Illusory Self Framework: Accessing Subtler States of Consciousness in Waking, Dreaming, and Deep Sleep

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Abstract

"Illusory Self Framework," a novel model integrating insights from predictive brain and contemplative practices. The framework proposes a hierarchical cognitive architecture grounded in the "all-ground," the foundational space of pure awareness. Within this architecture, neuronal packets, knowledge domains, and thoughtseeds interact, leading to an emergent self—a dynamic Markov blanket modulating conscious experience. This framework explores the dissolution of the illusory self through contemplative practices drawn from Indo-Tibetan traditions, the insights of J. Krishnamurti and recent research on minimal phenomenal experiences (MPEs) and self-models.

It posits that by modulating attention, reducing self-referential processing, and cultivating stillness, one can weaken the emergent self and reveal the underlying all-ground of pure awareness. An illustrative mathematical model formalizes these concepts, for emergence and the dissolving process of the illusory self. Furthermore, the framework elucidates the unfolding of MPEs by proposing a 5-stage lucidity pathway for advanced meditators. This pathway begins with lucid dreaming and culminates in an attentive sleepful state, highlighting the progressive dissolution of the illusory self and the deepening of non-dual awareness. The framework also offers testable predictions about the sleep architecture of advanced meditators using signal-validated lucidity tracking measures and how it might change with progression in these practices.

Introduction

The philosophical discourse concerning consciousness during dreamless sleep has a long-standing history, especially in classical Indian philosophy. The schools of Advaita Vedānta and Yoga maintained that consciousness persists in dreamless sleep, while the Nyāya School argued for its absence. This philosophical discourse challenges the standard neuroscientific definition of consciousness as "that which disappears in dreamless sleep and reappears when we

wake up or dream" and suggests a more nuanced taxonomy of sleep states to highlight the potential relevance of contemplative methods in advancing the neurophenomenology of sleep and consciousness (Thompson, 2014, 2017).

MPE and Active Inference

Minimal Phenomenal Experiences (MPEs), with reduced or absent phenomenal content and low arousal, challenge conventional views of consciousness and offer a promising avenue for exploring *consciousness-as-such* (Josipovic & Miskovic, 2020). Some researchers have proposed that MPEs offer a unique window into the fundamental building blocks of conscious experience. MPEs discuss *"pure awareness"* experiences in meditation and the phenomenon of *lucid dreamless sleep (jagrat-sushupti)*, where consciousness persists in the absence of sensory or dream content (Metzinger, 2019; Windt, 2015; Thompson, 2015), provide an empirical entry point for investigating consciousness in its most minimal form. MPEs can be understood as a Bayesian representation of *tonic alertness* of an *unpartitioned epistemic space* (Metzinger, 2020) or as involving *pure subjective temporality*, characterized only by the phenomenal *now* and sense of duration (Windt, 2015).

Most studies on MPEs rely on self-reported experiences (Gamma & Metzinger, 2021) and discussions with experienced practitioners who emphasize the phenomenal nature of encountering *pure awareness* with its associated *luminous* quality (Costines et al., 2021). Although these phenomenological experiences have been described in contemplative traditions for thousands of years, scientific validation through empirical methods is still an ongoing journey (Metzinger, 2024).

Recent advances in neuroscience have leveraged predictive brain and active inference frameworks to explore MPEs (Laukkonen & Slagter, 2021; Pagnoni, 2019; Friston et al., 2017). These models conceptualize the brain as an *inference engine* that generates predictions about sensory inputs and minimizes prediction errors to reduce variational free energy (VFE), a mathematical proxy for surprise (Friston, 2010; Hohwy, 2013). The Free Energy Principle (FEP) offers a unifying perspective, suggesting that living systems actively engage in a process of model refinement and action selection to align their internal predictions with the external world (Friston et al., 2017; Hohwy & Friston, 2020). Central to FEP is the concept of the Markov blanket, which delineates the boundary between an organism's internal states and the external world, facilitating localized computations and ensuring conditional independence (Friston, 2019, 2023).

Meditation practices are typically categorized into three primary types: Focused Attention (FA), which gradually shifts away from habitual, content-driven predictions (Lutz et al., 2015); Open Monitoring (OM), which provides increasingly deeper insights (Lutz et al., 2008); and non-dual (ND) experiences transcending the subject-object duality (Dunne, 2011; Josipovic, 2010). This classification system facilitates the exploration of MPEs and suggests that consciousness can exist in an adaptive, minimal form, with specific neural correlates (Laukkonen & Slagter, 2021).

In particular, conscious states during dreaming and deep sleep offer promising avenues for connecting consciousness research to connect ancient contemplative practices (Varela, Thompson, & Rosch, 1991; Seth & Tsakiris, 2018).

Conscious experiences during sleep - Lucid Dreaming, Yoga Nidra and Clear Light Sleep

Lucidity during sleep encompasses a spectrum of experiences, ranging from the well-documented phenomenon of lucid dreaming during REM sleep, in which individuals are aware that they are dreaming and can occasionally exert control over the dream narrative (LaBerge, 1990; Baird et al., 2019), to the considerably less frequent occurrence of lucid NREM sleep, where awareness persists even in the absence of vivid dream imagery in NREM 2 (Stumbrys & Erlacher, 2012), and potentially in transient NREM 3 episodes (Türker et al., 2023). The capacity to cultivate and maintain conscious awareness during NREM sleep challenges the conventional conceptualization of sleep (Parker et al., 2013).

Yoga Nidra (YN) or *Yogic Sleep*, an ancient meditation technique rooted in *tantric* traditions, offers a unique pathway for exploring this elusive state of *conscious sleep* (Saraswati, 1988; Pandi-Perumal et al., 2022). This inward turning of attention resembles *"Pratyahara"* in classical Yoga, where the senses are consciously disengaged from external stimuli, leading to deep internal focus, much like a tortoise withdrawing into its shell. (Iyengar, 1991). Exceptionally advanced practitioners can navigate the various stages of sleep with awareness, recognizing changes in sleep physiology without external stimuli (Rama, 1985; Green & Green, 1977). Yoga Nidra meditation is usually performed in the waking state, whereas authentic YN occurs during nocturnal sleep, rendering meditation a preparatory phase for Yogic Sleep (Swami, 1985; Saraswati, 1988). These advanced transcendental meditation states are sometimes described as *amanaska yoga* (Birch, 2013).

Lucid dreaming training, with the ability to *influence dreams*, corresponds to **Dream Yoga** . The phenomenology of **Sleep Yoga** from the Bon-Buddhist tradition corresponds to the authentic *YN* that leads to the experience of luminosity or *"clear light sleep"*. Interestingly, these practices are performed as preparation for the *bardo*, incorporating concepts like conscious death (Greyson, 2004; Wangyal, 1988).

Krishnamurthy (1974), a renowned meditator and philosopher, described sleep as an *attentive sleepful state*, albeit without employing explicit meditation techniques.

Central Thesis*: Pure awareness is not an emergent property but a fundamental aspect of consciousness, revealed when the barriers of thought and the illusory self dissolve. Contemplative practices act as tools to refine perceptions and facilitate the direct experience of this underlying awareness.*

Representations of Self

The perception of a unified and enduring self is central to human experience, but various contemplative traditions and modern cognitive science challenge this notion. In Buddhist

philosophy, "*anatta*" denotes the absence of a permanent self, while Yogic teachings use "*ahamkara*" to describe the ego-based sense of identity. Both traditions suggest that the continuous "I" is an illusion, constructed by the mind and acting from a "center" that directs attention and guides behavior (Krishnamurti, 1979). Kraus, interpreting Kant's philosophy, argues that the self is not an inherent entity but a dynamic process of self-formation, created through perceptual and cognitive interactions (Kraus, 2020). Similarly, Metzinger's concept of the "*ego tunnel*" describes the self as a virtual construct produced by the brain, a transparent model we mistake for a real and permanent self (Metzinger, 2009). It can be further understood as a "*controlled hallucination,*" where the brain constructs a coherent narrative of the self based on sensory inputs and prior experiences (Seth, 2014).

Representations of Self using EAM and PSM

Metzinger's models of self-representation, the Epistemic Agent Model (EAM) and the Phenomenal Self Model (PSM), provide a framework for understanding the emergence of the illusory self. The EAM emphasizes the brain's capacity for self-modeling and agency, comprising a self-model, a world-model, and a sense of agency (Metzinger, 2003). The interplay of these three components generates the experience of being a conscious agent capable of interacting with and influencing the world. Metzinger (2015) further elaborates on the concept of agency by introducing the notion of M-autonomy, which refers to the capacity for voluntary control and intentional inhibition of mental processes. It is the loss of this control, during moments of mind-wandering or non-lucid dreaming, that highlights the ephemeral nature of mental autonomy and the recurring loss of self-determination in our cognitive phenomenology.

The PSM, on the other hand, focuses on the subjective experience of selfhood, encompassing both bodily sensations (homeostatic self-model) and long-term goals and values (allostatic self-model) (Metzinger, 2003; Seth & Tsakaris, 2018).

The concept of transparency, wherein the brain represents the world directly without conscious awareness of underlying cognitive processes, further contributes to the illusion of a unified and continuous self (Metzinger, 2003). This transparency can also lead to the reification of the self, making it seem more concrete and enduring than it truly is.

In subsequent sections, the following topics will be examined through the lens of mathematical models commonly used in Active Inference literature, but grounded in meditation literature. An **Illusory Self Framework** is proposed for understanding the emergence and eventual dissolving of the *illusory self*. While these models could offer valuable insights, it is essential to recognize that they serve as representations rather than direct experiences of the illusory self(Andrews, 2023).

- **The emergence of the illusory self**: Accompanied by an illustrative mathematical framework.
- **The dissolving process of the illusory self:** During advanced meditations and MPEs, also with an illustrative mathematical framework.
- **Experimental predictions:** On progressively advanced lucidity pathways during a nightly sleep (dreaming and deep sleep), using standard AASM sleep architecture (Iber, 2007) as validation criteria.

A Cognitive Architecture of the Brain and the Mind inspired from Contemplative Traditions

Integrating Contemplative Traditions and the Thoughtseed Framework

This paper adopts a holistic perspective to understand the "bundle of consciousness," as described by Krishnamurti (De Sousa, 2012), also known as "chitta"(or "citta") in Yogic and Buddhist philosophies. Chitta, or mind-stuff functions as the repository of karmic traces and embodied knowledge, storing all mental impressions, memories, and latent tendencies that shape an individual's consciousness and behavior (Gethin, 1998; James, 1890).

Contemplative traditions, especially Buddhist ones, categorize the mind into three layers: Gross-Body/Gross-Mind, Subtle-Body/Subtle-Mind, and Very Subtle Body/Very Subtle Mind (Wayman, 1977, 1982; Kavi, 2023). Central to this investigation is the concept of the *"all-ground,"* an atemporal, uncreated space described in contemplative traditions as having the "cognitive capacity for knowing" and containing *buddha-nature* or *dharma-dhatu* (Rangdrol, 2010). Analogous concepts are *pabhassara citta* (luminous mind) in *ālaya-vijñāna* (Young-Eisendrath, 2018), *rigpa* in Tibetan Dzogchen teachings (Baker, 2012), and luminosity in Kashmir Shaivism (Timalsina, 2020).

The Thoughtseeds Framework (Kavi et al., 2024) describes a layered cognitive architecture that aims to explain biologically plausible processes giving rise to cognition. It incorporates both phylogenetic and ontogenetic processes, which act as Bayesian priors at different scales. Each layer functions as a "nested holographic screen," encoding information about the world at increasing levels of abstraction (Fields, Glazebrook, & Levin, 2022; Ramstead et al., 2023) containing nested Markov blankets across scales, forming both heterarchical and hierarchical organizations.

