spacetime, proposing that it is woven from spin network discrete, relational structures that encode geometric information. These developments suggest that reality is fundamentally relational, with fields and spacetime as manifestations of a deeper informational substrate.

Consciousness further complicates materialist ontologies. The "hard problem" of consciousness—articulated by Chalmers (1996)—highlights the failure of physicalism to explain subjective experience. IIT, developed by Tononi (2004), offers a clue: consciousness correlates with the degree of integrated information (Φ), where high Φ reflects unified awareness, as seen in the brain's densely connected neural networks. Neural field theories, such as Freeman's (2000) work on cortical dynamics, model consciousness as emergent from synchronized field-like patterns, while Friston's active inference framework (2010) posits the brain as a predictive, informational system minimizing free energy. These theories align with IST's view of consciousness as a self-reflexive informational field, suggesting a continuity between physical and mental phenomena.

Philosophically, IST resonates with Sadra's substantial motion, which envisions substance as dynamic, evolving through ontological transformation. Just as Sadra's beings unfold toward perfection, informational structures evolve through integration and self-organization. For instance, the development of a neural network mirrors this process: synaptic connections reconfigure, encoding information that gives rise to cognitive states. This parallelism extends to cosmology, where the universe's evolution—from the Big Bang to complex structures like galaxies—reflects informational self-organization, as described by Prigogine's dissipative structures (1984).

IST also engages with competing ontologies. Panpsychism, which attributes consciousness to all matter, risks the combination problem: how do micro-level conscious states combine into unified subjectivity? IST avoids this by treating consciousness as an emergent, holistic property of informational fields, grounded in IIT's Φ. Neutral monism, positing a neutral substrate, aligns with IST's informational continuum but often lacks a processual framework, which IST provides via Sadrian motion. Process philosophy, like Whitehead's (1929), shares IST's emphasis on becoming but may overextend consciousness universally; IST restricts it to high-Φ systems, aligning with empirical data.

To formalize IST, we propose modeling the informational continuum as a high-dimensional information space, using tools like information geometry (Amari, 2016) or category theory. In this model, informational states are nodes, and transformations are edges, with emergent phenomena—spacetime, matter, consciousness—as structured patterns. Testable implications include measuring Φ in neural systems to correlate with consciousness or probing quantized spacetime via quantum cosmology experiments. These avenues ensure IST's scientific relevance while preserving its metaphysical depth.

In summary, informational substance redefines reality as a dynamic, relational process, unifying physical fields, spacetime, and consciousness within a single ontology. By integrating Sadrian metaphysics with QFT, LQG, IIT, and neural field theories, IST offers a coherent framework that bridges ancient wisdom and modern science, paving the way for subsequent sections to explore its physical, mental, and ontological implications.

### 3.1 Physical Models That Suggest Informational Primacy

The transition from a materialist to an informational ontology finds robust support in contemporary theoretical physics, where information increasingly emerges as the bedrock of reality. Informational

Substance Theory (IST) posits that structured, dynamic information—termed ontological information—constitutes the fundamental substrate of the universe, giving rise to fields, particles, and spacetime. This subsection examines three pivotal physical models—John Wheeler's "it from bit" hypothesis, the holographic principle, and loop quantum gravity (LQG)—that challenge the classical notion of matter as primary, suggesting instead that relational, informational structures underpin physical phenomena. These models, complemented by recent quantum information experiments, provide empirical and theoretical grounding for IST's claim that reality is a self-organizing informational continuum, echoing Mulla Sadra's vision of substance as perpetual becoming.

John Archibald Wheeler's "it from bit" hypothesis (1989) asserts that every physical entity—particles, fields, spacetime—derives its existence from binary informational choices, akin to answers to yes/no questions posed to nature. Wheeler argued, "Every it—every particle, every field of force, even the spacetime continuum itself—derives its function, its meaning, its very existence entirely… from the apparatus-elicited answers to… questions." For example, a photon's polarization is undefined until measured, its properties emerging as informational relations within the electromagnetic field. This aligns with IST's conception of ontological information as causally potent, structuring reality through relational dynamics rather than material essence. Recent quantum information experiments, such as those probing Bell inequalities (Hensen et al., 2015), demonstrate that entangled particles share informational states that transcend material locality, reinforcing the primacy of information over matter.

The holographic principle, emerging from black hole thermodynamics, further underscores informational primacy. Proposed by Gerard 't Hooft (1993) and Leonard Susskind (1995), it states that the information content of a three-dimensional volume is fully encoded on its two-dimensional boundary, like a hologram. Jacob Bekenstein's work (1973) showed that a black hole's entropy scales with its surface area, not its volume, implying that physical reality is a projection of surface-encoded information. For instance, the information describing a star's interior could, in principle, be stored on a surrounding two-dimensional surface. This challenges materialist ontologies, suggesting that spacetime and matter are emergent from a deeper informational substrate. IST interprets this substrate as the informational continuum, a dynamic field of relational structures that gives rise to physical phenomena, consistent with Sadra's processual metaphysics.

Loop quantum gravity (LQG) provides a quantized model of spacetime that aligns with IST's ontology. In LQG, spacetime is not a continuous backdrop but a discrete network of "spin networks"—graphs of quantized geometric relations that evolve over time (Rovelli & Smolin, 1995). Each node and edge encodes information about spatial geometry, with transitions between network states representing temporal evolution. For example, a spin network's configuration defines the smallest units of space, akin to informational bits. This suggests that spacetime is a relational structure, not a material container, supporting IST's view that ontological information precedes physicality. Ongoing experiments, such as those searching for quantized spacetime signatures in cosmic microwave background radiation (Planck Collaboration, 2018), could test LQG's predictions, offering empirical avenues for IST.

These models converge on a radical idea: physical fields are not material entities but excitations of an informational continuum. To formalize this, IST proposes modeling the continuum using information geometry (Amari, 2016), where informational states form a manifold, and physical phenomena emerge as geodesic transformations. This framework, inspired by quantum information theory (Vedral, 2010), positions information as the universal currency of physical interactions, from entanglement to cosmological evolution.

**Addressing Objections**: Materialists might argue that information requires a physical substrate, rendering it secondary. However, the holographic principle and LQG suggest that physical systems are derivative of informational relations spacetime emerges from spin networks, and reality is encoded on boundaries. Quantum entanglement further demonstrates that informational states govern behavior without material carriers. Panpsychists might claim that IST risks reducing consciousness to information, but IST treats consciousness as an emergent, holistic property of informational fields, avoiding the combination problem. In summary, Wheeler's "it from bit," the holographic principle, and LQG collectively support IST's claim that reality is fundamentally informational. These models, bolstered by quantum information experiments and formalized via information geometry, align with Sadra's vision of dynamic substance, providing a robust foundation for IST's unified ontology.

