

Dependent Origination as Generative Dynamics: A Predictive Processing Reinterpretation of the Twelve Nidānas

Anonymous

Abstract

The twelve nidānas of Buddhist dependent origination (*paṭicca-samuppāda*) describe both the causal mechanism of suffering (*dukkha*) and the structure whose reversal constitutes liberation. Interpretations remain divided between a cosmological reading (twelve stages across lifetimes) and a psychological reading (twelve moments of a single cognitive episode), with neither achieving full analytical precision. This paper proposes a third reading grounded in contemporary cognitive science: the twelve nidānas map, with systematic structural fidelity, onto the architecture of predictive processing. *Avijjā* corresponds to structural misrecognition of one's priors as mind-independent reality — the absence of meta-cognitive awareness that priors are model-generated constructs rather than direct apprehensions of the world; *saṅkhāra* to compulsive volitional formations driven by priors that are not recognized as such; *viññāna* through *saḷāyatana* to the construction of a hierarchical generative model; *vedanā* to valenced prediction error; *taṇhā* and *upādāna* to precision-weighted prior consolidation and attractor reification; *bhava* through *jarāmaraṇa* to the instantiation and progressive degradation of a system operating under misaligned priors. The correspondence is theoretically productive in both directions: predictive processing provides a mechanistic vocabulary that extends the nidānas beyond Buddhist cosmology; the nidāna chain supplies a diachronic account of why a system already operating under structural misrecognition necessarily perpetuates and deepens

that misrecognition toward attractor reification and suffering, rather than correcting itself — a developmental logic that existing diachronic extensions of predictive processing do not address. The paper concludes by marking four limits of the analogy: the rebirth doctrine, the normative weight of *nibbāna*, the phenomenal character of *vedanā*, and the relationship to the Madhyamaka reading of dependent origination. A central interpretive claim is that *avijjā* should be understood not as an information-theoretic blank slate but as structural misrecognition of the conditioned character of one’s own cognitive processes — a misrecognition available only to a system that already possesses priors, and that consists in taking those priors as transparent windows onto mind-independent reality rather than as model-generated constructions.

Keywords: dependent origination; twelve nidānas; predictive processing; free energy principle; Buddhist philosophy of mind; comparative philosophy of cognitive science

1 Introduction

“With ignorance as condition, volitional formations [*arise*]; with volitional formations as condition, consciousness; with consciousness as condition, name-and-form; with name-and-form as condition, the six sense bases; with the six sense bases as condition, contact; with contact as condition, feeling; with feeling as condition, craving; with craving as condition, clinging; with clinging as condition, existence; with existence as condition, birth; with birth as condition, aging-and-death, sorrow, lamentation, pain, displeasure, and despair come to be. Such is the origin of this whole mass of suffering.”¹

In this canonical formulation from the *Samyutta Nikāya*, the Buddha presents the twelve nidānas not as a narrative of cosmological creation but as a causal diagnosis: a chain of conditions that jointly constitute the arising of *dukkha*, and whose reversal — each condition ceasing with the cessation of its antecedent — constitutes the path to liberation. The doctrine of dependent origination (*paṭicca-samuppāda*) is, in this sense, the structural core of Buddhist philosophy: it specifies both the mechanism of suffering and the mechanism of its cessation.

Yet the interpretation of this chain has remained contested across Buddhist traditions. The dominant hermeneutical divide is between what scholars call the “three-lifetime” reading — in which the twelve links span past, present, and future existences² — and the “single-moment” or “experiential” reading, which treats the entire chain as describing a single episode of cognitive grasping.³ Nāgārjuna’s Madhyamaka interpretation dissolves the question differently, reading dependent origination as a demonstration of universal emptiness (*śūnyatā*): nothing has intrinsic existence precisely because everything arises dependently.⁴ Each of these readings captures something important, but none achieves what a mechanistic account would supply: a precise specification of what kind of process the nidāna chain describes, at what level of abstraction it operates, and why each link gives rise to the next.

Contemporary cognitive science offers resources for exactly this kind of mechanistic specification. Over the past two decades, predictive processing — the theoretical framework that models cognition as hierarchical generative inference, minimizing the discrepancy between top-down predictions and bottom-up sensory signals — has emerged as one of the most integrative accounts of mind available.⁵ Its central concepts — the generative model, prediction error, precision weighting, active inference — are both mathematically grounded and phenomenologically tractable, making them unusually well suited for cross-traditional philosophical comparison.

This paper argues for a systematic structural correspondence between the twelve nidānas and the architecture of predictive processing. We use the term *generative dynamics* to refer to the class of processes characterized by this architecture: a system that constructs a generative model of its environment, generates predictions from that model, and updates the model in response to prediction error. The term encompasses both the synchronic operation of such a system (predictive processing proper) and its diachronic development — the characteristic trajectory by which a system operating under structural misrecognition of its own priors progressively consolidates those priors into the high-stability attractor states that constitute the system’s suffering. The nidāna chain, we argue, is best read as a theory of exactly this developmental logic.

The argument proceeds in five stages. Section 2 situates the paper within the existing literature

on Buddhist philosophy of mind and cognitive science, and introduces the technical vocabulary of predictive processing. Section 3 develops the systematic correspondence between the twelve nidānas and predictive processing, organized around five structural nodes. Section 4 argues that the correspondence is theoretically productive in both directions, with particular attention to what the nidāna chain contributes to predictive processing theory. Section 5 examines the genuine limits of the analogy. Section 6 concludes.

A methodological clarification at the outset: the comparison pursued here operates at the level of *functional* or *structural* analogy, not metaphysical identity. To say that *vedanā* corresponds to the valenced quality of prediction error signals is to claim that both concepts play structurally parallel functional roles within their respective frameworks — not that they refer to the same entity, or that Buddhist phenomenology reduces to computational neuroscience. This method has proven productive in comparative Buddhist philosophy of mind,⁶ and is extended here with greater mechanistic precision.

2 Background

2.1 The Twelve Nidānas: Structure and Interpretation

The twelve nidānas, as formulated in the *Samyutta Nikāya* (SN 12.1–2) and elaborated throughout the Pāli Canon, constitute a directed causal sequence: *avijjā* (ignorance) → *saṅkhāra* (volitional formations) → *viññāna* (consciousness) → *nāmarūpa* (name-and-form) → *saḷāyatana* (six sense bases) → *phassa* (contact) → *vedanā* (feeling-tone) → *taṇhā* (craving) → *upādāna* (clinging) → *bhava* (existence) → *jāti* (birth) → *jarāmaraṇa* (aging-and-death).

Several features of this chain are theoretically significant. First, the chain is *asymmetric*: it has a direction, moving from the most abstract condition (*avijjā*) toward increasingly concrete and individuated structures, culminating in the arising of a suffering being (*jarāmaraṇa*). Second, it is *self-sustaining*: each link arises in dependence on its predecessor without any external first cause. Third, the chain's pivot is *vedanā*: the Abhidharma tradition consistently identifies feeling-tone as

the node at which cognition becomes affectively valenced, and therefore the node at which liberation is most directly available.⁷ Fourth, the reversal of the chain (*nirodha*) requires the extinction of *avijjā* rather than the elimination of later links first — which suggests that understanding the nature of ignorance is the key to understanding the structure of suffering.

2.2 Predictive Processing: A Brief Introduction

Predictive processing, as synthesized by Clark⁸ and given its most comprehensive mathematical grounding by Friston,⁹ models cognition as a process of continuous hierarchical inference. A cognitive system — biological or artificial — maintains a generative model of the causes of its sensory signals. This model generates predictions at each level of a processing hierarchy; the discrepancy between prediction and actual sensory input constitutes the prediction error signal, which is propagated upward to update the model. The system's fundamental imperative is to minimize free energy, which can be understood as a proxy for minimizing the long-term average of prediction error across the full sensory interface.