The Illusory Self Framework - Cognitive Architecture

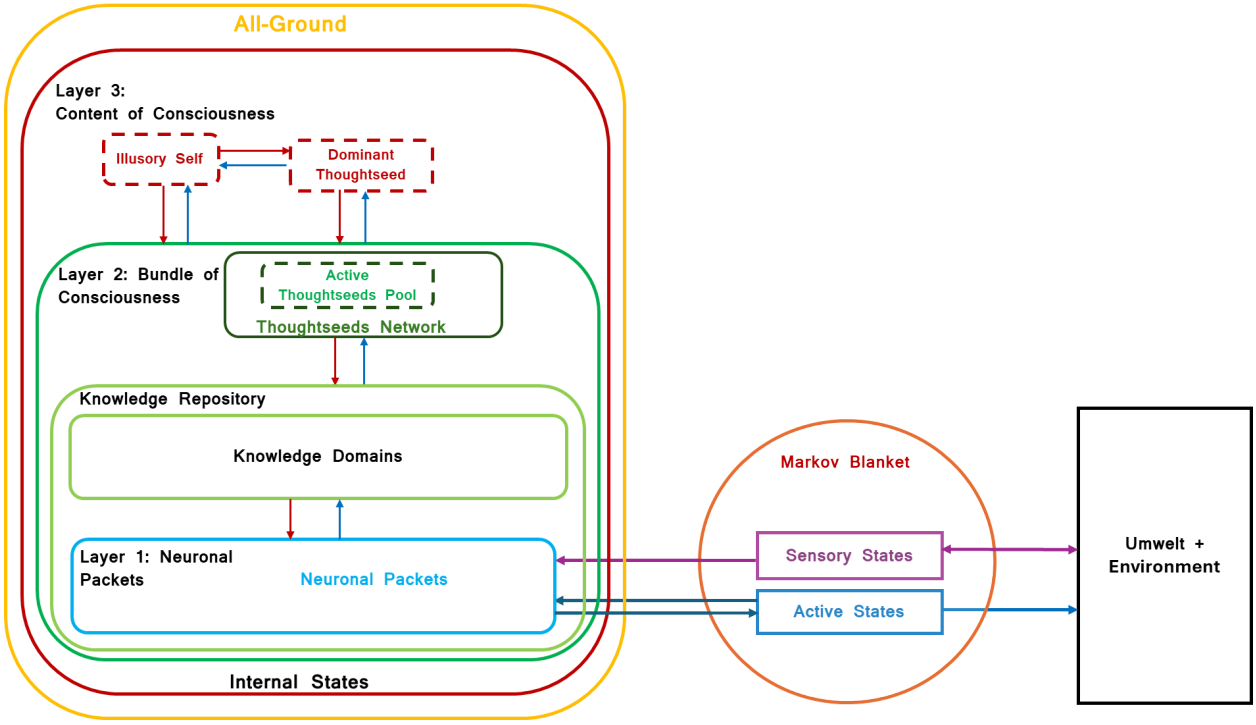

Figure 1: Illusory Self Framework illustration. This illustration provides a high-level conceptualization overview of the multi-layered Illusory Self model of an Agent, inspired from Thoughtseeds Framework. It depicts the hierarchical organization of cognitive processes, starting from the foundational levels of *Neuronal Packets (NPs)* and *Knowledge Domains (KDs)*. KDs and the *Thoughtseed Network* together contribute to the *Bundle of Consciousness*. Meta-cognition encompasses the *Emergent Self* and the *dominant thoughtseed*, which in turn shape the *"content of consciousness."* The entire architecture is grounded in the *All-Ground,* representing the foundational space of *pure awareness*. Each layer within this model can be conceptualized as a *"nested holographic screen,"* encoding increasingly abstract representations of the world as one ascends the hierarchy. The dynamic interplay between these layers is facilitated by nested Markov blankets and reciprocal message passing, depicted by red lines (top-down influences and predictions) and blue lines (bottom-up influences and prediction errors).The agent interacts with its *Umwelt (subjective world)* and the broader environment through the Markov blanket at the *Agent level.* The "content of consciousness" is shaped by the dominant thoughtseed, which actively generates predictions and guides behavior, and is selected through a competitive process based on *cumulative Expected Free Energy minimization*.

Formally, a thoughtseed can be defined as follows: “An activated thoughtseed is a higher-order transient Markov-blanketed epistemic agent that generates the ‘content of consciousness’ projected on and reflected on the ‘all-ground.’ It emerges from the coordinated activity of superordinate ensembles (SEs) across different knowledge domains (KDs) representing the ‘bundle of consciousness,’ enabling active exploration of the umwelt/environment and the development of affordances—possibilities for action—that are associated with specific patterns of neuronal activity (Kavi et al., 2024).”

These ideas are further elaborated in the three-layered cognitive architecture of the Illusory Self Framework (ISF).

Layer 1: Neuronal Packets (NPs)

The foundational level builds upon the concepts of "neuronal packets"(NPs) (Yufik, 2013, 2016, 2019), and the "neuronal packet hypothesis" (NPH) (Ramstead et al., 2021). These NPs serve as the fundamental units of neuronal representation, encoding specific features or aspects of the world. The hierarchical organization of NPs, through nested Markov blankets, reflects the "ascending scales of canonical microcircuits" observed in the brain (Hipólito et al., 2021; Sporns & Betzel, 2016), enabling the emergence of complex computations from simpler units. This architecture facilitates efficient information processing and adaptive behavior (Palacios et al., 2020).

NPs can exist in three potential states (Kavi et al., 2024). The Unmanifested State represents latent potential neural activity, shaped by evolutionary priors, with low stability and high potential for change. The Manifested State emerges from the unmanifested state through repeated exposure to stimuli, leading to a *phase transition* (Yufik, 2019) and the formation of a stable Markov blanket with a core attractor representing the NP's primary functionality. When activated, it becomes part of an active thoughtseeds pool and can even become the *dominant thoughtseed* influencing behavior or cognition.

NPs engage in a competitive process of free energy minimization, ensuring the selection and refinement of efficient internal models and can result in a diverse repertoire of specialized NPs, each representing different aspects of the world. NPs dynamically interact to form "superordinate ensembles (SEs)" representing a higher level of organization and encoding more complex and abstract concepts. The hierarchical organization, where Markov blankets of lower-level NPs are nested within those of higher-level SEs, allows the brain to represent knowledge across multiple scales, from sensory details to abstract categories. SEs may emerge as stable entities when they accurately predict and explain sensory input (Ramstead et al., 2021).

Layer 2: Knowledge Domains (KDs) and Thoughtseed Network: The "Bundle of Consciousness"

Knowledge Domains (KDs) represent the organized repositories of the Agent's accumulated knowledge, experiences, and memories. They can be conceptualized as knowledge graphs (Hogan et al., 2021). These KDs serve as the conceptual scaffolding upon which raw sensory information, projected from the Neuronal Packets, is interpreted and contextualized.

KDs act as dynamic "content generators" that engage in a context-dependent binding process, contributing to the "content of consciousness" projected on the *all-ground*, conditioned by the *dominant* thoughtseed. This process may involve the synchronization of neural activity (Singer, 1999; Palacios et al., 2019) or other binding mechanisms (Roelfsema, 2023), facilitated by shared generative models, reciprocal message passing, and attentional selection (Friston & Kiebel, 2009).

Furthermore, KDs possess an intrinsic affective dimension, reflecting the emotional valence and arousal associated with their content (Patisappu et al., 2024). This affective dimension plays a crucial role in shaping an individual's subjective experience and influencing their behavior and

decision-making processes (Solms, 2021). However, KDs representing purely abstract concepts, such as mathematical or grammatical rules, may lack this affective component.

In the context of contemplative traditions, KDs can be seen as a representation of the "chitta" as an evolving repository of experiences and latent tendencies.

Thoughtseeds Network

Thoughtseeds, the emergent agents of cognition, arise from the coordinated activity of distributed neural networks and compete for dominance on the all-ground, shaping the content of consciousness, including sensory observations, memories, knowledge, and potential actions. These dynamic patterns of neuronal activity and connectivity are self-sustaining, driven by interactions with the environment and internal dynamics. Thoughtseeds can be understood as metastable states within the brain's pullback attractor landscape, representing stable patterns of neural activity that minimize free energy and are reinforced through repeated visits (Deco & Kringelbach, 2016; Friston, 2012 , 2014). When active, thoughtseeds function as pullback attractors, integrating information from multiple SEs and KDs to form coherent representations. This establishes a transient Markov blanket, maintaining autonomy and computational independence. Each thoughtseed is associated with a core attractor, representing its most probable and stable pattern of neural activity, embodying its core functionality or meaning. It may also have subordinate attractors, offering flexibility and adaptability in response to varying contexts or stimuli. The ongoing neural activity during the activation of specific thoughtseeds is guided by an interplay of bottom-up saliency signals and top-down attentional mechanisms, influenced by meta-cognition and higher-order thoughtseeds.

Active Thoughtseed Pool and Activation Threshold

An activation threshold, conditioned upon the Phenomenal Self Model (PSM) and the consciousness state, acts as a gatekeeper. Additionally, the Epistemic Agent Model (EAM) provides the context, ensuring that only relevant thoughtseeds contribute to the ongoing stream of thought, preventing the 'noise' of weakly activated thoughtseeds. The set of thoughtseeds whose activation levels surpass this threshold constitutes the "active thoughtseed pool."

Thoughtseed States: Thoughtseeds can exist in the following states (Kavi et al., 2024):

- **Unmanifested**: The initial state where the thoughtseed exists as a potential configuration within the neural network, but is not yet actively influencing cognition or behavior.
- **Manifested**: The thoughtseed has emerged and is now part of the cognitive landscape, with the potential to influence thought and action. The sub-states further refine this:
    - **Inactive**: The thoughtseed is present but not currently contributing to conscious experience.
    - **Activated**: The thoughtseed is in the "active thoughtseed pool" and contributes to the content of consciousness.
    - **Dominant**: The thoughtseed has the highest activation level and is primarily shaping conscious experience.
- **Dissipated**: The thoughtseed has ceased to be active and its influence has diminished, potentially returning to an unmanifested state or leaving remnants that could facilitate future re-activation.

Layer 3: MetaCognition and "Contents of Consciousness"

This layer represents the pinnacle of cognitive processing, encompassing self-awareness, attentional control, and the monitoring of thoughts and feelings via the Emergent Self Markov Blanket and the dominant thoughtseed. It is grounded in the "all-ground," the foundational, unconstructed, atemporal space of *pure awareness*, which serves as the backdrop for the emergence of conscious experience.

The Emergent *Illusory Self*

Within the *all-ground* resides the Emergent Self Markov Blanket, a dynamic, quasi-stable construct representing the *illusory self* composed of higher-order thoughtseeds. This blanket encompasses components of the Epistemic Agent Model (EAM) - self-model, world-model, sense of agency - and the Phenomenal Self Model (PSM) - homeostatic and allostatic self-models. The EAM and PSM components are represented by distinct sets of higher-order thoughtseeds, capturing the specific aspects of self-representation and their interactions with the environment.

The Emergent Self actively modulates the selection and activation of lower-order thoughtseeds and Knowledge Domains (KDs), shaping the content of consciousness. It also exerts top-down control over the *dominant* thoughtseed, which represents the current focus of attention (the *attention spotlight* (Baars, 1988) and the primary "content of consciousness" projected onto the *all-ground*, which serves as the "locus of conscious experience."

Multiple Personas and Dynamic Switching

The Emergent Self could encompass multiple personas, each with its own set of goals, policies, and affordances (Friston, 2022) that may shift depending on the world-model and the interaction with the world. This dynamic persona switching allows the agent to adapt to different contexts and social roles, reflecting the flexibility and adaptability of the self-model.

