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A Dialogue on Dynamics: Mulla Sadra's Essential Movement and Presentist-Fragmentalism in Quantum Gravity

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Abstract

The nature of consciousness and the soul remains one of philosophy's oldest enigmas and science's most formidable challenges. This paper explores the distinctive philosophy of Mulla Sadra (c. 1571 CE-1640 CE) regarding consciousness, rooting it in his revolutionary doctrine of Essential Movement (al-Harakat al-Jawhariyyah). Unlike previous philosophers who largely adhered to a static understanding of substance, Sadra posited a continuous, inherent transformation of all material beings, culminating in the emergence of the soul as a higher, more perfected mode of existence. This paper will first delineate Sadra's unique metaphysical framework for consciousness, emphasizing its dynamic and emergent nature. Subsequently, it will compare Sadra's views with those of pre-Sadraean Islamic philosophers, particularly Avicenna, highlighting the crucial shifts his doctrine introduced. Finally, it will engage Sadra's ideas with prominent contemporary scientific approaches to consciousness, such as Integrated Information Theory and Presentist-Fragmentalism in quantum gravity, exploring points of conceptual resonance and inherent divergence, including potential, albeit speculative, mathematical mappings. This interdisciplinary analysis underscores the enduring relevance of Sadra's thought in enriching modern discussions on the mind-body problem and the fundamental fabric of reality.

Keywords

Mulla Sadra, Essential Movement, Consciousness, Soul, Mind-Body Problem, Avicenna, Presentist-Fragmentalism, Quantum Gravity, Emergentism, Islamic Philosophy, Metaphysics of Time

1. Introduction

The problem of motion, change, and the nature of time has perpetually challenged

both philosophers and scientists (Smolin & Verde, 2021; Rovelli, 2019; Le Poisevin, 2011; Marchesini, 2018). While Mulla Sadra's "Transcendent Philosophy" (Shirazi, 2008; Zamaniha, 2022) offers a comprehensive metaphysical system rooted in the 17th century Islamic intellectual tradition, the Presentist-Fragmentalism (PF) approach to quantum gravity represents a contemporary theoretical framework grappling with the fabric of spacetime at its most fundamental level (Merriam, 2022a). Despite their disparate origins and methodologies, both systems articulate a vision of reality that is intrinsically dynamic, far from a static continuum. In various philosophical and spiritual traditions, the soul and consciousness are distinct yet interrelated concepts, often understood as existing on different planes of "substance perfection." Consciousness is broadly defined as immediate awareness—the subjective experience of thoughts, sensations, and surroundings, often considered an emergent property of the brain and thus ceasing with bodily death. In contrast, the soul is posited as a more fundamental, immaterial, and often immortal essence of a being, serving as a template or blueprint for the growth and development of consciousness. From this perspective, the soul's "matter" is not physical but rather energetic, informational, or pure spirit, representing a deeper potentiality that transcends the physical realm. Mulla Sadra's theory of essential movement provides a crucial bridge between these concepts, positing that material substances, including the body, are in a continuous process of transformation from potentiality to actuality. This inherent dynamism, ultimately deriving its efficient and final cause from God, facilitates the gradual unfolding of the soul's inherent perfection, leading to the emergence and evolution of consciousness. Thus, movement becomes the very process through which the soul actualizes its potential within the material world, linking the ephemeral conscious experience to an enduring, transcendent essence. This paper constructs a conceptual dialogue between Mulla Sadra's Essential Movement and the core tenets of the PF approach, highlighting their points of convergence, illuminating their fundamental divergences, and underscoring the richness such interdisciplinary engagement can bring. For clarification on "presentist fragmentalism" (PF) within the context of quantum gravity proposals. Here's a concise definition and its placement:

Presentist Fragmentalism (PF):

Presentist fragmentalism is the idea that *only the present moment is real*, and that reality is fundamentally discrete or "fragmented" rather than continuous. In the context of quantum gravity, it suggests that spacetime itself is not a smooth, continuous manifold, but rather emerges from a series of discrete, causally related "nows."

Location within Quantum Gravity Proposals:

PF resonates most strongly with, or finds conceptual parallels in, the following quantum gravity proposals:

- **Causal Set Theory:** This approach to quantum gravity posits that spacetime is fundamentally discrete, consisting of individual spacetime "events" that are ordered by a causal relation (Cortês & Smolin, 2014). There is no underlying con-

tinuum; the continuous spacetime of general relativity is an approximation valid at large scales. The "fragmentalism" aspect aligns with the discrete nature of events, and the "presentist" aspect can be seen in the idea that causality progresses from one event to the next, effectively building up a history from successive "presents."

