# Consciousness as Exploration: From Functional Adaptation to Explicit Representation

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**Abstract**

This paper proposes that the evolution of consciousness can be partially understood through increasingly complex forms of exploration. We trace how features such as integration, intentionality, temporality, and valence evolved as functional tools for dealing with uncertainty and contradiction. Central to this process is a shift from implicit to explicit representation, which we relate to established models of consciousness levels. Our approach emphasizes structural and functional continuity between these levels, while avoiding sharp thresholds or binary distinctions. Understood as exploration, consciousness supports what Stegmaier (2019) calls orientation, *the achievement of finding one's way* in a changing environment by establishing temporary relevance and stability in conditions of uncertainty. We argue that exploration provides a productive framework for understanding how conscious capacities developed in response to situational demands. The account further raises questions about the conditions under which synthetic systems might replicate conscious capacities, highlighting the role of affect, embodiment, and representational structure in the evolution of conscious cognition.

**Keywords:** Consciousness, Exploration, Mental Representation, Cognition, Evolution, Phenomenology

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# 1 Introduction

The origin and function of consciousness remain among the most complex and debated topics in philosophy and cognitive science. Many recent theories attempt to understand the role of consciousness in terms of its biological utility, particularly its relevance to adaptive behavior (Damasio, 1999; Earl, 2014; Rosenthal, 2008; Tye, 1996). Rather than presupposing a definition of consciousness, we investigate which functionally defined capacities give rise to the properties we associate with consciousness. Specifically, we ask how the capacity for conscious experience might have evolved through the increasing complexity of an organism's interaction with its environment.

Several scholars have proposed that consciousness emerged to meet specific adaptive challenges. Veit (2022a) suggests that consciousness arose in response to growing pathological complexity describing the problem in mastering a complex body with many degrees of freedom. Ginsburg and Jablonka (2019) argue that consciousness developed to support unlimited associative learning (UAL), which enables the flexible recombination of learned elements across domains. These theories identify evolutionary triggers but leave open various aspects of how this results in the functional capacities that are usually associated with consciousness. We propose that one central answer lies in the evolution of *exploration*.

While our account shares the evolutionary orientation of approaches such as UAL and the focus on valence systems (Veit, 2022a, 2023), it introduces a distinct perspective: exploration is neither a long-term learning process nor an emotional selection but a short-term, situated process of resolving uncertainty through active engagement. Valence plays a central role in exploration by enabling the comparison of options, but exploration goes beyond affective evaluation; it involves withholding immediate responses to review, reevaluate, and reorient in face of ambiguous situations. Then again, predictive processing models emphasize internal modeling and error correction—e.g., Clark (2013). In contrast, exploration includes interaction with the environment, for instance, taking a closer look, shifting perspective or actively investigating when a contradiction arises. This active, temporally extended probing is the functional precursor of many features associated with conscious experience.

As sensory systems became more integrated and behavioral repertoires more diverse, organisms faced increasingly complex, ambiguous, and even contradictory input. This created situations where simple stimulus-response mechanisms were insufficient and where conflicting cues could not be immediately resolved. The resulting informational challenges necessitated the capacity for first internal and then external exploration, that is, the ability to withhold immediate reaction, evaluate possible interpretations or courses of action and improve active probing of the environment. This process of dealing with unresolved or ambiguous input before acting contributed significantly to the emergence of what we now associate with consciousness.

We propose that *exploration* offers a productive lens for explaining how functional and structural capacities associated with consciousness evolved under conditions of situational uncertainty and contradiction. Exploration, as we define it, is the process of resolving informational uncertainties or contradictions in sensory input by performing targeted perceptual acts, which might be supported by additional motor acts, reintegrating cues, and re-evaluating possible courses of action.[1] The resulting decoupling of stimulus and response created the evolutionary space for a new kind of cognition, grounded in a set of functional features that have long been associated with consciousness: integration, intentionality, attention, valence, and temporality. As we argue, these features are not just properties of consciousness; they are the very mechanisms that enable exploration.

While exploration plays the key role in our account, much of the consciousness literature has approached the phenomenon from other perspectives. This has led to important but somewhat disconnected lines of inquiry, particularly regarding the role of representation, the structure of consciousness, and the character of conscious experience.

First, theories of consciousness have increasingly focused on the representational capacities of cognitive systems. Much of this discussion has revolved around whether consciousness requires structured, symbol-like vehicles (as in classical cognitive models), or whether it can emerge from distributed, connectionist architectures. This tension has more recently evolved into debates about whether consciousness should be explained primarily through the *vehicles* of representation (its structural basis) or its *content* (what the representation is about)—see, for example, Clark (1997), Shea (2018) or Ramsey (2023). However, these perspectives often overlook how representations function *within consciousness itself*. As our account suggests, exploration brings into focus specific *representational entities* that are relevant to situational perception. These entities are not merely internal neural states but elements that become available for comparison, evaluation, and guidance of behavior. Their content, related to intentional directedness, reflects not merely an external objective reference, but the organism's situated interaction with its environment. From this perspective, exploration does not rely on pre-given representations; rather, it dynamically constitutes representations by integrating and re-integrating perceptual and affective input. This view is closely aligned with teleosemantics (Millikan, 1984, 1995; Neander, 2017), where representational content is shaped by function and success in guiding adaptive behavior. What we refer to as representational content here is thus not a static depiction of the world, but a process-sensitive frame that supports the emergence of action-relevant distinctions (percepts).