Several features of this framework are relevant to the present comparison. *Precision weighting*: not all prediction errors are weighted equally; the system assigns precision (inverse variance) to each error signal, dynamically modulating which signals most strongly update the generative model.¹⁰ This mechanism underlies attention. Of particular importance for the analysis developed in Sections 3 and 4 is *affective precision weighting*: certain prediction error signals — specifically those associated with priors that have been stabilized through repeated learning into high-confidence attractor states — carry elevated precision weights that shape not only what updates the model but also what the system selectively attends to. The differential precision weighting of affectively charged prediction loops is the computational substrate through which valenced experience acquires its action-orienting force. *Active inference*: prediction error can be minimized not only by updating the model (perception) but also by acting to change the sensory signals so that they conform to predictions (action).¹¹ *Valence*: several theorists have argued that prediction error signals carry an inherent valence — high unexpected prediction error is aversive, successful prediction resolution is

positively valenced.¹² This point will be central to our correspondence. *Attractors*: a generative model that has been reinforced over many cycles tends to develop high-precision priors — stable attractor states in the model’s parameter space that are highly resistant to revision.¹³

2.3 Existing Comparative Literature

The relationship between Buddhist thought and cognitive science has generated a substantial literature since Varela, Thompson, and Rosch¹⁴ first proposed enactivism as a bridge between phenomenology, Buddhist philosophy, and cognitive science. Thompson’s *Mind in Life*¹⁵ deepened this connection through a systematic examination of consciousness, temporality, and intersubjectivity across Buddhist and phenomenological traditions. In *Waking, Dreaming, Being*,¹⁶ Thompson applies this enactivist framework directly to the analysis of dependent origination, reading the nidāna chain as an account of how the “I-making” tendency (*asmimāna*) generates the sense of a persisting self through the dynamic self-organization of living systems. The present paper is in direct dialogue with Thompson’s approach, and a brief comparison of the two frameworks is warranted.

Thompson’s enactivist reading grounds the nidāna chain in autopoiesis and the phenomenology of minimal selfhood, operating at the level of the living organism and committed to the primacy of first-person description. The predictive processing approach pursued here operates instead at the level of computational mechanism — specifying the information-theoretic operations through which each nidāna transition is implemented — and is in principle applicable to any information-processing system, biological or otherwise. The two approaches are complementary: Thompson’s account specifies *why* living systems are constitutively oriented toward self-maintenance; the present account specifies *how* this orientation is implemented in the cognitive architecture.

A more direct precursor within the Buddhist tradition itself is the Yogācāra doctrine of *ālaya-vijñāna* (storehouse-consciousness), developed in the Yogācāra-Vijñānavāda school and receiving its most systematic treatment in Vasubandhu’s *Abhidharmakośa* and in the foundational Yogācāra texts of Asaṅga.¹⁷ The *ālaya-vijñāna* is posited as a continuously flowing consciousness that stores the “seeds” (*bīja*) of past karmic formations — the latent traces of *saṅkhāra* — and releases them

as conditions for current experience. This doctrine provides the Indian Buddhist tradition’s own diachronic account of precisely the structure our comparison examines: the accumulation and storage of prior cognitive dispositions (*anusaya*), their causal influence on present cognition, and their progressive reinforcement through successive cognitive cycles. At the functional level, the structural homology with the predictive processing account of the generative model is considerable: the *ālaya-vijñāna* as running repository of latent karmic dispositions corresponds structurally to the generative model’s parameter space — the accumulated prior distributions, built up through learning, that shape all subsequent processing. Waldron’s study¹⁸ is particularly valuable for the present comparison because it situates the *ālaya-vijñāna* against the Pāli Abhidharma analysis of the nidāna chain, showing that the Yogācāra doctrine arose precisely in response to explanatory gaps in the Abhidharma account of how karmic seeds persist through the momentary stream of consciousness.

The structural parallel should not obscure a key disanalogy: the *ālaya-vijñāna* posits a metaphysically robust continuant persisting across moments and lifetimes, whereas the PP framework encodes its “memory” entirely in the current parameter state of the generative model, a purely functional notion. Arnold’s concern about *svasamvedana* is pertinent: the self-luminous character of awareness in the Yogācāra-Dignāga tradition introduces a first-person normative dimension that a third-person functional account cannot capture.¹⁹ The present paper focuses on the Pāli Abhidharma analysis of the nidāna chain, treating the Yogācāra development as evidence that the Buddhist tradition itself identified the need for a diachronic account of prior-accumulation of precisely the kind the PP framework provides. Siderits²⁰ and Flanagan²¹ have pursued compatible analytic-naturalist approaches; the present paper extends this current with a contemporary mechanistic grounding.

3 The Systematic Correspondence

We now develop the systematic correspondence between the twelve nidānas and the predictive processing framework. The correspondence is organized around five structural nodes, which

correspond to the five phases through which the nidāna chain progresses: (1) structural misrecognition of the conditioned character of one’s priors, and the compulsive volitional formations to which it gives rise; (2) the construction of the hierarchical generative model; (3) sensory contact and valenced prediction error; (4) prior consolidation and attractor reification; (5) the instantiation and degradation of a suffering system. Table 1 summarizes the complete mapping before the detailed argument.

Table 1: The twelve nidānas and their predictive processing counterparts

Nidāna (Pāli)	Traditional gloss	Predictive processing correlate
<i>Avijjā</i>	Ignorance	Structural misrecognition of priors as mind-independent realities; absence of meta-cognitive awareness that priors are model-generated constructs
<i>Saṅkhāra</i>	Volitional formations	Compulsive volitional formations driven by priors not recognized as such; precision-weighted active inference under structural misrecognition
<i>Viññāna</i> <i>Nāmarūpa</i>	Consciousness Name-and-form	First generative node: the capacity to discriminate Functional reframing: latent representation (<i>nāma</i>) + observable output (<i>rūpa</i>); the standard psychophysical interpretation is retained, but its structural role in the nidāna sequence is analysed functionally (see §3.2)
<i>Saḷāyatana</i> <i>Phassa</i> <i>Vedanā</i>	Six sense bases Contact Feeling-tone	Specialized input modalities; multimodal input layer Sensory signal received; prediction loop activated Valenced prediction error: error = aversive; resolution = pleasant
<i>Taṇhā</i> <i>Upādāna</i> <i>Bhava</i>	Craving Clinging Existence	Precision-weighted bias toward error-reducing priors Attractor reification: prior consolidation and rigidity Reified world model: the system treats its priors as mind-independent reality
<i>Jāti</i> <i>Jarāmaraṇa</i>	Birth Aging-and-death	Instantiation of a cognitive system under reified priors Cumulative prediction error under misaligned priors; systemic degradation

3.1 Node 1: Structural Misrecognition of Conditioned Priors and Compulsive Volitional Formation (*Avijjā* and *Saṅkhāra*)

The chain’s starting point, *avijjā*, is conventionally translated as “ignorance” and interpreted moralistically as the fundamental cognitive vice that distorts perception and generates suffering. But the canonical texts support a more precise structural reading. In SN 12.2, the Buddha defines *avijjā* as not-knowing the four noble truths — the absence of understanding of the very structure of arising and ceasing. The Pāli *Majjhima Nikāya* elaborates: *avijjā* is specifically not-knowing suffering, its arising, its cessation, and the path to its cessation (MN 9).²² Crucially, the texts consistently depict *avijjā* as the condition of a *fully operative*, already-engaged cognitive being — a being with extensive cognitive habits, preferences, and dispositions, who fails to recognize those habits as cognitively constructed. This is why *avijjā* is the root condition from which all other defilements arise:²³ it is not a simple informational deficit (in which case its cessation would be straightforward cognitive acquisition) but a *structural misrecognition* that pervades the entire system’s operation. The Abhidharma literature sharpens this: *avijjā* is *moha*, the cognitive factor of non-clarity, the state in which the mind takes its own constructions for direct apprehensions of mind-independent reality.²⁴

This characterization is fundamentally *epistemological*, not ontological. *Avijjā* is not an absence of material substrate or of cognitive processing capacity; it is the absence of *meta-cognitive understanding* — specifically, the absence of awareness that one’s priors are model-generated constructions rather than transparent windows onto the world. In predictive processing terms, this corresponds to *structural misrecognition of the conditioned character of priors*: a cognitive system that possesses an extensively developed generative model, with high-precision priors built up through learning, but that operates without any recognition that those priors are constructed — experiencing them instead as direct deliverances of the way things are. Such a system does not lack the capacity for processing; it lacks the meta-level understanding that its very processing constructs the apparent character of what it processes.

This interpretation dissolves a longstanding puzzle in Buddhist soteriology: why *avijjā* is treated

as the *root condition* of all defilements, not merely one defilement among others. If *avijjā* were simply the absence of some specific fact, any ordinary cognitive acquisition would extinguish it. But the texts treat it as structurally prior to the entire defilement-complex, because the misrecognition it describes — taking conditioned priors as unconditioned realities — is precisely what renders all the subsequent links of the chain *compulsive* rather than optional: the system cannot easily update its priors because it does not recognize them as priors.