- **GRW-type Collapse Models (and other objective collapse theories):** While not directly a quantum gravity theory, these models propose modifications to quantum mechanics where the wave function undergoes spontaneous, objective collapses (Ghirardi et al., 1986). If such collapses are interpreted as defining a series of definite, real events in time, they can be seen as contributing to a "presentist" view where each collapse defines a new, real "present." The "fragmentalism" here would stem from the idea that reality is updated in discrete, unpredictable jumps rather than evolving smoothly deterministically. This connects to quantum gravity through the idea that such fundamental collapses might influence or define the very structure of spacetime at a fundamental level.
- Therefore, when engaging in the dialogue, it's important to frame PF as a philosophical stance that finds its most natural home in discrete approaches to quantum gravity like Causal Set Theory, and can also be conceptually linked to the implications of objective col-lapse models for the nature of time and reality.

2. The Voices in Dialogue: Brief Overviews

Mulla Sadra's Essential Movement: From the heart of Islamic metaphysics, Mulla Sadra posits that all material substances are in a state of continuous, intrinsic, and gradual transformation of their very essence (Essential Movement). This movement is not accidental but fundamental to their existence, driven by an inherent teleological impulse towards greater perfection and actuality (Eshkevari, 2013). Time, for Sadra, is not an external container but the internal measure of this ceaseless substantial change, a continuous flow from potentiality to actuality. The soul (consciousness) itself emerges as the most perfected and actualized form of matter's essential evolution (Abdulaziz, 2010). The tension between the sequential "growth by adding new elements" in causal set theory (as employed in Presentist Fragmentalism, or PF) and Mulla Sadra's concept of time as a qualitative aspect of existential intensity, rather than a mere framework for discrete events. We argue that this apparent discrepancy can be resolved by reinterpreting the causal set's growth through Sadra's lens of essential movement (Harakat al-Jawhariyyah). For Sadra, entities are in constant, intrinsic transformation, and time is the measure of this continuous existential actualization. It's not an external container but the very flow of being, characterized by existential gradation.

In this context, each new element added to a causal set in PF should not be seen as a flat, disconnected "event." Instead, it represents a novel actualization or instantiation of being—a point in the ongoing, qualitative unfolding of existential intensity. The causal links within the set reflect not just temporal succession, but

existential dependence and the hierarchical emanation of one state of being from another.

Therefore, the "growth" of the causal set isn't simply an accumulation of discrete events; it signifies a progressive deepening and intensification of reality itself. The qualitative aspect of existence, so central to Sadra, can be reflected in the emergent properties of the growing causal set—for instance, increasing complexity or coherence within a fragment could correlate with a higher degree of existential actualization. This framework allows "event-based" physics to reflect existential gradation by viewing each "event" as a moment of existential becoming.

Presentist-Fragmentalism (PF) in Quantum Gravity: Emerging from contemporary theoretical physics, PF posits that the fundamental reality of time aligns with McTaggart's A-series (McTaggart, 1908): an intrinsically subjective, tensed present. At the quantum level, this present is not unified but fragmented into distinct "A-series fragments." This fragmentation is central to addressing the quantum measurement problem, with consciousness often implicated in the collapse of these superposed states. The theory further suggests that these fragments, driven by a gravitational-like "ontological privacy minimization principle," tend to approximate each other and "collapse" to form the unified, classical, tenseless B-series spacetime (Merriam & Habeeb, 2024).

3. The Dialogue: Points of Contention and Resonance

The interplay between these two perspectives unfolds across several key dimensions.

3.1. On the Nature of Time: Continuous Flow vs. Fragmented Presents and Collapse

This section examines two contrasting perspectives on the fundamental nature of time: Presentist Fragmentalism's view of time as a fragmented present with collapse, and Mulla Sadra's concept of time as a continuous flow.

Presentist Fragmentalism (PF) Stance:

- **Premise 1:** Reality fundamentally exists only in the present moment; the past no longer exists, and the future has not yet come into being (Merriam, 2022b).
- **Premise 2:** Each moment is a distinct, self-contained "now," and the transition from one moment to the next involves a "collapse" or cessation of the previous moment.
- **Premise 3:** The appearance of continuity in time is an illusion, arising from the rapid succession of these discrete, fragmented presents.
- **Premise 4:** Quantum phenomena, such as wave function collapse, may be interpreted as supporting this fragmented, presentist view of time, where potential states actualize in discontinuous moments.
- **Conclusion:** Time is not a continuous flow but rather a series of fragmented, discrete present moments, where each "now" emerges and collapses, leading to a fundamentally discontinuous temporal reality.