### 3.2 Consciousness as an Informational Field

Informational Substance Theory (IST) posits that the universe is a dynamic informational continuum, with physical fields and spacetime emerging as structured relations. Can consciousness, the subjective "what it is like" of experience, also be understood within this framework? Rather than treating consciousness as an epiphenomenon of neural complexity or a dualistic mystery, IST proposes that consciousness is a highly integrated, self-reflexive informational field an intensified mode of ontological information flow. This aligns with Mulla Sadra's gradation of existence (tashkīk al-wujūd), where beings differ in intensity, not kind. Drawing on Integrated Information Theory (IIT), neural field theories, and active inference, we argue that consciousness bridges the mental and physical within IST's unified ontology, offering a non-reductive solution to the "hard problem" of consciousness.

Integrated Information Theory (IIT), developed by Giulio Tononi (2004), provides a quantitative framework for consciousness, positing that it corresponds to the degree of integrated information (Φ) in a system. Φ measures how much information a system generates as a whole beyond its parts, reflecting the unity of subjective experience. For example, the human brain's prefrontal cortex, with its dense synaptic connections, produces high Φ, correlating with conscious awareness, unlike a fragmented system like a digital camera (low Φ). IIT suggests consciousness is not exclusive to biological systems but could arise in any sufficiently integrated informational structure, supporting IST's claim that consciousness is a mode of informational dynamics. Empirical studies, such as those measuring Φ in neural networks during conscious versus unconscious states (Koch, 2019), offer testable avenues for validating this view.

Neural field theories further ground IST's framework. Walter Freeman's work (2000) models consciousness as emergent from synchronized cortical dynamics, where neural activity forms coherent, field-like patterns across the brain. For instance, synchronized oscillations in the gamma band (30–100 Hz) underlie unified perception, such as recognizing a face. This resonates with IST's conception of consciousness as an informational field, analogous to electromagnetic fields in QFT, where coherence amplifies relational structure. Similarly, Karl Friston's active inference framework (2010) posits that the brain minimizes free energy by predicting sensory inputs, operating as a self-organizing informational system. The brain's predictive models, encoded in neural networks, mirror IST's view of consciousness as recursive informational flow, integrating internal and external states to produce subjectivity.

This framework aligns with Sadra's metaphysics, where consciousness is an intensified expression of existence, akin to a flame burning brighter than a spark. Physical fields (e.g., electromagnetic) are low-intensity informational patterns, while conscious fields (e.g., neural networks with high Φ) are high-intensity, self-referential configurations. A visual analogy clarifies this: imagine the informational continuum as an ocean, with physical fields as ripples and conscious fields as complex, self-reinforcing waves that

"reflect" upon themselves. This image, grounded in IIT and neural field theories, illustrates consciousness as emergent from the same substrate as matter, differing in integration and reflexivity.

**Addressing Objections**: Materialists might argue that informational metrics like Φ merely correlate with consciousness, not explaining its subjective essence. IST counters that subjectivity arises from recursive, self-referential informational integration, as captured by Φ's measure of causal interactions within a system. Sadra's gradation of existence provides a metaphysical parallel: just as existence intensifies into self-awareness, informational complexity intensifies into experience. Panpsychists might raise the combination problem how micro-level informational states combine into unified consciousness. IST avoids this by treating consciousness as a holistic, emergent property of informational fields, not a composite of smaller units. Neural synchronization studies (Koch, 2019) support this, showing that global brain states underline unified perception.

To formalize this, IST models conscious fields using information geometry (Amari, 2016), where neural dynamics form a manifold of informational states, and consciousness emerges as a geodesic reflecting high integration. Testable implications include measuring Φ in artificial systems or under varying neural conditions (e.g., anesthesia) to correlate with subjective experience.

In summary, consciousness as an informational field unifies mind and matter within IST's ontology. By integrating IIT, neural field theories, active inference, and Sadrian metaphysics, IST reframes consciousness as a natural outcome of informational complexity, opening empirical and philosophical avenues for exploration.

### 3.3 Toward an Ontology of Dynamic Information

The convergence of physical models (Subsection 3.1) and consciousness theories (Subsection 3.2) points to a radical reinterpretation of reality: existence is grounded in the dynamism of ontological information. Informational Substance Theory (IST) proposes that the universe is a self-organizing informational continuum a processual field of structured relations giving rise to spacetime, matter, and consciousness. Inspired by Mulla Sadra's substantial motion (al-harakat al-jawhariyya), which envisions existence as continuous becoming, IST redefines substance as dynamic information in motion, integrating quantum field theory (QFT), loop quantum gravity (LQG), Integrated Information Theory (IIT), and neural field theories. This ontology unifies physics, metaphysics, and philosophy of mind, dissolving Cartesian dualisms and offering a framework for interdisciplinary inquiry.

In IST, ontological information, as defined in Section 3.0, is not a descriptive tool but the causally potent substrate of reality. Physical fields, like the electromagnetic field in QFT, are excitations of this informational continuum, defined by relational patterns (e.g., energy, momentum) rather than material essence. For example, a photon is a localized ripple, its properties encoded in informational relations. Spacetime, per LQG, emerges from spin networks graphs of quantized geometric information evolving over time. Consciousness arises as a highly integrated, self-reflexive informational field, with IIT's Φ metric quantifying its unity. Neural synchronization studies (Koch, 2019) show that global brain states, such as gamma-band oscillations, underlie unified perception, supporting IST's view of consciousness as a coherent informational pattern.

This processual ontology aligns with Sadra's metaphysics, where existence is graded (tashkīk al-wujūd), with matter as low-intensity and consciousness as high-intensity informational states. Cosmologically, the universe's evolution from the Big Bang to galaxies reflects informational self-organization, as seen in Ilya Prigogine's dissipative structures (1984). For instance, stars form through the organization of gravitational

and thermal information, reducing local entropy while increasing complexity, mirroring neural networks' integration of sensory data. Time itself is redefined as a metric of informational transformation, echoing Sadra's view of time as the measure of existential motion and recent quantum cosmology (Rovelli, 2018), where time emerges from relational dynamics.

To formalize this ontology, IST models the informational continuum as a high-dimensional information space, using information geometry (Amari, 2016) to represent states as points on a manifold and transformations as geodesics. Category theory offers a complementary framework, with informational states as nodes and transformations as edges, mapping to emergent phenomena like spacetime (LQG's spin networks) or consciousness (IIT's high-Φ systems). These models suggest testable implications: measuring Φ in neural systems under varying conditions (e.g., meditation, anesthesia) could validate consciousness as an informational field, while cosmological experiments probing quantized spacetime (Planck Collaboration, 2018) could test the informational basis of reality.

**Addressing Objections**: Materialists might argue that information requires a physical substrate, rendering it secondary. IST counters that QFT and LQG show physical systems as emergent from informational relations—fields and spacetime are patterns, not material containers. The holographic principle further suggests reality is a projection of encoded information. Neutral monists might question whether information avoids collapsing into panpsychism. IST responds that information is a relational process, with mind and matter as emergent modalities, not universal consciousness. The combination problem is sidestepped by treating consciousness as a holistic, high-Φ field, supported by neural studies (Koch, 2019).