Second, empirical and theoretical models have identified distinctions between primary and secondary forms of consciousness (Damasio, 1999; Edelman, 2003), but the functional procedures behind this distinction remains underdeveloped. In our framework, this distinction emerges naturally from the demands of exploration. Primary consciousness enables an organism to maintain a stream of engagement with its environment, integrating sensory cues to determine and evaluate immediate action possibilities. Secondary consciousness, by contrast, builds upon this dynamic process by incorporating stable representations to formulate goals, rules, and plans. They allow an organism to compare options across time and simulate outcomes beyond the present moment. This shift does not merely reflect a higher level of cognition but a

[1] Exploration can be understood as a specific kind of problem solving related to the perception and sense-making of the perceived input.

transformation in how the organism perceives and copes with its environment: through persistent representations that extend and stabilize the horizon of exploration.

Third, phenomenological approaches have played a central role in describing the first-person character of consciousness. But even here, the focus is often on what consciousness is like and not on how it works. The *Philosophy of Orientation* as developed by Stegmaier (2008, 2019) offers an important corrective. Rather than treating experience as a static quality, he emphasizes its dynamic, temporal, and situational character: orientation is the process of *finding one's way* in changing situations. This aligns closely with our account of exploration. Stegmaier's conceptual tools such as standpoint, horizon, perspective, and leeway mirror structural features we attribute to exploratory consciousness.

Taken together, these three strands—representational theory, evolutionary function, and phenomenological structure—converge towards a central insight: *consciousness is best understood not as a state, but as a capacity for exploration.* This shift allows us to reframe longstanding debates, explain puzzling structural features of consciousness, and close down the gap between first- and third-person perspectives.

The paper proceeds as follows. Section 2 outlines the functional limitations of stimulus–response systems and introduces the role of exploration as a decoupling mechanism that supports flexible behavior under uncertainty. Section 3 traces the developmental transition from implicit to explicit representation, showing how increasingly structured forms of exploration correspond to higher levels of cognitive integration and consciousness. Section 4 analyzes the structural features that enable explicit cognition—modularity, composability, and persistence—and shows how these features transform functional capacities such as intentionality, attention, valence, and temporality. Section 5 brings these insights into dialogue with Stegmaier's concept of orientation, offering a complementary first-person perspective on exploratory dynamics. Section 6 situates the proposed framework within ongoing philosophical debates about representation and consciousness and considers its implications for synthetic cognition. Section 7 concludes with a summary of the core argument and its significance for understanding consciousness as a structurally and functionally grounded capacity. It concludes with an outlook on possible future research.

# 2 From Stimulus–Response to the Need for Exploration

## 2.1 Early Cognitive Systems and Their Limits

The early evolution of cognition was shaped by simple stimulus–response systems, in which organisms reacted immediately to environmental cues. As organisms evolved more refined sensory systems, they were able to gather and process more input, enabling more nuanced and adaptive behavior. This growing complexity brought not only advantages but also new challenges. With more differentiated input, responses became more elaborate and, thus, more energetically costly or situationally risky. At the same time, richer information opened up greater opportunities for adaptive action if the organism had the means to selectively evaluate it. In short, more information required a new strategy to avoid costly mistakes and make better use of the available input.

Learning from experience can be seen as an early evolutionary solution to these challenges. Dennett (1975) called organisms "that are susceptible to operant conditioning" Skinnerian creatures; they repeat successful actions and avoid those associated with failure. However, this kind of trial-and-error learning entails significant risks as failure might come at a high cost. He therefore contrasted Skinnerian creatures with Popperian creatures as those organisms that could generate internal hypotheses about possible behaviors and mentally *pretest* them before acting. This evolutionary step marks a major shift: creating a space in which behavior can be simulated and not simply performed, which in turn requires time for exploration between perception and action.

## 2.2 Emotion and Valence as Decoupling Mechanisms

The appearance of this exploratory space has also been connected to the rise of affective evaluation. Scholars such as Scherer (1984, 1994) and Grinde (2012, 2023) have argued that emotion played a key role in the decoupling of stimulus and response. Emotions allowed organisms to register the significance of environmental stimuli without reacting immediately. Recent empirical work supports the idea that affective systems play a central role in modulating perception and action by guiding attention and enhancing behavioral flexibility. For instance, Pessoa (2008) has shown that emotion is not distinct from but fundamentally integrated with cognition, shaping how organisms prioritize and interpret input under uncertainty. Veit (2022b) even suggested that the evolution of value systems, which assign valence to states of affairs, was the key driver of consciousness itself. However, as Jablonka and Ginsburg (2022) criticized, while valence is likely a necessary component, it is not sufficient by itself to explain the emergence of conscious cognition.

## 2.3 Conflicting Inputs and the Emergence of Exploratory Space

Another important development concerns the mapping between sensory input and action. Wu (2011, 2014) identified the *Many–Many Problem*, which arises when organisms must choose from many possible actions in response to many possible inputs. The challenge is not merely to integrate input but to select a path through a dense space of possibilities. While Wu emphasizes the structural problem of selecting among many-to-many mappings, his framework also underscores the need for mechanisms that can explore and evaluate input–action pairings before committing.

Droege (2009, 2022) addressed a related challenge by drawing on Millikan's concept of pushmi–pullyu representations—primitive, action-guiding structures that fuse perception with behavioral directives (Millikan, 1995). She argues that a crucial evolutionary step was to decouple the descriptive and directive aspects of such representations, allowing for internal comparisons between current states, past experiences, and future goals. In this way, behavior becomes goal-oriented, which allows for greater flexibility. Although her *Temporal Representation Theory* emphasizes the structural role of representing the present moment, the broader implication is that this temporal representation creates a space for internal differentiation and assessment as the very conditions needed for exploration.