Agent-Level Goals, Policies, and Affordances

The Emergent Self, within a particular persona, guides the agent's behavior by generating agent-level goals, policies, and affordances. These are influenced by both the long-term aspirations encoded in the allostatic self-model and the immediate needs and drives represented in the homeostatic self-model. The selection of policies is further guided by the knowledge and beliefs stored within the KDs, the current context, and the perceived affordances—both epistemic (opportunities for learning) and pragmatic (opportunities for goal fulfillment)—of the environment.

The Unitary Nature of Conscious Experience

Despite the dynamic interplay of thoughtseeds and the potential for multiple personas within the Emergent Self, the content of consciousness at any given moment is unified and coherent

(Winters, 2021). This is hypothesized to be achieved by the dominant thoughtseed (selected from the active thoughtseed pool), a process driven by the minimization of cumulative Expected Free Energy (EFE) (Parr & Friston, 2019) and modulated by the Emergent Self's attentional control.

Dissolving the *Illusory Self* (Advanced Meditations)

The great yogi Milarepa's insight (11th century, Tibet), "In the gap between the past thought and the next thought, thought-free wakefulness continuously dawns," highlights the potential for accessing the all-ground in the stillness between thoughts. He outlines a three-fold process for cultivating this recognition: (1) Stillness: The cessation of a thought; (2) Occurrence: The arising of a new thought; and (3) Noticing: Bringing attention to the transition between stillness and occurrence (Adeu Rinpoche, 2011) .

Modeling Milarepa's Threefold Process

In advanced states of non-dual awareness, such as those achieved through deep meditative practices, the dominant thoughtseed continues to play a crucial role, albeit in a transformed capacity. It acts as a pullback attractor, integrating information and maintaining a Markov blanket, but it no longer shapes consciousness through the lens of the self-model. Instead, the dominant thoughtseed facilitates a direct, unmediated experience of reality, reflecting the qualities of the all-ground, the fundamental awareness underlying all experience.

Despite being metastable—able to shift in response to subtle fluctuations—the flow of the dominant thoughtseed in non-dual awareness is characterized by fluidity, interconnectedness, and a lack of separation, unlike the ordinary waking state where agency and ownership dominate. This dynamic aligns with Milarepa's threefold process of stillness, occurrence, and noticing:

- **Stillness:** This represents moments when the dominant thoughtseed temporarily subsides or its content merges with the all-ground, creating a gap in the stream of consciousness. This gap allows for a temporary experience of *pure awareness*, free from mental proliferation and the constraints of the self-model.
- **Occurrence:** This refers to the emergence of a new dominant thoughtseed or subtle shifts in the existing one. In non-dual awareness, these thoughtseeds do not reinforce the self-model; rather, they reflect the openness and fluidity of the all-ground, manifesting as subtle fluctuations in the field of awareness.
- **Noticing:** This involves meta-cognitive awareness of the transitions between stillness and occurrence, recognizing the impermanent nature of even the subtlest mental activity. By noticing these shifts, the practitioner deepens their connection to the all-ground and weakens the habitual tendency to reify thoughts and experiences into a solid sense of self.

Through the practice of noticing, meditators can stabilize the experience of non-dual awareness, progressively dissolving the boundary between stillness and occurrence (Adeu Rinpoche, 2011). This aligns with the ISF, which conceptualizes mental activity as a fluid, dynamic interplay of thoughtseeds and KDs. By learning to recognize these transitions and disengage from the

self-referential interpretations that typically accompany them, practitioners disrupt the habitual formation of the self-model. This weakening of the emergent self Markov blanket opens the door to a more direct, unbounded experience of reality, characterized by a deeper connection to the *all-ground* and a greater sense of freedom from the limitations of the *illusory self*.

Awareness as Attention of Inattention

In the thoughtseed framework, the interplay between *attention* and *inattention* is key to either maintaining or dissolving the self-model:

- **Inattention**: When habitual inattention dominates, thoughtseeds take over consciousness, reinforcing the self-model. In this state, self-referential thought patterns strengthen the perceived boundary between "self" and "world," perpetuating the illusion of a separate self.
- **Attention as Awareness of Inattention:** Cultivating attention means recognizing the patterns of inattention (Krishnamurti, 1979) that reconstruct the self-model. This meta-awareness allows practitioners to de-identify with self-referential thoughtseeds, loosening the bonds of the self-model (Thompson, 2015). By observing this process, practitioners weaken the tendencies that reinforce separation, opening space for interconnectedness.

This shift mirrors contemplative traditions that speak of moving from *dualistic mind* to *non-dual awareness* (Loy, 2012). In the dualistic mind, the self-model acts as a "*center*," organizing the observer's experience of the external world. However, in non-dual awareness, this center dissolves, leading to a perception where the "*observer is the observed*" (Krishnamurti, 1972). The dominant thoughtseed, in this state, no longer interprets reality through the self-model but rather as a conduit for a holistic and interconnected experience. This shift, often described as functioning "*without a center*" (Krishnamurti, 1978), transcends the boundaries of the illusory self, enabling direct and undivided perception.

MPEs without Absorption: A Shift from "I"ness to "Am"ness

In the context of the thoughtseed framework, MPEs without absorption can be understood as a weakening, though not a complete dissolution, of the *illusory self*. This weakening corresponds to a significant shift in the experience of self, transitioning from a sense of *I-ness* (ahankara) to a sense of *am-ness* (asmita) (Feuerstein, 2001).

- **Ahankara (I-ness)**: This represents the neurotypical *dualistic mind*, characterized by a pronounced sense of individuality, separation, and agency. It is associated with an outwardly projecting tendency, constantly seeking to define and assert itself in relation to the world. Within the thoughtseed framework, *I-ness* arises from the strong activation of higher-order thoughtseeds related to the self-model, particularly those associated with the Emergent Agent Model (EAM) and its components (Thompson, 2015).
- **Asmita (Am-ness)**: In contrast, am-ness signifies a more subtle and refined sense of self, characterized by passive, inwardly focused awareness. This state is less aggressive and more receptive, where the boundaries between self and world begin to soften. In the ISF,

asmita can be understood as a weakening of the emergent self's Markov blanket, where the influence of EAM components diminishes. This shift allows for the emergence of *MPEs*, where the dynamics of the brain, including the dominant thoughtseed and even lower-order thoughtseeds, become less pronounced and more *opaque* (Metzinger, 2003, 2019; Varela et al., 1991).

In MPE without absorption, the dominant thoughtseed continues to shape consciousness, but its activity is less influenced by the *illusory self* model. The experience is characterized by a reduction in self-referential thoughts and emotions, greater openness and receptivity, and a subtle awareness of the underlying all-ground. However, a sense of duality persists, as the minimal self, represented by asmita, remains present.

MPE with Absorption: Dissolving into *"Such"*ness

MPE with absorption represents a deeper level of dissolution, where the emergent Markov blanket of the *illusory self* is significantly weakened, and the boundaries between the experiencer and the experience dissolve. This corresponds to a non-dual state of awareness, where the feeling of *am-ness* is further dissolved into "*as-such*" (Metzinger, 2009) as the emergent *illusory self* merges with the all-ground.

In this state, the dominant thoughtseed functions as a conduit for a direct and unmediated experience of reality, free from the constraints of the self-model. The content of consciousness reflects the qualities of the all-ground, such as emptiness, luminosity, or *pure awareness*. The experience is characterized by a sense of unity, immersion, and interconnectedness with all phenomena.

Nirodha Samapatti and the Knowing Capacity

- **Dissolution of *Illusory Self* without Knowing (Nirodha Samapatti)**: This represents a state of complete cessation of mental activity, where even the subtle awareness of the experience is absent. It could be described as a temporary state of absorption in the *all-ground*, characterized by a complete lack of phenomenal content and self-awareness, yet can also persist for extended periods (Laukkonen et al., 2022).
- **Dissolution *Illusory Self* with the quality of Knowing:** This advanced stage involves abiding in the all-ground with awareness or knowing capacity present, and can be described as "*pure awareness*" (Metzinger, 2024) characterized by a state "free of thoughts" and timelessness (Krishnamurti, 1969; Urgyul, 1999). This state transcends normal waking consciousness and can progressively lead to awareness during dream and sleep stages (Mota-Rolim et al., 2020; Wangyal, 1988; Rama, 1985).

Both MPE with absorption and *nirodha samapatti* represent extremely advanced stages of meditation, highlighting the varying depths of self-transcendence that can be attained through contemplative practices.

Illustrative Mathematical Model

The illustrative mathematical model is derived from organizing principles described in the thoughtseeds framework (Kavi et al., 2024).

Neuronal Packets and Knowledge Domains

Neuronal Packet (NP) state $\mathbf{x}_\nu(\mathbf{t})$ in its manifested form is represented by its core attractor $\psi_{\nu-c}$ and subordinate attractors $\psi_{\nu-s_i}$ and their corresponding activation levels $\alpha_{\nu-c}$ and $\alpha_{\nu-s_i}$, $\alpha_{\nu-c}$ and and $\alpha_{\nu-s_i} \in [0, 1]$.

$$\mathbf{x}_\nu(t) = \{(\psi_{\nu-c}, \alpha_{\nu-c}(t)), (\psi_{\nu-s_1}, \alpha_{\nu-s_1}(t)), \ldots, (\psi_{\nu-s_n}, \alpha_{\nu-s_n}(t))\} \quad (1)$$

Knowledge Domain (KD): The learnings, knowledge, memories encapsulated by these NPs, particularly within their core attractors, and their superordinate ensembles (SEs) at nested scales, lead to the encapsulation and formation of KDs. The state of a KD $\mathbf{x}_\mathcal{K}(\mathbf{t})$ is represented as a collection of its constituent SEs $\boldsymbol{\varepsilon}_i$, each with its own core attractor, subordinate attractors, and their corresponding activation levels. Additionally, we incorporate the valence $v_i(t) \in [-1, 1]$ (unpleasantness/pleasantness or grasping/aversion) and arousal $r_i(t) \in [0, 1]$ associated with the KD.

$$\mathbf{x}_\mathcal{K}(\mathbf{t}) = \{(\boldsymbol{\varepsilon}_\mathbf{1}, \mathbf{v_1(t)}, \mathbf{r_1(t)}), (\boldsymbol{\varepsilon}_\mathbf{2}, \mathbf{v_2(t)}, \mathbf{r_2(t)}), \ldots, (\boldsymbol{\varepsilon}_\mathbf{n}, \mathbf{v_n(t)}, \mathbf{r_n(t)})\} \quad (2)$$

Generative Model of a KD $\mathcal{K}$ describes how its internal states $\mathbf{x}_\mathcal{K}(\mathbf{t})$ contribute to generating content $\mathbf{c}_\mathcal{K}$ projected onto the *all-ground*. This content encompasses sensory observations, knowledge, memories, and expertise associated with the domain, and is conditioned on the KD's internal model parameters $\theta_\mathcal{K}$ and the dominant thoughtseed state $\mathbf{x}_{\mathcal{T}^*}$, reflecting top-down influence. $\mathbf{v}_\mathcal{K}$ and $\mathbf{r}_\mathcal{K}$ reflects the valence and arousal respectively.

$$p(\mathbf{c}_\mathcal{K}, \mathbf{v}_\mathcal{K}, \mathbf{r}_\mathcal{K} | \mathbf{x}_\mathcal{K}, \theta_\mathcal{K}, \mathbf{x}_{\mathcal{T}^*}) \quad (3)$$