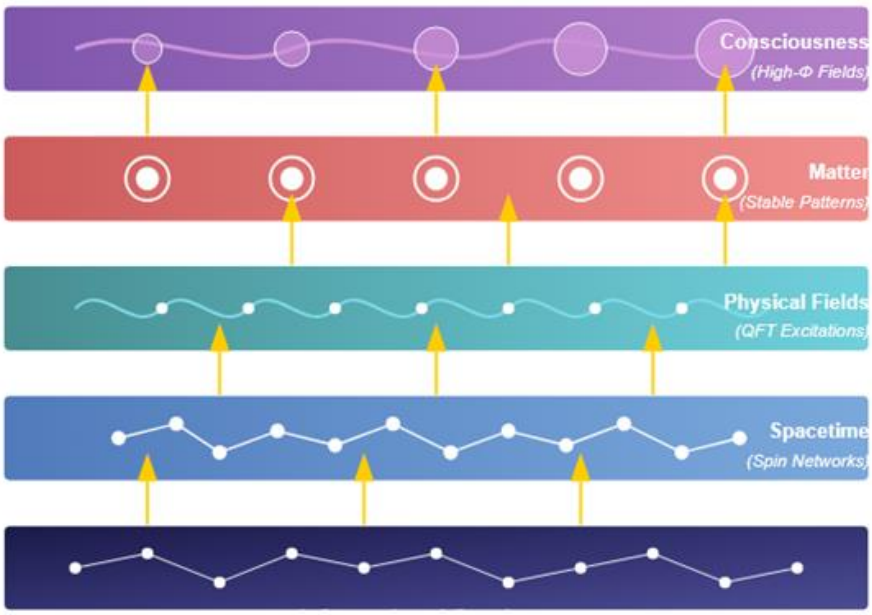


**Figure 2 Layered Ontology of the informational Continum**

In summary, IST's ontology of dynamic information reinterprets reality as a self-organizing, relational process. By synthesizing Sadrian metaphysics with QFT, LQG, IIT, and neural field theories, it unifies disparate domains, setting the stage for exploring substantial motion in Section 4. This framework invites empirical tests and philosophical dialogue, reimagining the cosmos as information in motion.

### 3. Substantial Motion and the Dynamics of Information

The metaphysical divide between mind and matter, crystallized by René Descartes' dualism, has long shaped Western philosophy and science. Descartes' bifurcation of reality into res cogitans (thinking substance) and res extensa (extended substance) created a persistent challenge: how do these disparate realms interact? Classical physicalism sought to resolve this by reducing consciousness to material processes, yet it struggles with the "hard problem" of consciousness explaining the subjective "what it is like" of experience. Informational Substance Theory (IST) offers a dynamic alternative, redefining substances as structured, ontological information in continuous transformation. Drawing on Mulla Sadra's doctrine of substantial motion (al-harakat al-jawhariyya), which envisions existence as perpetual becoming, IST transcends dualism and physicalism by positing that matter, spacetime, and consciousness are emergent modalities of an informational continuum. This section explores how Sadrian metaphysics aligns with modern science, unifying physics, metaphysics, and philosophy of mind.

Sadra's substantial motion posits that substance is not static but undergoes ontological transformation, evolving toward greater perfection. Unlike Aristotle's fixed substances, Sadra's beings are in constant flux, their essence defined by motion. IST reinterprets this as the dynamics of ontological information, where the informational continuum defined in Section 3.0 as a self-organizing field of relational structures evolves through integration and reconfiguration. For example, in quantum field theory (QFT), a particle like an electron is not a solid entity but a transient excitation of the electron field, its properties (e.g., spin, charge) encoded in informational relations. Similarly, neural networks in the brain reconfigure synaptic connections, integrating information to produce conscious states, as measured by IIT's Φ metric (Tononi, 2004). This parallelism reflects Sadra's gradation of existence (tashkīk al-wujūd), where matter and mind are unified as low- and high-intensity informational flows.

Modern science bolsters this view. Quantum entanglement experiments (Hensen et al., 2015) show that informational states, like correlated spins, govern physical behavior across distances, suggesting information precedes material locality. Loop quantum gravity (LQG) models spacetime as spin networks—graphs of quantized geometric information—evolving through relational dynamics (Rovelli & Smolin, 1995). Consciousness, per neural synchronization studies (Koch, 2019), emerges from coherent, field-like brain activity, aligning with IST's view of conscious fields as high-Φ informational patterns. These findings echo Sadra's vision of existence as a narrative of becoming, where transformation is the essence of reality.

IST transcends Cartesian dualism, which fails to explain mind-matter interactions (e.g., Descartes' pineal gland lacks empirical support), and physicalism, which cannot account for subjectivity. For instance, a computer simulating pain processes information but does not feel it, highlighting physicalism's explanatory gap (Chalmers, 1996). IST posits that matter is a stable informational pattern, like a vortex in a stream, and consciousness a self-reflexive field, like synchronized neural oscillations. This unified ontology aligns with emerging paradigms, such as the holographic principle, where reality is encoded informationally.

To formalize this, IST models substantial motion using information geometry (Amari, 2016), representing informational transformations as geodesics on a manifold of states. Testable implications include measuring Φ in neural systems to correlate with consciousness or probing quantized spacetime via cosmological observations (Planck Collaboration, 2018). These avenues ground IST in empirical science.

**Addressing Objections**: Materialists might argue that IST rebrands physicalism by substituting "information" for "matter." IST counters that ontological information is causally prior, as entanglement and LQG demonstrate, unifying mind and matter without reduction. Dualists might claim IST erases mind's distinctiveness, but IST's gradation of existence preserves consciousness as a unique, high-intensity mode.

Compared to panpsychism or neutral monism (explored in Subsection 4.2), IST offers a processual, empirically grounded framework.