Mulla Sadra's Response (Continuous Flow):

- **Premise 1:** Time is inherently linked to "essential movement" (al-haraka al-jawhariyya), which is a continuous, dynamic process of existential renewal and transformation within the very essence of beings.
- **Premise 2:** This movement implies a continuous actualization of potentiality into actuality, meaning time is not a series of static, disconnected points but a flowing continuum.
- **Premise 3:** The flow of time is a manifestation of the continuous outpouring of being from the Necessary Existent, indicating an ontological connection between temporal duration and divine actualization.
- **Premise 4:** While there are distinctions between past, present, and future, these are not absolute ontological divisions but rather phases within a unified, ongoing process of existential renewal.
- **Conclusion:** Time is fundamentally a continuous, dynamic flow, representing the ongoing existential movement and actualization of beings, integrated within a unified, uninterrupted ontological process.
- **Dialogue Point:** Can PF's "discrete collapse events" at the quantum level be interpreted as the fine-grained moments of "renewal" that, at a more macroscopic level, Sadra perceives as continuous substantial flow? Or does Sadra's philosophical insistence on true continuity preclude such a fundamentally discrete underpinning? The tension lies between the continuous ontological becoming and the discrete events of quantum collapse.

3.2. On the Mechanism of Evolution and Change: Teleological Actualization vs. Gravitational Unification

This section examines two contrasting perspectives on the mechanism of evolution and change: Presentist Fragmentalism's view of change as driven by gravitational unification, and Mulla Sadra's concept of teleological actualization.

Presentist Fragmentalism (PF) Stance:

- **Premise 1:** The fundamental forces of nature, particularly gravity, dictate the organization and transformation of matter and energy.
- **Premise 2:** Change is a consequence of these forces interacting locally and non-teleologically, leading to emergent patterns and structures.
- **Premise 3:** There is no inherent direction or ultimate goal embedded within the universe's evolutionary processes; it is a continuous process of rearrangement and unification governed by physical laws.
- **Conclusion:** Evolution and change are mechanistically driven by gravitational dynamics, resulting in a presentist, fragmented, and non-purposeful cosmic unfolding.

Mulla Sadra's Response (Teleological Actualization):

- **Premise 1:** Existence is characterized by "essential movement" (al-haraka al-jawhariyya), an inherent dynamism and qualitative transformation within the very essence of beings.
- **Premise 2:** This movement is teleological, meaning it is directed towards the

actualization of inherent perfections and higher levels of being.

- **Premise 3:** While physical forces may play a role in the manifestation of change, the underlying impetus is an ontological drive towards ultimate realization and unity with the Divine Principle.
- **Conclusion:** Evolution and change are fundamentally driven by an intrinsic teleological impulse, where beings are continually actualizing their potential, moving towards a divinely ordained perfection, a process distinct from mere gravitational unification.
- **Dialogue Point:** Could PF's "ontological privacy minimization principle" and the unifying role of gravity be seen as a physical manifestation of Sadra's deeper metaphysical principle of existential striving towards unity and perfection (less fragmentation, more integrated existence)? Is the gravitational collapse a "natural" consequence or mechanism through which the universe actualizes its potentials, moving towards greater coherence?

3.3. On the Role of Consciousness and Subjectivity: Fundamental Driver vs. Emergent Culmination

This section contrasts Presentist Fragmentalism's view of consciousness as an emergent culmination with Mulla Sadra's assertion of consciousness as a fundamental driver within reality.

Presentist Fragmentalism (PF) Stance:

- **Premise 1:** Consciousness and subjectivity are phenomena that arise from sufficiently complex material systems, specifically advanced neural structures.
- **Premise 2:** They are epiphenomenal, or at best, causally dependent on underlying physical processes and the organization of matter.
- **Premise 3:** Consciousness represents a late-stage development in the evolutionary process, emerging as a result of environmental pressures and genetic selection.
- **Conclusion:** Consciousness is an emergent property and culmination of complex material organization, not a foundational element of reality.