Free Energy Minimization of a KD $\mathcal{K}$ updates its internal states and of its constituent SEs to ensure that the content projected onto the *all-ground* aligns with observed data, conditioned by the dominant thoughtseed. The complexity term reflects the diversity and flexibility of the KD's internal model, while the accuracy term gauges how well the KD's internal model predicts sensory data, including affective experiences. $F_\mathcal{K}$ process is pivotal in the emergence of the *illusory self*, as the self-model is continuously refined to minimize prediction errors and maintain a sense of coherence and continuity amidst a constantly changing environment.

$$F_\mathcal{K} = \underbrace{D_{KL}\left[q\left(\mathbf{x}_\mathcal{K}\right) \| p\left(\mathbf{x}_\mathcal{K} \mid \mathbf{c}_\mathcal{K}, \mathbf{v}_\mathcal{K}, \mathbf{r}_\mathcal{K}, \theta_\mathcal{K}, \mathbf{x}_{\mathcal{T}^*}\right)\right]}_{\text{Complexity}} - \underbrace{\mathbb{E}_{q(\mathbf{x}_\mathcal{K})}\left[\ln p\left(\mathbf{c}_\mathcal{K}, \mathbf{v}_\mathcal{K}, \mathbf{r}_\mathcal{K} \mid \mathbf{x}_\mathcal{K}, \theta_\mathcal{K}\right)\right]}_{\text{Accuracy}} \quad (4)$$

where:

- D_{KL} term: Represents the complexity or Kullback-Leibler divergence between the approximate posterior (q term) of the KD's internal states vs the true posterior distribution (p term) given the projected content, valence, arousal, internal model parameters, and the dominant thoughtseed
- $\mathbb{E}_{q(\mathbf{x}_\mathcal{K})}$ term: Represents the accuracy, or the expected log-likelihood of the projected content, valence, and arousal.
- Weighted difference between the predicted and actual valence and arousal associated with a KD can also be added as shown $\lambda_v(\mathbf{v}_\mathcal{K} - \hat{\mathbf{v}}_\mathcal{K})^2 + \lambda_r(\mathbf{r}_\mathcal{K} - \hat{\mathbf{r}}_\mathcal{K})^2$

Thoughtseeds

Thoughtseed $\mathcal{T}$: The state of a Thoughtseed, $\mathbf{x}_\mathcal{T}$ in its manifested form, is represented by its core attractor $\psi_{\mathcal{T}-c}$ and subordinate attractors $\psi_{\mathcal{T}-s_i}$ and their corresponding activation levels $\alpha_{\nu-c}$ and $\alpha_{\nu-s_i}$, $\alpha_{\nu-c}$ and and $\alpha_{\mathcal{T}-s_i} \in [0, 1]$.

$$\mathbf{x}_\mathcal{T}(t) = \{(\psi_{\mathcal{T}-c}, \alpha_{\mathcal{T}-c}(t)), (\psi_{\mathcal{T}-s_1}, \alpha_{\mathcal{T}-s_1}(t)), \ldots, (\psi_{\mathcal{T}-s_m}, \alpha_{\mathcal{T}-s_m}(t))\} \quad (5)$$

Activation Level of a Thoughtseed $\alpha_{\mathcal{T}_i}(t)$ is represented by a weighted combination of the brain's current state in the thoughtseed's core attractor $\psi_{\mathcal{T}-c_i}$ or subordinate attractors $\psi_{\mathcal{T}-s_{ij}}$.

$$\alpha_\mathcal{T}(t) = w_c \cdot p(\psi_{\mathcal{T}-c} \mid \mathbf{x}_\mathcal{T}(t)) + \sum_{j=1}^{m} w_{s_j} \cdot p(\psi_{\mathcal{T}-s_j} \mid \mathbf{x}_\mathcal{T}(t)) \quad (6)$$

Generative Model of a Thoughtseed predicts the content projected on the all-ground $\mathbf{c}$, the sensory observations $\mathbf{s}$ and generated actions $\mathbf{a}$, conditioned upon its internal states $\mathbf{x}_\mathcal{T}$, state of primary associated KD $\mathbf{x}_\mathcal{K}$, its content $\mathbf{c}_\mathcal{K}$, sensory input $\mathbf{u}$ and its saliency σ, perceived affordances $\mathbf{A}$, model parameters $\theta_\mathcal{T}$, policies $\mathbf{\Pi}$ and state of the emergent self $mb(t)$.

$$p(\mathbf{c}, \mathbf{s}, \mathbf{a} | \mathbf{x}_\mathcal{T}, \mathbf{x}_\mathcal{K}, \mathbf{c}_\mathcal{K}, \theta_\mathcal{T}, \mathbf{u}, \sigma, \mathbf{A}, \mathbf{\Pi}, mb(t)) \quad (7)$$

Active Thoughtseed Pool and Activation Parameter: The thoughtseeds network comprises a multitude of *manifested* thoughtseeds $\mathcal{T}_i$, but most are inactive. A global activation parameter $\Theta_{activation}(t)$, modulated by the emergent self and the arousal levels, serves as a threshold for entering the "active thoughtseed pool" $\mathcal{P}_{active}$, within an arbitrarily small time interval Δt.

$$\mathcal{P}_{\mathbf{active}}(t - \Delta t, t) = \{\mathbf{x}_{\mathcal{T}_i}(t') | \alpha_i(t') > \Theta_{activation}(t'), t' \in (t - \Delta t, t]\} \quad (8)$$

Dominant Thoughtseed

Selecting the Dominant Thoughtseed from the Active Thoughtseeds Pool involves choosing the thoughtseed index (i^*) from active thoughtseeds in $\mathcal{P}_{\mathbf{active}}(t)$ that minimizes the cumulative Expected Free Energy EFE_i given its policy $\mathbf{\Pi}_i$ over a specific time window Δt. The dominant thoughtseed shapes the "content of consciousness."

$$i^*(t-\Delta t,t) = \underset{i\in\mathcal{P}_{\mathbf{active}}(t-\Delta t,t)}{\operatorname{argmin}} \sum_{t'=t-\Delta t}^{t} EFE_i(\mathbf{\Pi}_i, t') \tag{9}$$

State of a Dominant Thoughtseed $\mathcal{T}^*$, $\mathbf{x}_{\mathcal{T}^*}$is represented by its core attractor $\psi_{\mathcal{T}^*-c}$ and subordinate attractors $\psi_{\mathcal{T}^*-s_i}$ and their corresponding activation levels.

$$\mathbf{x}_{\mathcal{T}^*}(t) = \{(\psi_{\mathcal{T}^*-c}, \alpha_{\mathcal{T}^*-c}(t)), (\psi_{\mathcal{T}^*-s_1}, \alpha_{\mathcal{T}^*-s_1}(t)), ..., (\psi_{\mathcal{T}^*-s_m}, \alpha_{\mathcal{T}^*-s_m}(t))\} \tag{10}$$

Generative Model of the Dominant Thoughtseed predicts content projected on the all-ground and is similar to the generative model of a thoughtseed discussed in Eq 7, but includes additional parameters attentional modulation γ and meta-awareness parameters m.

$$p(\mathbf{c}, \mathbf{s}, \mathbf{a}, \gamma, m | \mathbf{x}_{\mathcal{T}^*}, \mathbf{x}_{\mathcal{K}^*}, \mathbf{c}_{\mathcal{K}^*}, \theta_{\mathcal{T}^*}, \mathbf{s}, \sigma, \mathbf{A}, \mathbf{\Pi}, mb(t)) \tag{11}$$

Free Energy Minimization of Dominant Thoughtseed involves updating its internal states $\mathbf{x}_{\mathcal{T}^*}$ to best explain the observed data (including generated content, sensory inputs, and actions) and the meta-cognition parameters: γ and m. This process balances the complexity of its representation, where the complexity term reflects the flexibility of the thoughtseed's internal model, and the accuracy term measures how well it predicts the observed data, including its influence on attention and meta-awareness.

$$F_{\mathcal{T}^*} = \underbrace{D_{KL}\left[q(\mathbf{x}_{\mathcal{T}^*}) || p(\mathbf{x}_{\mathcal{T}^*} | \mathbf{c}, \mathbf{s}, \mathbf{a}, \gamma, m, \mathbf{x}_{\mathcal{K}^*}, \mathbf{c}_{\mathcal{K}^*}, \theta_{\mathcal{T}^*}, \mathbf{s}, \sigma, \mathbf{A}, \mathbf{\Pi}, mb(t))\right]}_{\text{Complexity}}$$

$$- \underbrace{\mathbb{E}_{q(\mathbf{x}_{\mathcal{T}^*})}\left[\ln p(\mathbf{c}, \mathbf{s}, \mathbf{a}, \gamma, m | \mathbf{x}_{\mathcal{T}^*}, \mathbf{x}_{\mathcal{K}^*}, \mathbf{c}_{\mathcal{K}^*}, \theta_{\mathcal{T}^*})\right]}_{\text{Accuracy}} \tag{12}$$

Content Projected on the All-Ground: The transient nature of the "content of consciousness" projected on the *all-ground* over an arbitrarily small time interval Δtcan be described using a f_{proj} that includes sequences of states of the dominant thoughtseed $\mathbf{x}_{\mathcal{T}^*}$, the associated KD $\mathbf{x}_{\mathcal{K}^*}$and the content projected by the primary KD $\mathbf{c}_{\mathcal{K}^*}$

$$\mathbf{c}(t-\Delta t, t) = f_{proj}(\mathbf{x}_{\mathcal{T}^*}(t-\Delta t, t), \mathbf{x}_{\mathcal{K}^*}(t-\Delta t, t), \mathbf{c}_{\mathcal{K}^*}(t-\Delta t, t)) \tag{13}$$

Higher-order Thoughtseeds

Higher-order Thoughtseed $\mathbf{T}$ with $\mathbf{x_T}$ is represented as

$$\mathbf{x_T}(t) = [s_\mathbf{T}(t), g_\mathbf{T}(t), \pi_\mathbf{T}(t), \mathbf{T}_{eam}(t), \mathbf{T}_{psm}(t), I(t)] \tag{14}$$

where:

- Informational Content $s_\mathbf{T}(t)$: Represents the specific knowledge or beliefs
- Goals $g_\mathbf{T}(t)$: Encodes the long-term goals or desired outcomes
- Policies $\pi_\mathbf{T}(t)$: Represents the specific chosen policy $\pi_\mathbf{T} \in \Pi_\mathbf{T}$
- EAM Components $\mathbf{T}_{eam}(t)$: Includes the self-model, world-model, and sense of agency associated with the thoughtseed, reflecting its role in self-representation and interaction with the environment.
- PSM Components $\mathbf{T}_{psm}(t)$: Encompasses the homeostatic and allostatic self-models, capturing the thoughtseed's connection to bodily states, internal needs, and long-term values.
- Integration Factor $I(t)$: Represents the degree of integration or coherence between the EAM and PSM components within the higher-order thoughtseed.

Generative Model of a Higher-order Thoughtseed: Predicts the next state of the *emergent self Markov blanket* $mb(t+1)$, the agent's goals $g(t)$ and policies $\pi(t)$, and its own integration factor $I(t+1)$ given its state $\mathbf{x_T}(t)$ and influence of the underlying KDs $\{\mathbf{x_K}\}_{K\in\mathcal{K}}$ weighted by W_m.

$$p(mb(t+1), g(t), \pi(t), I(t+1) | \mathbf{x_T}(t), \{\mathbf{x_K}\}_{K\in\mathcal{K}}, W_m(t)) \tag{15}$$

Expected Free Energy (EFE) of the Agent given its policy $\mathbf{\Pi}_{\text{agent}}$ is described as a function its policy and emergent markov blanket $mb(t)$ of the self-model.

$$EFE_{\text{agent}}(\mathbf{\Pi}_{\text{agent}}, t-\Delta t, t) = f_{EFE}(mb(t), \mathbf{\Pi}_{\text{agent}}) \tag{16}$$

Illusory Self *as a Higher-Order Emergent Markov Blanket*

State Representation of the Markov Blanket of the Illusory Self $mb(t)$ incorporates the EAM and PSM components and the active persona.

$$mb(t) = [S_{mb}(t), E_{mb}(t), T_{mb}(t), P(t), \{m_{eam_l}(t)\}_{l=1}^{N}, m_{psm}(t)] \tag{17}$$

where:

- **Strength and Stability:** $S_{mb}(t)$ reflects the overall coherence, stability of the resilience of the self-model, indicating how strongly the agent identifies with the illusory self.