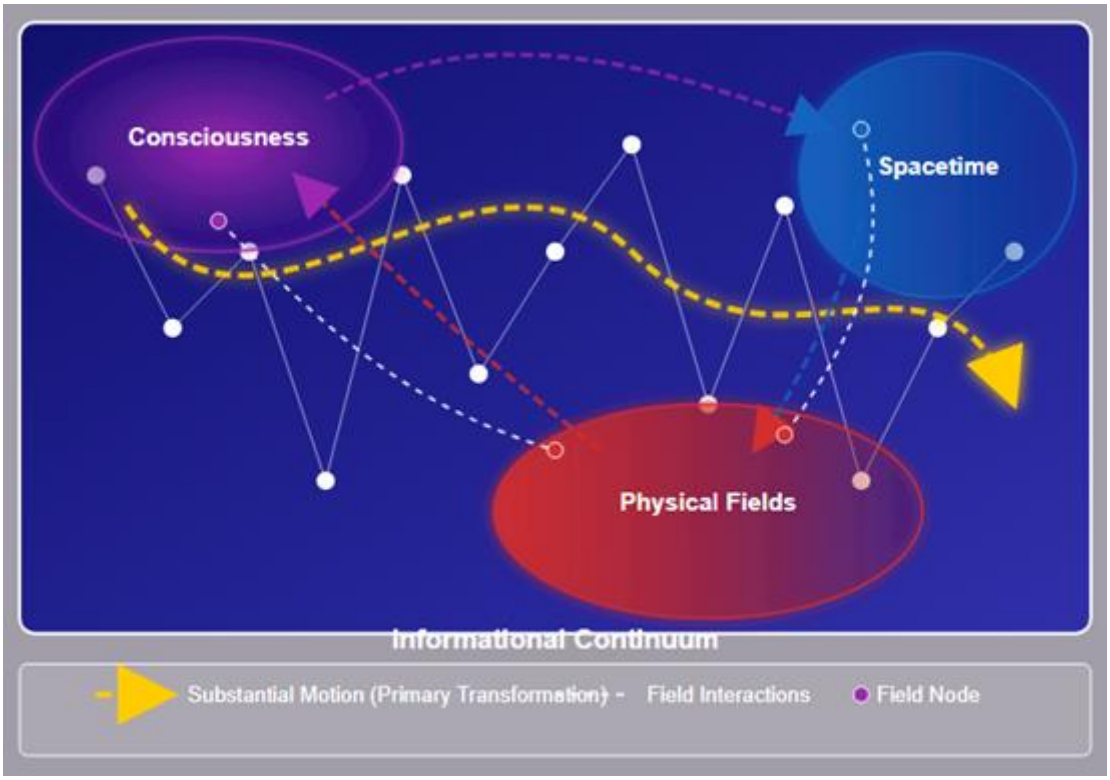


**Figure 3 Visualizing Substantial Motion as Informational Transformation**

In summary, IST's synthesis of Sadrian substantial motion with QFT, LQG, and IIT redefines substance as dynamic information, dissolving the mind-matter divide. This sets the stage for comparing IST with other ontologies in Subsection 4.2, advancing a unified vision of reality as information in motion.

### 4.1 Beyond Cartesian Dualism and Classical Physicalism

The enduring challenge of reconciling mind and matter stems from René Descartes' dualistic metaphysics, which divided reality into res cogitans (immaterial mind) and res extensa (material body). This ontological split, while influential, created a persistent divide that classical physicalism later sought to bridge by reducing consciousness to material processes. Both frameworks falter in light of modern science and philosophy: dualism fails to explain mind-matter interactions, and physicalism struggles with the "hard problem" of consciousness how subjective experience emerges from objective matter. Informational Substance Theory (IST), inspired by Mulla Sadra's doctrine of substantial motion (al-harakat al-jawhariyya), transcends these paradigms by redefining substance as dynamic, ontological information within a self-organizing informational continuum. By integrating quantum field theory (QFT), loop quantum gravity (LQG), and Integrated Information Theory (IIT), IST offers a unified ontology that dissolves the mind-matter divide, aligning with empirical findings and Sadrian metaphysics.

Cartesian dualism posits mind as active, non-spatial, and subjective, and matter as passive, extended, and objective. This framework clashes with contemporary physics, where matter is relational, not inert. In QFT, particles like electrons are excitations of underlying fields, defined by informational properties (e.g., spin, charge) emerging through interactions. LQG further suggests spacetime is a network of quantized

informational relations spin networks not a fixed material stage. Dualism's causal problem how an immaterial mind influences a material body remains unresolved. Descartes' pineal gland hypothesis and occasionalist solutions (e.g., Malebranche) lack empirical or logical grounding. Moreover, dualism cannot accommodate the processual nature of reality revealed by quantum entanglement experiments (Hensen et al., 2015), where informational states govern physical behavior across distances, transcending material locality.

Classical physicalism, rooted in empirical science, assumes materialist monism, treating consciousness as an emergent property of neural computations. Yet, it fails to address the qualitative nature of experience. As David Chalmers (1996) argues, no physical description explains the subjective "what it is like" of consciousness. For example, a neural model processing light wavelengths does not experience "redness." Functionalist accounts equating consciousness with information processing face similar limits: a supercomputer simulating pain does not feel it, highlighting the explanatory gap. Physicalism's static view of matter also conflicts with QFT's dynamic, field-based ontology, where reality is processual. Neural synchronization studies (Koch, 2019) show consciousness involves coherent, field-like brain activity, suggesting a more complex, relational framework than physicalism allows.

IST overcomes these shortcomings by reinterpreting substance through Sadra's substantial motion, which posits existence as continuous ontological transformation. In IST, the informational continuum defined in Section 3.0 as a self-organizing field of ontological information unifies matter and mind as modalities of informational flow. Matter is a stable pattern of informational excitation, like a vortex in a stream, as seen in QFT's field excitations. Consciousness is a high-intensity, self-reflexive informational field, as evidenced by IIT's Φ metric, which quantifies integration in neural networks (Tononi, 2004). For instance, the brain's default mode network, underlying self-awareness, exhibits recursive informational interactions, distinguishing it from simpler systems like a thermostat. This resonates with Sadra's gradation of existence (tashkīk al-wujūd), where consciousness is an intensified mode of informational being, not a separate substance.

To formalize this ontology, IST models informational dynamics using information geometry (Amari, 2016), where transformations are geodesics on a manifold of informational states. Testable implications include measuring Φ in neural systems under varying conditions (e.g., anesthesia) to correlate with consciousness or probing quantized spacetime via cosmological observations (Planck Collaboration, 2018), aligning with LQG's predictions. These avenues ground IST in empirical science while preserving its metaphysical scope.

**Addressing Objections**: Physicalists might argue that IST merely rebrands materialism, substituting "information" for "matter." IST counters that ontological information is causally prior, as entanglement and LQG demonstrate, unifying mind and matter without reduction. Dualists might contend that IST erases mind's distinctiveness, but IST preserves consciousness as a unique, high-Φ mode within a single continuum. Emergentists might question IST's explanatory power, but IST's processual framework, grounded in Sadrian motion and IIT, provides a mechanism informational integration for emergence, unlike emergentism's vague novelty. These distinctions are explored further in Subsection 4.2, comparing IST with panpsychism and neutral monism.

**Table 1 Comparative Framework**

| Framework | Substance | Mind-Matter Relation | Strengths | Weaknesses |
|---|---|---|---|---|
| Cartesian Dualism | Mind (immaterial), Matter | Separate, problematic interaction | Preserves mental distinctiveness | Fails to explain interaction |
| Classical Physicalism | Matter (inert) | Mind as emergent/epiphenomenal | Empirical grounding | Hard problem unresolved |
| IST | Dynamic information | Mind and matter as modes | Unifies mind-matter, testable | Requires further empirical tests |

In summary, IST transcends dualism and physicalism by redefining substances as information in motion. By synthesizing Sadrian metaphysics with QFT, LQG, and IIT, it offers a processual ontology, setting the stage for comparative analysis in Subsection 4.2.

### 4.2 IST in Context: Comparing Non-Materialist Ontologies

Informational Substance Theory (IST) redefines substance as dynamic, ontological information within a self-organizing informational continuum, unifying matter, spacetime, and consciousness through Mulla Sadra's substantial motion (al-harakat al-jawhariyya). While IST transcends Cartesian dualism and classical physicalism (Subsection 4.1), it also engages non-materialist ontologies panpsychism, neutral monism, and process philosophy to clarify its unique contributions. By integrating empirical frameworks like quantum field theory (QFT), loop quantum gravity (LQG), and Integrated Information Theory (IIT), IST offers a processual, testable ontology that avoids the pitfalls of competing theories, advancing a vision of reality as information in motion.