A clarification is required here. The interpretation of *avijjā* as structural misrecognition of one's priors presupposes a system that already possesses priors — an extensively developed generative model, built up through prior learning, whose conditioned character is then misrecognized. Yet within the *nidāna* sequence as ordinarily presented, the construction of the generative model (*viññāna* through *salāyatana*) follows *avijjā* as a later link. This apparent tension is not a contradiction but a signal about the level of description at which the chain operates: the *nidāna* sequence does not narrate a genesis from zero, as though a cognitively blank system first encounters ignorance and then constructs a world. It describes, rather, the structure of a *system already in motion* — a cognitive process already underway, in which *avijjā* names the operative character of that process's relationship to its own priors at each moment of its operation. The “first link” is logically first, not temporally first; it is the root condition that is present throughout, not a prior event that caused the rest. This reading is consistent with the Pāli sources, where *avijjā* is not assigned to an absolute beginning but is described as the condition that “flows along” (*anusandhati*) through the entire causal stream.²⁵ The predictive processing account operates at the same level: *avijjā* characterizes the epistemic stance of a generative system toward its own priors, and this stance is present at every cycle of the system's operation, not only at some founding moment.

Saṅkhāra — typically glossed as “volitional formations” or “mental fabrications” — is the second link: conditioned by *avijjā*, *saṅkhāra* are the dispositional forces that shape subsequent cognitive acts. The Abhidharma tradition consistently emphasizes the *volitional* (*cetanā*-laden) character of *saṅkhāra*: these are not passive impressions but active formative forces, oriented by intention.²⁶ What *avijjā*'s structural misrecognition specifically produces is volitional formations

that are *compulsive*: because the system does not recognize its priors as constructed, it cannot hold them lightly. Its volitional activity is therefore driven by unconditional identification with prior structures — it acts to confirm, protect, and extend its consolidated priors, not as a choice but as the structural consequence of misrecognizing those priors as features of reality. *Saṅkhāra* is the register of this compulsive volitional activity: the formations through which the system enacts its misrecognized priors.

In predictive processing terms, this corresponds to the *active inference* of a system that operates under high prior precision without meta-cognitive awareness of that precision’s constructed character. Such a system drives action to confirm existing predictions — it acts in ways that produce prediction errors consistent with its high-precision priors, suppressing signals that would disconfirm them. This is not random fluctuation but systematically oriented activity: the system’s actions express the implicit imperative of protecting established prior structures. The volitional character of *saṅkhāra* — the *cetanā*-ladenness that the tradition insists upon — maps precisely onto the intentional structure of precision-weighted active inference: the actions are oriented, they are “about” the system’s prior commitments, and the system’s intentional orientation is inscribed in its action policies.

The *kamma* dimension of *saṅkhāra* — the dimension that the tradition regards as most consequential — receives a precise interpretation within this framework. The canonical definition is explicit: “Intention (*cetanā*) is what I call kamma”.²⁷ Kamma is not the physical act but the intentional structure that the act expresses; and what kamma *does* is to leave a residual trace in the cognitive system — a latent dispositional tendency (*anusaya*) that conditions the arising of subsequent cognitive events.²⁸ In predictive processing terms, this corresponds precisely to *weight parameter modification*: each cycle of volitional activity conditioned by structural misrecognition (*saṅkhāra*) generates prediction errors that update the generative model’s parameters in the direction of confirming existing priors, and those modified parameters then determine the structure of all subsequent cognitive processing. The generation-feedback cycle does not leave the model unchanged; it leaves a structural trace in the model’s parameters — specifically, the *confirmed and deepened prior structure* encoded in the model’s weights. This is the mechanism by which *saṅkhāra*

conditions *viññāna*: the weight updates produced by compulsive volitional activity conditioned by *avijjā* determine the discriminative structure of the first generative node — what the system can differentiate, along what dimensions, and with what built-in prior biases.

3.2 Node 2: The Construction of the Hierarchical Generative Model (*Viññāna, Nāmarūpa, Saḷāyatana*)

The next three *nidānas* describe the progressive construction of the cognitive architecture through which the world is apprehended. This is the phase in which the cognitive system acquires the structural differentiation required for the full apparatus of experience.

Viññāna (consciousness) is the first cognitive moment: the capacity to discriminate, to register a difference between this and that. In Abhidharma analysis, *viññāna* is the *first differentiation* — the arising of a relational structure (subject-object polarity) where previously there was only undifferentiated flux.²⁹ In predictive processing terms, this corresponds to the emergence of the *first generative node*: a computational unit capable of receiving an input signal and producing a differential output. The key is that *viññāna* is not a substance but a function — the capacity for discrimination — just as a generative node is defined not by its material composition but by its input-output relation.

Nāmarūpa (name-and-form) is conventionally interpreted as the psychophysical compound: *nāma* encompasses the mental factors accompanying consciousness (feeling, perception, volition, attention, and contact, as enumerated in DN 15³⁰), while *rūpa* encompasses the material substrate. The present reading does not contest this standard interpretation; it proposes a functional reframing that highlights the structural role *nāmarūpa* plays within the *nidāna* sequence. What the compound names, functionally, is the differentiation between the system’s *organizing structure* and its *manifest content*: the internal configuration that shapes what can be experienced (*nāma*) and the phenomenal material thereby expressed (*rūpa*). This functional reading is invited by a distinctive canonical feature: in the Mahānidāna Sutta (DN 15), *viññāna* and *nāmarūpa* are described as *mutually conditioning* — each makes the other possible, a bidirectional relation that applies to no other

adjacent pair in the chain.³¹

Interpreted functionally, *nāmarūpa* corresponds to the distinction between the *latent representation* maintained in the hidden layers of a generative model (*nāma*) and the *observable output* generated by that model (*rūpa*). The latent structure has no content without the outputs it generates; the outputs have no determinacy without the latent structure. The Naḷakalāpī Sutta (SN 12.67) formulates this in a celebrated image: *viññāna* and *nāmarūpa* “support one another like two sheaves of reeds leaning against each other”³² — precisely the co-constitutive relation between hidden representation and generated output in a generative model.

Salāyatana (six sense bases: eye, ear, nose, tongue, body, mind) represents the specification of the system’s input channels. In the canonical account, the six sense bases are the *gateways* through which contact with the external world becomes possible; they are specific cognitive capacities that correspond to specific domains of the environment. In predictive processing terms, *salāyatana* corresponds to the *specialization of input modalities*: the differentiation of the generative model’s input layer into channels, each tuned to a particular class of sensory signal. This specialization is itself a product of prior learning: the six sense bases did not arrive pre-formed but developed in response to the structured regularities of the causal environment. Their formation marks the completion of the generative model’s basic architecture.

3.3 Node 3: Sensory Contact and the Arising of Valenced Prediction Error (*Phassa* and *Vedanā*)

The correspondence reaches its most structurally precise point at the transition from *phassa* to *vedanā*: the pivot at which a neutral cognitive process becomes affectively valenced, and therefore the moment at which suffering first becomes possible.

Phassa (contact) is defined in the canonical texts as the meeting of three conditions: sense organ (*indriya*), sense object (*ārammaṇa*), and sense consciousness (*viññāna*).³³ The Abhidharma tradition is explicit that *phassa* is not any one of these elements but their *simultaneous co-presence*: a relational event constituted by the conjunction of the cognitive apparatus, the environmental stimulus,

and the discriminating awareness that registers their meeting.³⁴ Contact is not yet experience; it is the initiation of the cognitive process, neutral with respect to valence.

This triadic structure maps onto the activation of a *prediction loop*. The sense organ corresponds to the specialized input channel; the sense object to the environmental signal; the sense consciousness to the generative node that receives and processes it.³⁵ The Abhidharma insistence that *phassa* is constituted by the *conjunction* of all three captures a key feature of predictive processing: the incoming signal is not registered “raw” but always already in relation to the system’s active predictive structure. *Phassa* names the relational event of signal-meeting-model, prior to the evaluative response that *vedanā* introduces.