Mulla Sadra's Response (Fundamental Driver):

- **Premise 1:** Consciousness, in varying degrees and forms, is present at all levels of existence, from the lowest material forms to the highest intellects.
- **Premise 2:** It is not merely an emergent property but an intrinsic aspect of reality, reflecting the ultimate unity of existence.
- **Premise 3:** Consciousness, particularly the highest forms of intellect, plays a fundamental role in the actualization and ordering of existence, acting as a divine principle manifesting through the cosmos.
- **Conclusion:** Consciousness is a fundamental and pervasive aspect of reality, serving as a driving force behind ontological actualization and not merely an emergent culmination of physical processes.
- **Dialogue Point:** Here lies a central divergence. PF appears to place subjectivity (via the A-series) at the very foundation of quantum reality's emergence. Sadra, while affirming the soul's unique ontological status, sees it as an *emergent out-*

come of matter's teleological self-organization.

3.4. On Ontological Grounding: Self-Organization vs. Divine Actualization

This section explores the contrasting ontological groundings proposed by Presentist Fragmentalism, focusing on self-organization, and Mulla Sadra's concept of divine actualization.

Presentist Fragmentalism (PF) Stance:

- **Premise 1:** Complex systems in the universe can spontaneously generate order and structure through processes of self-organization.
- **Premise 2:** These processes are driven by internal dynamics, feedback mechanisms, and environmental interactions, without recourse to external intelligent design or foundational teleology.
- **Premise 3:** The fundamental constituents of reality are inherently capable of forming complex arrangements through emergent properties.
- **Conclusion:** The ontological grounding of reality lies in the inherent capacity of its fundamental constituents to self-organize and form complex structures through non-designed, emergent processes.

Mulla Sadra's Response (Divine Actualization):

- **Premise 1:** All contingent existence (everything that is not necessarily existent) is in need of an ultimate cause or ground for its being.
- **Premise 2:** This ultimate ground is the Necessary Existent (Wajib al-Wujud), which is pure actuality and the source of all being.
- **Premise 3:** The existence of all things is a continuous act of "divine actualization" or emanation from this Necessary Existent, where being is continuously poured forth and sustained.

Conclusion: The ontological grounding of all reality is ultimately rooted in the continuous actualization and emanation of being from a singular, self-subsistent Divine Source, rather than solely from self-organizing material processes

- **Dialogue Point:** This highlights the different explanatory scopes. PF provides a mechanism for quantum gravity within a physicalist framework. Sadra provides a comprehensive metaphysical explanation for *all* existence, including its ultimate source and purpose. Can the scientific laws and principles of PF be seen as the *secondary causes* or *mechanisms* through which Sadra's ultimate, continuous divine causation manifests the unfolding of reality?

4. Towards a Conceptual Mathematical Mapping: Structural Analogies

To bridge the philosophical concepts with concrete frameworks in quantum gravity, we introduce the following formal considerations for "ontological privacy" and the "collapse rate" in GRW-type models. We will first clarify these formal considerations before discussing conceptual mathematical mapping.

Formal Definition of Ontological Privacy

In the context of presentist fragmentalism, where reality is conceived as a succession of discrete "nows," we can formalize the concept of ontological privacy. Let S_t denote the complete state of the universe (or a relevant subsystem) at a discrete "present" moment t. Let $P(S_t)$ be the set of all definite properties and relations instantiated by the state S_t.

Definition: A "present" moment t possesses ontological privacy if and only if its set of definite properties $P(S_t)$ is exhaustively determined solely by the internal configuration of S_t and its immediate causal predecessors (S_{t-1}, S_{t-2}, …). Crucially, $P(S_t)$ is not intrinsically or simultaneously dependent on the ontological status of any future state ($S_{t'}$, $t' > t$) or any non-causally connected past state. In essence, each S_t stands as a complete, self-sufficient ontological unit, not deriving its fundamental reality from participation in a larger, pre-determined, continuous block-universe structure. This definition underscores the radical discontinuity and self-contained reality attributed to each "present" in presentist fragmentalism.

Explicit Collapse Rate in GRW-Type Models (Objective Collapse Theories)

When considering the implications of GRW-type spontaneous collapse models (such as Continuous Spontaneous Localization, CSL) for the emergence of a presentist reality, the collapse rate plays a crucial role. These models introduce a fundamental physical mechanism that causes the quantum wave function to objectively localize (collapse) even without measurement. This process effectively defines the actualization of definite properties in a discrete manner.

The standard GRW-type models introduce a universal parameter, the collapse rate λ, which dictates the frequency of spontaneous localization events for a given particle. For a single nucleon, the typical value used is:

$$\Lambda \approx 10^{-16}\ \mathrm{s}^{-1}$$

This rate is extremely small for individual particles, ensuring quantum coherence for microscopic systems. However, the collapse rate scales with the number of particles in a system, meaning that macroscopic objects undergo extremely rapid and frequent collapses, leading to their classical, definite appearance. This rapid succession of collapse events, each actualizing a definite reality, can be conceptually linked to the succession of "ontologically private" present moments in a fragmentalist view, where each collapse signifies the birth of a new, definite "now."