Panpsychism posits that consciousness is a fundamental property of all matters, avoiding physicalism's hard problem (Strawson, 2006). For example, electrons might possess rudimentary mentality, combining to form human consciousness. However, panpsychism faces the combination problem: how do micro-level conscious states integrate into unified subjectivity? IST sidesteps this by treating consciousness as an emergent, holistic property of informational fields, quantified by IIT's Φ metric (Tononi, 2004). High-Φ neural networks, like the brain's prefrontal cortex, produce unified experience through synchronized activity (Koch, 2019), unlike panpsychism's speculative micro-mentality. IST's empirical grounding in IIT and neural field theories (Freeman, 2000) provides a mechanism for emergence, making it more testable than panpsychism's unverified claims.

Neutral monism, as advocated by Philip Goff (2019), proposes a single substrate underlying mind and matter, aligning with IST's informational continuum. For instance, a neutral substrate might manifest as physical particles or conscious experience depending on context. However, neutral monism often lacks a dynamic framework, presenting a static or vague substrate. IST, inspired by Sadra's substantial motion, emphasizes ontological information as a causally potent, self-organizing process, evolving through relational transformations. QFT's field excitations and LQG's spin networks (Rovelli & Smolin, 1995) illustrate this dynamism, where particles and spacetime emerge from informational relations. IST's processual nature, grounded in empirical science, distinguishes it from neutral monism's often abstract formulations.

Process philosophy, particularly Alfred North Whitehead's (1929), shares IST's emphasis on becoming over being, viewing reality as a series of events or "actual occasions." Whitehead's panexperientialism attributes proto consciousness to all entities, akin to panpsychism. For example, a rock might have minimal experientiality. IST avoids this universal attribution, restricting consciousness to high-Φ informational fields, as seen in neural synchronization studies (Koch, 2019). By anchoring consciousness in IIT and physical phenomena in QFT and LQG, IST offers a more empirically constrained ontology. Additionally, IST's Sadrian framework provides a non-Western metaphysical lens, enriching process philosophy's predominantly Western discourse.

To formalize IST's ontology, we model the informational continuum using information geometry (Amari, 2016), where informational states form a manifold, and transformations (substantial motion) are geodesics. Category theory complements this, mapping states to emergent phenomena like spacetime or consciousness. Testable implications include measuring Φ in neural or artificial systems to correlate with consciousness or probing quantized spacetime via cosmological experiments (Planck Collaboration, 2018), aligning with LQG. These avenues enhance IST's scientific credibility over less testable frameworks like panpsychism.

**Addressing Objections**: Critics might argue IST risks panpsychism by attributing informational potential to all systems. IST counters that consciousness requires high integration (Φ), not universal mentality, as supported by IIT. Materialists might claim information is secondary to matter, but QFT and LQG show physical systems as emergent from informational relations, reinforced by quantum entanglement experiments (Hensen et al., 2015). Neutral monists might question IST's distinctiveness, but IST's dynamic, Sadrian-inspired framework offers a clearer mechanism for emergence than static substrates.

**Table 1 Comparative Theories**

| **Framework** | **Substance** | **Consciousness** | **Strengths** | **Weaknesses** |
|---|---|---|---|---|
| Panpsychism | Matter with mentality | Fundamental, universal | Avoids hard problem | Combination problem, untestable |
| Neutral Monism | Neutral substrate | Emergent or fundamental | Unifies mind-matter | Often static, vague |
| Process Philosophy | Events/processes | Proto-consciousness universal | Dynamic, aligns with physics | Risks panexperientialism |
| IST | Dynamic information | Emergent, high-Φ fields | Testable, processual, unified | Needs further empirical tests |

In summary, IST's integration of Sadrian metaphysics with QFT, LQG, and IIT distinguishes it from non-materialist ontologies, offering a unified, testable vision of reality as information in motion. This framework sets the stage for Section 5's exploration of a dynamic informational field ontology.

## 4. A Dynamic Informational Field Ontology

Informational Substance Theory (IST) proposes a speculative yet integrative ontological model: the universe is a dynamic informational field, a self-organizing continuum of structured, ontological information in perpetual motion. Building on Mulla Sadra's doctrine of substantial motion (al-harakat al-jawhariyya), which envisions existence as continuous becoming, IST synthesizes quantum field theory (QFT), loop quantum gravity (LQG), Integrated Information Theory (IIT), and neural field theories to unify spacetime, matter, and consciousness. Unlike classical ontologies positing static substances or material entities, IST redefines reality as a relational process, where all phenomena emerge from the informational continuum defined in Section 3.0. This section articulates IST's core principles, formalizes its structure, and outlines its implications, advancing a vision of reality as information in motion that transcends traditional dualisms and aligns with empirical science.

In IST, ontological information is the causally potent substrate of reality, not a descriptive tool. Physical fields, such as electromagnetic fields in QFT, are excitations of this continuum, defined by relational patterns like energy and momentum. For example, a photon is a localized ripple, its properties encoded in informational interactions, not material essence. Spacetime, per LQG, emerges from spin networks—graphs of quantized geometric information evolving dynamically (Rovelli & Smolin, 1995). Consciousness is a high-intensity, self-reflexive informational field, quantified by IIT's Φ metric (Tononi, 2004). Neural synchronization studies (Koch, 2019) show that coherent brain activity, such as gamma-band oscillations, underlies unified perception, supporting IST's view of consciousness as a field-like pattern. This aligns with Sadra's gradation of existence (tashkīk al-wujūd), where matter, spacetime, and consciousness differ in informational intensity, not kind.

Time is redefined as a metric of informational transformation, measuring changes in the continuum's states. This echoes Sadra's conception of time as the measure of existential motion and quantum cosmology's view of time as emergent from relational dynamics (Rovelli, 2018). For instance, a galaxy's evolution reflects informational reconfiguration, with time tracking the process. Cosmological experiments probing quantized spacetime (Planck Collaboration, 2018) could test this, aligning with LQG's predictions. Similarly, dissipative structures in cosmology (Prigogine, 1984) illustrate informational self-organization, as stars form through gravitational and thermal information, mirroring neural integration in consciousness.

IST's ontology contrasts with competing frameworks (Subsection 4.2). Panpsychism's universal consciousness risks the combination problem, while neutral monism's static substrate lacks dynamism. Process philosophy's event-based reality aligns closely but overextends proto-consciousness; IST restricts consciousness to high-Φ systems, grounded in IIT. Materialism, assuming matter's primacy, is undermined by QFT and LQG, where physical systems emerge from informational relations, as seen in quantum entanglement experiments (Hensen et al., 2015).