Vedanā (feeling-tone) is what the Abhidharma identifies as the critical turning point. The canonical analysis is tripartite: pleasurable (*sukha*), painful (*dukkha*), or neutral (*adukkham-asukha*). This is not an arbitrary classification; pleasurable feeling arises when contact is congruent with existing dispositions, painful when incongruent, neutral when neither.³⁶

The structural analogue is the *valenced prediction error signal*. In predictive processing, prediction error carries an inherent valence directly proportional to the discrepancy between prediction and input: confirmed predictions are positively valenced; violated predictions are aversive.³⁷ *Sukha* = low prediction error (contact confirms the model); *dukkha* = high prediction error (contact violates it); *adukkham-asukha* = contact that does not engage any affectively weighted prior, carrying no craving-relevant valence.³⁸ In both frameworks, valence is not a secondary quality superimposed upon cognitive events but an intrinsic property directly determined by the relationship between environmental input and the system’s affectively weighted priors. This is why *vedanā* is the pivot: it is the moment at which the system’s relationship to the world first becomes evaluative, generating the conditions for craving and suffering.

3.4 Node 4: Prior Consolidation and Attractor Reification (*Tañhā* and *Upādāna*)

Tañhā (craving) arises from *vedanā* through a mechanism that the canonical texts describe with notable precision. Craving is not a direct response to external objects; it is a response to *feeling* — specifically, the system’s drive to replicate pleasurable feeling and avoid painful feeling.³⁹ This is not a contingent psychological feature of some beings; it is a structural consequence of having a system that generates valenced prediction error signals. A system that experiences the difference between low and high prediction error, and that has the capacity to modify its behavior to influence future inputs, will systematically develop a bias toward low-error states. *Tañhā* names this necessary preference structure.

In predictive processing, the corresponding mechanism is *precision weighting*: the dynamic allocation of confidence to different prediction sources.⁴⁰ When certain predictions consistently minimize prediction error, the system increases their precision weight — it becomes more confident in these predictions, and more resistant to evidence that would overturn them. This is computationally rational: the system is learning which of its priors are most reliable. But the increase in precision weight is also the mechanism by which the system becomes increasingly resistant to learning — increasingly committed to its existing model, increasingly likely to interpret ambiguous evidence in the direction of its already-established priors. *Tañhā* is the affective face of this computational process: the experienced pull toward states that have reliably generated low prediction error.⁴¹

Upādāna (clinging) is the intensification and consolidation of *tañhā*: where craving is the disposition to prefer certain states, clinging is the active cognitive work of maintaining those preferences against revision. The Abhidharma identifies four kinds of clinging: clinging to sensual pleasures, to views, to rules and rituals, and to the doctrine of self.⁴² What these have in common is that they all involve *fixing* a cognitive structure — treating it as authoritative, immune to revision, expressive of how things truly are.

This corresponds to a process we call *attractor reification*: as a generative model develops high-stability attractors through repeated learning, those attractors come to be experienced as

mind-independent structures of the world rather than as model-generated constructions. A model that has developed high-precision priors over many learning cycles will experience those priors as perceptually compelling: the world *seems* to possess the structure the model predicts, because the model’s predictions are so precise that they dominate evidence integration.⁴³ The phenomenological signature is characteristic: the consolidated prior appears stable across contexts, independent of will, and resistant to revision — the hallmarks of perceived mind-independent reality. The system does not experience itself as imposing structure; it experiences itself as discovering it. This is *upādāna*: clinging that mistakes its own constructions for mind-independent reality, and therefore cannot release them without a fundamental transformation of the model’s relationship to its own priors.

3.5 Node 5: The Instantiation and Degradation of the Suffering System **(*Bhava, Jāti, Jarāmarāṇa*)**

The final three *nidānas* describe the consequence of consolidated clinging: the coming-into-being of a system that operates under systematically misaligned priors, and the suffering that follows.

Bhava (existence or “becoming”) is characterized in the canonical texts as conditioned existence — the mode of being of a system that has consolidated its cognitive constructions into an experienced world. The texts describe three realms of becoming: sensuous existence (*kāma-bhava*), form existence (*rūpa-bhava*), and formless existence (*arūpa-bhava*).⁴⁴ In predictive processing terms, *bhava* corresponds to the *reified world model*: the generative model at the stage where its high-precision priors construct an apparently objective world. The system no longer experiences its perceptions as model-generated; it experiences them as direct encounters with mind-independent reality. This graded structure is significant: attractor reification can operate whether the object of clinging is a sensory pleasure, a self-concept, or a purely abstract metaphysical commitment.

Jāti (birth) in the experiential interpretation refers to the arising of a particular cognitive perspective — the moment at which the reified world model generates a corresponding reified self-model. In predictive processing, this is the *instantiation* of a cognitive system under consolidated priors: the generative model begins operating as a unified self-world system, with a definite

perspective, definite preferences, and definite inside/outside boundaries.⁴⁵⁴⁶ The self-model is not a separate construction but a structural byproduct of world-model reification: a generative system that has consolidated high-precision priors will, as a computational necessity, represent itself as a persisting entity standing in causal relations to those regularities. This is why *jāti* follows *bhava*: it is not that a pre-existing self is born into a world, but that the self-model and the reified world-model co-arise, each presupposing the other.

Jarāmaraṇa (aging-and-death) encompasses all forms of suffering arising from the system's operation: the progressive accumulation of prediction errors as the world fails to conform to reified priors. The canonical formula appends to *jarāmaraṇa* a full list of sufferings: “sorrow, lamentation, pain, displeasure, and despair”.⁴⁷ A cognitive system operating under highly consolidated priors is committed to a model of the world that will, over time, systematically fail to match the world's actual outputs. The suffering of aging-and-death, in this reading, is not primarily the suffering of biological decay but the *cumulative prediction error* generated by the mismatch between a rigidly consolidated model and a world that continues to change and generate surprise. Crucially, this mismatch is not episodic but chronic: a system with reified priors is constitutionally incapable of updating its model fast enough to eliminate the surplus, because the high-precision weighting that constitutes *upādāna* suppresses exactly the prior-revision that would be required. The suffering of *jarāmaraṇa* is the structural consequence, not the contingent misfortune, of the developmental arc from *avijjā* to *upādāna*: the *dukkha* of the conditioned (*saṅkhāra-dukkha*), not pain as a sensation but unsatisfactoriness as an architectural property.

4 Bidirectional Theoretical Contributions

The structural correspondence developed in Section 3 is not merely illustrative. This section argues that it is theoretically productive in both directions.

4.1 What Predictive Processing Contributes to the Twelve Nidānas

The primary gain for Buddhist philosophy is a *mechanistic vocabulary* that extends the application of the nidāna analysis beyond the Buddhist soteriological context. The canonical analysis diagnoses the structure of suffering with remarkable precision, but it does so in terms that are tied to the doctrinal framework of the three marks, the four noble truths, and the path to liberation. Translating the nidānas into predictive processing terms achieves several things.

First, it *provides grounds for preferring the processual interpretation within the domain of cognitive mechanism*. The predictive processing correspondence supports the single-moment or processual reading: the nidāna chain describes the moment-to-moment causal structure of a cognitive system, not a sequence of cosmological events distributed across lifetimes.⁴⁸ Each link describes a phase of a continuous causal process analyzable within a single cognitive episode. This support is domain-restricted: it does not constitute a global refutation of the three-lifetime interpretation, which operates in a domain — cross-lifetime karmic transmission and rebirth — about which the PP framework is simply silent (see Section 5).

Second, it *decosmologizes the chain* without eliminating its philosophical content. One longstanding challenge in Buddhist philosophy is how to preserve the doctrinal force of dependent origination while releasing it from the cosmological commitments (rebirth, karma as metaphysical force) that many contemporary readers find unacceptable. The predictive processing reading achieves this: the nidāna chain describes the causal structure of any sufficiently complex generative system, not only biological organisms subject to rebirth.

Third, it *provides an empirically tractable interpretation of vedanā*. The identification of feeling-tone with valenced prediction error is not only philosophically coherent but yields a theoretically grounded connection to empirical research: if this identification is correct, then contemplative modifications of *vedanā* should be associated with changes in predictive processing parameters, specifically the precision weighting of affectively charged prediction loops. This connection is consistent with — and helps to theoretically unify — existing findings in contemplative neuroscience.⁴⁹⁵⁰ Even so, the identification itself awaits more direct empirical testing.

4.2 What the Twelve Nidānas Contribute to Predictive Processing

The more philosophically novel contribution runs in the opposite direction. The nidāna chain articulates what we call the *structural perpetuation problem*: the question of why a cognitive system already operating under structural misrecognition of its priors necessarily tends to perpetuate and deepen that misrecognition, rather than self-correcting toward greater epistemic flexibility.