While these definitions provide a more formal grounding, it is critical to reiterate that the mapping between these physics concepts and the philosophical tenets of presentist fragmentalism and Mulla Sadra's philosophy often involves conceptual analogies rather than direct, formal equivalences. The aim is to illuminate the philosophical positions through the lens of modern physics concepts, identifying areas of resonance or divergence, and to stimulate interdisciplinary dialogue. Any interpretation of these formalisms as a complete, testable physical theory directly derived from the philosophical premises should be avoided unless explicitly stated and rigorously demonstrated.

While a direct mathematical derivation from Mulla Sadra's metaphysics to a quantum gravity theory is beyond the scope of current understanding, we can seek

conceptual analogies where the formalisms of PF might represent, or be interpreted in terms of, Sadraean dynamics. This is a highly speculative exercise, aimed at identifying potential structural correspondences rather than precise mathematical identities.

4.1. Mapping Essential Movement and Continuous Becoming

- **Sadra's Conceptualization:** Essential Movement (al-Harakat al-Jawhariyyah) represents the continuous, ceaseless transformation of a substance (matter) from potentiality to actuality. If we denote a substance's existential state at a given "moment" (which for Sadra is not a discrete instant but a phase in a continuous flow) as $\Sigma(t)$, then its evolution is a continuous function: $\Sigma(t) \to \Sigma(t+\delta t)$ as $\delta t \to 0$ where $\Sigma(t)$ represents the entire substantial being, embodying its form and matter as inseparable aspects of existence. The change is in the very *intensity* or *degree of existence* of Σ.
- **PF's Potential Analogy:** In PF, the emergence of the B-series (classical spacetime) from the A-series fragments involves a process of "collapse" or unification. If we consider a causal set (a discrete structure of events and their causal relations, often used in quantum gravity) as the underlying framework, then its growth is discrete. Let C_k be a causal set at "step" k. Its evolution is $C_k \to C_{k+1}$, where C_{k+1} is formed by adding new events to C_k. $C_k \subset C_{k+1}$ The challenge is reconciling Sadra's *continuity* with PF's *discreteness*.
  - **Proposed Bridge:** Sadra's continuous flow ($\Sigma(t)$) could be seen as an effective, emergent description of the underlying discrete "jumps" of PF's A-series fragments undergoing collapse and unification. Just as a continuous fluid flow emerges from the discrete motion of billions of molecules, Sadra's continuous Essential Movement might be the macroscopic manifestation of countless, rapid "collapses" and re-formations of PF's A-series fragments.
  - The "density" of causal events or the "rate of collapse" in a region of spacetime could be interpreted as a measure of the "intensity of existence" or "degree of actualization" of the Sadraean substance in that region. A higher density of collapse events might signify a more rapid or profound process of actualization.

4.2. Mapping Gradation of Existence and Perfection

- **Sadra's Conceptualization:** The Primacy of Existence (Asalat al-Wujud) posits a graded hierarchy of existence (tashkik al-wujud). Beings exist in varying degrees of intensity, from lower (potential-laden) to higher (more actualized, unified, perfected). We might conceptualize this as a function $I(\Sigma)$ representing the "intensity of existence" or "degree of perfection" of a substance:

$$I(\Sigma)_{\text{Being}} \to R^{+} \tag{1}$$

where $I(\Sigma_1) < I(\Sigma_2)$ implies Σ_2 is "more perfect" than Σ_1. Essential Movement, then, is a process where $I(\Sigma(t))$ strictly increases.

- **PF's Potential Analogy:**
  - **Reduction of Fragmentation:** In PF, the transition from fragmented A-series

to a unified B-series implies a move towards less "ontological privacy" and greater coherence. If we can quantify fragmentation FA (e.g., as a measure of entanglement or causal disjointness between A-series fragments), then the process of evolution moves towards minimizing this: FA (t) → minimized FA upon collapse Sadra's increase in "perfection" (I) could be inversely proportional to PF's "fragmentation" (FA). So,

$$I(\Sigma) \propto 1/\mathrm{FA} \tag{2}$$

We ensure that the proportionality given in (2) is not mistaken for a precise, quantifiable physical law for the following arguments:

1) Conceptual Basis of the Inverse Proportionality:

The analogy "intensity of existence inversely proportional to fragmentation" is intended to convey a core philosophical insight stemming from the contrast between Mulla Sadra's essential movement and presentist fragmentalism:

- **Mulla Sadra's View:** For Sadra, existence is fundamentally a continuous, unified, and intensively dynamic process of becoming (essential movement). In his framework, there is maximal "intensity of existence" precisely because there is no fundamental fragmentation; being is a ceaseless, unifying flux. A more continuous and less fragmented reality implies a higher, undivided "intensity" of being.
- **Presentist Fragmentalism (PF) View:** In contrast, PF posits a reality built from **dis**crete, ontologically private "now-moments." This inherent fragmentation implies that existence is constantly "re-created" or actualized in separate instances, rather than being a single, enduring, continuous flow. The more fragmented reality is, the less the "intensity" is concentrated in a continuous, enduring substance, as it is dispersed across discrete, separate instances.

Therefore, the inverse proportionality suggests that a more continuous and less fragmented reality corresponds to a higher, undivided ontological intensity, while a more fragmented reality implies a diminished, dispersed, or less unified "intensity of existence."

2) Reframing the Analogy:

Given the conceptual nature of "intensity of existence" and "fragmentation" as used in this philosophical context (beyond the precise definitions of collapse rates or causal set elements), this relationship is best understood as a heuristic conceptual mapping rather than a quantifiable mathematical equation.

Instead of presenting it as proportionality given in (2), we will reframe it as a qualitative principle:

- "From a philosophical perspective, there appears to be an inverse qualitative relationship between the ontological intensity of being and the degree of fundamental fragmentation of reality. Where existence is conceived as a unified, continuous process (as in Sadra's essential movement), its 'intensity' is maximal and undivided. Conversely, where reality is posited as fundamentally discrete and fragmented (as in Presentist Fragmentalism), this implies a dispersion or dilution of continuous ontological 'intensity' across separate, re-created mo-

ments."

- **Emergent Dimensionality/Connectivity:** A "more perfect" or "higher degree of existence" in Sadra's terms could correspond to a region of spacetime emerging with higher causal connectivity or even higher effective dimensionality within the PF framework, representing greater complexity and integration. The degree of information integration (e.g., related to Tononi's Φ metric from IIT, which some connect to quantum gravity) (Tononi et al., 2016) could also be a candidate for Sadra's "intensity of existence."

4.3. Mapping Teleology and Ontological Privacy Minimization

- **Sadra's Conceptualization:** Essential Movement is inherently teleological, guided by a divine impulse towards actualizing potentials and achieving perfection. This can be seen as a drive to minimize potentiality (P) and maximize actuality (A), where $A + P =$ constant for a given being.

$$\mathrm{d}P/\mathrm{d}t < 0 \quad \text{and} \quad \mathrm{d}A/\mathrm{d}t > 0 \tag{3}$$

The "purpose" of existence is this continuous ascent towards greater actuality.

We indeed suggesting that gravity, as a physical force, can be understood as a manifestation of divine teleology within Mulla Sadra's framework. This is based on several core principles of his Transcendent Philosophy.

Sadra's worldview posits a graded unity of existence (tashkīk al-wujūd), where all reality emanates from the One Necessary Existent, God. The universe is characterized by essential movement (harakat al-jawhariyyah), an inherent, continuous process of becoming and actualization. This motion is not random but intrinsically purposeful, driven by an immanent divine teleology.

Our philosophical basis for this claim rests on:

1) Principality of Existence: Since existence is primary and all existence derives from God, the ordered operations of forces like gravity are seen as direct expressions of divine will and wisdom, structuring the cosmos.

2) Gradation of Existence: Gravity, by facilitating cosmic structure and order, acts as a means for lower existential degrees to progress towards higher actualization, reflecting the perfection of the Necessary Existent.

3) Unity of the Agent: All secondary causes, including physical forces, are ultimately instrumental in the hands of the single Divine Agent. Gravity thus operates as a continuous divine act sustaining cosmic coherence.

4) Continuous Creation and Final Causality: The universe is perpetually recreated. Gravity, in organizing this ongoing process, serves the ultimate divine purpose of the manifestation of divine perfection and the return of all existents to their Divine Source. Its operation contributes to the conditions necessary for existential unfolding towards this ultimate *telos*."