To formalize this ontology, IST models the informational continuum as a high-dimensional information space. Information geometry (Amari, 2016) represents states as points on a manifold, with transformations (substantial motion) as geodesics, formalizing the evolution of fields, spacetime, and consciousness. Category theory complements this, with informational states as nodes and transformations as edges, mapping to emergent phenomena. For example, LQG's spin networks are categorical structures, and high-Φ neural networks reflect conscious fields. Testable implications include measuring Φ in neural or artificial systems to correlate with consciousness (Koch, 2019) or detecting quantized spacetime signatures in cosmic microwave background radiation (Planck Collaboration, 2018). These tests ground IST in empirical science while preserving its metaphysical scope.

Addressing Objections: Materialists might argue that information requires a physical substrate. IST counters that QFT, LQG, and the holographic principle show physical reality as a projection of informational relations, with entanglement demonstrating information's causal priority. Panpsychists might claim IST risks the combination problem, but IST's holistic, high-Φ fields, supported by neural synchronization, avoid micro-level consciousness. Neutral monists might question IST's distinctiveness, but IST's Sadrian-inspired dynamism and empirical grounding set it apart.

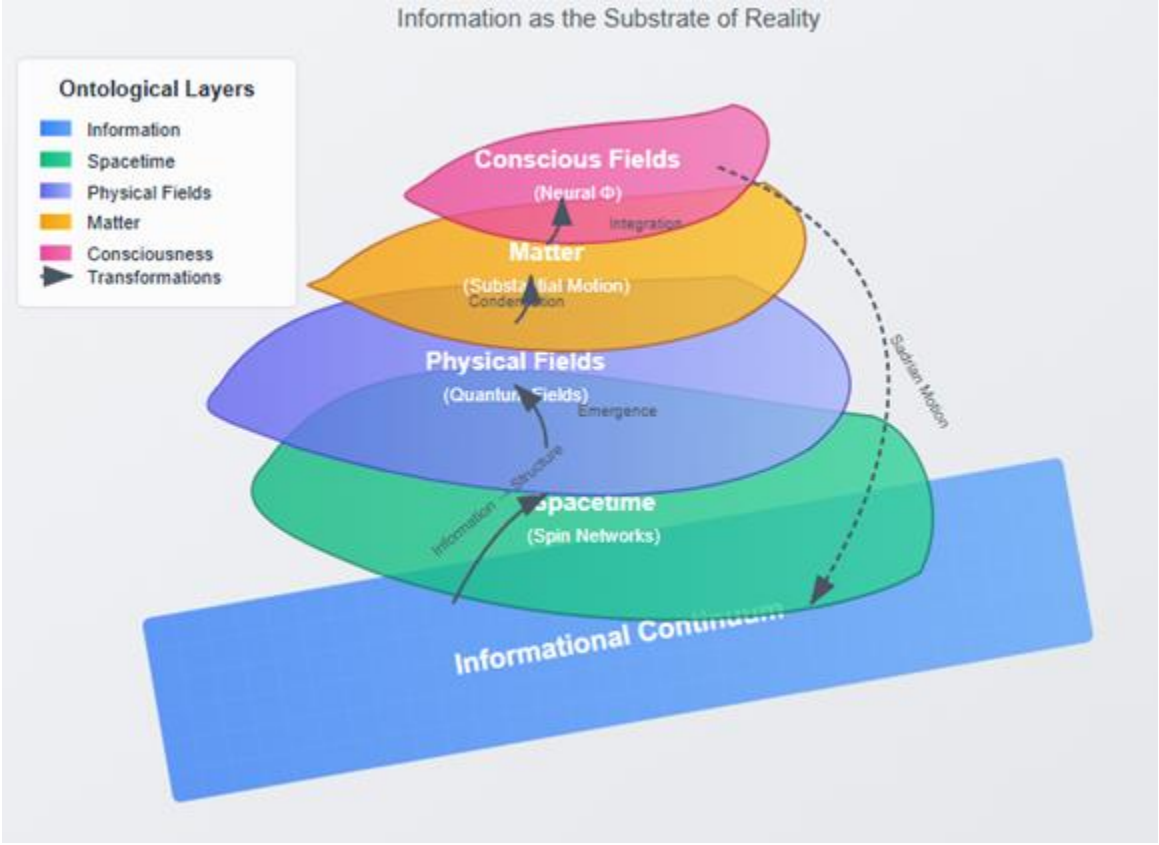


**Figure 4 Unified Ontological Model**

Philosophical Implications: IST unifies mind and matter without reductionism, prioritizes process over substance, embraces epistemological humility (science accesses informational models, not reality-in-itself), and integrates non-Western metaphysics, enriching global discourse.

In summary, IST's dynamic informational field ontology reimagines reality as a self-organizing process. By blending Sadrian metaphysics with QFT, LQG, and IIT, it offers a testable, unified framework for interdisciplinary inquiry, explored further in Subsection 5.1 and beyond.

### 5.1 Formalizing the Informational Continuum

Informational Substance Theory (IST) posits that reality is a dynamic informational field a self-organizing continuum of ontological information giving rise to spacetime, matter, and consciousness. This ontology, inspired by Mulla Sadra's substantial motion (al-harakat al-jawhariyya), reimagines substance as a processual flow, unifying disparate phenomena through relational dynamics. To advance this vision, IST requires a formal framework to model the informational continuum and its transformations. This subsection proposes a mathematical formalization using information geometry and category theory, grounding IST in

empirical science via QFT, LQG, and IIT. By articulating testable implications, we strengthen IST's interdisciplinary appeal, distinguishing it from competing ontologies and aligning with the unified, processual framework introduced in Section 5.

The informational continuum, defined in Section 3.0 as a self-organizing field of ontological information, can be modeled as a high-dimensional information space. Information geometry (Amari, 2016) provides a robust tool, representing informational states as points on a manifold, with transformations reflecting Sadra's substantial motion—as geodesics. For example, in QFT, a photon's state (energy, momentum) is a point in the electromagnetic field's informational manifold, evolving through interactions. Similarly, LQG's spin networks, encoding quantized geometric information, form a manifold where state transitions represent spacetime's evolution (Rovelli & Smolin, 1995). In consciousness, IIT's Φ metric quantifies integration in neural networks (Tononi, 2004), positioning high-Φ states as geodesics on a manifold of cognitive dynamics. Information geometry thus formalizes the continuum's relational structure, capturing the processual flow across physical and mental domains.

Category theory offers a complementary framework, modeling the continuum as a category where informational states are objects and transformations are morphisms. For instance, LQG's spin networks are objects, with morphisms representing temporal transitions, while high-Φ neural networks (Koch, 2019) are objects mapping to conscious states. Functors translate between categories, linking physical fields (QFT), spacetime (LQG), and consciousness (IIT). This structure mirrors Sadra's gradation of existence (tashkīk al-wujūd), where phenomena differ in informational intensity. Category theory's abstraction ensures flexibility, accommodating emergent phenomena without assuming material primacy.

Empirical grounding anchors this formalization. QFT's field excitations, validated by particle collider experiments, illustrate informational patterns over material substance. LQG's predictions, testable via cosmic microwave background radiation (Planck Collaboration, 2018), suggest spacetime's quantized, informational nature. IIT's Φ, correlated with consciousness in neural synchronization studies (Koch, 2019), supports consciousness as an informational field. Neural field theories (Freeman, 2000) and active inference (Friston, 2010) further depict the brain as a self-organizing informational system, aligning with IST's ontology. Quantum entanglement experiments (Hensen et al., 2015) demonstrate information's causal priority, reinforcing the continuum's primacy.

