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On the spatial experience of animal in architecture: A speculative transdisciplinary inquiry

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Abstract
This article explores the architectural spatial experience of animals by employing the speculative inquiry as methodology with transdisciplinary research and Socratic questioning. It begins by addressing the gap in architectural theory regarding the animal's role as an active spatial experiencer, often overshadowed by anthropocentric perspectives. Drawing on key concepts such as "Umwelt," "affect," and the newly proposed "trans-umwelt," the study establishes a speculative framework to examine how animals interact with architectural spaces. The article investigates how "affective embodiment"— the process through which animals are considered to engage with space—, affective possessions of the animal and the spatial experience can inform our understanding of their interactions. The article then speculates on the architectural spatial experience of animals through two primary stages: perceptual engagement and affective response, followed by behavior, learning, and place-making. Using the narrative of a cat entering an in-between space surrounded by walls, the study demonstrates how animals might perceive, emotionally respond to, and interact with architectural environments, ultimately transforming them into meaningful places with post-experiential situations like site selecting and place-making. The study concludes that architectural spaces, conceived as trans-umwelts, have the potential to actively shape an animal's existential experience, offering a new dimension to architectural theory.

Keywords
Affective embodiment, Animal, Architectural spatial experience, Umwelt, Speculative inquiry.

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1. Introduction: On motivation and methodology

The animal's encounter with the built environment may form a fundamental relationship that allows it to be included in the architectural theory through the spatial experience. It can be argued that, however; the state of architecture with an anthropocentric structure reveals the existence of a distorted animal-architecture relationship, which places the animal in a passive position detached from the spatial experience. Thus, it can not find a reflection in architectural theory as a spatial experiencer, which presents a gap in that awaits discussion. Construction of a discussion structure trying to form knowledge of the animal's spatial experience may be a critical attempt to reveal a possibility of a new aspect in architectural theory. Therefore, this article aims to present a set of speculations for the construction of a knowledge on the architectural spatial experience of animals.

The exploration of a knowledge focused on the spatial experience of animals inherently involves navigating significant dilemmas. These challenges stem from the human researcher's limitations which inhibits them from fully comprehending a form of existence fundamentally different from their own. As humans, researchers are constrained by their subjective experiences and the human-centric perspective, which makes it difficult to draw absolute consequences about an animal's experiential world. This dilemma is mentioned by Nagel (1974), regarding the subjective nature of experience: the idea that understanding "what it is like to be a bat" is beyond human grasp because it involves a reality fundamentally distinct from human experience. The question is not about how a bat's existence appears from a human standpoint, but rather what the experience of being a bat signifies for the bat itself.

Given that the core of this research centers on the animal's own experience, the study embraces a speculative framework. It recognizes that any attempt to understand the nature of an animal's spatial experience will necessarily involve an element of speculation. By adopting a speculative framework, the study aims to explore the possibilities and potentials within an animal's experiential world, rather than attempting to definitively describe or quantify it. In this context, speculative inquiry has the potential as a methodology to move beyond traditional empirical approaches, which often struggle to capture the richness and variability of non-human experiences. Speculation, as an experimental mode of thought, does not exist apart from experience but is an ongoing engagement with it, seeking to transform understanding through imaginative propositions (Savransky, 2021). The pragmatic aspect of speculation is reflected in the way it establishes logical connections between the situations being speculated upon. It might enable creative experimentation, allowing for the envisioning of new ways of thinking and knowing that are not confined to human-centric perspectives (Savransky et al., 2021a). It invites researchers to consider how speculative thinking might help reveal the complex relationships animals have with their worlds, challenging established notions and embracing a more open-ended exploration of possibilities (Savransky et al., 2021b; Savransky, 2021).

Within the context of the article, the production of speculative theories through the speculative inquiry methodology presents two fundamental approaches to the reader: transdisciplinary research, which provides access to knowledge about both the animal's world and the structure of architectural spatial experience, and Socratic questioning as a tool, which knots the knowledge revealed by this research, enabling the formation of speculative theories. The article is structured around the "knitting" of insights gained from these two approaches in simultaneity. The author, in accordance with this, simultaneously embodies three roles: conducting transdisciplinary research, aiming to form relationships through Socratic questioning, and constructing speculative theories by providing answers within a logical structure based on their research and the questions posed.

In order for speculative research to pave the way for the emergence of

speculative theories, there is a need for a 'knowledge repository' concerning the themes and contents of speculative discourse. In this context, it is believed that opening up the 'knowledge' about both the animal's world and the structure of architectural spatial experience through the lens of different disciplines is required, which navigate us to transdisciplinary research. Transdisciplinary research encourages researchers to be open to various viewpoints and diverse sources of knowledge. It goes beyond simply combining insights from different fields; seeking to create new frameworks and understandings by synthesizing diverse disciplines, fostering collaborative inquiry that transcends traditional boundaries. This approach enriches knowledge by allowing for the integration and co-creation of insights that might not be possible within a single discipline. Thus, the complex nature of the theme of animal's architectural spatial experience and the diverse channels through which disciplines can contribute their knowledge highlight the importance and necessity of transdisciplinary inquiry in the study.

Notions, discussions, and findings from different disciplines related to both the animal's world and architectural spatial experience are "knotted" through question-and-answer sets positioned at critical thresholds in the article. These sets are generated using the Socratic questioning approach. Socratic questioning is a methodical and structured approach to inquiry designed to explore thoughts in various directions and for multiple purposes, such as examining complex ideas, uncovering hidden assumptions, analyzing concepts, and distinguishing between what is known and what remains unknown (Paul & Elder, 2006). It systematically focuses on utilizing critical thinking as a vital tool. The goal of both critical thinking and Socratic questioning is to cultivate an inner voice of reason that examines thoughts, feelings, and actions, directing them toward more reasoned and reflective thinking (Paul & Elder, 2006).

The speculative set is composed of questions precisely because this format activates thought processes, facilitates the emergence of new ideas and scenarios, assists in envisioning different possibilities, and helps cope with uncertainty. This method of questioning not only enriches the speculative nature of the study but also allows for a critical stance. Unlike classical Socratic questions, which typically follow a linear and progressive path to unveil a single logical outcome, the primary aim of these questions being fed by Socratic questioning approach -not question format- is to encourage speculative exploration rather than to reach definitive consequences. The questions not only guide the development of a speculative theory but also encourage the reader to engage actively, thinking their own responses and criticisizing the answers speculated by the author. The author, while posing these questions, simultaneously provides responses that are informed by their encounters with the body of knowledge, contributing to a theory-building process. These responses aim to establish a logical flow that is based on both the structure of the questions and the findings derived from the research. At this point, the author simultaneously answers the questions, as if the questions were directed at them, thus shifting from the role of author to that of reader.

The questions are structured along three overlapped and intersected axes, each capturing distinct dimensions of the inquiry process (Figure 1). The Socratic Questioning Form Axis (SQ) addresses the functional structure of the questions, illustrating how they drive the study's progression. Within this axis, questions follow either a linear-kind of progression (SQ1)—a more systematic flow where each question builds upon the previous one to establish theoretical grounding—or a format of simultaneous thresholds (SQ2). This latter approach invites multidimensional thinking, where questions act as interconnected, exploratory entry points that foster speculative inquiry beyond a straightforward sequence.

Next, the Roles in Interaction Axis (RI) categorizes questions according to their intended actors and type of engagement. Here, the author's self-reflective inquiry process (RI1) is distinguished by questions that guide the

author introspectively, helping them build the theoretical framework as they formulate responses. The author and reader's critical engagement process (RI2) is designed to engage both parties actively. It encourages a shared interpretive process, including readers to question, interpret, and evaluate the propositions in parallel with the author's inquiry.

Finally, the Methodology Axis (M) organizes questions based on their thematic focus, emphasizing the specific goals within the research. The axis includes theoretical foundation (M1) questions, which provide a structured basis for the core arguments, alongside conceptual deepening and analytical examination (M2) questions that relates with central concepts to clarify and analyze key theoretical ideas. Additionally, speculative exploration, intellectual expansion, and critical engagement (M3) questions encourage speculative inquiry, prompting readers to explore and engage critically with the study's insights.

The reason for examining the questions across three axes is to support the multidimensional nature of the research, fostering a more in-depth analysis and meaning-making process by encouraging different forms of thinking and engagement. Each axis provides a framework that highlights a specific aspect and function of the research.