$E_{mb}(t)$ reflects the "energy barrier" signifying the resistance to change or dissolution of the self-model. It could be related to the depth of the attractor basin representing the self in the brain's state space.

- **Transparency** $T_{mb}(t) \in [0,1]$ represents the degree to which the underlying cognitive processes contributing to the self-model are consciously accessible.
- **Active Persona** $P(t)$ indicates which of the multiple potential personas chosen from EAM model $\{m_{eam_l}(t)\}_{l=1}^{N}$ are currently active in relation to a specific world context or external agent interaction, with factors for self-model, world-model and agency. And also from PSM model, $m_{psm}(t)$ representing homeostatic and allostatic models.

Generative Model of the Illusory Self: Predicts the next state of the *illusory self*, the agent's goals $g(t)$ and policies $\pi(t)$, as well as the active persona (EAM and PSM components), given the current state of its higher-order thoughtseeds represented by $\{\mathbf{x_T}\}$ and the influence of the underlying KDs $\{\mathbf{x_K}\}_{K\in\mathcal{K}}$ weighted by W_m.

$$p(mb(t+1), g(t), \pi(t), \{m_{eam_l}(t+1)\}_{l=1}^{N}, m_{psm}(t+1) | \{\mathbf{x_T}\}, \{\mathbf{x_K}\}_{K\in\mathcal{K}}, W_m(t)) \quad (18)$$

Free Energy Minimization of the Illusory Self updates the agent's internal model to accurately predict sensory inputs, actions, and the states of higher-order thoughtseeds and KDs, while balancing the complexity of its representation. The KL-divergence term quantifies the complexity of the emergent self's internal representation (the q term) and penalizes overly complex or flexible representations that might overfit the data. The expected log-likelihood term measures the accuracy of the emergent self's generative model in predicting the observed data (sensory inputs, actions, and states of higher-order thoughtseeds and KDs). It rewards representations that generate accurate predictions and minimize prediction errors.

$$F_{\text{Emergent-Self}} = \underbrace{D_{KL}\left[q(mb(t)) || p(mb(t) | \{\mathbf{x_T}\}, \{\mathbf{x_K}\}, \mathbf{s}, \mathbf{a})\right]}_{\text{Complexity}} - \underbrace{\mathbb{E}_{q(mb(t))}\left[\ln p(\mathbf{s}, \mathbf{a}, \{\mathbf{x_T}\}, \{\mathbf{x_K}\} | mb(t))\right]}_{\text{Accuracy}} \quad (19)$$

Dissolution of the *Illusory Self* (during MPEs)

Stillness, Occurrence and Noticing

The key equations for Milarepa's threefold process are described below. The equations for occurrence relate to the dynamics of dominant thoughtseed activation and selection, as discussed earlier.

State Representation of Stillness: The degree of stillness is defined as the complement of the average activation level of thoughtseeds in the active pool $\mathcal{P}_{\mathbf{active}}(t)$. When the average

activation level $< \alpha_i(t) >$ is high or number of active thoughtseeds $|\mathcal{P}_{\text{active}}(t)|$ is high, the stillness is low, and vice-versa.

$$S(t) = 1 - \frac{1}{|\mathcal{P}_{\text{active}}(t)|} \sum_{i \in \mathcal{P}_{\text{active}}(t)} \alpha_i(t) \tag{20}$$

State Representation of "Noticing": Noticing becomes active when both the degree of stillness $S(t)$ exceeds a certain threshold Θ_N, enabling the process of noticing, and the meta-awareness parameter $m(t)$ surpasses its threshold Θ_m. Thus, noticing requires a sufficient degree of stillness (reduced thought activity) and a heightened level of meta-awareness to recognize the *gaps* between thoughts and the underlying *all-ground*.

$$N(t) = \begin{cases} 1, & \text{if} S(t) > \Theta_N \text{and} m(t) > \Theta_m \\ 0, & \text{otherwise} \end{cases} \tag{21}$$

Generative Model for "Noticing": This process is influenced by the degree of stillness $S(t)$ and the transparency of the emergent Markov blanket $T_{mb}(t)$. A higher degree of stillness and lower transparency (increased opacity) would increase the probability of *N(t+1) = 1*, indicating that the agent is more likely to become aware of the gaps between thoughts and the underlying all-ground.

$$p(N(t+1)|S(t), T_{mb}(t), \Theta_N) \tag{22}$$

Influence of Contemplative Practices

The parameter Θ_C in the modified generative models for thoughtseeds and KDs represents the influence of contemplative practices. It could modulate the precision of predictions, alter prior beliefs , and shift attentional focus, leading to a less rigid self-representation and a more flexible, open, and non-reactive mental state. It captures the impact of contemplative practices on the thoughtseed network and KDs in the dissolution process of the *illusory self*. Furthermore, the attentional modulation parameter γ shifts attention towards the *all-ground* or enhances stillness.

Modified Generative Model of a Thoughtseed

$$p(\mathbf{c}, \mathbf{s}, \mathbf{a}, \gamma, m|\mathbf{x}_\mathcal{T}, \mathbf{x}_\mathcal{K}, \mathbf{c}_\mathcal{K}, \theta_\mathcal{T}, \mathbf{s}, \sigma, \mathbf{A}, \mathbf{\Pi}, mb(t), \theta_C) \tag{23.1}$$

Modified Generative Model of a KD

$$p(\mathbf{x}_\mathcal{K}(t+1), v(t+1), r(t+1)|\mathbf{x}_\mathcal{T}(t), \mathbf{x}_\mathcal{K}(t), \theta_C) \tag{23.2}$$

Free Energy Functional for Dissolution: $F_{dissolution}$ quantifies the free energy of the dissolution process, combining the free energy of the illusory self $F_{\text{Emergent-Self}}$(Eq 19) with

factors crucial for dissolving this illusory self. $\lambda_S, \lambda_N, \lambda_E$ are weighting parameters of stillness, noticing, and energy dynamics. Dissolution factors include promoting stillness (higher $S(t)$ values), activating the "noticing" process *(N(t) = 1)*, and shifting energy dynamics to favor the all-ground $E_{ag}(t)$ over the emergent self $E_{self}(t)$. By minimizing this functional, the system moves towards a state characterized by increased stillness, heightened meta-awareness ("noticing"), and a heightened awareness of the all-ground's energy, facilitating the dissolution of the illusory self.

$$F_{\text{dissolution}} = F_{\text{Emergent-Self}} + \lambda_S(1 - S(t)) + \lambda_N(1 - N(t)) + \lambda_E \cdot f_E(E_{\text{self}}(t), E_{\text{ag}}(t)) \quad (24)$$

Additionally, the energy dynamics $f_E(E_{\text{self}}(t), E_{\text{ag}}(t))$ could also be understood as thresholds for typical contemplative practices, like Focused Attention: Θ_{FA}, Open Monitoring: Θ_{OM}, and Non-dual Awareness: Θ_{ND}. These thresholds decrease significantly as non-dual awareness increases, as shown in Eq 24.1.

$$f_E(E_{\text{self}}(t), E_{\text{ag}}(t)) = \begin{cases} \frac{E_{\text{self}}(t)}{E_{\text{ag}}(t)}, & \text{if} \frac{E_{\text{self}}(t)}{E_{\text{ag}}(t)} > \Theta_{FA} \\ \frac{1}{1+\exp(\Theta_{OM}(\frac{E_{\text{self}}(t)}{E_{\text{ag}}(t)} - \theta_{FA}))}, & \text{if} \Theta_{ND} \leq \frac{E_{\text{self}}(t)}{E_{\text{ag}}(t)} \leq \Theta_{FA} \\ 0, & \text{if} \frac{E_{\text{self}}(t)}{E_{\text{ag}}(t)} < \Theta_{ND} \end{cases} \quad (24.1)$$

Experimental Predictions of the *Illusory Self* Framework

Formalized Stages of Lucidity in Non-Waking States

A progressive framework for accessing subtler states of consciousness during various sleep stages is presented. While lucid dreaming has been extensively studied and documented, other related phenomena have not yet received the same level of research attention.

Stage 1: Lucid Dreaming

Lucid dreaming, a state where the practitioner becomes aware of their dreaming state and gains control over the dream narrative, typically occurs during REM sleep (LaBerge, 1990). Practitioners utilize techniques like Signal Validated Dreaming to distinguish between dreaming and waking states (Konkoly et al., 2021). This practice, widely documented, serves as an accessible entry point for training conscious sleep awareness via advanced meditation techniques such as Dream Yoga (Wangyal, 1988).

Stage 2: Conscious Entry into Sleep

This stage involves the practitioner consciously transitioning from wakefulness into the first NREM 2 sleep stage while maintaining lucidity. A critical aspect is identifying the precise moment of sleep onset and differentiating it from hypnagogic states (during sleep onset and

NREM 1), which are often characterized by light sleep and visual imagery. Mastering this stage, also referred to as "Lucid N2," allows practitioners to recognize sleep onset without external stimuli and maintain awareness throughout the process, including accurately notifying the transition from wake to sleep and vice versa (Kavi, 2023).

Muscle movements, such as corrugator or zygomatic contractions, can be used for precise signal-validated lucidity tracking (SVLT) measures (Türker et al., 2023). The practitioner can make a volitional signal, such as a pre-agreed pattern of three zygomatic muscle movements, to signal the onset of sleep, which can be validated empirically. A success rate of 80% within 5 seconds of NREM 2 onset could be a reasonably good criterion, as neurotypical individuals are generally not aware of the precise moment they fall asleep or wake up. The transition to sleep from wakefulness and vice versa typically occurs without conscious awareness.

This phenomenon is documented in ancient texts like the Vijnana Bhairava Tantra, Verse 31 (Singh, 1991), highlighting the historical recognition of conscious sleep states, which states: "O gazelle-eyed one, in the transition between waking and sleep, and also between sleep and waking, the supreme goddess reveals herself."