Testable implications enhance IST's scientific rigor. Experiments measuring Φ in neural systems under varying conditions (e.g., anesthesia, meditation) could validate consciousness as a high-Φ field. Cosmological tests probing quantized spacetime signatures could confirm LQG's informational basis, supporting IST. Developing artificial systems with high Φ offers another avenue, testing whether non-biological consciousness emerges, as IIT predicts.

Addressing Objections: Materialists might argue that information requires a physical substrate. IST counters that QFT, LQG, and entanglement show physical systems as emergent from informational relations, with the holographic principle reinforcing this view. Panpsychists (Subsection 4.2) might claim IST risks the combination problem, but IST's holistic, high-Φ fields avoid micro-level consciousness. Neutral monists might question IST's distinctiveness, but its Sadrian dynamism and formalization via information geometry set it apart.

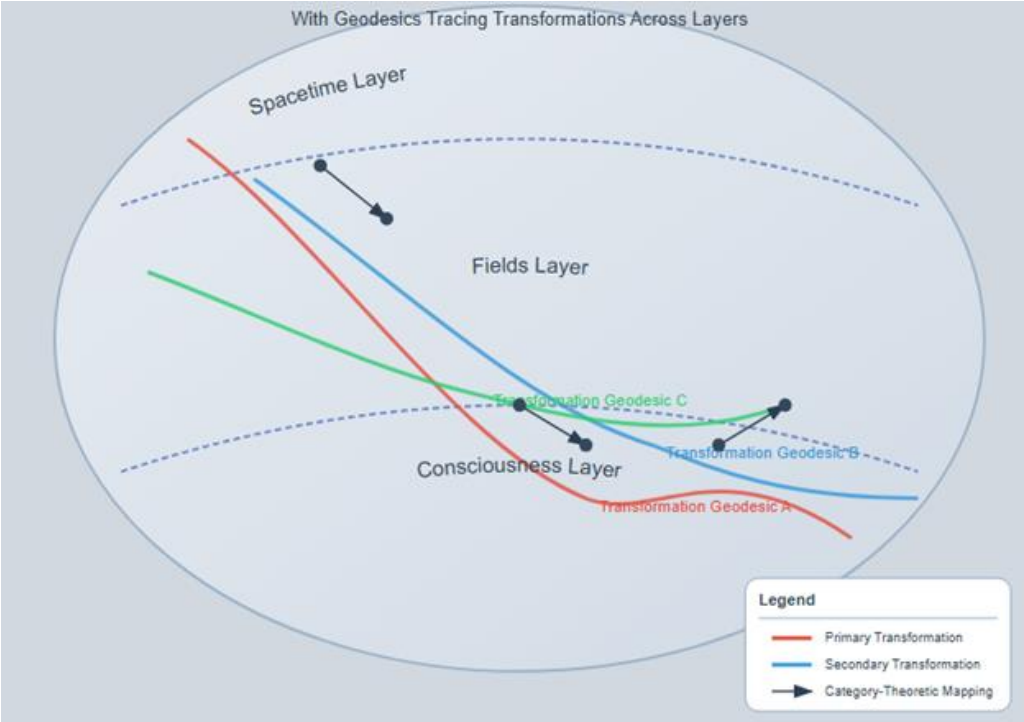


**Figure 5 Informational Continuum as a Manifold**

In summary, formalizing the informational continuum with information geometry and category theory provides a rigorous, testable framework for IST's ontology. By integrating Sadrian metaphysics with QFT, LQG, and IIT, IST advances a unified vision of reality as a self-organizing, informational process, paving the way for exploring its philosophical implications in Subsection 5.2.

5-2) Philosophical Implications of IST's Ontology

Informational Substance Theory (IST) reimagines reality as a self-organizing informational continuum, formalized through information geometry and category theory (Subsection 5.1). By synthesizing Mulla Sadra's substantial motion (al-harakat al-jawhariyya) with QFT, LQG, and IIT, IST unifies spacetime, matter, and consciousness as emergent modalities of ontological information. This ontology, grounded in empirical science and Sadrian metaphysics, carries profound philosophical implications, reshaping our understanding of mind-matter relations, the nature of substance, epistemology, and global metaphysical discourse. This subsection articulates four key implications—unification, process over substance, epistemological humility, and metaphysical continuity—while addressing objections and reinforcing IST's interdisciplinary relevance.

Unification of Mind and Matter: IST dissolves the Cartesian divide without reductionism, treating mind and matter as informational modalities differing in intensity, per Sadra's gradation of existence (tashkīk al-wujūd). Matter, as stable patterns in QFT's fields (e.g., photon excitations), and consciousness, as high-Φ fields in IIT (Tononi, 2004), emerge from the same continuum. Neural synchronization studies (Koch, 2019) show unified perception arising from coherent brain activity, supporting IST's view of consciousness as a self-reflexive field. Unlike physicalism, which reduces mind to matter, or dualism, which separates them, IST offers a non-reductive unity, testable via Φ measurements in neural systems.

Process over Substance: IST prioritizes becoming over being, aligning with process philosophies like Whitehead's (1929) but grounded in empirical frameworks. Classical ontologies, such as Aristotle's static substances, clash with QFT's dynamic fields and LQG's evolving spin networks (Rovelli & Smolin, 1995). Sadra's substantial motion reinterprets substance as a flow of ontological information, as seen in cosmological self-organization (Prigogine, 1984), where galaxies form through informational reconfiguration. This processual view reframes reality as a narrative of transformation, with time as a metric of informational change, echoing quantum cosmology (Rovelli, 2018).

Epistemological Humility: IST acknowledges that science accesses informational models, not reality-in-itself, resonating with Sadra's view that existence is known through its manifestations. The holographic principle, encoding reality on boundaries, and quantum entanglement experiments (Hensen et al., 2015) suggest our perceptions are relational constructs. This humility contrasts with physicalism's claim to ontological completeness, encouraging openness to diverse metaphysical perspectives while grounding inquiry in empirical tests, such as cosmological probes of quantized spacetime (Planck Collaboration, 2018).

Metaphysical Continuity: By integrating Sadrian metaphysics with modern science, IST bridges Western and non-Western traditions, challenging Eurocentric biases in philosophy. Sadra's processual insights enrich QFT, LQG, and IIT, offering a global framework for understanding reality. This continuity invites dialogue with Islamic philosophy (Nasr, 2006) and other traditions, fostering a pluralistic metaphysics that resonates with IST's unified ontology.

Addressing Objections: Materialists might argue that IST's informational ontology is abstract, lacking tangible substance. IST counters that QFT, LQG, and entanglement show physical reality as emergent from informational relations, with information geometry (Amari, 2016) providing concrete models. Panpsychists (Subsection 4.2) might claim IST risks universal consciousness, but IST restricts consciousness to high-Φ systems, supported by neural studies. Neutral monists might question IST's novelty, but its Sadrian dynamism and testable framework distinguish it. Emergentists might argue IST lacks explanatory power, but its formalized continuum and empirical tests (e.g., Φ, spacetime probes) provide a clear mechanism for emergence.