While neither Wu nor Droege directly frame these transitions in terms of exploration, their analyses converge on the idea that the decoupling of perception and response creates a space in which there is more leeway. This space was not simply filled by more integration of informational input; it evolved new kinds of mental operations that were capable of handling conflicting affordances, ambiguous cues, and situational variability. Under the altered conditions, immediate responses were often premature. Thus, the organism had to pause, evaluate, and test alternatives internally.

This background also helps clarify the distinction between sensory processing and exploration. For example, in blindsight (Weiskrantz, 1986), patients react to visual stimuli but without conscious awareness, so they cannot use the content in further exploration, i.e., for comparing, evaluating, or planning. The situation is similar with pain: the reflexive withdrawal of the hand from a hot surface should suffice, but only the experience of pain enables the subject to reorient, e.g., to attend to the affected body part, protect the hand from further damage, or reconsider ongoing action. Without serving as input for exploration, the experience of pain would have no further behavioral utility.

In this light, the emergence of exploration marks a functional transition in cognition, laying the groundwork for the eventual rise of explicit representation and higher-order consciousness. Greater informational richness exposed tensions, ambiguities, or inconsistencies that simple associative systems could not resolve. Exploration thus became a biological necessity: a means of coping not only with more input, but also with uncertain, shifting, and potentially conflicting input. This has opened up a route to the development of consciousness.

# 3 From Implicit to Explicit Representation in Exploration

## 3.1 From Situated Reaction to Internal Evaluation

To understand the evolution of exploration and consciousness, we must examine the kinds of representations involved (Chalmers, 2004) even if they should not be understood as simple depictions of the world. First, *implicit representations*[2], such as those found in reflex action, stand for immediate responses to stimuli and operate in a distributed and usually non-decomposable manner (Dennett, 1983; Hadley, 1995). They determine behavior without isolating distinct informational components for composition. The behavior comes fast and efficiently but is inflexible. In addition, they enable what we call *implicit exploration*, an explanatory behavior—e.g., see Cisek

[2]Following (Dennett, 1983, pp. 216, 224), an explicit representation is present in a system "if and only if there actually exists in the functionally relevant place in the system a physically structured object, a formula or string or tokening of some members of a system (or 'language') of elements for which there is a semantics or interpretation, and a provision (a mechanism of some sort) for reading or parsing the formula." In contrast, implicit representations—what Dennett called *tacit representations*—"get their semantic properties directly and only from their globally defined functional roles." He illustrates this with the example of an elevator: while its behavior may reflect rule-like regularities, those "rules" are not explicitly represented within the system itself but can only be inferred from its operations.

(2019)—that emerged from the further development of several functional features commonly associated with consciousness:

- **Integration**, already operative in pre-exploratory stimulus–response reactions, became more dynamical: rather than integrating all incoming signals equally, systems began to form percepts as temporarily stable reference points that guide further activity based on situational salience, evaluation, and coherence, reflecting what stands out as actionable or urgent.
- **Intentionality** as the directedness of this the integration of sensory cues towards effective activity became more nuanced and embedded in the exploratory search. Instead of being passively shaped by external stimuli or internal states (e.g., hunger or arousal), directedness began to partially show patterns of ambiguity or contradiction that drew exploratory engagement. These entailed tensions that prompted shifts in perceptual or behavioral focus.
- **Attention** no longer only served the purpose of selection, but began to respond to these tensions. As a mechanism for selective prioritization, attention enables localized integration by focusing on one element at a time, while allowing unattended aspects to remain accessible for later inspection. This process structures exploratory activity into a temporally ordered sequence. This mechanism allowed organisms to isolate conflicts and examine situational alternatives across short time spans.
- **Valence** introduced as an affective indicator characterizes the options with positive or negative tendencies and thus enables comparison. Following Veit (2022b), the emergence of value sensitivity played an essential role in the development of sentience.
- **Temporality** became a functional dimension of behavior once perception and response were decoupled. Organisms began to track and anticipate durations, delays, and the timing of actions relative to changing conditions. Regarding exploration, organisms evolved sensitivity to urgency, delay, and pacing. The emergence of temporality introduced an affective tension: the felt need to maintain stability while responding in time to unfolding situations.

In the processual structure of exploration, attention emerged as the first dynamic organizing principle. Another process-oriented feature that might have played a role is integration, However, as Polanyi (1965) emphasized, integration is irreversible in synthesizing inputs and is therefore unfit for juxtaposition. Attention, by contrast, allows for a reversible engagement with perceptual foci, enabling the system to return to, contrast, or reassess aspects as exploration. This reversibility is essential for flexible behavior, particularly in environments where conditions change rapidly or contradictions emerge between initially salient cues. Attention thus provides the temporal and structural flexibility needed for exploratory refinement and reintegration of informational cues.

Attention is not only determined by the salience of the environment but can be implicitly biased by contextual factors. Empirical studies show that this is not limited to top-down control, which enables the deliberate selection of inputs, but also includes biases shaped by emotional states, learned associations, or recent experiences (Todd & Manaligod, 2018; White, 2024). For example, a subject expecting a threat may disproportionately attend to ambiguous stimuli, even if they are not objectively salient. Such biases are functionally important for exploratory engagement, as they modulate what is prioritized when navigating uncertainty.

However, implicit exploration faces limits. The underlying implicit representations does not possess components that can be compared or recombined, even if the complexity of responses increases. This constrained their capacity to evaluate and adapt to complex situations with conflicting or novel elements. As pressures toward greater flexibility increased, particularly in organisms facing information-rich or ambiguous environments, a new layer of processing began to emerge.

The emerging layer was characterized by *explicit representations*, which were composed of modular components that could be individuated, stored, and recombined. The modular components show clear boundaries and syntactic relations and were later associated with symbols, imagistic elements, or structured representations. Following Dennett (1983) and others, we understand explicit representations as *vehicles* whose internal structure supports semantic interpretation and systematic manipulation. Their modularity enables composability and externalization, making them ideal for exploration.