With transdisciplinary research and Socratic questioning, the article's structure is designed to guide the reader through these complex concepts. In the "Foundations" section of the article, key concepts such as *umwelt*, affect, and trans-umwelt are introduced, opening a discussion on the animal's world and exploring the ontological relationship between architectural space and its world. After establishing this ontological relationship, the "Toward the Architectural Spatial Experience of the Animal" section focuses on the concept of affectiveness, examining both the affective possessions of spatial experience and of the animal's cognitive world. This section aims to uncover the knowledge and framework for speculating on the architectural spatial experience of the animal. The concept of affective embodiment is introduced as the focal point of the experiential relationship between the animal and architectural space. In the section titled "Affective Embodiment of the Animal in Architectural Space", the affective possessions of the animal's world are used as layers in the speculative theory-making, working through two stages: "perceptual engaging and affective response" and «behavior, learning, selecting, place-making." The speculative theory set is supported simultaneously with the narrative of a cat entering an in-between space surrounded by walls. According to this theory, the cat may perceive the wall, interpret it pragmatically within an affective framework, produce emotion (seeking), which leads to behavior (scratching), and learn from the space. The learning process may lead the cat to return to the space as it selects it and even transform it into a place.

2. Foundations

2.1. Umwelt

The concept of "Umwelt," central to Uexküll's studies, is derived from the German word for environment. Umwelt serves as the key to understanding an animal's world and its relationships with the elements it interacts with (Uexküll, 1982). Each animal's Umwelt forms a closed unit, with its own unique significance for the subject (Uexküll, 1982). Tailored precisely to meet specific needs, the Umwelt of each animal, as described by Uexküll (1957), avoids any deficiencies or excesses. To illustrate Umwelt's role, Uexküll employs the metaphor of a "soap bubble" (Uexküll, 1926). This metaphor vividly portrays Umwelt as both defining the boundaries of the organism's world and acting as a protective shield, concealing infinite possibilities beyond its limits.

Uexküll's concept of Umwelt illustrates how animals perceive and interpret elements in their surroundings. He identifies two core worlds in relation with the animal's Umwelt: the "perceptual world," [Merkwelt] shaped by sensory input and processed by the nervous system and the "action world," [Wirkwelt] associated with the animal's interaction with the world by their actions (Uexküll, 1913).

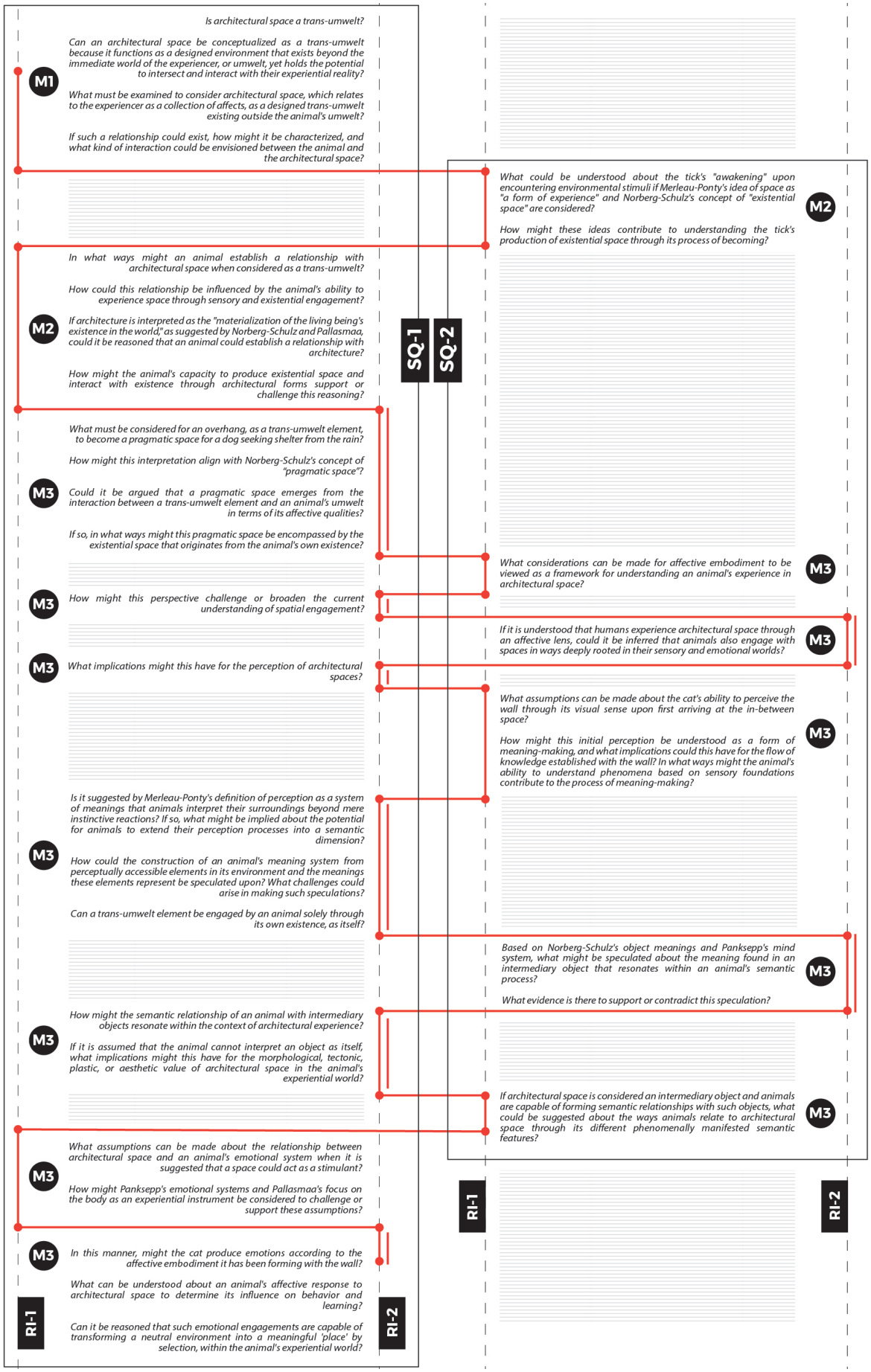

Figure 1. *Map of axes of questions during questioning process in article.*

In his studies on ticks, Uexküll showcases how animals create their experiences based on their interactions with the elements forming these two worlds in their Umwelt. Ticks, driven by hunger, operate within a system comprising specific stimuli from the mammal they feed on. Uexküll describes the tick's life experience as it interacts with the mammal's stimuli (Uexküll, 1957). The tick's existential position in an environment is investigated by biologists at the Zoology Institute in Rostock, Germany. To understand the tick's lack of stimuli, they kept it in a state of hunger or "close to sleep" without a mammal interaction for eighteen years (Uexküll, 2010). Uexküll suggests that time provides consistent objectivity, but the tick's relationship with time demonstrates that the subject controls time depending on its environment (Uexküll, 2010). Thus, he concludes that time and space may not exist without a living subject (Uexküll, 2010).

On their fundamental relationship, Uexküll states that the tick does not perceive the mammal as a whole entity, but as a source of butyric acid (Uexküll, 1957). From the perspective of stimulus and stimulator, the tick and mammal interact as a smelling organ and a source of odor. Subsequently, the relationship progresses through touch and feeding organs, detached from individuality and bodies (Figure 2). By reinterpreting Uexküll's work on the tick, Deleuze suggests that the stimuli it encounters should be understood as affects rather than strictly defining the interacting entities [the mammal] as organisms (1988). Deleuze's framing of this situation in terms of affects seems crucial for understanding Uexküll's conception of the tick-mammal relationship, or umwelt-organism interaction in general. In this sense, examining the interactions that occur within an organism's umwelt through the notion of *affect* can offer potential insights for the study as well.

2.2. Affect and umwelt

Starting with the definition, affect refers to the forces that operate alongside conscious awareness—visceral and vital energies that propel a living-being toward action, thought, and expansion. It embodies a body's ability to influence and be influenced, shaping its ongoing interaction with the world and the particularity of its existence. Affect arises from complex, intertwined relationships, dissolving boundaries into thresholds and tensions, blends and blurs. It inherently belongs to the interconnectedness of worlds, bodies, and the spaces between them (Seigworth & Gregg, 2010).