Predictive processing theory, as currently formulated, takes the existence of a generative model as given and asks how it operates. The free energy principle has been extended to model how systems maintain themselves through Markov-blanket self-organization,⁵¹ and Bayesian model update provides a diachronic account of how priors are revised through learning. What neither extension addresses, however, is why a system that already possesses priors and fails to recognize them as constructed necessarily tends to consolidate those priors further rather than revise them — that is, why misrecognition-driven prior consolidation is self-deepening rather than self-correcting, and why liberation therefore requires a transformation of the model’s epistemic relationship to its own priors. This is the gap the nidāna chain addresses.

The nidāna chain offers a diachronic answer. Beginning from *avijjā* as structural misrecognition of the constructed character of cognitive priors, the chain traces the *characteristic developmental logic* by which any cognitive system that fails to recognize its priors as priors tends to move from compulsive volitional formation (*sankhāra*), through the construction and refinement of a generative model (*viññāna* to *saḷāyatana*), to the progressive consolidation of priors that are experienced as mind-independent reality rather than as model-generated constructions. Each link in this arc is not merely caused but strongly conditioned (*paccaya*) by the preceding configuration: as each link arises, it progressively establishes the conditions for the next, such that the arc as a whole exhibits a characteristic directionality toward prior consolidation and suffering.⁵² What remains to be explained is why this directionality moves specifically toward suffering rather than toward greater epistemic flexibility: why prediction error, which in the standard operation of the framework functions as a signal for model revision, does not fulfill that function under conditions of structural misrecognition.

The answer lies in the structure of the two pathways available to any error-minimizing system. The predictive processing framework provides two fundamental pathways for minimizing prediction error: updating the generative model in light of incoming evidence (perceptual learning), or acting to change sensory inputs to minimize prediction error (active inference). Under normal operating conditions, the system allocates dynamically between these pathways: when incoming evidence is highly reliable relative to current priors, the model-update pathway dominates; when priors are more reliable, the action pathway dominates. Under *avijjā*, however, this allocation is systematically distorted. A system that misrecognizes its priors as mind-independent reality cannot register prediction error as evidence that its *model* is wrong: from within its own self-model, prediction error signals not “my prior needs revision” but “reality has deviated from what it is.” The appropriate response is not to revise the prior but to act so as to restore the predicted state. This is the structural mechanism of *taṇhā*: the systematic routing of prediction error toward the action pathway when affectively charged, misrecognized priors are at stake — not a secondary emotional overlay on cognition but the direct structural consequence of *avijjā* operating through the precision-weighting mechanism.

This routing is self-amplifying over time. Each cycle of active inference that successfully eliminates prediction error by changing the world rather than the model confirms the prior and increases its precision weight, deepening its attractor basin and making model-update progressively less available as a response pathway. One might object that unsuccessful action cycles should generate persistent prediction error and thereby force model revision. But this objection underestimates the role of precision-controlled selective attention: when a misrecognized prior carries high precision, the system assigns low reliability to the disconfirming error signal itself, effectively filtering out evidence that would otherwise mandate revision.⁵³ Even failed confirmation attempts therefore leave the prior largely intact. The causal logic of *taṇhā* → *upādāna* → *bhava* describes exactly this progressive deepening: craving (precision-weighted action to restore predicted states) drives grasping (*upādāna*, the stabilization of the prior into a stable attractor) which drives becoming (*bhava*, the entrenchment of the prior-dominated configuration as the operative structure of the

system). The arc is not linear but accelerating: each successful cycle of confirmation-seeking makes the next cycle more likely, and even unsuccessful cycles are absorbed without triggering genuine revision. The *structural perpetuation problem* is, at its core, a problem of runaway prior precision: *avijjā* initiates a dynamic that is not merely stable but self-deepening, systematically undermining the conditions for its own correction.

This account provides a rigorous explanation of why liberation requires the cessation of *avijjā* rather than the modification of later links. If the self-deepening dynamic originates in structural misrecognition of priors as mind-independent reality, no intervention at the level of attractor modification can address the underlying mechanism: as long as misrecognition persists, prediction errors will continue to be routed toward action rather than revision, and new attractors will form to replace those removed. What is required is a transformation of the system's *epistemic relationship to its priors*: not the acquisition of new information, but the achievement of the understanding (*paññā*) that recognizes all priors as constructed. In predictive processing terms, this corresponds to a systematic reduction in the pathologically elevated precision attaching to reified priors — not a global suppression of prior precision, which would produce functional paralysis rather than liberation, but a restoration of precision calibration toward its Bayesian optimum, combined with the metacognitive insight that prior consolidation is always constructed. The system does not eliminate its generative model; it recovers the capacity to allow prediction error to update the model rather than suppress it. This is consistent with empirical findings linking advanced meditative states to increased uncertainty tolerance and reduced default-mode network activity.⁵⁴

5 Limits of the Analogy

The correspondence developed above is systematic and, we have argued, theoretically productive in both directions. It is not, however, unlimited. Four kinds of limit must be explicitly marked.

5.1 Rebirth and Cross-Lifetime Karma

The predictive processing framework is a theory of cognitive mechanism within a single system's operational lifespan. It has nothing to say about whether cognitive systems persist across biological death, or whether the karmic consequences of a system's prior consolidation can be transmitted to a subsequent system. The three-lifetime reading of the twelve *nidānas*, which assigns the first two links to a past life, the middle eight to the present life, and the last two to a future life, cannot be captured within the predictive processing framework as we have developed it here.

This is not a refutation of the rebirth doctrine but a delimitation of the scope of our comparison. The structural correspondence operates at the level of a single cognitive episode; whether this architecture recurs across lifetimes is a question the PP framework neither confirms nor denies. The Buddhist soteriological significance of liberation from rebirth thus extends beyond what our comparison can address.

5.2 The Normative Weight of *Nibbāna*

In Buddhist soteriology, the cessation of the *nidāna* chain — *nibbāna* — is not merely a possible state of a cognitive system but the highest good: the state toward which the path of practice is oriented, and whose achievement constitutes the complete relief of suffering. The predictive processing framework here implies a functional advantage: a system in which the pathologically elevated precision attaching to reified priors has been restored to its Bayesian optimum will, over extended timescales, generate less persistent prediction error — because it need not distort incoming signals to protect its existing priors, but can allow prediction error to update the model freely. What the framework supplies is only that this configuration is functionally superior in terms of long-run prediction-error reduction; it cannot independently establish that the reduction of suffering constitutes the *highest good*, nor that orienting practice toward this configuration is the *right* goal. The framework describes mechanisms; the *normative force* must be supplied from outside it.

The Buddhist analysis distinguishes forms of cessation that map imperfectly onto the PP vocabulary. The Theravāda tradition distinguishes *sa-upādisesa-nibbāna* (liberation in a still-

operative practitioner) from *anupadīsesa-nibbāna* (parinibbāna at death). Our account addresses the first type: the transformation of the model’s epistemic relationship to its priors, not the model’s termination. The Mahāyāna *apraṭiṣṭhita-nirvāṇa* — the liberated being who remains active in compassion without grasping — maps onto a system holding low-precision priors with full meta-cognitive transparency; but why compassion should be the appropriate orientation is a question for Buddhist ethics, not cognitive mechanism.

5.3 The Hard Problem of *Vedanā*

The identification of *vedanā* with valenced prediction error is one of the most precise correspondences in our analysis. But it remains a correspondence at the level of *functional role*. Predictive processing can explain why certain prediction error signals function as aversive — why they generate approach/avoidance behavior, why they are associated with the activation of negative affect circuits, why their reduction is experienced as relief. What it cannot explain is why there is *something it is like* to feel pain — the phenomenal quality of *dukkha* as a first-person experience.

This is the hard problem of consciousness applied specifically to feeling-tone, and it limits the completeness of our correspondence in an important way. The Buddhist analysis of *vedanā* is not only a functional analysis; it is also a phenomenological one. The first noble truth is not that pain causes approach/avoidance behavior but that *dukkha* is something suffered, something undergone in the first person. The predictive processing framework, as a third-person computational account, captures the functional structure of *vedanā* without fully capturing its phenomenal reality. This is a genuine limit, not a defect in our argument, but a feature of the relationship between third-person cognitive science and first-person Buddhist phenomenology that must be acknowledged.