Implicit representations integrate sensory inputs into perceptual gestalts that can be directly assessed and guide behavior in the present moment. In contrast, explicit representation allows alternatives to be composed from identifiable components. While outcomes may be similar, the structure of an alternative (with its intermediate steps) can carry its own valence, influencing selection even when endpoints are equivalent. This compositional granularity supports more nuanced evaluation than outcome comparison alone. By structuring options in this way, explicit representations enable subjects to compare alternative courses of action, simulate outcomes, and formulate longer-term goals. This, in turn, allows for decoupling from immediate stimuli and supports extended planning.

**Table 1** Characteristic functional features of primary and secondary consciousness. Only some references are provided to show that the agreement goes across studies.

| **Primary consciousness** | **Secondary consciousness** | **Selected references** |
|---|---|---|
| phylogenetically older | phylogenetically younger | Baumeister and Masicampo (2010)<br>Edelman (2005) |
| processual | representational | Damasio (1999)<br>Bickhard (2021) |
| perception-based | mind-based | Schooler (2002)<br>Edelman (2005) |
| in the immediate present | structured in past, present and future | Baumeister and Masicampo (2010)<br>Edelman (2005) |
| non-semantic and non-linguistic | semantic and linguistic | Edelman (2005)<br>Damasio (1999) |

A range of authors have proposed two-level models of consciousness that parallel this distinction between implicit and explicit exploration, as we will show in the following. Damasio (1999) differentiates between core and extended consciousness; Edelman (2005) draws a similar line between primary and higher-order consciousness. Notably, a similar distinction between primary and secondary consciousness was already articulated by Sinclair (1923), whose early account anticipates core elements of the two-level frameworks later developed by Damasio and Edelman. These models associate the lower level with perception-bound, present-oriented awareness and the higher level with memory, planning, and reflective thought. Baumeister and Masicampo (2010) describe this distinction in terms of phenomenal awareness versus conscious thought, while Bickhard (2005) emphasizes interaction and self-monitoring within a dynamic systems framework. More recent contributions include Bayne, Hohwy, and Owen (2016), who discuss the multidimensional character of consciousness, and Fazekas and Overgaard (2016), who argue for graded and multi-level models that combine representational and access features. Despite differences in terminology and emphasis, these models converge on a functional transition: from immediate, affect-guided responsiveness to the construction of temporally extended, symbolically structured representation. Our account aligns with this perspective but focuses on the exploratory processes that scaffold this transition. As summarized in Table 1, the distinction between primary and secondary consciousness reflects a widely shared understanding of how representational and temporal complexity co-develop with conscious capacities.

The preceding analysis has shown that the functional differences between implicit and explicit representation align closely with well-established distinctions between primary and secondary consciousness. This parallel illustrates how increasingly complex forms of conscious evaluation emerge from structural refinements in representational capacity. To deepen this account, we now turn to the philosophical discussion of representational vehicles and content. This allows us to situate our proposal within ongoing debates about the nature and function of representation, and to clarify how structural properties—such as modularity and composability—contribute to evaluative processes central to explicit cognition.

## 3.2 Vehicles, Content, and the Structure of Evaluation

Starting with a working definition of representation following the discussion of Thomson and Piccinini (2018), we define representations as entities with semantic content—either descriptive or directive (Millikan, 1984)—that play a functional role in guiding behavior, where that role depends on the representational content (Ramsey, 2016). A contradiction arises when the directive contents of two representations refer to mutually exclusive actions.

In line with recent debates on vehicle- and content-based theories of representation (see Ramsey (2023) or Shea (2018) for example), we propose that representations involved in exploration cannot be neatly classified into one side of this dichotomy. Instead, the account developed here suggests a functional relation between representational vehicles (modular, manipulable structures) and their role in guiding exploration.

As exploration shifts from implicit to explicit forms, representations become modular. These vehicles allow for composition, framing attention, and temporary decoupling from immediate sensory input. The structural features of explicit representation enable further inquiry and the composition of possible consecutive actions for anticipatory planning. The capacity for planning thus relies not on the content alone but on the structural manipulability of the vehicle.

What we call 'content' in this context refers not to external affordances *per se*, but to internally constructed elements that are made available for evaluative processes. These contents are shaped to serve internal comparison and selection of action, based on how they integrate with the subject's prior experiences and current situational framing.

This view aligns with the suggestion made by Ramsey (2023) that semantic content should not be treated as a static mapping between representation and world, but rather as emerging from the representational structure's functional role in the cognitive system. In the exploratory process, feedback from action can refine which representational vehicles are more effective, not in terms of correctness *per se*, but in terms of the organism's capacity to cope with complex and ambiguous situations.

# 4 Explicit Representation and the Expansion of Cognitive Capacities

While the previous section examined the structural and functional distinctions between implicit and explicit representation, the present section turns to the cognitive capacities that explicit representation makes possible. Rather than focusing on the transition itself, we explore how structural features such as modularity, persistence, and composability afford new modes of evaluation, comparison, and planning. These features not only support more complex forms of information processing but also reshape how attention, valence, and temporality function in exploratory activity. The shift to explicit representation thus expands the subject's cognitive reach and enables symbolic manipulation, future-oriented reasoning, and flexible response to contradictory or uncertain inputs.

## 4.1 Structural Features: Modularity, Persistence, and Composability

Explicit representation introduces structural features that qualitatively expand cognitive capacities. While implicit representations are effective in guiding immediate action, they are limited by their non-decomposable structure and their uniform stimulus-bound responses, which constrain the horizon for comparison and projection. Explicit representation, by contrast, enables representations to be constructed from discrete, manipulable components that can be selectively recombined, retained, and redeployed. These properties—modularity, composability, and structural support for persistence—transform exploration from reactive orientation into constructive simulation and projection.