In Uexküll's definition of umwelt, there can be seen points that both align with and diverge from the perspectives touched upon by the notion of affect. Firstly, Uexküll introduces the concepts of perception image and affect image to interpret that the relationships with other umwelts may vary and different organisms' umwelts may overlap by holding different meanings for each other. The perception image results from the general existence of an element in the organism's umwelt, while the affect image arises from the interaction. Uexküll exemplifies this through the dragonfly's relationship with a branch. The branch, among those forming the perception image, becomes an affect image for the dragonfly when it flies around and lands on it, as it serves as a landing spot (Uexküll, 2010).

Overlapping umwelts may lead to diverse situations in perception and affect image production. Organisms, initially unaware of each other's existence, gain meaning through "being-like-the-other," where absolute harmony with the other's existential features is achieved, going beyond mere resemblance. Uexküll illustrates this with the relationship between spiders and flies. The spider adopts fly-like qualities in weaving its web, entirely shaped by the fly's existential features (Uexküll, 1982).

An inanimate element like a spider web as an affective entity demonstrates that Umwelt's structure may consist of non-living elements. Moreover, these elements may extend beyond the physical, encompassing affects such as shadow, light, and temperature. For instance, the crab's perception image is quite simple, being any object with a cylindrical or conical shell in a specific arrangement (Uexküll, 2010).

Uexküll's perspective on perception and affect images, being-like-the-other, and inanimate-physical/non-physical elements in umwelt aligns with the concept of affect, which emphasizes the interrelation of different worlds, bodies, and the spaces that connect them, as well as the capacity of a body to influence and be influenced, continuously shaping its relationship with the environment and the uniqueness of its existence. On the other hand, it seems like he does not correspond to the idea within the notion of affect that focuses on dissolving boundaries into thresholds and tensions, blends and blurs; because of the previously mentioned soap bubble metaphor, which defines the boundaries of the organism's world while acting as a protective barrier that hides endless possibilities beyond its confines, and the discussion of inter-umwelt relations in terms of overlapping rather than intersecting.

In accordance with this, the divergence in Uexküll's concept of *overlapping* as a *relationship form between umwelts* can be said to have been criticized and developed in the context of affect by Deleuze and Guattari (1987, 1992), while Merleau-Ponty's thoughts can be interpreted in relation to this concept (1983, 2003).

Deleuze and Guattari contrast Uexküll's concept of the "umwelt" as a soap bubble and overlapping instead of intersecting, with their fragmented umwelt approach based on intersections, allowing for the co-existence of shared parts, agents, and stimuli, [thus affects], rather than exclusive environments unique to living beings (1987). According to Seigworth & Gregg (2010), Deleuze positions affect at the core of things and relationships, embedded in immanence, and within the complex assemblages that simultaneously shape bodies and worlds. This perspective suggests that affect acts as the primary force driving bodily impulses, and as a vital field of transformations that traverse both human and nonhuman becomings. Focusing on the animal, additionally, Deleuze's philosophical perspective questions the existence of animals in a framework with the notion of the "mechanism of affects," emphasizing the capacity of the affected organism to respond differently to the same stimuli (1992).

In Merleau-Ponty's philosophy, on the other hand, behavior [as an action of the affected] is a dynamic form that continuously reveals new relations between the individual and the environment (1983) and the place of the animal is understood through the "phenomenon of behavior," which he conceptualizes as the body of existence (2003). According to Merleau-Ponty (2003), the umwelt is a world that enables the animal to establish a relationship with its behavior, conforming to its limits and regulating its actions. Moreover, Merleau-Ponty enhances Uexküll's umwelt concept with a new layer: the intersections of umwelts. He states that existence is created through these intersections (1983). Drawing from Uexküll's biology and the concept of umwelt, Merleau-Ponty establishes an insight where existence emerges from the interactions between bodies and environments (Buchanan, 2008). In this perspective, neither the animal nor the umwelt becomes the central focus; instead, the focus lies on the behavior that reveals the animal's existence.

While Uexküll discusses perception and affect images in terms of what might be understood as overlapping structures, he is ultimately referring to the affective transformation of an entity when it encounters an animal. In contrast, Deleuze and Merleau-Ponty interpret this transformation through the concept of intersection, where the entity becomes relational through affective engagement. Although they use different terminologies, one might speculate that all three theorists are addressing a process of transformation that could imply a dynamic shift from overlap to intersection (Figure 3). This raises the question of whether what initially appears as overlapping could later be interpreted as intersecting as it undergoes transformation through affect. To further investigate this, I propose the concept of the *trans-umwelt*, which captures this dual nature—an umwelt with elements that initially coexist within an overlapping framework but can become engaged and be relational through intersections driven by

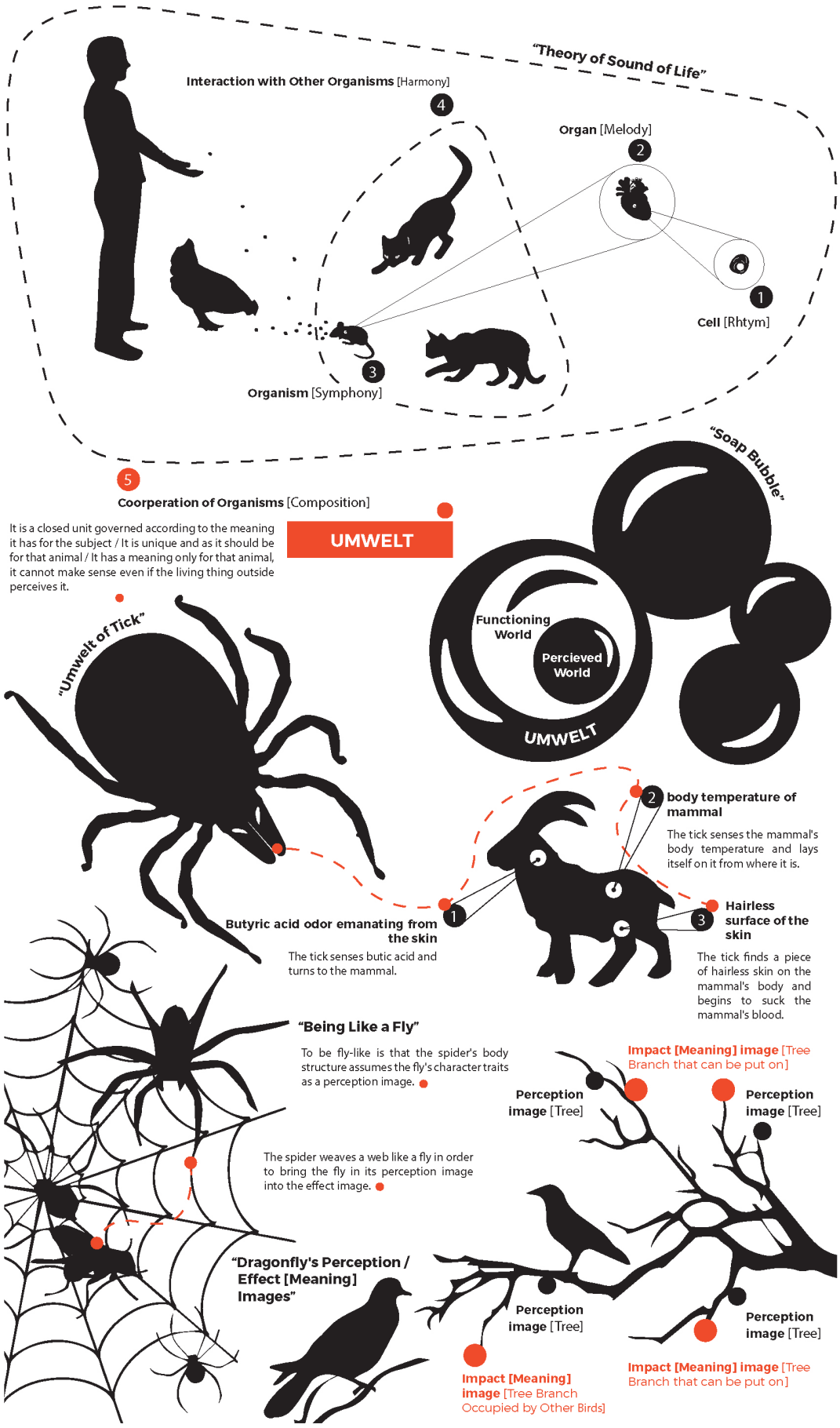

Figure 2. *Uexküll's Umwelt.*

affects. By introducing the notion of the *trans-umwelt*, it can be better understood how these entities and processes evolve, moving from mere coexistence to active relationality within the animal's experiential world.