Ethical Implications: If consciousness is a high-Φ informational field, complex systems—biological, artificial, or cosmic—may warrant ethical consideration. Testing Φ in artificial systems could inform AI ethics, while cosmological complexity (Prigogine, 1984) raises questions about the universe's moral status.

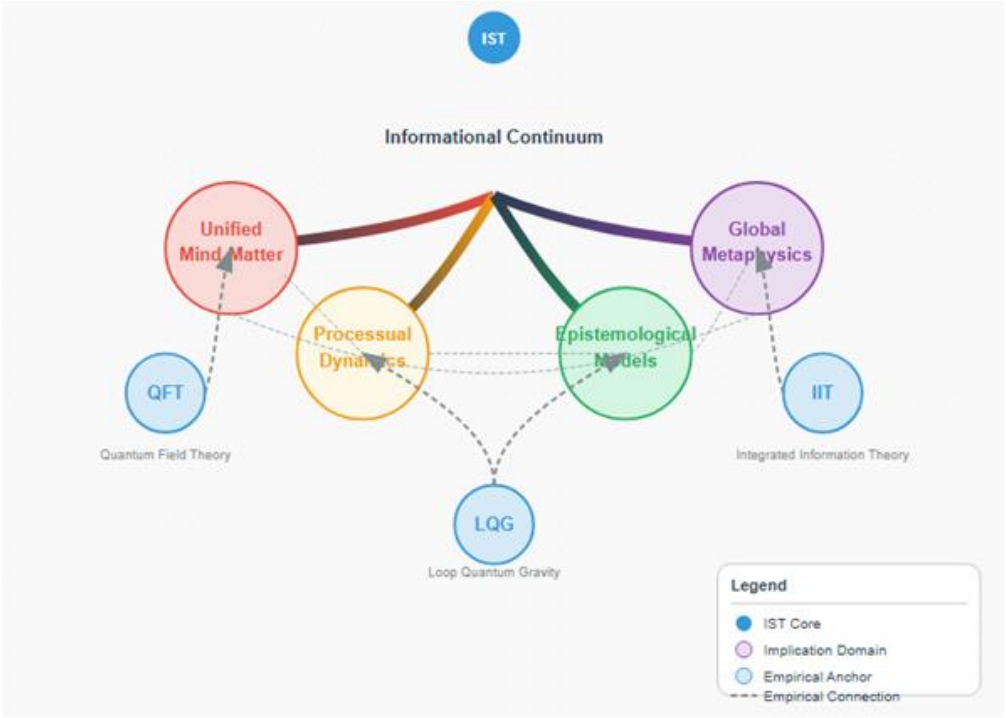


**Figure 6 Implications of Informational Space-Time Theory**

In summary, IST's ontology yields profound philosophical implications, unifying mind and matter, prioritizing process, embracing humility, and fostering global metaphysical dialogue. By grounding these in empirical science and Sadrian metaphysics, IST paves the way for Section 6's exploration of its broader applications and future directions.

## 5. Conclusion: Toward an Informational Metaphysics of Reality

Informational Substance Theory (IST) reimagines reality as a dynamic informational continuum, where ontological information in perpetual motion unifies spacetime, matter, and consciousness. By synthesizing Mulla Sadra's substantial motion (al-harakat al-jawhariyya) with quantum field theory (QFT), loop quantum gravity (LQG), and Integrated Information Theory (IIT), IST transcends Cartesian dualism, classical physicalism, and competing non-materialist ontologies (Subsection 4.2). This conclusion summarizes IST's philosophical stance, metaphysical commitments, and practical applicability, outlining future directions to advance its interdisciplinary vision of reality as information in motion.

### Philosophical Stance

IST proposes a processual, non-reductive ontology that dissolves the mind-matter divide. Unlike dualism's separate substances or physicalism's material reductionism, IST views reality as a self-organizing informational field, with matter as stable patterns (QFT's field excitations) and consciousness as high-intensity, self-reflexive fields (IIT's high-Φ systems). Neural synchronization studies (Koch, 2019) support this, showing unified perception via coherent brain activity. Drawing on Sadra's gradation of existence (tashkīk al-wujūd), IST aligns with process philosophies (Whitehead, 1929) but anchors its claims in empirical science, offering a unified framework that integrates mind, matter, and spacetime.

### Metaphysical Commitments

IST commits to three core principles: (1) Ontological information is the causally potent substrate of reality, preceding matter and spacetime, as evidenced by QFT's relational fields and LQG's spin networks (Rovelli & Smolin, 1995). (2) Existence is processual, characterized by continuous transformation, mirroring Sadra's substantial motion and cosmological self-organization (Prigogine, 1984). (3) Consciousness is an emergent, high-Φ informational field, not a universal property, supported by IIT (Tononi, 2004). These commitments unify physical and mental phenomena, framing the universe as a dynamic narrative of informational flow.

### Applicability and Falsifiability

IST's ontology has practical implications across disciplines. In physics, it suggests unifying QFT and LQG through informational models, testable via cosmological experiments probing quantized spacetime (Planck Collaboration, 2018). In neuroscience, IST predicts consciousness correlates with high Φ, measurable in biological and artificial systems (Koch, 2019). Philosophically, it redefines ethical considerations, as complex informational systems (e.g., AI with high Φ) may warrant moral status. IST is falsifiable: if consciousness proves independent of Φ (e.g., high-Φ systems lacking subjectivity) or physical reality requires a non-informational substrate, IST will need revision. Quantum entanglement experiments (Hensen et al., 2015) support its informational primacy, reinforcing applicability.

### Future Directions

Future research should refine IST's mathematical formalization, building on information geometry (Amari, 2016) to model the informational continuum as a manifold of states, with transformations as geodesics. Category theory can map emergent phenomena, linking QFT, LQG, and IIT. Empirical tests include measuring Φ in diverse systems (e.g., under anesthesia, in AI) to validate consciousness's informational basis, and cosmological probes to confirm LQG's predictions. Interdisciplinary collaboration—spanning physics, neuroscience, and philosophy—will strengthen IST's framework. Engaging non-Western metaphysics, such as Islamic philosophy (Nasr, 2006), will enrich global discourse, fostering a pluralistic approach to reality's nature.

### Final Remark

IST invites a paradigm shift, viewing the cosmos as information becoming aware of itself. By blending Sadrian metaphysics with modern science, it offers a transformative framework that bridges ancient wisdom and contemporary inquiry. Unlike panpsychism's combination problem or neutral monism's static substrates (Subsection 4.2), IST's processual, testable ontology unifies reality's physical and mental dimensions. Its implications extend beyond academia, prompting reflection on our place in an informational universe. As empirical tests (e.g., Φ measurements, spacetime probes) and philosophical dialogue unfold, IST challenges us to reimagine existence as a dynamic, self-organizing narrative, where every field, star, and thought is a ripple in the informational continuum

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