**Modularity** enables representations to be composed of separable parts that retain their identity across contexts. This allows specific elements of a plan or situation to be held constant while others are varied, forming the basis for systematic comparison. For example, a subject might consider two routes to the same goal, altering only the middle segment. Modularization plays a crucial role in cognitive evolution[3], as it supports informational encapsulation, substitution, alignment, and recombination. These are operations of central importance to reasoning, counterfactual exploration, and the construction of alternative actions. These same structural principles underlie technological systems, where complex designs emerge through the reuse and reassembly of prior modules. Arthur (2009) introduced the term *combinatorial evolution* to describe the role of structural modularity in innovation. This principle can also be applied to biological and cognitive systems.[4]

**Composability** complements modularity by enabling structured representations to be built from known components. This allows subjects not only to respond to given alternatives but to construct hypothetical configurations beyond direct experience. The resulting capacity for generative exploration is critical for planning and supports generalization by enabling the reuse of representational vehicles across different contexts. However, composability alone is not sufficient: assembled representations must be integrated into an action-guiding structure that supports evaluation and comparison. As Polanyi (1967) emphasized, explicit components such as words in a sentence do not carry structure simply by juxtaposition. Their functional coherence arises from how they are integrated and interpreted in light of what the system is trying to achieve.[5] This highlights the role of intentionality in compositional representation: components must be aligned and interpreted in view of coordinated action.

**Persistence** enables representations to be held across time, revisited, and reconsidered. This does not require sustained internal activation but depends on structural features (e.g., symbolic placeholders or spatial indexing) that allow components to remain accessible even when they are not actively engaged. As Piaget (1954) observed, a key milestone in cognitive development has been the transition from transient percepts to persistent mental "objects" that can be re-identified and manipulated in thought. Explicit representation supports this capacity by providing stable structures that encode referential continuity. This allows exploratory processes to extend beyond the immediate situation, supporting delayed evaluation, comparison across options, and planning over extended temporal horizons.

Polanyi (1967) pointed out the different integrative processes related to perception and language. In perception, we integrate sensory cues directly, yielding an experience that is immediately present; in language, we integrate symbolic components whose

[3]See, for instance, (Shettleworth, 2000). In this study, we only focus on the question which cognitive advantages are related to modularity, which is independent of the question to which degree the mental architecture as such possesses a modular structure (Fodor, 1983).

[4]For a broader account of how modularity enables cumulative innovation, see Arthur (2009), who characterizes technological development as combinatorial evolution—the construction of novel functions through the recombination of existing modules. A similar structural principle applies to biological and cognitive domains, where modular reuse supports increasingly complex forms of adaptation.

[5]Polanyi (1967) stresses that the function of explicit representations, especially in language, is not merely to display elements, but to integrate them into a coherent framework of sense-making. While he refers specifically to linguistic structure, the point is more general: compositional systems must be guided by a unifying intention in order to yield functional representations.

referents are accessed only through interpretive thought. This distinction closely parallels the transition from primary to secondary consciousness as outlined in Section 3. However, the process of integration extends across both and thus enables cross-level processing.

These structural affordances—modularity, composability, and supported persistence—lay the groundwork for explicit reflection, symbolic reasoning, and self-monitoring. In this sense, explicit representation supports an architecture of orientation in which exploration is no longer driven solely by reactive tension, but by constructed possibilities. As we will explain in Section 6, artificial agents increasingly rely on such structural principles, yet often lack the integrative and affective grounding necessary for truly adaptive cognition.

## 4.2 From Implicit Exploration towards Conscious Cognition

This section traces how core functional dimensions of cognition such as intentionality, attention, valence, and temporality are transformed through the structural capacities introduced by explicit representation. The features of explicit representation then lead to a reconfiguration of the functional landscape of cognition. In this process, functions such as intentionality, attention, valence, and temporality take on new forms and change the cognitive scope of these features. In what follows, we explore how this transformation unfolds, beginning with the evolution of intentionality from reactive directedness to explicitly goal-guided organization.

**Intentionality**, at its core, refers to the directedness of how a system is oriented towards possibilities for action. In implicit exploration, intentionality is situational and dynamically structured by affect and affordance. With explicit representation, this directedness becomes decoupled from immediate input, and the system can actively organizes its exploration around abstract targets that exist independently of the current situation in persistent and situation-independent *goals*. As (Droege, 2022, p. 75) emphasizes, a system capable of explicit representation can distinguish its goal from the specific paths leading to it.

**Attention** that was the first dynamic mechanism in exploration, operates in both implicit and explicit contexts. Explicit representation introduces a new form of attentional control: it enables subjects to also focus on internal constructs, not just external stimuli. Attention becomes a tool for operating over persistent and modular representations. As attention is reversible, subjects can return to earlier views, rearrange focal elements, and reevaluate partial structures as exploration unfolds. This flexibility is essential for dealing with complex or contradictory inputs. Moreover, attention is not only shaped by environmental salience but also by internal context: emotional states, recent experience, or implicit biases can all modulate which alternatives are selected for consideration (Todd & Manaligod, 2018; White, 2024). This modulation is not a limitation but a central mechanism for situated, adaptive cognition.