PF's Potential Analogy: A connection between the A-series becoming in PF quantum gravity, ontological privacy minimization, and gravity can be conceptualized by viewing the A-series as a form of inherent ontological privacy at the fragmented quantum level. Interactions and the consequent alignment of these A-se-

ries then represent the "minimization" of this privacy, leading to the emergence of a unified spacetime and the gravitational force, which is fundamentally linked to the causal relationships established through this temporal harmonization. The "Ontological Privacy Minimization Principle" in PF, where fragmented A-series tend towards unity, can be interpreted as a physical manifestation of a unifying drive. If "ontological privacy" OP is a quantifiable measure of disjointness or separation between A-series fragments, then the system's evolution is governed by minimizing this OP:

$$\mathrm{d}(\mathrm{OP})/\mathrm{d}t < 0 \tag{4}$$

- **Proposed Bridge:** Sadra's teleological drive to minimize potentiality and maximize actuality could be seen as the *metaphysical substrate* that gives rise to the *physical principle* of ontological privacy minimization. The "force" of gravity, as envisioned by Penrose causing wave function collapse, could be the physical mechanism by which this metaphysical drive towards unity (less ontological privacy, more actuality) is realized. So, Penrose's $\Delta E \cdot \tau \approx \hbar$ (gravitational self-energy uncertainty leading to collapse time) (Jones & Seidel, 2024) might be seen as a physical expression of a fundamental tendency towards greater existential coherence.

4.4. Mapping A-Series (Subjectivity) and Consciousness (Soul)

- **PF's Conceptualization:** The A-series is the fundamental tensed "present," inherently subjective. The collapse of the wave function, bringing forth a definite reality, is tied to this subjective "present" and its gravitational dynamics.

$$\Psi_{\text{superposition}} \xrightarrow{\text{A-series collapse(gravity)}} \Psi_{\text{definite}} \tag{5}$$

  Here, the "present" (A-series) is active in shaping reality.

- **Sadra's Conceptualization:** Consciousness (the soul) is the *emergent spiritual substance* that arises from the perfected matter. It is the most actualized form of a substance's existential journey. Let $\Psi_{\text{material(t)}}$ be the material state and $\Psi_{\text{soul(t)}}$ be the emergent soul:

$$\Psi_{\text{material(t)}} \xrightarrow{\text{Essential Movement}} \Psi_{\text{soul(t)}} \tag{6}$$

where Ψ_{soul} is a higher degree of existence.

- **Proposed Bridge:** If each A-series fragment represents a primitive, localized "subjective present" or a "proto-conscious event," then the "ontological privacy minimization" and subsequent *unification* (gravitational collapse) of these fragments could lead to the emergence of a higher-order, unified consciousness that corresponds to Sadra's soul. The Sadraean soul, once it emerges, would then be the integrated subject that experiences the now unified present, rather than being merely one of the fragmented presents. In this view, the A-series dynamics *build* the conditions for the soul's emergence, and the soul then *inhabits* and *experiences* the classical reality that PF describes.

5. Engaging the Discreteness-to-Continuity Emergence Problem in Quantum Gravity

The problem of how a continuous spacetime, as described by General Relativity, could emerge from fundamentally discrete or granular underlying structures is a central challenge in various approaches to quantum gravity. This "continuity problem" provides a vital precedent for the philosophical discussion of how continuous becoming (Mulla Sadra) might relate to a fragmented or discrete reality (Presentist Fragmentalism). By examining the proposed mechanisms in physics, we can better appreciate the conceptual chasm that Sadra's philosophy aims to bridge.

1) Causal Set Theory: The Continuum Limit and Order

Causal Set Theory (CST) fundamentally posits that spacetime is a discrete set of events related only by causality (Cortês & Smolin, 2014). There is no underlying manifold; the continuum is an emergent phenomenon.

- **The Problem:** The core challenge for CST is to demonstrate how a continuous, manifold-like spacetime with a specific metric can emerge from a "sprinkling" of discrete points. This involves defining a "continuum limit" where the discrete structure approximates a continuous one.
- **Proposed Mechanisms:** CST attempts to address this through:
  - **"Order = Geometry":** The causal order of the discrete events is paramount, and it is from this order that geometric properties are expected to emerge.
  - **Lorentzian Volume:** The number of causal set elements in a region is conjectured to be proportional to the Lorentzian volume of that region, establishing a link to continuous geometry.
  - **Coarse-Graining:** While not a "continuum limit" in the traditional sense, coarse-graining techniques are used to approximate continuous spacetime from the discrete causal set.
- **Relevance to Sadra:** CST grapples with building continuity from fundamental discreteness. This provides a direct analogue to the tension between Sadra's continuous "essential movement" and a fragmentalist view. While CST starts from discreteness and tries to *build* continuity, Sadra begins with continuous becoming and could offer a philosophical framework for why such a continuity *must* be fundamental, even if perceived as discrete at certain scales. The success (or challenges) of CST in recovering continuity highlights the profundity of the problem that Sadra's philosophy implicitly addresses.