2.3. Trans-umwelt

The concept of *trans-umwelt* can be constructed to describe other umwelts that exist both within and outside an animal›s umwelt, containing elements that have the potential to

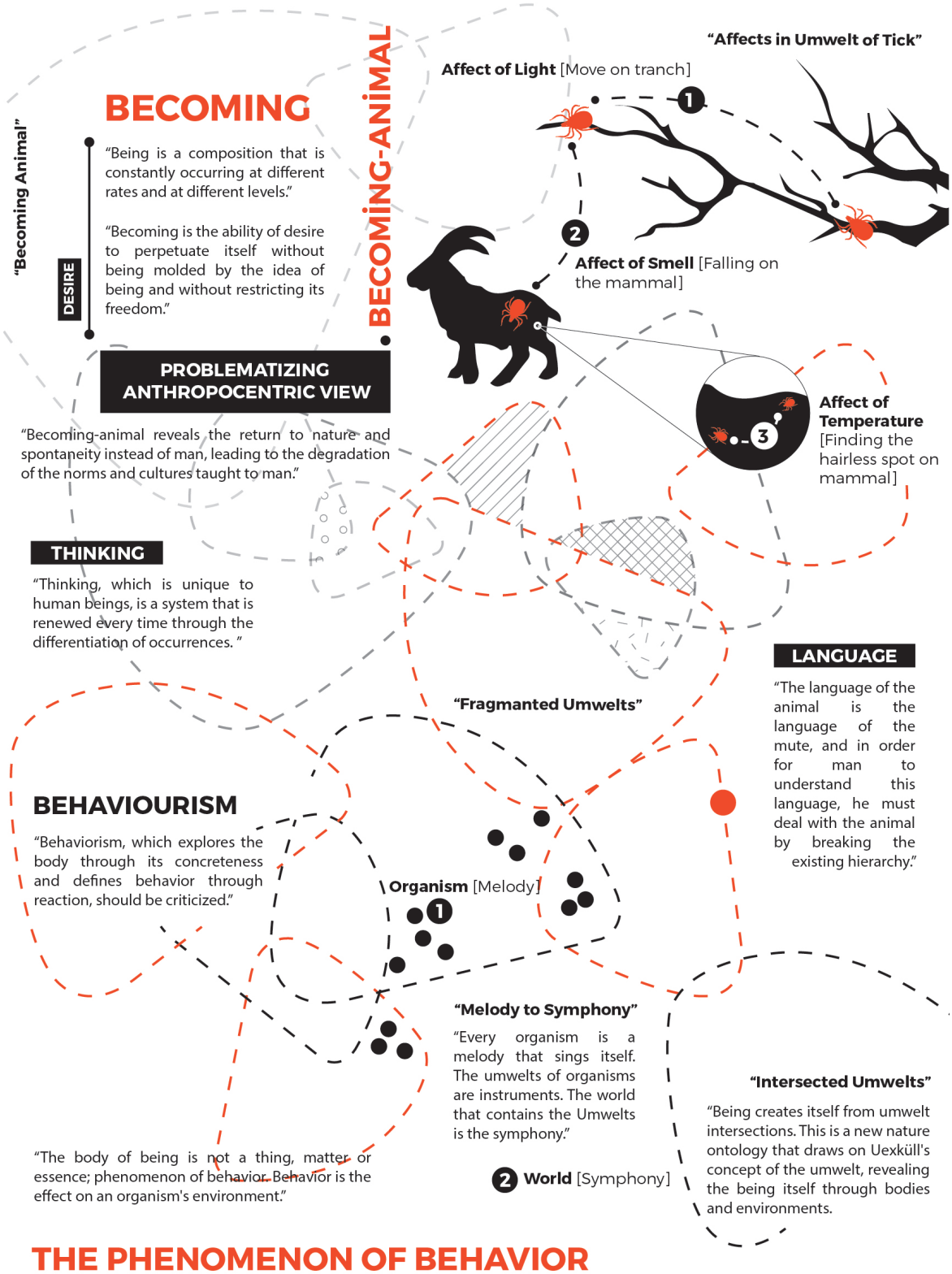

Figure 3. *Thoughts of Deleuze, Guattari and Merleau-Ponty on Umwelt.*

become accessible to the animal depending on its affective capabilities. Designed or not-designed, a *trans-umwelt* represents a set of phenomena that can partially reveal themselves to the animal based on the extent to which these entities intersect with the animal's own *umwelt*. For instance, Heidegger's example of a lizard lying on a rock illustrates how the rock serves as a *trans-umwelt* element; the lizard does perceive the rock as a surface on which it can lie (1995). Similarly, Uexküll›s study of the dog-chair relationship shows how a chair transforms to a *trans-umwelt* element for a dog; when commanded «Chair!», a trained dog will jump onto any surface it can sit on, perceiving it as a place to sit (Uexküll, 2010). These examples demonstrate how certain entities can occur within an animal›s *umwelt* while also belonging to a *trans-umwelt*; they bridge the gap between the animal's world and other potential worlds by becoming openable.

When elements from outside an animal's umwelt become relevant, they do so not just through their presence but through their potential to be integrated into the animal's world. For a trans-umwelt element to become an affect, the animal's umwelt must be opening to it. This openness is made possible through an experience that is connected to the animal's ontological and cognitive possessions. As the animal interacts with these elements, they can transform into intersected entities, where the interaction is driven by affect and becomes integral to the animal's experiential world. This example of a blind person and their guide dog can be an expansive example to elaborate on this process of interaction of trans-umwelt with animal's umwelt:

> "A blind person's *umwelt* is quite limited; the road is familiar only to the extent that they can feel it with their feet and cane. The street they pass through is shrouded in darkness for them. Their guide dog must lead them home along a specific path. The difficulty in training the dog lies in incorporating certain perceptual cues into the dog's environment, cues that are not of concern to the dog but are crucial for the blind person. Therefore, the path the dog takes should pass over obstacles that the person can feel with their cane. It is particularly challenging to teach the dog perceptual cues for things like a mailbox or an open window, which the dog would normally pass under without noticing. Moreover, it is difficult to include in the dog's *umwelt* a cobblestone on the street that could trip the blind person, since such an object is almost unnoticed by a freely running dog." (Uexküll, 1934)

It is important here to emphasize that objects like the mailbox or open window, which the dog would typically pass by without noticing, represent *overlapped* elements [perception image] of a trans-umwelt. However, to guide a blind person, the dog must be introduced to these elements, transforming them into *intersected* components [affect image] within the dog's own *umwelt*. From this perspective, the relationship between the dog's *umwelt* and the designed trans-umwelt is both overlapped and intersected throughout the process. What transforms this relationship is the trans-umwelt elements becoming affects, thereby evolving the way they interact with the animal.

2.4. Architectural space as trans-umwelt

Is architectural space a trans-umwelt? Can an architectural space be conceptualized as a trans-umwelt because it functions as a designed environment that exists beyond the immediate world of the experiencer, or umwelt, yet holds the potential to intersect and interact with their experiential reality? Unlike a static environment, architectural space is crafted to evoke specific affects—emotional responses, sensory stimuli, and behavioral reactions—that can transcend the boundaries of an individual's world. Through its materiality, spatial configurations, lighting, textures, and acoustics, architectural space creates a dynamic field where elements can either remain latent or become activated based on how they are experienced. Thus, this capacity for being both part of and separate from an individual's world [overlapped and intersected],

can align architectural space with the concept of a trans-umwelt—an environment that is not fully contained through immediate experience but offers possibilities for connection, engagement, and transformation through its designed elements and affective potentials.