**Valence** expands its scope of what is evaluated significantly with explicit representation. Affects do not only refer to possible outcomes but can include intermediate steps or hypothetical scenarios. This enables the system to assign value not just to what the subject perceives, but to internally constructed options, including imagined futures. In addition, explicit *rules* begin to influence evaluation. These rules may encode preferences, constraints, or learned standards for action, enabling the subject to evaluate alternatives not only emotionally but also systematically. The result is a new interplay between rule-based evaluation and affective guidance: an action may be structurally preferred according to internalized norms, yet emotionally resisted—or vice versa. This interplay does not replace emotional dynamics but rather builds on them, creating a layered system of evaluation that includes both inferred structure and felt relevance.

**Temporality** also undergoes a structural transformation. In implicit exploration, temporal pressure is experienced as affective urgency: the need to act within a changing situation. Early temporality is thus bound to felt tension and attentional sequencing. With explicit representation, time becomes representable: subjects can plan sequences, represent delays, and compare alternative temporal structures. The capacity to construct timelines, simulate outcomes, and monitor future consequences marks a major cognitive expansion. As Droege's Temporal Representation Theory emphasizes, this ability to represent and reason about time explicitly is a defining feature of reflection (Droege, 2009, 2022). Temporal structures are no longer embedded in a reactive flow but become subject to manipulation and integration within larger exploratory processes.

Together, these transformations in intentionality, attention, valence, and temporality show how explicit representation enables not just more information, but different forms of orientation: the capacity to structure, evaluate, and revise one's engagement with the present situation. The shift from implicit to explicit cognition does not erase earlier capacities, but builds on them; it transforms exploratory engagement into a layered, revisable process grounded in structural depth and functional flexibility.

# 5 Orientation as Phenomenal Exploration: A Complementary Perspective

The preceding sections described the emergence of exploratory behavior as a response to increasing complexity, ambiguity, and contradiction in an organism's environment. The change in exploration through the development of explicit representation introduced features commonly associated with consciousness. To complement this functional and evolutionary account, we turn to Stegmaier's *Philosophy of Orientation* (PO)[6] that offers a phenomenological perspective on how such exploration processes are experienced subjectively.

For a working definition of *orientation*, we follow Stegmaier's phenomenal description characterizing "orientation as finding one's way in a situation and making out promising opportunities for action to master the situation" (Stegmaier, 2019, p. 25). Orientation unfolds in time and is responsive to both external conditions and internal dispositions. The subject is always already immersed in an ever-changing situation that must be interpreted, structured, and acted upon. What appears to the subject is never a mere objective fact, but something grasped as potentially relevant. Orientation, in this view, is the experienced process of coping with contingency by adjusting

[6] Stegmaier developed the philosophy of orientation mainly in his main work (Stegmaier, 2008), parts of which were adapted into the English translation Stegmaier (2019).

one's perspective through changing views (PO, 207), affective evaluation (PO, 254-256), and the iterative search for footholds (PO, 237-238). This resonates with the idea developed in earlier sections that the core features of consciousness emerged to support exploration. In PO, these features are reflected in the structure of orientation, though often under different names and emphases:

**Attention**[7] is treated by Stegmaier as a fundamental attitude of orientation, though in a broader sense than standard cognitive theories. Rather than a mechanism for selecting among competing inputs, attention here refers to a basic *attentiveness*, a readiness to be affected, guided by mood, and responsive to the irritations of the situation (PO, 169-170). This pre-intentional attentiveness, which can increase or wane depending on one's sense of unsettlement, precedes more focused acts of orientation, which he associates with intention (PO, 162-165). In this way, attentiveness plays a foundational role in orientation, not by filtering information, but by sustaining openness to possible directions of sense-making.

**Valence** is associates with affects in Stegmaier's description of the process of orientation. Moods and feelings imbue situations with a sense of urgency, possibility, or resistance; he refers to them as *affective evaluation* (PO, 254–256). Rather than being applied to predefined options, affect helps shape what counts as a possibility in the first place, guiding exploration from within the situation.

**Temporality** plays a central role in orientation, where it marks the unstable, unfolding nature of situations that always demand reinterpretation and readjustment (Stegmaier, 2015, PO, 151-152). Rather than treating time as an objective parameter or a representational structure, Stegmaier emphasizes its existential character: time both threatens orientation by dissolving stability and enables it by opening paths forward. This aligns with our account of implicit exploration as a temporally embedded process, which is shaped by shifting in chnaging situations.

**Intentionality**, though not a major focus in PO, is touched upon in Stegmaier's treatment of alignment (*Ausrichtung*) (PO, 191–192). It is structured by horizons, standpoints, and perspectives (PO, 194). The subject's standpoint (their embodied and situational point of view) and horizon (what can be expected or anticipated) determine their perspectives (PO, 206). Structuring a situation by standpoint and horizon resonates with intentionality as directedness toward affordances. In particular, Stegmaier shows that orientation does not start with a direction but with a need to find access to and sense in a situation (PO, 181-182). Goals emerge from this process rather than preceding it, aligning with the earlier suggestion that early exploration was driven not by plans, but by the resolution of local ambiguities or contradictions.

Of particular importance is Stegmaier's concept of foothold (*Anhaltspunkt*), which plays a critical role in the transition from implicit to explicit representation. Footholds are provisional reference points constructed in the flow of orientation. They provide temporary stability, enabling the subject to continue navigating the situation without

[7] In Section 3.3 of *What is Orientation?*, Stegmaier (2019) discusses attention explicitly, but his usage diverges from the technical sense found in cognitive science or philosophy of mind. Rather than referring to a selective mechanism for prioritizing inputs, e.g., Wu (2011), Stegmaier uses *attention* to denote a pre-intentional openness or *attentiveness*—a basic readiness to be affected by the situation, guided by mood and unsettlement. This form of attentiveness can intensify or wane and precedes the more focused, goal-directed selectivity he associates with *intention*. For clarity, we distinguish Stegmaier's attentiveness from selective attention in the cognitive sense.

full comprehension. As Stegmaier notes, "footholds that appear tenable can always turn out to be unstable... they only make sense when connected to other points" (Stegmaier, 2019, pp. 55-56). This chain of footholds supports the continuity of orientation and creates traces of sense, reflecting to the idea of constructing courses of action through modular representations in explicit exploration.