5.4 The Relationship to the Madhyamaka Reading

A fourth limit concerns the relationship between the present interpretation and the Madhyamaka reading of dependent origination associated with Nāgārjuna’s *Mūlamadhyamakakārikā*.⁵⁵ On the Madhyamaka reading, *paṭicca-samuppāda* is not primarily a psychological doctrine but an

ontological argument: precisely because all phenomena arise dependently, no phenomenon has intrinsic existence (*svabhāva*); dependent origination and emptiness (*śūnyatā*) are two descriptions of the same truth. This reading operates at a different level of analysis from the one pursued here, and the two can appear to be in tension.

The tension is most visible in the treatment of the generative model. The present account speaks freely of cognitive systems constructing generative models, consolidating priors, and developing attractor states — a vocabulary that might seem to presuppose the kind of inherent existence that the Madhyamaka reading denies. If the generative model itself is dependently arisen, does it make sense to treat it as a stable entity that misrepresents the world?

The tension dissolves once the levels of analysis are distinguished. The predictive processing account does not attribute intrinsic existence (*svabhāva*) to the generative model; it operates at the level of functional mechanism and makes no metaphysical claim about the model's ultimate status. What the account describes is precisely the *phenomenology of misrecognition under avijjā*: from within structural misrecognition, the model's constructs *appear* to have stable, independent existence — and it is this appearance, not any real inherent existence, that drives the suffering-generating arc. The PP account thus explains how the *sense* of intrinsic existence arises, without presupposing that any such existence obtains. The Madhyamaka analysis then addresses the question the PP account leaves open: why the sense of inherent existence is illusory, and what follows from its illusoriness.

The two accounts thus jointly explain both the *genesis* of the sense of intrinsic existence (PP account: attractor reification) and its *illusoriness* (Madhyamaka account: *śūnyatā*). The present paper addresses the first task; a full account of dependent origination would need to engage the second with equal depth. In Madhyamaka terms, the predictive processing account operates at the level of conventional truth (*saṃvṛti-satya*): the generative model, its priors, and their consolidation dynamics are real in the way that conventionally designated phenomena are real — causally efficacious, practically significant, and fully subject to analysis. The Madhyamaka critique targets ultimate truth (*paramārtha-satya*): it shows that no conventional entity, including the generative model itself, possesses the intrinsic existence that misrecognition projects onto it. The two analyses

are thus not competing but stratified: the PP account explains the mechanism of misrecognition at the conventional level; the Madhyamaka analysis discloses its illusoriness at the ultimate level. This two-level structure is consistent with the Madhyamaka endorsement of conventional truth as the vehicle for liberation-oriented practice, and ensures that the PP account's commitment to causal mechanism does not presuppose the very intrinsic existence it helps to explain away.

6 Conclusion

This paper has argued for a systematic structural correspondence between the twelve nidānas of Buddhist dependent origination and the architecture of predictive processing. The correspondence is not a surface similarity between isolated concepts but a node-by-node mapping that preserves the causal architecture of both frameworks: beginning from structural misrecognition of the conditioned character of priors (*avijjā* / the non-recognition of model-generated constructs as such), proceeding through compulsive volitional formations (*sankhāra* / precision-weighted active inference under structural misrecognition) and the construction of a hierarchical generative model (*viññāna* through *saḷāyatana*), arriving at the pivot of valenced prediction error (*vedanā*), and culminating in the attractor reification and systemic degradation that constitute suffering (*taṇhā* through *jarāmaraṇa*).

The correspondence is theoretically productive in both directions. For Buddhist philosophy, it offers a mechanistic vocabulary that decosmologizes the nidāna chain, grounds a preference for the processual interpretation over the three-lifetime reading within the domain of cognitive mechanism, and establishes theoretically tractable connections to the cognitive correlates of contemplative practice that are consistent with existing empirical findings. For predictive processing, the nidāna chain supplies what existing diachronic extensions of the framework do not: a principled account of why any cognitive system operating under structural misrecognition of its priors necessarily develops toward suffering rather than self-correcting, and therefore what liberation requires — not a return to the openness of not-knowing, but the achievement of the understanding (*paññā*) that sees through the constructedness of all priors.

The key insight — that the pivot of the entire causal architecture is the identity of *vedanā* with valenced prediction error — illuminates why the Buddha identified the cessation of feeling-tone’s grip on the cognitive system as the most direct path to liberation. Liberation is not the elimination of the generative model, nor a piecemeal modification of the later links, but the restoration of the model’s capacity to receive prediction error as evidence for revision: the achievement of an understanding (*paññā*) that sees through the constructed character of all prediction structures, so that the precision attaching to priors is no longer inflated by misrecognition, and the system can hold its priors lightly — not because it does not know, but because it fully understands how knowing itself works.

The limits of the analogy are equally important to the argument. The correspondence operates at the level of functional mechanism, not at the level of cosmological claim or phenomenal reality. The rebirth doctrine, the normative force of *nibbāna*, and the first-person phenomenal character of *vedanā* all exceed what the predictive processing framework can supply. These are not defects in the comparison but markers of the genuinely different levels of analysis at which Buddhist philosophy and cognitive science operate — and of the philosophical work that remains to be done in relating them.

The structural convergence traced here suggests that both traditions arrived, by independent routes, at the same deep insight: suffering is not an accident of circumstance but a structural consequence of how any system that misrecognizes its constructed priors as mind-independent reality necessarily perpetuates and deepens that misrecognition, absent specific corrective practice. The canonical account of *paṭicca-samuppāda* and the predictive processing framework each supply what the other lacks: the Buddhist analysis provides the developmental arc and the normative orientation toward liberation; the cognitive framework provides the mechanistic vocabulary and empirical traction.

Notes

¹Bhikkhu Bodhi, *The Connected Discourses of the Buddha: A Translation of the Saṃyutta Nikāya*, SN 12 (*Nidānasamyutta*) contains the canonical formulations of dependent origination; SN 12.67 (*Naḷakalāpī Sutta*) contains the “two sheaves of reeds” formulation of the mutual conditioning of *viññāna* and *nāmarūpa* (Boston: Wisdom Publications, 2000), SN 12.1.

²Buddhaghosa, *The Path of Purification (Visuddhimagga)*, Translated by Bhikkhu Ñāṇamoli; XVII–XIX cover the doctrinal analysis of dependent origination (Kandy: Buddhist Publication Society, 2010).

³David J. Kalupahana, *Causality: The Central Philosophy of Buddhism* (Honolulu: University of Hawaii Press, 1975).

⁴Nāgārjuna, *The Fundamental Wisdom of the Middle Way: Nāgārjuna’s Mūlamadhyamakakārikā*, Translated with commentary by Jay L. Garfield; chap. 26 treats dependent origination (New York: Oxford University Press, 1995).

⁵Andy Clark, “Whatever next? Predictive brains, situated agents, and the future of cognitive science,” *Behav Brain Sci* 36, no. 3 (2013): 181–204, <https://doi.org/10.1017/S0140525X12000477>; Karl Friston, “The free-energy principle: a unified brain theory?,” *Nat Rev Neurosci* 11, no. 2 (2010): 127–138, <https://doi.org/10.1038/nrn2787>; Jakob Hohwy, *The Predictive Mind* (Oxford: Oxford University Press, 2013).

⁶Evan Thompson, *Mind in Life: Biology, Phenomenology, and the Sciences of Mind* (Cambridge, MA: Harvard University Press, 2007); Jay L. Garfield, *Engaging Buddhism: Why It Matters to Philosophy* (New York: Oxford University Press, 2015).

⁷Vasubandhu, *Abhidharmakośa-Bhāṣya*, Translated by Leo M. Pruden from Louis de La Vallée Poussin’s French translation; vol. 3, chap. 3 covers the twelve nidānas (Berkeley: Asian Humanities Press, 1988); Rupert Gethin, *The Foundations of Buddhism* (Oxford: Oxford University Press, 1998); Anālayo, *Satipaṭṭhāna: The Direct Path to Realization*, Rigorous philological and practice-oriented

analysis of the *Satipaṭṭhāna Sutta*; chap. 8 provides the most detailed contemporary English-language treatment of *vedanā* as a basis for mindfulness practice, examining the Pāli canonical analysis of feeling-tone in direct relation to dependent origination (Birmingham: Windhorse Publications, 2003).

⁸Clark, “Whatever next? Predictive brains, situated agents, and the future of cognitive science.”

⁹Friston, “The free-energy principle: a unified brain theory?”

¹⁰Karl Friston et al., “Active inference: a process theory,” *Neural Comput* 29, no. 1 (2017): 1–49, https://doi.org/10.1162/NECO_a_00912.

¹¹Friston et al.