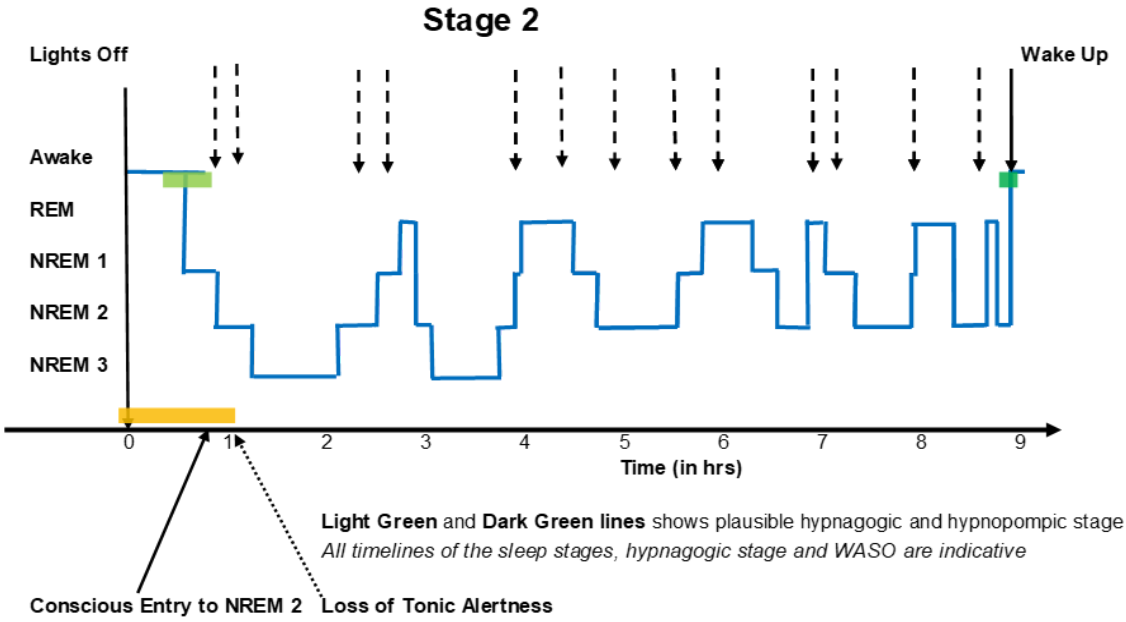

Fig 2. Plausible sleep stages for Stage 2

Stage 3: Lucid Dreamless Sleep (Lucid N3 / Yogic Sleep)

Lucid dreamless sleep occurs in the deeper stages of NREM 3, also known as "Sushuptipaad" in the Akshi Upanishad (Warrier, 1967). This stage represents a significant advancement, where the practitioner enters deep sleep without dreams but retains a subtle, tonic alertness. It is a target phenomenology of MPE (Metzinger, 2019). Some practitioners may sleep for longer durations or experience excessive sleepiness despite maintaining lucidity during sleep. Others may have reduced sleep durations due to the refreshing qualities associated with this advanced stage of meditation practice, also referred to as its target phenomenon. Practitioners may experience

greater levels of stillness during their meditation during the waking state and have an increase in "white dreams," (with minimalistic dream imagery often devoid of complex narratives) (Siclari et al., 2013). This stage is the true Yoga Nidra or "Yogic Sleep" (Swami, 1985) and the essence of Sleep Yoga (Wangyal, 1988). Though it is an extremely advanced stage, it is not the final one.

The study by Türker et al. (2023) supports the idea that sleepers can transiently process external stimuli at a high cognitive level and respond to them across all sleep stages, including NREM 3, hence for an advanced mediator or practitioner volitional SVLT is plausible.

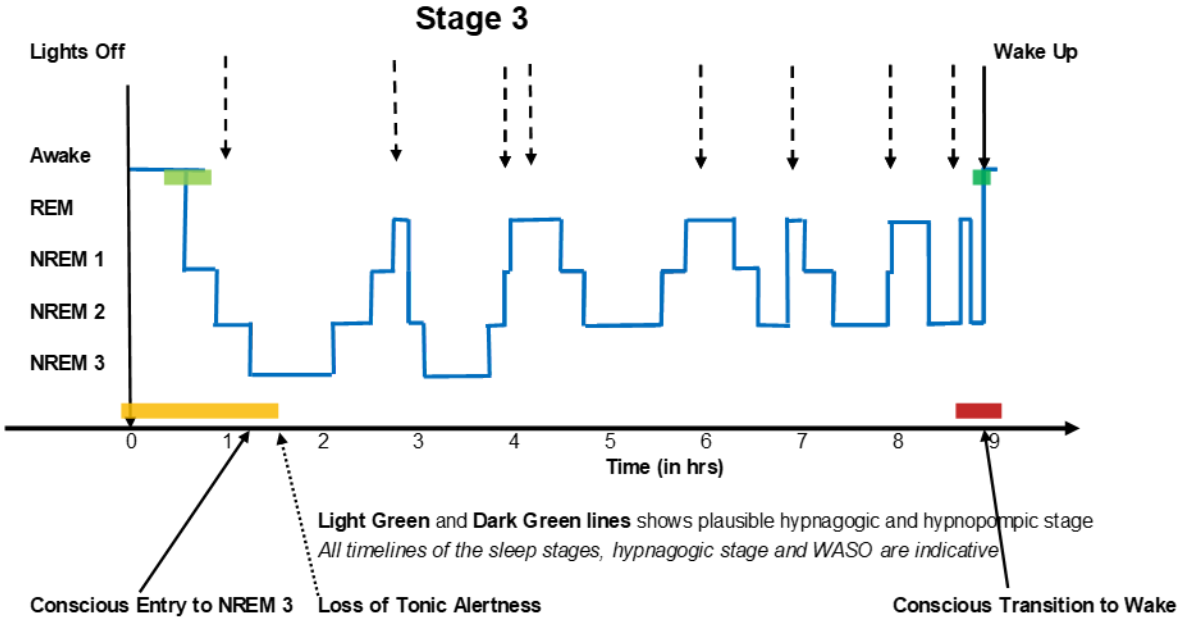

Fig 3. Plausible sleep stages for Stage 3

Stage 4: Lucid Dreamless Sleep with Dream Transformation

In the Completion Stage of the Highest Yoga Tantra, Dalai Lama 14th describes, "at a certain level of this practice, the *clear light* will manifest. If you have arrived at that point in your experience and practice, then it is very easy for you to recognize the clear light of sleep when it naturally occurs. And if you have arrived at the point where you can recognize dreamless sleep as dreamless sleep, then it's very easy for you to recognize the dream as the dream." (Dalai Lama & Varela, 2002; Lodoe, 1995).

Tibetan Buddhist traditions, particularly the *GuhyaSamaja Tantra*, describe this phenomenon as part of the development of the "subtle body" or "dream body," a manifestation separate from the physical form. In these traditions, this body is referred to as the "*impure illusory body*" (Chang, 1986; Wayman, 1977). Advanced lucid sleep training mirrors the progression of such subtle body work in Tantric practices, where familiarizing oneself with the dream body correlates with lucid entry into sleep. Some studies, such as Hunt (1991), have demonstrated the connection between lucid dreaming and out-of-body experiences (OBE), further linking these experiences to subtle body training. SVLT techniques, neuro-imaging studies in a sleep lab along with well-documented sleep reports can guide investigations at this stage.

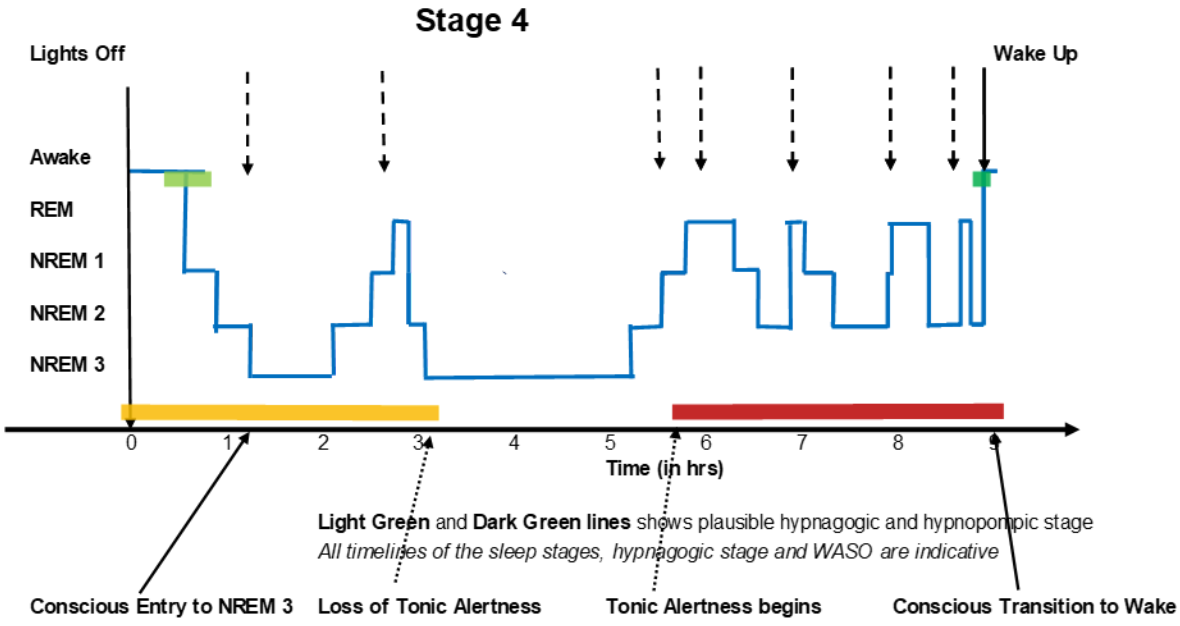

Fig 4. Plausible sleep stages for Stage 4

Stage 5: Attentive Sleepful State

At this stage, the practitioner transcends both waking and dream states to enter a unified, non-dual awareness during deep dreamless sleep. The pure illusory body manifests, symbolizing a state of perfected awareness beyond duality. This stage is marked by no-more meditation, where deliberate practice is no longer necessary, accompanied by "no hope and no fear." The *clear light sleep is* fully accessible (Dalai Lama & Varela, 2002; Chang, 1986).

In Yogic literature, this state is referred to as the final samadhi, which leads to the *turiya* state—where deep sleep becomes a form of pure consciousness (*jagrat sushupti*). In this quality of sleep, there are only the waking and deep sleep states, with no dreams. The practitioner experiences a luminous state entirely free from mental fluctuations or egoic identification, as described by Ramana Maharshi (Ramana Maharshi & Osborne, 1970).

In the Emergent Self framework, this can be described as a complete dissolution of the Emergent *Illsuory Self Markov Blanket* both waking and sleeping states, and residing in the all-ground without any kind of obscurations.

This state is described as the *attentive sleepful state* (Krishnamurti, 1974), characterized by its luminous nature. The practitioner abides in non-dual awareness and functions "without a center," where "the observer is the observed," even in the waking state. This profound shift can lead to neuroplastic changes in the brain, resulting in an identification that transcends the individual, aligning with the "collective consciousness" of humanity (Krishnamurti, 1974).

The practitioner could be proficient in Nirodha Samapatti (Laukkonen, 2022) and employ it during sleep, and it could lead to changes in the underlying sleep architecture in Stages 3, 4 and 5.