In the earlier sections, the formation of explicit representations was described as a transition from transient, holistic patterns to persistent, decomposable structures. Footholds describe exactly this kind of transition from fluid to fixed—though always in a temporally bound, situation-sensitive way. Once externalized (e.g., in language, writing, or signs), such footholds become persistent in symbolic carriers (vehicles), detaching the representation from immediate perception and enabling planning and rule-following. This connection between stable orientation points and explicit representational content suggests that Stegmaier's phenomenological approach may also provide insight into the formation of functional content. This question is further explored in representational theories of mind (see Section 6).

Finally, Stegmaier introduces the concept of leeway (*Spielraum*)—the room for maneuver afforded by the movability of standpoint and horizon (PO, 221–224). This concept mirrors the expanded design space that emerges with explicit representation. Just as modular recombination allows for more powerful forms of reasoning and planning, leeway introduces a regulated limit of unregulated behavior to orientation. This increases flexibility not as arbitrariness, but as an organized response to the interplay of rules and contingency—an idea that Stegmaier links to the language games of Wittgenstein (1953).

Although Stegmaier's *Philosophy of Orientation* does not describe consciousness in the same way as in the account developed earlier, the structural parallels to the process of exploration offer a complementary phenomenological perspective. His method reveals how features such as attention, temporality, and affectivity are experienced, not simply how they function.

# 6 Discussion

Our investigation has argued that the evolution of consciousness is best understood through the dynamics of exploration rather than through static categories such as "subjectivity" or "qualia" (Chalmers, 1996; Nagel, 1974). This shift emphasizes process over substance and structure over states. Consciousness, on our account, is a scaffolded capacity for coping with uncertainty and contradiction, which developed gradually through increasing representational complexity, affective guidance, and temporal embedding. In this final section, we consider how this view interacts with two core philosophical and technological challenges: (i) how content and structure emerge in representational systems, and (ii) whether such systems could arise outside biological organisms.

## 6.1 Bridging Semantic Content and Representational Structure

Our account touches directly on the longstanding philosophical debate about the nature of mental representation—specifically, the distinction between vehicle-based and content-based theories. Content-based theories, rooted in the tradition of Fodor (1987) and Millikan (1984), aim to explain cognition in terms of internal states that are "about" something and typically evaluate their accuracy by reference to external conditions. Vehicle-based accounts, in contrast, emphasize the structures or mechanisms (i.e., the vehicles) that carry or implement representations, often with reference to computational or neural systems—see, for example, Clark (1997); Grush (2004).

Our proposal challenges the exclusivity of both views. The concept of exploration, and especially the distinction between implicit and explicit modes, shows that representational processes can be better understood as functionally scaffolded, where content-like features emerge only once certain vehicle properties such as modularity, persistence, and composability are in place. This aligns with Ramsey (2023), who recently suggested that the emergence of explicit representation should be seen as a functional adaptation, not a metaphysically discrete phenomenon.

Our view resonates with Richmond's argument that theories of neural representation should be evaluated not by what representations are, but by the explanatory work they do (Richmond, 2024). In his view, representational notions help articulate how systems manage complexity, respond to inputs, and generate behavior. Our process-based account reflects a similar orientation: representations are not metaphysically primitive entities but functional constructs that enable increasingly structured forms of exploration and support explanation at different levels from reactive adaptation to symbolic planning.

What our account adds is a process-based and evolutionary bridge between the two camps. Implicit representation operates without symbolic structure or semantic articulation, serving instead as a temporally embedded and affectively guided mechanism for rapid response and situated adaptation. Explicit representation, by contrast, introduces modularity and symbolic structure, which in turn support stabilization of contents, volitional control, and reflection. Stegmaier's concept of footholds captures this transition beautifully: footholds are transient but temporarily stable points that allow orientation to proceed.

In this way, we see the emergence of representational content as gradual and pragmatic, not as an all-or-nothing threshold. The concept of footholds indicates the transition from transient to (temporarily) stable structures. The setting resembles the heap paradox: In the perception of transient percepts, the appearance of a heap indicates an action opportunity, while its disappearance puts an end to it. In the perception of an explicitly represented object, adding or removing grains do not change the heap's persistence. (Stegmaier, 2015, p. 488) comments: "Paradoxes warn against accepting concepts as if that about which they speak existed outside of them."

Philosophers such as van Gelder (1995) and Hutto and Myin (2012) have also challenged the adequacy of computational or content-based accounts, emphasizing instead the dynamical and enactive aspects of cognition. While we do not go so far as to reject representation entirely (as radical enactivists do), we share the view that representation emerges from process, not vice versa. Our account thus helps synthesize vehicle and content views by treating them as complementary aspects of a functional-evolutionary continuum.

Indeed, as Stegmaier reminds us, even concepts like sense and orientation are grounded not in formal rules but in continuous engagement with situations. In this light, we also share Shagrir's caution that overly focusing on physical computation or symbol manipulation risks ignoring the inherently temporal, affective, and goal-sensitive nature of cognition and consciousness (Shagrir, 2022). Systems designed only for binary symbolic control may fail to capture the subtleties of exploratory dynamics.