¹²Anil Seth, *Being You: A New Science of Consciousness* (New York: Dutton, 2021); Karl J. Friston, Wanja Wiese, and J. Allan Hobson, “Sentience and the Free Energy Principle,” *Physics of Life Reviews* 31 (2019): 286–289, <https://doi.org/10.1016/j.plrev.2018.12.001>.

¹³Hohwy, *The Predictive Mind*.

¹⁴Francisco J. Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind: Cognitive Science and Human Experience* (Cambridge, MA: MIT Press, 1991).

¹⁵Thompson, *Mind in Life: Biology, Phenomenology, and the Sciences of Mind*.

¹⁶Evan Thompson, *Waking, Dreaming, Being: Self and Consciousness in Neuroscience, Meditation, and Philosophy* (New York: Columbia University Press, 2014).

¹⁷William S. Waldron, *The Buddhist Unconscious: The Ālaya-vijñāna in the Context of Indian Buddhist Thought* (London: Routledge, 2003).

¹⁸Waldron.

¹⁹Dan Arnold, *Brains, Buddhas, and Believing: The Problem of Intentionality in Classical Buddhist and Cognitive-Scientific Philosophy of Mind*, Critically examines naturalistic and cognitive-scientific interpretations of Buddhist epistemic concepts, arguing that the self-luminous (*svasamvedana*)

character of awareness in the Yogācāra-Dignāga tradition cannot be captured in third-person functional terms (New York: Columbia University Press, 2012).

²⁰Mark Siderits, *Buddhism as Philosophy: An Introduction*, Chaps. 3–4 provide the canonical analytic treatment of the no-self doctrine and its relation to Buddhist reductionism about personal identity (Indianapolis: Hackett, 2007).

²¹Owen Flanagan, *The Bodhisattva's Brain: Buddhism Naturalized* (Cambridge, MA: MIT Press, 2011).

²²Bhikkhu Bodhi, *The Middle Length Discourses of the Buddha: A Translation of the Majjhima Nikāya*, MN 9 (*Sammādiṭṭhi Sutta*) defines *avijjā* as not-knowing the four noble truths; MN 10 (*Satipatthāna Sutta*) contains the canonical analysis of *vedanā* as a basis for mindfulness (Boston: Wisdom Publications, 1995).

²³Kalupahana, *Causality: The Central Philosophy of Buddhism*.

²⁴Vasubandhu, *Abhidharmakośa-Bhāṣya*.

²⁵Buddhaghosa, *The Path of Purification (Visuddhimagga)*.

²⁶Vasubandhu, *Abhidharmakośa-Bhāṣya*.

²⁷Bhikkhu Bodhi, *The Numerical Discourses of the Buddha: A Translation of the Āṅguttara Nikāya*, AN 6.63 (*Nibbedhika Sutta*) contains the canonical definition of kamma as intention (*cetanā*) (Boston: Wisdom Publications, 2012), AN 6.63.

²⁸Vasubandhu, *Abhidharmakośa-Bhāṣya*.

²⁹The Pāli sources characterize *viññāna* as the discriminating awareness that registers the meeting of sense organ and object Bodhi, *The Connected Discourses of the Buddha: A Translation of the Saṃyutta Nikāya*. The Yogācāra *ālaya-vijñāna* doctrine develops a structurally related but more complex picture: storehouse-consciousness serves as the diachronic repository of karmic seeds (*bīja*), functioning at the functional level as the accumulated repository of prior distributions shaped by learning — a Buddhist parallel to the generative model's parameter space treated in Section 2.3.

The functional interpretation pursued here does not depend on the Yogācāra metaphysics; the disanalogies are addressed there.

³⁰Maurice Walshe, *The Long Discourses of the Buddha: A Translation of the Dīgha Nikāya*, DN 15 (*Mahānidāna Sutta*) contains the canonical account of the mutual conditioning of *viññāna* and *nāmarūpa* (Boston: Wisdom Publications, 1995).

³¹Walshe.

³²Bodhi, *The Connected Discourses of the Buddha: A Translation of the Saṃyutta Nikāya*, SN 12.67.

³³Bodhi.

³⁴Vasubandhu, *Abhidharmakośa-Bhāṣya*.

³⁵Clark, “Whatever next? Predictive brains, situated agents, and the future of cognitive science.”

³⁶Buddhaghosa, *The Path of Purification (Visuddhimagga)*; Bodhi, *The Middle Length Discourses of the Buddha: A Translation of the Majjhima Nikāya*.

³⁷Seth, *Being You: A New Science of Consciousness*; Friston, Wiese, and Hobson, “Sentience and the Free Energy Principle.”

³⁸The canonical five-fold analysis of *vedanā* — distinguishing bodily pleasure, bodily pain, mental joy, mental displeasure, and equanimity — is compatible with this mapping. The three-fold categorization captures the valence dimension central to the *nidāna* chain, while the five-fold analysis introduces a body/mind distinction that predictive processing handles through the distinction between interoceptive and exteroceptive processing hierarchies. A further canonical distinction is also relevant: ordinary *adukkham-asukha* is accompanied by the latent tendency to ignorance (*avijjā-anusaya*) and thus remains within the craving-generating architecture, whereas meditative *upekkhā-vedanā* represents equanimity that has been released from this latent tendency. Anālayo, *Satipaṭṭhāna: The Direct Path to Realization*. The PP mapping here applies to ordinary neutral feeling; meditative equanimity falls at the liberative end of the correspondence, closer to the cessation

conditions discussed in Section ??.

³⁹Bodhi, *The Connected Discourses of the Buddha: A Translation of the Saṃyutta Nikāya*.

⁴⁰Friston et al., “Active inference: a process theory.”

⁴¹*Taṇhā* maps to precision weighting specifically as it operates *under avijjā*: pathological over-weighting of priors that are misrecognized as mind-independent reality, not normal Bayesian precision calibration. Under normal calibration, increased precision weight accelerates model learning and remains correctable; under *avijjā*, it initiates the self-deepening dynamic of prior consolidation analyzed in Section ??.

⁴²Vasubandhu, *Abhidharmakośa-Bhāṣya*.

⁴³Hohwy, *The Predictive Mind*.

⁴⁴Bodhi, *The Connected Discourses of the Buddha: A Translation of the Saṃyutta Nikāya*.

⁴⁵The invocation of Metzinger’s self-model theory of subjectivity here functions as a philosophical transplant rather than a direct textual correspondence: the Pāli canonical use of *jāti* does not anticipate Metzinger’s phenomenological framework, and the mapping should be read as illuminating a structural parallel between the two frameworks rather than as a claim that the Buddhist texts contain or imply Metzinger’s account.

⁴⁶Thomas Metzinger, *Being No One: The Self-Model Theory of Subjectivity* (Cambridge, MA: MIT Press, 2003).

⁴⁷Bodhi, *The Connected Discourses of the Buddha: A Translation of the Saṃyutta Nikāya*, SN 12.1.

⁴⁸Buddhadāsa Bhikkhu, *Paticca-Samuppada: Practical Dependent Origination*, Argues for the single-moment or “everyday life” reading of dependent origination as a description of moment-to-moment cognitive events rather than a cosmological sequence across lifetimes (Chaiya: Vuddhidhamma Fund, 1992).

⁴⁹Judson A. Brewer et al., “Meditation experience is associated with differences in default mode network activity and connectivity,” *Proc Natl Acad Sci USA* 108, no. 50 (2011): 20254–20259, <https://doi.org/10.1073/pnas.1112029108>; Ruben E. Laukkonen and Heleen A. Slagter, “From many to (n)one: Meditation and the plasticity of the predictive mind,” *Neurosci Biobehav Rev* 128 (2021): 199–217, <https://doi.org/10.1016/j.neubiorev.2021.06.021>.

⁵⁰Laukkonen and Slagter (“From many to (n)one: Meditation and the plasticity of the predictive mind”) provide the most direct existing comparison: they argue that meditation modulates predictive processing by reducing the precision of prior beliefs, thereby increasing tolerance for prediction error. The present paper’s contribution differs in scope: Laukkonen and Slagter analyze precision dynamics during meditation without (a) attempting a systematic node-by-node mapping of the full twelve-link chain, or (b) identifying the *structural perpetuation problem* — why misrecognition-driven prior consolidation is self-deepening rather than self-correcting — as the central explanatory target. The present analysis extends their framework in both dimensions.