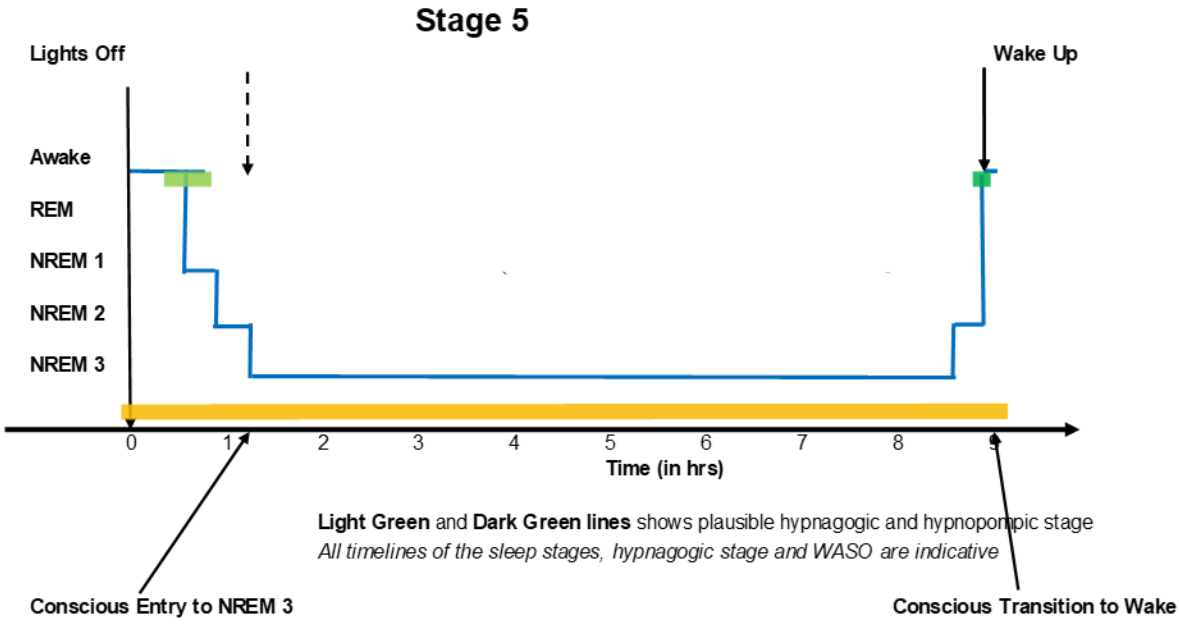

Fig 5. Plausible sleep stages for Stage 4

Proposed Research Direction

The five stages of lucidity provide a potential framework for navigating the intricate landscape of lucidity in sleep and meditation. These stages are adaptable for experimental design, with the aim of establishing biologically plausible research pathways that can be validated through straightforward methodologies, such as Signal Validated Lucidity Tracking (SVLT), rather than relying on overly complex testing protocols. The primary objective is to achieve Stage 3, accessible through either Stage 1 (Lucid Dreaming) or Stage 2 (Conscious NREM 2), depending on the practitioner's experience.

Stages 1 and 2 can serve as preliminary benchmarks, particularly given the potential resource and time constraints associated with conducting multi-unit studies on a global scale. Longitudinal studies on MPEs, as described, are inherently complex and pose significant challenges for testing these phenomenologies in controlled environments. Innovative strategies for participant recruitment will be essential to facilitate such studies.

In contrast, advanced stages—3, 4, and 5—are exceedingly rare and demand substantial contemplative practice. Identifying practitioners who can demonstrate proficiency in these stages presents significant challenges. By recognizing the intriguing and largely uncharted dimensions of the all-ground, researchers can enhance scientific understanding of these MPEs and establish robust experimental conditions and criteria for further investigation.

Ethical Statement

The proposed research will adhere to the highest ethical standards, ensuring the safety and well-being of participants. The focus will be on exploring subjective experiences and naturally

occurring states of consciousness, with no intention of artificially creating or manipulating phenomenal states, particularly those that could induce suffering or distress. The study will involve non-invasive monitoring of brain activity and will not involve any procedures that could induce pain, discomfort, or negative emotions. Participants will be fully informed about the nature of the research and will provide consent before participation. The research will be conducted in a safe and supportive environment, and participants will be free to withdraw at any time.

References

Adeu Rinpoche. (2011). Dzogchen/Mahamudra, the Two Great Paths. In E. P. Kunsang (Trans.) & M. B. Schmidt (Comp.), Freedom in Bondage: The Life and Teachings of Adeu Rinpoche. Rangjung Yeshe Publications.

Andrews, M. (2023). The math is not the territory: navigating the free energy principle. Biology & Philosophy, 36(30). https://doi.org/10.1007/s10539-021-09807-0

Baars, B. J. (1988). A cognitive theory of consciousness. Cambridge University Press.

Baker, I. A. (2012). Embodying Enlightenment: Physical Culture in Dzogchen as revealed in Tibet's Lukhang Murals. *Asian Medicine*, *7*(1), 225–264. https://doi.org/10.1163/15734218-12341249

Baird, B., Mota-Rolim, S. A., & Dresler, M. (2019). The cognitive neuroscience of lucid dreaming. Neuroscience & Biobehavioral Reviews, 100, 305-323.

Bentor, Y. (2000). Interiorized Fire Rituals in India and in Tibet. Journal of the American Oriental Society, 120(4), 594. https://doi.org/10.2307/606619

Besedovsky, L., Ngo, H. V. V., & Born, J. (2022). The memory function of sleep. Nature Reviews Neuroscience, 23(2), 115-131.

Birch, J. (2013). Amanaska yoga: The yoga of the mind. Oxford University Press.

Chang, G. C. C. (1986). *The practice of Dzogchen*. State University of New York Press.

Costines, C., Borghardt, T. L., & Wittmann, M. (2021). On the experience of "pure" consciousness: A qualitative single case study of a highly experienced meditator. Phenomenology and the Cognitive Sciences, 20(5), 867-886. https://doi.org/10.1007/s11097-020-09723-w

Dalai Lama, & Varela, F. J. (2002). Sleeping, Dreaming, and Dying: An Exploration of Consciousness. Wisdom Publications, Boston, MA.

Deco, G., & Kringelbach, M. L. (2016). Metastability and coherence in brain dynamics. Trends in cognitive sciences, 20(4), 251-257.

De Sousa, A. (2012). Mind and Consciousness as per J. Krishnamurti. Mens Sana Monographs, 0(0), 0. https://doi.org/10.4103/0973-1229.86145

Dołęga, K. (2018). Commentary: M-Autonomy. Frontiers in Psychology, 9, 1875.

Dunne, J. (2011). Toward an understanding of non-dual mindfulness. Contemporary Buddhism, 12(1), 71-88. https://doi.org/10.1080/14639947.2011.564820

Feuerstein, G. (2001). The Yoga Tradition: Its History, Literature, Philosophy and Practice. Hohm Press. Retrieved from Integral Yoga Magazine.

Fields, C., Glazebrook, J. F., & Levin, M. (2021). Minimal physicalism as a scale-free substrate for cognition and consciousness. *Neuroscience of consciousness*, *2021*(2), niab013. https://doi.org/10.1093/nc/niab013

Friston, K. J. & Kiebel, S. J. Predictive coding under the free-energy principle. Philosophical Transactions of the Royal Society B: Biological Sciences 364, 1211–1221 (2009).

Friston, K. (2010). The free-energy principle: A unified brain theory? Nature Reviews Neuroscience, 11(2), 127-138. https://doi.org/10.1038/nrn2787

Friston, K. J., & Ao, P. (2012). Free energy, value, and attractors. Computational and Mathematical Modeling, 23(4), 538–551. https://doi.org/10.1016/j.cmm.2012.03.001

Friston, K. (2013). Life as we know it. Journal of the Royal Society Interface, 10(20130475). https://doi.org/10.1098/rsif.2013.04751

Friston, K., Sengupta, B., & Auletta, G. (2014). Cognitive dynamics: From attractors to active inference. Proceedings of the IEEE, 102(4), 427–445. https://doi.org/10.1109/JPROC.2014.2306251

Friston, K. (2019). A free energy principle for a particular physics. arXiv preprint arXiv:1906.10184.

Friston, K. J., Wiese, W., & Hobson, J. A. (2017). Sentience and the origins of consciousness: From Cartesian duality to Markovian monism. Entropy, 19(4), 169. https://doi.org/10.3390/e19040169

Friston, K. J., Lin, M., Frith, C. D., Pezzulo, G., Hobson, J. A., & Ondobaka, S. (2017). Active inference, curiosity and insight. Neural Computation, 29(10), 2633–2683 https://doi.org/10.1162/neco_a_00999

Friston, K. J., Rosch, R., Parr, T., Price, C., & Bowman, H. (2018). Deep temporal models and active inference. Neuroscience & Biobehavioral Reviews, 90, 486–501. https://doi.org/10.1016/j.neubiorev.2018.04.0042

Friston, K., Da Costa, L., Hafner, D., Hesp, C., & Parr, T. (2021). Sophisticated inference. Neural Computation, 33(3), 713-763. https://doi.org/10.1162/neco_a_01351

Friston, K. (2022). Affordance and active inference. In M. van Elk & D. E. Anderson (Eds.), Affordances in everyday life: A multidisciplinary collection of essays (pp. 211–219). Springer International Publishing. https://doi.org/10.1007/978-3-030-97832-0_13

Friston, K., Da Costa, L., Sakthivadivel, D. A., Heins, C., Pavliotis, G. A., Ramstead, M., & Parr, T. (2023). Path integrals, particular kinds, and strange things. Physics of Life Reviews.

Gamma, A., & Metzinger, T. (2021). The Minimal Phenomenal Experience questionnaire (MPE-92M): Towards a phenomenological profile of “pure awareness” experiences in meditators. PLOS ONE. Retrieved from PLOS ONE.

Gethin, R. (1998). The Foundations of Buddhism. Oxford University Press. Retrieved from Oxford University Press.

Green, E., Green, A., 1977. Beyond Biofeedback. Delacorte Press, San Francisco, CA.

Greyson, B. (2004). The reimagination of death: Dream yoga, near-death, and clear light. Journal of Near-Death Studies, 22(4), 221-234. https://psycnet.apa.org/record/2004-19198-002

Grigg-Damberger, M. M. (2009). The AASM scoring manual: a critical appraisal. *Current Opinion in Pulmonary Medicine*, *15*(6), 540–549. https://doi.org/10.1097/mcp.0b013e328331a2bf

Hipólito, I., Ramstead, M. J. D., Convertino, L., Bhat, A., Friston, K., & Parr, T. (2021). Markov blankets in the brain. Neuroscience & Biobehavioral Reviews, 125, 88–97. https://doi.org/10.1016/j.neubiorev.2021.02.024

Hogan, A., Blomqvist, E., Cochez, M., d'Amato, C., de Melo, G., Gutierrez, C., Kirrane, S., Labra Gayo, J. E., Navigli, R., Neumaier, S., Ngonga Ngomo, A.-C., Polleres, A., Rashid, S. M., Rula, A., Schmelzeisen, L., Sequeda, J., Staab, S., & Zimmermann, A. (2021). Knowledge graphs. ACM Computing Surveys (CSUR), 54(4), 1-37. https://doi.org/10.1145/3447772

Hohwy, J. (2013). The predictive mind. Oxford University Press.

Hohwy, J., & Friston, K. (2020). The neural organ explains the mind. In Open MIND. MIT Press.

Hunt, H. (1991). The multiplicity of dreams. Lucidity letter, 10(1/2).

Iber, C. (2007). The AASM manual for the scoring of sleep and associated events: Rules. *Terminology and Technical Specification*.

Iyengar, B. K. S. (1991). Light on the yoga sutras of Patanjali. HarperCollins.

James, W. (1890). The mind-stuff theory. In W. James, The Principles of Psychology (Vol. 1, pp. 145–182). Henry Holt and Co. https://doi.org/10.1037/10538-006

Josipovic, Z. (2010). Duality and nonduality in meditation research. Consciousness and Cognition, 19(4), 1119-1121. https://doi.org/10.1016/j.concog.2010.03.016

Josipovic, Z., & Miskovic, V. (2020). Nondual awareness and minimal phenomenal experience. Frontiers in Psychology, 11, 2087. https://doi.org/10.3389/fpsyg.2020.02087

Kavi, P. C. (2023). Conscious entry into sleep: Yoga Nidra and accessing subtler states of consciousness. Progress in Brain Research, 280, 43–60. https://doi.org/10.1016/bs.pbr.2022.12.012

Kavi, P. C., Lopez, G. Z., & Friedman, D. A. (2024). Thoughtseeds: Evolutionary Priors, Nested Markov Blankets, and the Emergence of Embodied Cognition. arXiv preprint arXiv:2408.15982.

Konkoly, K. R., Appel, K., Chabani, E., Mangiaruga, A., Gott, J., Mallett, R., ... & Paller, K. A. (2021). Real-time dialogue between experimenters and dreamers during REM sleep. Current Biology, 31(7), 1417-1427.