## 6.2 Consciousness and the Limits of Synthetic Cognition

Global Workspace Theory remains one of the most influential functionalist models of consciousness (Baars, 1988). It proposes that consciousness arises when specialized, unconscious processors prompt the activation of a central workspace that enables cross-domain integration. Yet while this theory articulates the conditions under which information is broadcasted, it leaves open the question of how contradictions are resolved once information is globally available. Our framework addresses this gap by emphasizing the role of exploration in restoring coherence.

Evidence from developmental and comparative psychology supports the claim that the capacity to simulate and evaluate future possibilities—a hallmark of explicit exploration—emerges with increasing representational structure. Suddendorf and Corballis (2007) argue that this ability, often referred to as 'mental time travel,' is closely linked to the evolution of foresight and conscious deliberation and includes the (re)construction of past and future events.

In a parallel direction, our account connects with Heylighen and Beigi (2024), who propose that consciousness is a mechanism for prospective situational modeling. Their neurobiological model emphasizes that the evolutionary value of consciousness lies in its ability to simulate, compare, and evaluate potential outcomes. This closely aligns with the framework we propose here: exploration as the principal task from which the features of consciousness emerge.

Where our approach differs is in its minimal reliance on neural models. Consciousness is first and foremost seen as a functional capacity that could—in principle—arise in other substrates as well. This opens a pathway to discussions about synthetic cognition and artificial consciousness.

However, we caution against premature assumptions in this area. Simply embedding mechanisms for conflict resolution in AI systems does not suffice. As we have shown, feelings—particularly valence—play a central role in guiding exploration. These affective mechanisms are deeply rooted in the embodied, homeostatic, and evolutionary history of organisms. Artificial agents lack this rootedness, and thus may struggle to replicate the guidance system that underlies conscious exploration.

From the perspective of exploration, even the classic experiments of Libet (1985) are more easily interpreted. Rather than treating delayed conscious awareness as proof of epiphenomenality, we see the experience of a decision as an input for future exploration. The physical execution of an action and its explorative consideration can certainly take place in parallel, whereby the speed of execution can be faster. In this way, our framework also resonates with 4E approaches to cognition (embodied, embedded, enactive, extended), even though it does not adopt this terminology explicitly. The features we describe—affect-guided orientation, temporality, sensorimotor dynamics—are naturally situated in embodied action.

## 7 Conclusion

This paper proposed that the evolutionary function of consciousness can be fruitfully understood through the lens of exploration. Rather than treating consciousness as a mere state, we see it as a developmental achievement of organisms managing complexity through exploration. Moreover, we traced its development through two interrelated stages: an implicit, perception-driven mode of exploration rooted in integration, valence, and shifting attention, and a later, explicitly representational mode that introduced modularity, persistence, and rule-based evaluation. This transition enabled organisms to engage in more flexible, temporally extended responses to increasingly complex and contradictory informational environments.

The approach reframes several longstanding puzzles about consciousness. One example is blindsight, discussed in Section 2.3: patients respond to visual stimuli without consciously perceiving them. Although some information is clearly processed, the sensation lacks conscious experience. Our account explains this absence by the lack of opportunity to explore and evaluate options for action. It avoids defining consciousness *per se* and instead reconstructs it as an emergent process of situated orientation. The parallels with Stegmaier's phenomenology of orientation support this view, offering a bridge between evolutionary biology and first-person experience.

Our proposal that exploration offers a productive lens for explaining how functional and structural capacities associated with consciousness evolved under conditions of situational uncertainty and contradiction has been examined through structural, functional, and phenomenological perspectives. Rather than positing a single defining mechanism, we have traced how increasingly complex forms of exploration—enabled by modular representation, compositional evaluation, and temporal integration—give rise to features typically associated with conscious cognition. Across independent literatures, we find a coherent pattern: (1) increasing uncertainty due to a growth in available perceptual information creates a need for exploration and orientation to cope with a constantly changing environment; (2) the functional features most frequently cited in theories of consciousness (i.e., integration, intentionality, attention, valence, and temporality) correspond to those required for adaptive exploration; (3) the widely accepted distinction between levels of consciousness aligns closely with the shift from implicit to explicit representation; (4) the transition from primary to secondary consciousness, mirrored in implicit and explicit representation, enables modularity for expanding exploration; and (5) Stegmaier's core concepts of orientation—standpoint, horizon, perspective, and foothold—map onto internal state relevance, exploratory scope, and the stabilization of representations, respectively. All three perspectives—structural, functional, and phenomenological—result in a coherent picture of emergent exploration.

This convergence of independently motivated frameworks does not constitute empirical proof, but it offers a coherent explanatory structure. By showing how exploration, in its evolving complexity, gives rise to the capacities and dynamics associated with consciousness, the account provides conceptual grounding for further inquiry into conscious cognition in both biological and synthetic systems.

Several avenues for future research follow from this framework. First, the structural and dynamic analysis of exploration and orientation may offer new perspectives on longstanding philosophical questions—for example, the concept of leeway in orientation may help refine accounts of agency and free will by showing how choice emerges from the exploratory evaluation of possible actions, situating decision-making within the broader dynamics of exploration. Second, the alignment between implicit and explicit representation with primary and secondary consciousness invites further investigation into how these modes shape different forms of thinking, such as concrete reasoning versus abstract, symbolic reflection. Third, the functional pathway from perceptual cue integration to explicit representation—particularly how components are stabilized and evaluated—warrants closer examination at both computational and phenomenological levels. Fourth, a comparative analysis with neurobiologically grounded theories such as that of Heylighen and Beigi (2024) could yield deeper insight into the brain-based dynamics that support exploratory cognition. Finally, understanding how these mechanisms contribute to flexible, adaptive behavior could inform the development of more integrated and context-sensitive approaches to synthetic cognition, especially where current architectures lack affective modulation or temporally embedded evaluation.

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