2) Loop Quantum Gravity (LQG): Coarse-Graining and the Weave State

Loop Quantum Gravity (LQG) suggests that spacetime is fundamentally granular at the Planck scale, composed of excitations of the gravitational field (loops, nodes, and edges of spin networks) that define discrete units of area and volume (Rovelli, 2013).

- **The Problem:** The challenge here is to show how these discrete quantum excitations, described by spin networks, can give rise to the smooth, continuous

spacetime geometry of General Relativity at macroscopic scales. This is often referred to as the "continuum limit" or "classical limit" problem.

- **Proposed Mechanisms:**
  - **Weave States:** Specific "weave states" are hypothesized, which are quantum states of the geometry that, when coarse-grained over large distances, are indistinguishable from a classical smooth metric. The idea is that these dense arrangements of discrete quantum "chunks" of space effectively "weave" a continuous fabric.
  - **Approximation Methods:** Research focuses on how to average or sum over vast numbers of discrete excitations to recover the classical equations of gravity. This involves non-trivial mathematical techniques for taking limits.
  - **Thermodynamics of Spacetime:** Some approaches explore thermodynamic analogies, where classical spacetime emerges as a statistical average of underlying microscopic degrees of freedom.

Relevance to Sadra: LQG's struggle to show how a continuous geometry emerges from discrete quantum excitations provides a direct physical analogue to Sadra's philosophical emphasis on *continuous becoming* despite apparent discreteness. Sadra's "essential.

6. Limitations and Future Directions

It is crucial to reiterate that these mappings are conceptual analogies, not rigorous mathematical proofs. The primary limitations include:

1) Continuity vs. Discreteness: Sadra's insistence on continuous motion versus PF's fundamental discreteness remains a core tension. A mathematical bridge would require a compelling theory of how continuity precisely emerges from discreteness in a way that satisfies Sadra's philosophical arguments.

2) Qualitative vs. Quantitative: Concepts like "perfection" and "spirituality" are fundamentally qualitative in Sadra's metaphysics, making their direct quantification challenging within a physics framework.

3) Teleology: While "ontological privacy minimization" suggests a 'tendency', integrating a full-fledged teleological 'purpose' into a scientific model remains a significant hurdle.

Future research could involve exploring formal frameworks like category theory or topological dynamics to capture the continuous transformations of Sadra's Essential Movement and relate them to the discrete structures and dynamics of causal sets, potentially through the concept of 'coarse-graining' or 'continuum limits' of causal sets. This interdisciplinary approach, while speculative, holds the promise of fostering new conceptual insights into the profound questions surrounding consciousness, time, and the fundamental nature of reality.

It is a highly ambitious, yet conceptually captivating, task to attempt a mathematical mapping between a metaphysical philosophy like Mulla Sadra's and a speculative quantum gravity approach like Presentism-Fragmentalism (PF). Direct, rigorous mathematical equivalence is unlikely given their fundamentally dif-

ferent domains of inquiry (metaphysics vs. theoretical physics). However, we can explore conceptual analogies and propose hypothetical formalizations that might bridge the gap, acknowledging that these are highly speculative and serve primarily to stimulate interdisciplinary thought.

Let's integrate this into the dialogue by proposing potential "bridges" where mathematical concepts in PF might, at an abstract level, resonate with Sadra's philosophical insights.

7. Conclusion

The attempt to mathematically map these two profound frameworks highlights the formidable challenges and immense potential of interdisciplinary inquiry. While Mulla Sadra's philosophy provides a teleological, ontologically grounded understanding of continuous transformation and the emergence of consciousness, the Presentism-Fragmentalism approach offers a specific, though speculative, physical mechanism for the quantum-to-classical transition grounded in the nature of time and gravity.

The conceptual analogies proposed above, particularly regarding the interpretation of PF's fragmentation and collapse as manifestations of Sadra's continuous actualization, and the "ontological privacy minimization" as a physical reflection of a metaphysical drive towards unity and perfection, open avenues for a richer, more integrated worldview. The ultimate nature of the "present," the mechanism of subjective experience, and the telos of cosmic evolution remain profound mysteries. Yet, by allowing their unique "mathematical" and conceptual languages to interact, we can foster a deeper appreciation for the complex tapestry of reality as revealed by both ancient wisdom and cutting-edge science.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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