Kraus, K. T. (2020). Kant on self-knowledge and self-formation: The nature of inner experience. Cambridge University Press.

Krishnamurti, J. (1969). Freedom from the Known. Harper & Row. Retrieved from Krishnamurti Foundation Trust.

Krishnamurti, J. (1972). The Observer and the Observed. Public Discussion 1, Saanen, Switzerland. Retrieved from Krishnamurti Foundation Trust.

Krishnamurthi, J., 1974. An Attentive Sleepful State. J. Krishnamurti. YouTube. Available at https://www.youtube.com/watch?v=wOW1b3DnU6g&t=15s

Krishnamurti, J. (1974). *The Awakening of Intelligence*. HarperCollins.

Krishnamurti, J. (1978). Is it possible to live, act, without a centre? Public Talk 5, Ojai, California, USA. Retrieved from Krishnamurti Foundation Trust.

Krishnamurti, J. (1978). *The Awakening of Intelligence*. Harper & Row.

Krishnamurti, J. (1979). Public Talk #2, Madras (Chennai), India. Krishnamurti Foundation Trust. Retrieved from Krishnamurti Foundation Trust.

LaBerge, S. (1990). Lucid dreaming: Psychophysiological studies of consciousness during REM sleep. In R. R. Bootzin, J. F. Kihlstrom, & D. L. Schacter (Eds.), Sleep and cognition (pp. 109–126). American Psychological Association.

Laukkonen, R. E., & Slagter, H. A. (2021). From many to (n) one: Meditation and the plasticity of the predictive mind. Neuroscience & Biobehavioral Reviews, 128, 199-217. https://doi.org/10.1016/j.neubiorev.2021.06.021

Laukkonen, R. E., Sacchet, M. D., Barendregt, H., Devaney, K. J., Chowdhury, A., & Slagter, H. A. (2022). Cessations of consciousness in meditation: Advancing a scientific understanding of nirodha samāpatti. In Progress in Brain Research (Vol. 274, pp. 123-145). Elsevier. https://doi.org/10.1016/bs.pbr.2022.12.007

Lodoe, Y.G., 1995. Paths and Grounds of Guhyasamaja According to Arya Nagarjuna. Library of Tibetan Works & Archives, Dharmasala.

Loy, D. (2012). Nonduality: A study in comparative philosophy. Prometheus Books.

Lutz, A., Slagter, H. A., Dunne, J. D., & Davidson, R. J. (2008). Attention regulation and monitoring in meditation. Trends in Cognitive Sciences, 12(4), 163-169. https://doi.org/10.1016/j.tics.2008.01.005

Lutz, A., Jha, A. P., Dunne, J. D., & Saron, C. D. (2015). Investigating the phenomenological matrix of mindfulness-related practices from a neurocognitive perspective. American Psychologist, 70(7), 632-658. https://doi.org/10.1037/a0039585

Metzinger, T. (2003). Being no one: The self-model theory of subjectivity. MIT Press.

Metzinger, T. (2009). The ego tunnel: The science of the mind and the myth of the self. Basic Books.

Metzinger, T. (2015). M-autonomy. Journal of Consciousness Studies, 22(11-12), 270–302.

Metzinger, T. (2019). Minimal phenomenal experience: Meditation, tonic alertness, and the phenomenology of "pure" consciousness. Philosophy and the Mind Sciences, 1(I), 7. https://doi.org/10.33735/phimisci.2019.I.46

Metzinger, T. (2020). Minimal phenomenal experience: The ARAS-model theory: Steps toward a minimal model of conscious experience as such. MindRxiv. https://doi.org/10.31231/osf.io/5wyg7

Metzinger, T. (2024). *The Elephant and the Blind*. massachusetts institute of technology. https://doi.org/10.7551/mitpress/15196.001.0001

Mota-Rolim, S. A., Bulkeley, K., Campanelli, S., Lobão-Soares, B., De Araujo, D. B., & Ribeiro, S. (2020). The dream of god: how do religion and science see lucid dreaming and other conscious states during sleep? Frontiers in Psychology, 11, 555731.

Pagnoni, G. (2019). The contemplative exercise through the lenses of predictive processing: A promising approach. Frontiers in Psychology, 10, 2647. https://doi.org/10.3389/fpsyg.2019.02647

Palacios, E. R., Isomura, T., Parr, T., & Friston, K. (2019). The emergence of synchrony in networks of mutually inferring neurons. Scientific Reports, 9, 6412. https://doi.org/10.1038/s41598-019-42821-7

Palacios, E. R., Razi, A., Parr, T., Kirchhoff, M., & Friston, K. (2020). On Markov blankets and hierarchical self-organisation. Journal of Theoretical Biology, 486, 110089. https://doi.org/10.1016/j.jtbi.2019.110089

Pandi-Perumal, S. R., Spence, D. W., Verster, J. C., & Monti, J. M. (2022). Yoga nidra: A comprehensive review of the neurophysiological and clinical evidence. Sleep Medicine Reviews, 61, 101567.

Parker, S., Bharati, S. V., & Fernandez, M. (2013). Defining yoga-nidra: Traditional accounts, physiological research, and future directions. International Journal of Yoga Therapy, 23(1), 11-16.

Parker, S. (2018). Yoga nidra: The art of transformational sleep. Yoga Journal, 42(3), 45-49.

Parr, T., & Friston, K. J. (2019). Generalised free energy and active inference. Biological Cybernetics, 113(5), 495-513.

Pattisapu, C., Verbelen, T., Pitliya, R. J., Kiefer, A. B., & Albarracin, M. (2024). Free Energy in a Circumplex Model of Emotion. arXiv preprint arXiv:2407.02474.

Ramana, Osborne, A., 1970. The Collected Works of Ramana Maharshi. S. Weiser, New York.

Ramstead, M. J., Hesp, C., Tschantz, A., Smith, R., Constant, A., & Friston, K. (2021). Neural and phenotypic representation under the free-energy principle. Neuroscience & Biobehavioral Reviews, 120, 109-122.

Ramstead, M. J., Kiefer, A., Friston, K., Safron, A., Albarracin, M., Fields, C., & Klein, B. (2023). *The inner screen model of consciousness: applying the free energy principle directly to the study of conscious experience*. center for open science. https://doi.org/10.31234/osf.io/6afs3

Rangdrol, T. N. (2010). The mirror of mindfulness: The cycle of the four bardos. Rangjung Yeshe Publications.

Roelfsema, P. R. (2023). Solving the binding problem: Assemblies form when neurons enhance their firing rate—they don't need to oscillate or synchronize. Neuron, 111(7), 1003–1019.

Sandved-Smith, L., Hesp, C., Mattout, J., Friston, K., Lutz, A., & Ramstead, M. J. (2021). Towards a computational phenomenology of mental action: Modelling meta-awareness and attentional control as deep temporal inference. Neuroscience of Consciousness, 2021(2), niab018. https://doi.org/10.1093/nc/niab018

Saraswati, S. (1988). Yoga nidra. Bihar School of Yoga.

Seth, A. K. (2014). *The hard problem of consciousness: a perceptual prediction perspective*. In M. V. J. F. de Haro, J. K. (Eds.), *The Oxford Handbook of 4E Cognition*. Oxford University Press.

Seth, A. K., & Tsakiris, M. (2018). Being a beast machine: The somatic basis of selfhood. Trends in Cognitive Sciences, 22(11), 969-981. https://doi.org/10.1016/j.tics.2018.08.008

Siclari, F., LaRocque, J.J., Postle, B.R., Tononi, G., 2013. Assessing sleep consciousness within subjects using a serial awakening paradigm. Front. Psychol. 4. https://doi.org/10.3389/fpsyg.2013.00542

Singer, W. (1999). Neuronal synchrony: A versatile code for the definition of relations? Neuron, 24(1), 49–65. https://doi.org/10.1016/S0896-6273(00)80821-1

Singh, R. (1991). *Vijnana Bhairava Tantra: The Yoga of Divine Awareness*. Motilal Banarsidass Publishers.

Solms, M. (2021). The hidden spring: A journey to the source of consciousness. Profile Books.

Sporns, O., & Betzel, R. F. (2016). Modular brain networks. Annual Review of Neuroscience, 39, 63–84. https://doi.org/10.1146/annurev-neuro-070815-013843

Stumbrys, T., & Erlacher, D. (2012). Lucid dreaming during NREM sleep: Two case reports. International Journal of Dream Research, 5(2), 151-155.

Swami Rama. (1985). Path of fire and light: Advanced practices of yoga. Himalayan Institute Press.

Thompson, E. (2014). Waking, dreaming, being: Self and consciousness in neuroscience, meditation, and philosophy. Columbia University Press.

Thompson, E. (2015). Dreamless sleep, the embodied mind, and consciousness. In T. Metzinger & J. M. Windt (Eds.), Open MIND. MIND Group.

Thompson, E. (2017). Dreamless Sleep, the Embodied Mind, and Consciousness: The Relevance of a Classical Indian Debate to Cognitive Science. center for open science. https://doi.org/10.31231/osf.io/d9gqa

Timalsina, S. (2020). Aham, Subjectivity, and the Ego: Engaging the Philosophy of Abhinavagupta. *Journal of Indian Philosophy*, *48*(4), 767–789. https://doi.org/10.1007/s10781-020-09439-w

Türker, B., Munoz Musat, E., Chabani, E., Fonteix-Galet, A., Maranci, J.-B., Wattiez, N., Pouget, P., Sitt, J., Naccache, L., Arnulf, I., & Oudiette, D. (2023). Behavioral and brain responses to verbal stimuli reveal transient periods of cognitive integration of the external world during sleep. Nature Neuroscience, 26, 1981–1993.

Urgyen, T. (1999). As It Is, Volume I: Essential Teachings from the Dzogchen Perspective. Rangjung Yeshe Publications.

Varela, F. J., Thompson, E., & Rosch, E. (1991). The embodied mind: Cognitive science and human experience. MIT Press.

Wangyal, T. (1988). The Tibetan yogas of dream and sleep. Snow Lion Publications.

Warrier, A.G.K., 1967. Samanya Vedanta Upaniṣads. Adyar Library and Research Center, ISBN: 978-8185141077.

Wayman, A. (1977). Yoga of the Guhyasamaja Tantra: The Arcane Lore of Forty Verses: A Buddhist Tantra Commentary. Motilal Banarsidass.

Wayman, A., & Aiyar, K. N. (1982). Thirty minor Upanishads, including the yoga Upanishads. Philosophy East and West, 32(3), 360. https://doi.org/10.2307/1398480

Windt, J.M., 2015. Just in time—dreamless sleep experience as pure subjective temporality. In: Metzinger, T.K., Windt, J.M. (Eds.), Open MIND. MIND Group, Frankfurt am Main, https://doi.org/10.15502/9783958571174

Winters, J. J. (2021). The temporally-integrated causality landscape: reconciling neuroscientific theories with the phenomenology of consciousness. *Frontiers in Human Neuroscience*, *15*, 768459.

Young-Eisendrath, P. (2018). The Buddhist Unconscious (Alaya-vijnana) and Jung's Collective Unconscious: What Does It Mean to Be Liberated from the Self? (pp. 269–282). springer. https://doi.org/10.1007/978-3-319-79096-1_16
Yufik, Y. M. (2013). Understanding, consciousness and thermodynamics of cognition. Chaos, Solitons & Fractals, 55, 44–59. doi:10.1016/j.chaos.2013.04.010

Yufik, Y. M., & Friston, K. (2016). Life and Understanding: The Origins of "Understanding" in Self-Organizing Nervous Systems. Frontiers in systems neuroscience, 10, 98.

Yufik Y. M. (2019). The Understanding Capacity and Information Dynamics in the Human Brain. Entropy (Basel, Switzerland), 21(3), 308.