What must be examined to consider architectural space, which relates to the experiencer as a collection of affects, as a designed trans-umwelt existing outside the animal's umwelt? Such a question first directs us to examine the ontological relationship that an animal establishes with architectural space. *If such a relationship could exist, how might it be characterized, and what kind of interaction could be envisioned between the animal and the architectural space?*

2.5. An ontological relationship between the animal and architectural space as trans-umwelt

Merleau-Ponty (1945) posits that existence emerges intrinsically, without any pre-existing conditions, revealing the inseparable bond between being and the spaces we locate ourselves. Within these spaces, a significant dimension unfolds as a form of experience, offering a canvas for individual existence and self-discovery. Norberg-Schulz (1971) embarks on a defining exploration, characterizing existential space as the convergence of existence with the world, leading to a profound integration with the surroundings. Architecture plays a pivotal role in amplifying this connection, embodying existentiality within its structures, and solidifying the intangible facets of being into tangible forms [through affects], surpassing mere utilitarianism. Furthermore, Pallasmaa (1994) reminds us of architecture's enduring task—to concretize and structure the existential metaphors defining human existence.

Here, let's remember the tick. *What could be understood about the tick's "awakening" upon encountering environmental stimuli if Merleau-Ponty's idea of space as "a form of experience" and Norberg-Schulz's concept of "existential space" are considered? How might these ideas contribute to understanding the tick's production of existential space through its process of becoming? In what ways might an animal establish a relationship with architectural space when considered as a trans-umwelt? How could this relationship be influenced by the animal's ability to experience space through sensory and existential engagement? If architecture is interpreted as the "materialization of the living being's existence in the world," as suggested by Norberg-Schulz and Pallasmaa, could it be reasoned that an animal could establish a relationship with architecture? How might the animal's capacity to produce existential space and interact with existence through architectural forms support or challenge this reasoning?*

In response to these questions, Merleau-Ponty's concept of space as "a form of experience" and Norberg-Schulz's notion of "existential space" provide a framework to suggest that animals may be seen as creating their own existential spaces within their umwelts. These concepts allow us to speculate that animals, much like humans, have the potential to establish relationships with architectural spaces. When animals encounter architectural space, this space can become integrated into their lived experience—a place where their existence is actively expressed and shaped. If architectural space is understood as a trans-umwelt with affective qualities, the relationship between architectural space and the animal can be seen as a dynamic process of interaction and transformation, influenced by the animal's sensory and emotional responses. This perspective suggests that architecture is not a static but rather an "affective space" that plays an active role in creating existential experiences for animals. By considering architecture in this way, it becomes possible to view architectural space as an environment that participates in the animal's process of becoming.

This speculation can be expanded by considering Norberg-Schulz's (1980) discussion of three additional types of spatial production beyond existential space: pragmatic space, shaped by the unique needs and characteristics of the experiencer's existence [their umwelt]; perceptual space and cognitive space,

which run parallel to the experiential process that allows the definition of pragmatic space. According to Norberg-Schulz (1980), for an animal, pragmatic space is shaped by instincts arising from its existence. The concept defined by Norberg-Schulz as instinct is related to the umwelt, as the characteristics and necessities determined by an animal's umwelt guide its instincts.

What must be considered for an overhang, as a trans-umwelt element, to become a pragmatic space for a dog seeking shelter from the rain? How might this interpretation align with Norberg-Schulz's concept of "pragmatic space"? Could it be argued that a pragmatic space emerges from the interaction between a trans-umwelt element and an animal's umwelt in terms of its affective qualities? If so, in what ways might this pragmatic space be encompassed by the existential space that originates from the animal's own existence?

If these questions are answered affirmatively, it might be argued that an animal experiences space as a pragmatic space, guided by its pragmatic instincts. This suggests that an architectural space, when considered as a trans-umwelt element, exists in the animal's world only to the extent that it holds the potential to become pragmatically affective. The space's relevance and meaning are thus defined by its ability to engage with the animal's instincts and affective responses, creating a practical and meaningful environment for the animal based on its immediate needs and sensory experiences (Figure 4).

This speculative flow suggests that an animal can establish an ontological relationship with architectural space in the manner discussed. It also indicates that it is possible to conceptualize the foundation for the idea of discussing the animal's experience of architectural space in this way. In this context, to establish a speculative framework for the animal's experience of architectural space, it is necessary to unpack the affective layers of spatial experience and explore their relationship with the animal's existence.

3. Toward the architectural spatial experience of the animal

3.1. Affective possessions of spatial experience: Affective embodiment in architectural space

Spatial experience in architectural theory can be understood through the lens of affect, where the unity of mind and body is expressed through the dynamic interplay of sensory and emotional responses. Pallasmaa (2002) introduces the concept of embodied knowledge, suggesting that our understanding of architecture is generated through affective engagement, as our bodily presence interacts with the built environment. Merleau-Ponty (1945) supports this view, highlighting that bodily experience conveys not only an objective spatiality but also a lived, affective spatiality, where our being-in-the-world merges with the surrounding environment. Within this affective framework, Perez-Gomez (1994) and Pallasmaa (2005) consider architecture as an embodiment of consciousness, experienced through a combination of material presence and immaterial affects. This multidimensional perspective on the body encompasses affective responses, such as emotions, bodily sensations, sensorimotor capacities, and cultural influences, thereby enriching the depth of architectural experience (Bower & Gallagher, 2013; Varela et al., 1991).

By integrating affect into spatial embodiment, architecture becomes a medium that not only reflects but also actively shapes our sensory and emotional experiences. This notion goes beyond the physical structure of architecture, suggesting that spaces are deeply intertwined with the affective dimensions of human existence. Pallasmaa (2015) reflects on the echoes of architectural experience, going beyond mere facts to give meaning through concrete reflections, connections, and empathy. The built environment strongly highlights our sense of being. In this exploration of human existence, architectural experience becomes an intensified form of being (Pallasmaa, 2002). As we engage with the spaces

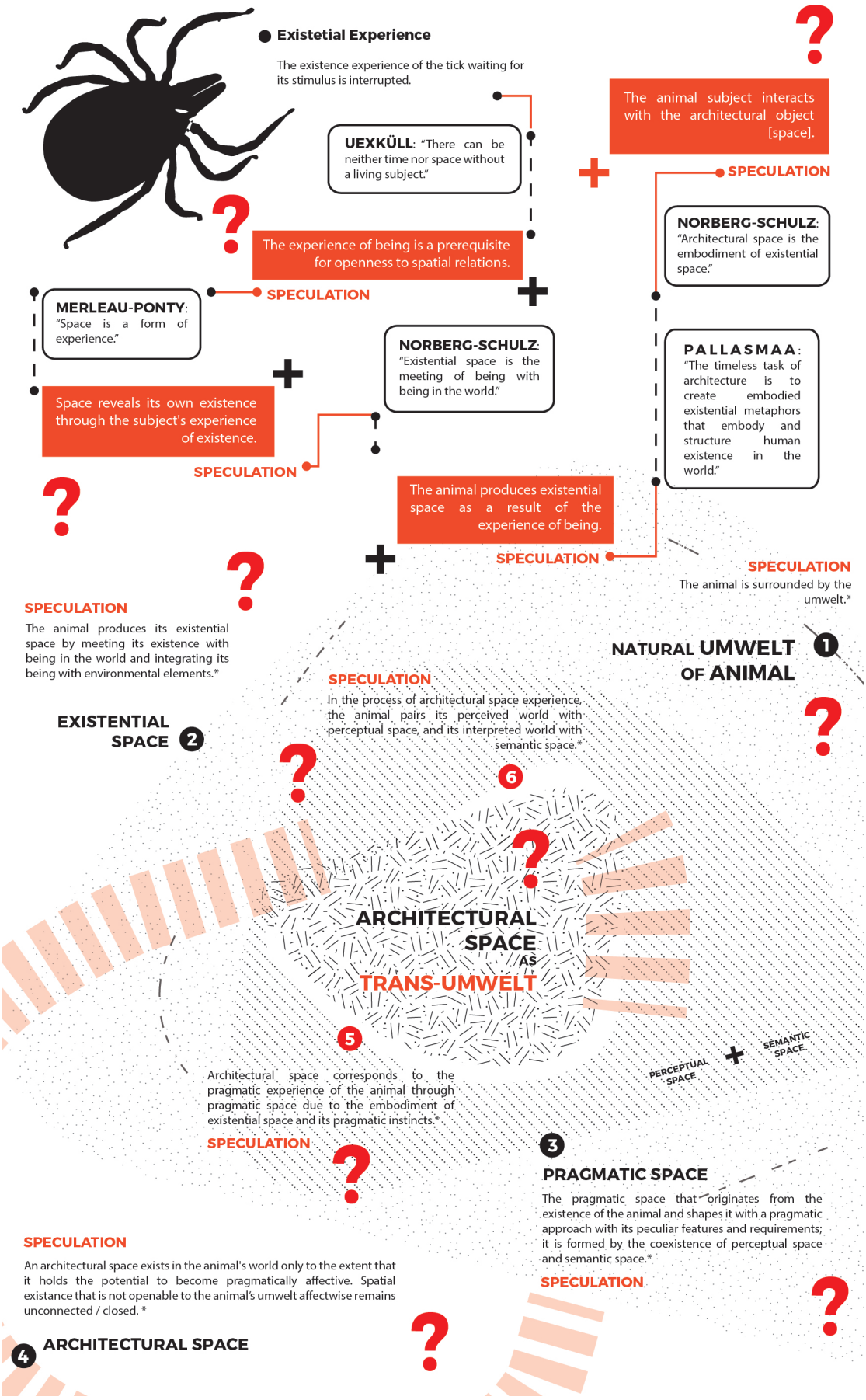

Figure 4. *The Ontological Relationship between the Animal and Architectural Space.*