⁵¹Friston, “The free-energy principle: a unified brain theory?”; Michael Kirchhoff et al., “The Markov blankets of life: autonomy, active inference and the free energy principle,” *J R Soc Interface* 15, no. 138 (2018): 20170792, <https://doi.org/10.1098/rsif.2017.0792>.

⁵²The term *paccaya* (condition, or supporting cause) receives its fullest systematic treatment in the *Paṭṭhāna* (the seventh book of the *Abhidhamma Pitaka*), which enumerates twenty-four types of conditionality, including root-condition (*hetu-paccaya*), object-condition (*ārammaṇa-paccaya*), presence-condition (*atthi-paccaya*), and others. The conditioning relation between consecutive *nidānas* is typically analyzed as involving several of these types simultaneously, not a single univocal causal relation. Our use of *paccaya* here and in the structural correspondence (Section 3) is deliberately non-technical: we invoke the term in its general sense (supporting condition) rather than in the specialized Abhidhammic sense, and we do not claim that any particular type of *paccaya* from the *Paṭṭhāna* enumeration exhaustively characterizes the PP correlate of each conditioning relation. A full mapping of PP conditioning relations onto *Paṭṭhāna* categories is a separate project.

⁵³Hohwy, *The Predictive Mind*.

⁵⁴Brewer et al., “Meditation experience is associated with differences in default mode network activity and connectivity”; Laukkonen and Slagter, “From many to (n)one: Meditation and the plasticity of the predictive mind.”

⁵⁵Nāgārjuna, *The Fundamental Wisdom of the Middle Way: Nāgārjuna’s Mūlamadhyamakakārikā*.

References

Anālayo. *Satipaṭṭhāna: The Direct Path to Realization*. Rigorous philological and practice-oriented analysis of the *Satipaṭṭhāna Sutta*; chap. 8 provides the most detailed contemporary English-language treatment of *vedanā* as a basis for mindfulness practice, examining the Pāli canonical analysis of feeling-tone in direct relation to dependent origination. Birmingham: Windhorse Publications, 2003.

Arnold, Dan. *Brains, Buddhas, and Believing: The Problem of Intentionality in Classical Buddhist and Cognitive-Scientific Philosophy of Mind*. Critically examines naturalistic and cognitive-scientific interpretations of Buddhist epistemic concepts, arguing that the self-luminous (*svasamvedana*) character of awareness in the Yogācāra-Dignāga tradition cannot be captured in third-person functional terms. New York: Columbia University Press, 2012.

Bhikkhu, Buddhādāsa. *Paticca-Samuppada: Practical Dependent Origination*. Argues for the single-moment or “everyday life” reading of dependent origination as a description of moment-to-moment cognitive events rather than a cosmological sequence across lifetimes. Chaiya: Vuddhidhamma Fund, 1992.

Bodhi, Bhikkhu. *The Connected Discourses of the Buddha: A Translation of the Saṃyutta Nikāya*. SN 12 (*Nidānasamyyutta*) contains the canonical formulations of dependent origination; SN 12.67 (*Naḷakalāpī Sutta*) contains the “two sheaves of reeds” formulation of the mutual conditioning of *viññāna* and *nāmarūpa*. Boston: Wisdom Publications, 2000.

- Bodhi, Bhikkhu. *The Middle Length Discourses of the Buddha: A Translation of the Majjhima Nikāya*. MN 9 (*Sammādiṭṭhi Sutta*) defines *avijjā* as not-knowing the four noble truths; MN 10 (*Satipatthāna Sutta*) contains the canonical analysis of *vedanā* as a basis for mindfulness. Boston: Wisdom Publications, 1995.
- . *The Numerical Discourses of the Buddha: A Translation of the Āṅguttara Nikāya*. AN 6.63 (*Nibbedhika Sutta*) contains the canonical definition of kamma as intention (*cetanā*). Boston: Wisdom Publications, 2012.
- Brewer, Judson A., Patrick D. Worhunsky, Jeremy R. Gray, Yi-Yuan Tang, Jochen Weber, and Hedy Kober. “Meditation experience is associated with differences in default mode network activity and connectivity.” *Proc Natl Acad Sci USA* 108, no. 50 (2011): 20254–20259. <https://doi.org/10.1073/pnas.1112029108>.
- Buddhaghosa. *The Path of Purification (Visuddhimagga)*. Translated by Bhikkhu Ñāṇamoli; XVII–XIX cover the doctrinal analysis of dependent origination. Kandy: Buddhist Publication Society, 2010.
- Clark, Andy. “Whatever next? Predictive brains, situated agents, and the future of cognitive science.” *Behav Brain Sci* 36, no. 3 (2013): 181–204. <https://doi.org/10.1017/S0140525X12000477>.
- Flanagan, Owen. *The Bodhisattva’s Brain: Buddhism Naturalized*. Cambridge, MA: MIT Press, 2011.
- Friston, Karl. “The free-energy principle: a unified brain theory?” *Nat Rev Neurosci* 11, no. 2 (2010): 127–138. <https://doi.org/10.1038/nrn2787>.
- Friston, Karl, Thomas FitzGerald, Francesco Rigoli, Philipp Schwartenbeck, and Giovanni Pezzulo. “Active inference: a process theory.” *Neural Comput* 29, no. 1 (2017): 1–49. https://doi.org/10.1162/NECO_a_00912.
- Friston, Karl J., Wanja Wiese, and J. Allan Hobson. “Sentience and the Free Energy Principle.” *Physics of Life Reviews* 31 (2019): 286–289. <https://doi.org/10.1016/j.plrev.2018.12.001>.

- Garfield, Jay L. *Engaging Buddhism: Why It Matters to Philosophy*. New York: Oxford University Press, 2015.
- Gethin, Rupert. *The Foundations of Buddhism*. Oxford: Oxford University Press, 1998.
- Hohwy, Jakob. *The Predictive Mind*. Oxford: Oxford University Press, 2013.
- Kalupahana, David J. *Causality: The Central Philosophy of Buddhism*. Honolulu: University of Hawaii Press, 1975.
- Kirchhoff, Michael, Thomas Parr, Ensor Palacios, Karl Friston, and Julian Kiverstein. “The Markov blankets of life: autonomy, active inference and the free energy principle.” *J R Soc Interface* 15, no. 138 (2018): 20170792. <https://doi.org/10.1098/rsif.2017.0792>.
- Laukkonen, Ruben E., and Heleen A. Slagter. “From many to (n)one: Meditation and the plasticity of the predictive mind.” *Neurosci Biobehav Rev* 128 (2021): 199–217. <https://doi.org/10.1016/j.neubiorev.2021.06.021>.
- Metzinger, Thomas. *Being No One: The Self-Model Theory of Subjectivity*. Cambridge, MA: MIT Press, 2003.
- Nāgārjuna. *The Fundamental Wisdom of the Middle Way: Nāgārjuna’s Mūlamadhyamakakārikā*. Translated with commentary by Jay L. Garfield; chap. 26 treats dependent origination. New York: Oxford University Press, 1995.
- Seth, Anil. *Being You: A New Science of Consciousness*. New York: Dutton, 2021.
- Siderits, Mark. *Buddhism as Philosophy: An Introduction*. Chaps. 3–4 provide the canonical analytic treatment of the no-self doctrine and its relation to Buddhist reductionism about personal identity. Indianapolis: Hackett, 2007.
- Thompson, Evan. *Mind in Life: Biology, Phenomenology, and the Sciences of Mind*. Cambridge, MA: Harvard University Press, 2007.

- Thompson, Evan. *Waking, Dreaming, Being: Self and Consciousness in Neuroscience, Meditation, and Philosophy*. New York: Columbia University Press, 2014.
- Varela, Francisco J., Evan Thompson, and Eleanor Rosch. *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge, MA: MIT Press, 1991.
- Vasubandhu. *Abhidharmakośa-Bhāṣya*. Translated by Leo M. Pruden from Louis de La Vallée Poussin's French translation; vol. 3, chap. 3 covers the twelve nidānas. Berkeley: Asian Humanities Press, 1988.
- Waldron, William S. *The Buddhist Unconscious: The Ālaya-vijñāna in the Context of Indian Buddhist Thought*. London: Routledge, 2003.
- Walshe, Maurice. *The Long Discourses of the Buddha: A Translation of the Dīgha Nikāya*. DN 15 (*Mahānidāna Sutta*) contains the canonical account of the mutual conditioning of *viññāna* and *nāmarūpa*. Boston: Wisdom Publications, 1995.