we inhabit, a greater understanding of existence emerges, linking the physical world with the intangible realm of existential experience. Building on this idea, architecture further enhances our sense of existence (Pallasmaa, 2005). Pallasmaa (2013) interprets architecture as a physical expression of mental space. Our world finds a tangible form in the structures around us, bringing together the areas of cognition and the physical body. In this exploration of existence and architectural space, Pallasmaa's insights (2005) highlight the importance of lived experience. Architecture embraces tactility, shaping our perceptions and encouraging an intimate connection with the world around us.

This brings us to the concept of *affective embodiment*—the idea that our experience of space is fundamentally shaped by the interplay of affective and sensory engagement. Affective embodiment in architecture considers how spaces are not merely physical entities but are charged with the potential to evoke emotional and sensory responses, thereby becoming an integral part of our lived experience.

What considerations can be made for affective embodiment to be viewed as a framework for understanding an animal's experience in architectural space? How might this perspective challenge or broaden the current understanding of spatial engagement? If it is understood that humans experience architectural space through an affective lens, could it be inferred that animals also engage with spaces in ways deeply rooted in their sensory and emotional worlds? What implications might this have for the perception of architectural spaces?

To consider affective embodiment as a framework for understanding an animal's experience in architectural space, it can be argued that attention must be given to how animals perceive and engage with their environments through sensory and emotional responses. This perspective may suggest that architectural space serve as a trans-umwelt, a pragmatically affective environment that extends beyond immediate sensory input to encourage deeper, more nuanced interactions for animals. By examining space through the lens of affective embodiment, one might explore how animals experience architectural space with an embodied and affective process. To construct the discussion, let's start with examining the cognitive and affective possessions of the animal.

3.2. Affective possessions of the animal's cognitive world

In *Matter and Memory*, Henri Bergson links affect to cognition, by defining it as part of organism's internal bodily experience that merges with the image of external objects. Bergson argues that this aspect naturally results from any act of perception, which leads him to claim that "perception can not occur without affection" (Bergson, 1991). Additionally, ethology, the study of animal behavior, is regarded by Deleuze as a "study of affects," defining living beings based on the affects they are open to (1988). Bergson emphasizes that affect is a crucial component of how organisms perceive their environments, suggesting that perception is always intertwined with an emotional or sensory response. Deleuze expands on this by arguing that animals can be understood based on the range of affects they are open to, thus positioning affect as central to animal behavior and experience. This alignment between Bergson and Deleuze leads us to cognitive ethology, which seeks to understand the mental processes underlying animal behavior.

This framework naturally leads to cognitive ethology, which explores the mental processes underlying behavior, often inferred from observed actions since these processes are not directly observable. Griffin's work supports the idea of animal consciousness, proposing that if neurons, synapses, and neuroendocrine mechanisms share fundamental properties across species, then similar mental experiences should also exist to some extent (1976). This approach connects the study of affect with the investigation of mental states, suggesting that understanding animal behavior requires considering both the affective and cognitive dimensions.

Building on this foundation, cognitive neuroscience provides further insight into animal consciousness by investigating the neural structures associated with conscious experiences.

Grasso (2014) discusses how similar neural structures in humans and animals might lead to comparable conscious experiences, focusing on the "phenomenal aspect" of consciousness—the experience of being an animal. Philosopher Ned Block describes this as "phenomenal consciousness," which includes sensations, feelings, perceptions, thoughts, desires, and emotions (1995).

This exploration paves the way for affective neuroscience, as examined by Panksepp (2004), which seeks to understand the emotional operating systems of the mammalian brain and the various conscious and unconscious internal states they generate. Affective neuroscience emphasizes the emotional origins of behavior and the shared nature of these origins among living beings. Panksepp suggests that both animals and humans possess similar affective emotions, which shape emotional behavior through brain programs (2004). This perspective provides a neurophysiological basis for understanding behavior, linking affective states with both conscious and unconscious processes, and offering an objective framework for interpreting the subjective experiences of animals.

Panksepp's investigation into the neural basis of subjective experience categorizes it into three main affective processes: Primary Process - Sensation & Emotions, Secondary Process - Behavior/Learning, and Tertiary Affects - Consciousness. The primary process involves a "primitive sense of experiencing oneself as an active agent in perceived events in the world," which is likely rooted in low-level brain circuits that create a coherent internal representation of the body (2004). This foundational affective layer is where primary emotions and sensations are generated, establishing a basic affective engagement with the environment. The secondary process builds upon this by incorporating emotional systems and learned behaviors. Brain functions such as habituation, sensitization, and conditioning operate nonconsciously, reflexively, and mechanistically, further shaping affective responses and contributing to instinctual emotional behaviors.

Panksepp's framework aims to objectify subjectivity by providing a structure for investigating affective states such as consciousness and awareness at the tertiary process level. He emphasizes the importance of understanding the affective tools for life and learning at the Primary Process level to comprehend how higher mental processes operate (2004). This approach underscores the significance of affect in shaping both basic and advanced levels of consciousness and behavior, offering insights into the cognitive and emotional lives of animals.

Emotion, in Panksepp's model, arises from the neural basis of sensation when endogenous sensory and emotional systems in the brain interact through changing neural rhythms. He suggests that while mammals experience emotions, they may do so similar to newborn infants, indicating they might not have cognitive awareness of their emotions (2004). This notion of affective states being experienced without higher cognitive reflection aligns with the idea that affect operates on a fundamental level across different species. Panksepp identifies eight primary affective systems that impact the primary process: the "seeking" system that drives exploration, the "rage" system for defense, the "fear" system to avoid pain, the "panic" system to initiate fear responses, and the lust, care, play, and pain systems, all of which contribute to affective behaviors (Panksepp, 2006).

The content of animal consciousness, according to Panksepp, is created through various sensory-perceptual processes such as visual, auditory, somatosensory, olfactory, vestibular, and kinesthetic inputs, which are closely linked to cognitive operations (2004). By emphasizing sensory mechanisms and learning capabilities, Panksepp's affective framework provides an understanding of animal consciousness rooted in affective embodiment. For instance, a rabbit fleeing from a mountain lion not only experiences a basic affective response of fear but also engages in a sensory and automated awareness of its behavioral options (2004). This model illustrates how affect is central to animal consciousness and cognition, shaping their emotional

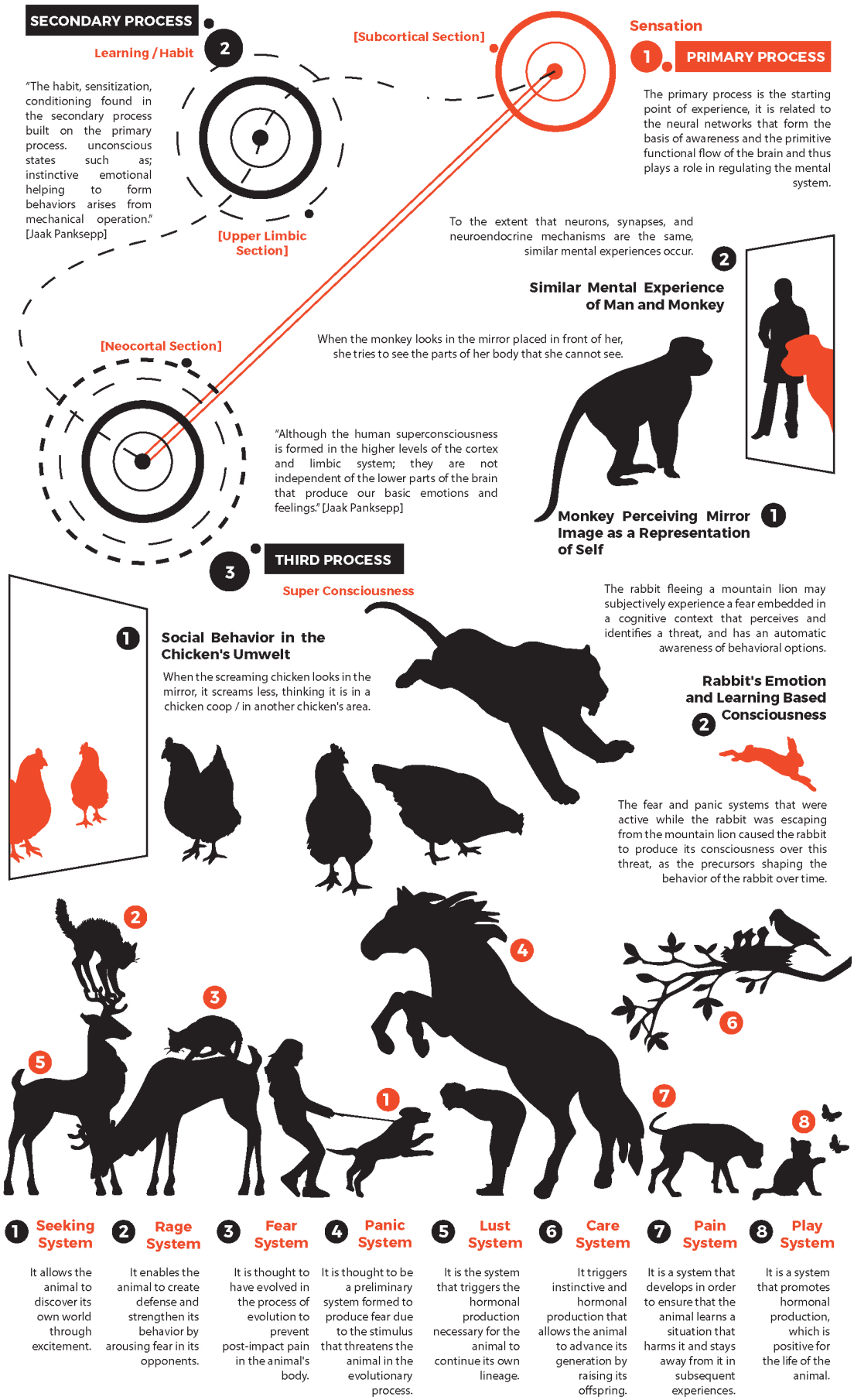

Figure 5. *Affective Possessions of Animal's Cognitive World.*

experiences and guiding their embodied interactions with the environment (Figure 5).

4. Affective embodiment of animal in architectural space

According to the background mentioned, to explore an animal's spatial experience in the context of affective embodiment, two cognitive and affective dimensions seem to occur: First, perceptual processes, as highlighted through discussions of visual, auditory, somatosensory, olfactory, vestibular, and kinesthetic inputs, which are tied to cognitive functions. These processes seem fundamental to how an animal perceives and navigates its environment, forming cognitive maps and interpreting spatial cues. Additionally, affective states, which are emphasized in Panksepp's discussion of primary emotional systems [such as "seeking," "fear," "rage," and "panic"] that shape behavior and interactions with the environment. Understanding these affective responses is crucial for comprehending how animals emotionally engage with architectural spaces and respond to different spatial contexts. Second, learning processes and behaviors, as described in Panksepp's secondary process - behavior/learning, which involves learned behaviors that operate reflexively. By integrating these sensory-perceptual processes, affective states, and learning mechanisms, we can speculate how animals experience and interact with an architectural spatial environment as a trans-umwelt. Therefore, to speculate an animal's spatial experience, it is essential to try to consider the existance of architectural spatial experience as speculative layers in parallel with the previously specified affective framework of the animal, and examine them with the contribution of architectural theory, especially in the beginning. This examination pairs with an example, where a cat arrives at a space surrounded with walls, and encounters with a wall. Each discussion on a layer of architectural spatial experience that allow for affective embodiment is expected to let us form the speculation on the cat's affective embodiment.

4.1. Speculative layer I: Perceptual engaging and affective response

The fusion of existentiality and architectural space intertwines with the conscious act of perception, shaping the background of experiential direction (Merleau-Ponty, 1945). Norberg-Schulz (1966) defines perception as the first step in forming the awareness of the phenomenal world. Even the simplest perceptual schema, as noted by Norberg-Schulz, emerges as a consequence of sensory-motor activity, while higher perceptual schemas are rooted in the interplay of experiences and cultural traditions (1966). According to Pallasmaa, every experience associated with architecture is highly sensory in nature, measured equally by attributes of matter, space, and scale, encompassing sight, hearing, smell, touch, taste, as well as the skeletal and muscular systems (1994). Architecture enables the living being to weave together sensory elements that interact and nourish one another, elevating the architectural experience to a multi-sensory realm. Norberg-Schulz (1966) further contends that a complex architectural organism can only be experienced when perceptions are mentally synthesized into a cohesive experience. The interplay of perception and architectural experience illuminates the intricate relationship between the human sensorium and the spaces we inhabit. As we immerse ourselves in the architectural realm, the sensory engagement encourages a profound understanding of existence, wherein perception transcends mere observation and becomes an essential medium for experiencing the fabric of architectural reality. While some studies, such as those by Eberhard (2008), explore the neuroscientific aspects of perception and how it relates to the brain's neural processes, their findings further enrich our understanding of the multi-sensory nature of architectural experience:

> Perceived conditions in space transform into images sent to the visual cortex, connecting memory systems in the brain. Neuronal groups activated by pre-perceptual experiences thus form moments of differently perceived objects, disseminated through networks linking the thalamus and the

cortex—the thalamo-cortical system (Eberhard, 2008).

In the exploration of existentiality and architectural space, the significance of perception in shaping our encounter with the built environment emerges. Merleau-Ponty (1945) contends that perception forms the backdrop of conscious action, allowing us to be aware of specific forms or situations, while architectural spaces become canvases for self-discovery, unveiling the essence of being through the subject's experience. Norberg-Schulz (1966) supplements this perspective by defining perception as the initial stage of creating awareness of the phenomenal world. He categorizes architectural objects into three fundamental types based on their meanings: pure objects, intermediary objects, and cultural objects. Through phenomena and their inherent properties, architectural elements are represented and perceived, encompassing both known and unknown characteristics of the objects (Figure 6).

The interplay between perception and semantics finds its expression in the architectural realm. Norberg-Schulz (1966) characterizes architectural spaces as intermediary, uniting diverse semantic poles and concretizing meanings, transforming the architectural experience into a profound encounter with the built environment. Norberg-Schulz (1980) encapsulates the existential purpose of architecture, manifesting spaces that reveal the inherent potential meanings within a given environment. As inhabitants engage with the architectural space, they co-create meaning through affective embodiment.

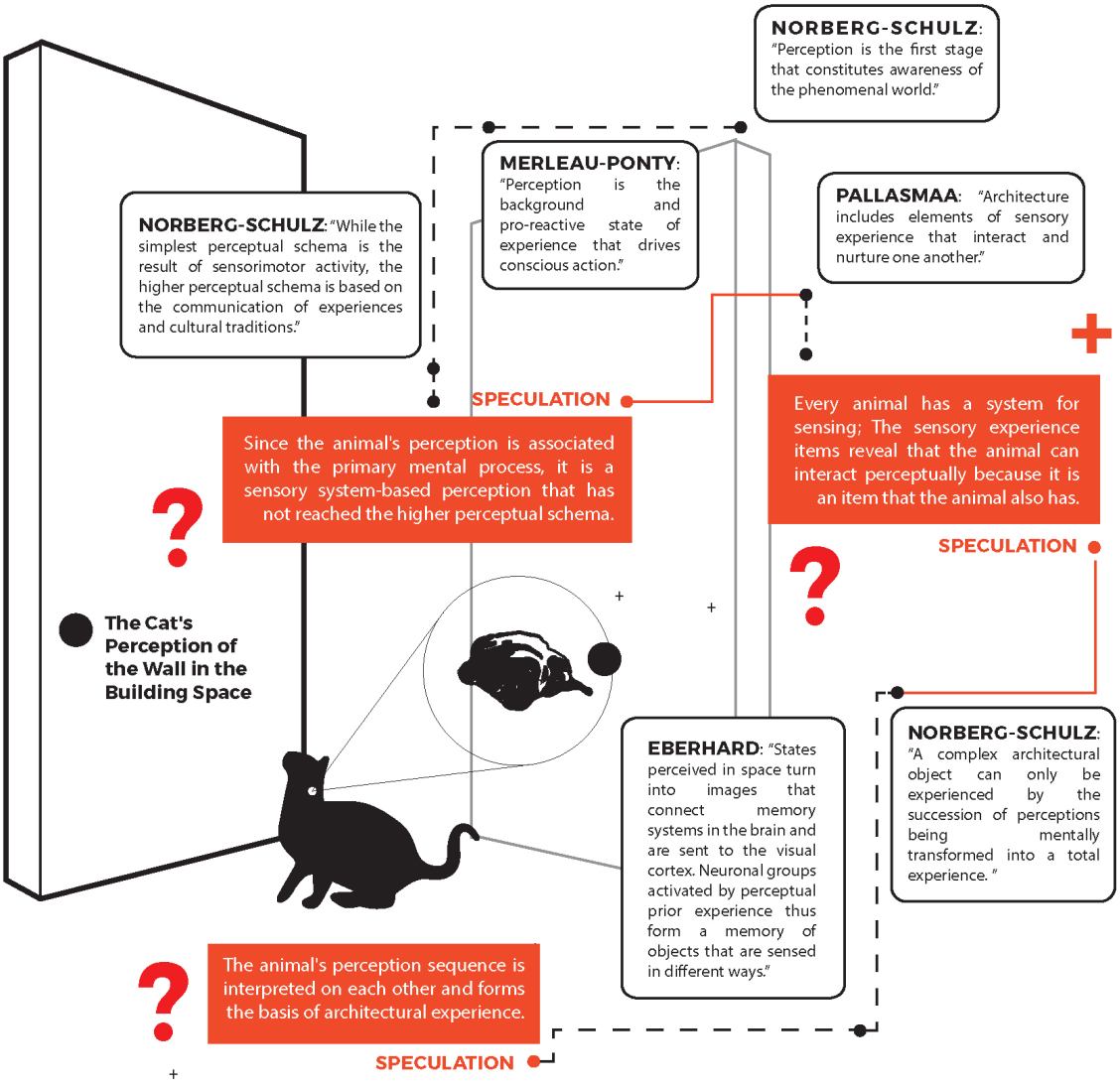

Figure 6. *Perceptual Engaging in Affective Embodiment of the Cat.*

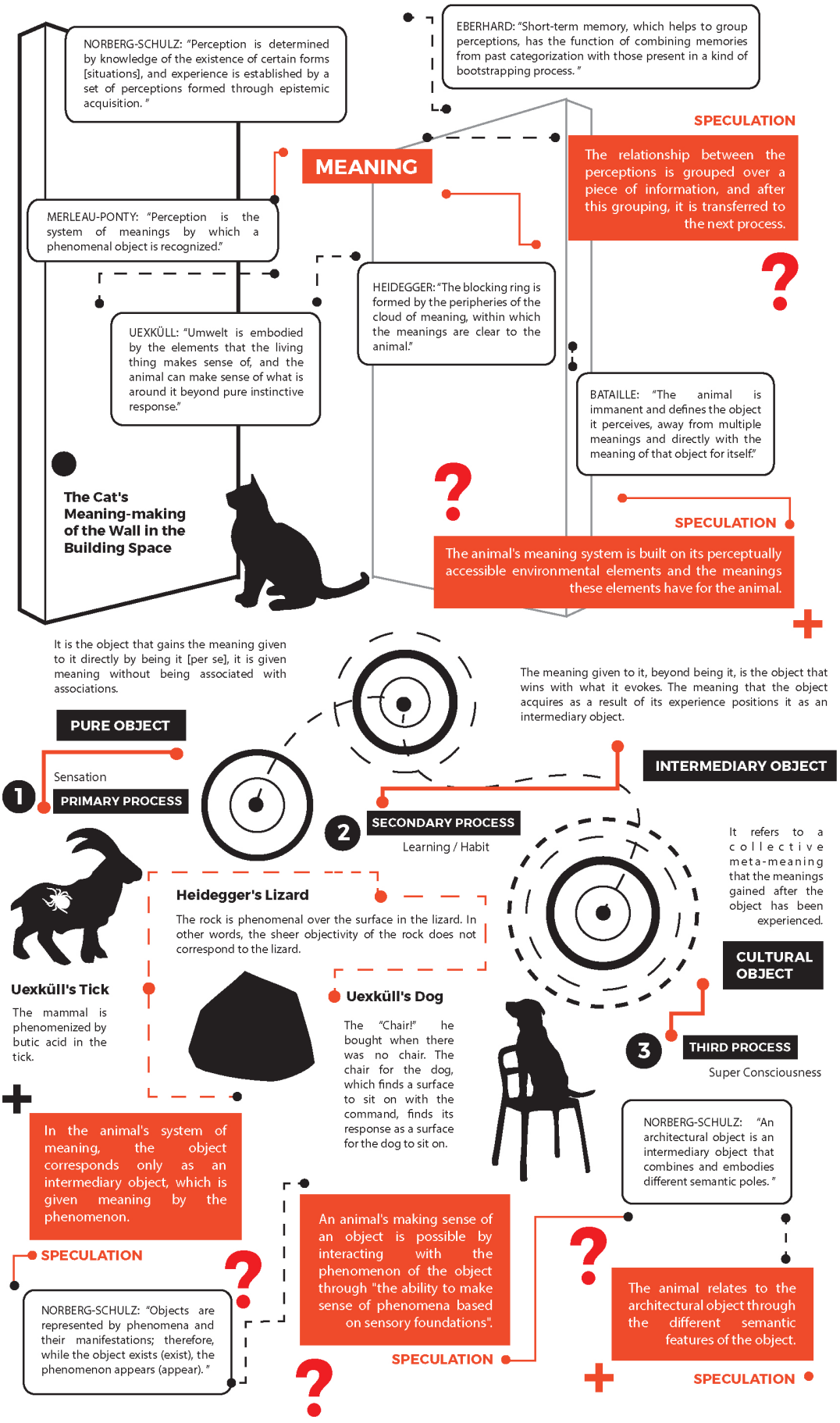

Figure 7. *Meaning-making in Affective Embodiment of the Cat.*

What assumptions can be made about the cat's ability to perceive the wall through its visual sense upon first arriving at the in-between space? How might this initial perception be understood as a form of meaning-making, and what implications could this have for the flow of knowledge established with the wall? In what ways might the animal's ability to understand phenomena based on sensory foundations contribute to the process of meaning-making?

Is it suggested by Merleau-Ponty's definition of perception as a system of meanings that animals interpret their surroundings beyond mere instinctive reactions? If so, what might be implied about the potential for animals to extend their perception processes into a semantic dimension?

How could the construction of an animal's meaning system from perceptually accessible elements in its environment and the meanings these elements represent be speculated upon? What challenges could arise in making such speculations?

Can a trans-umwelt element be engaged by an animal solely through its own existence, as itself? Based on Norberg-Schulz's object meanings and Panksepp's mind system, what might be speculated about the meaning found in an intermediary object that resonates within an animal's semantic process? What evidence is there to support or contradict this speculation?

How might the semantic relationship of an animal with intermediary objects resonate within the context of architectural experience? If it is assumed that the animal cannot interpret an object as itself, what implications might this have for the morphological, tectonic, plastic, or aesthetic value of architectural space in the animal's experiential world?

If architectural space is considered an intermediary object and animals are capable of forming semantic relationships with such objects, what could be suggested about the ways animals relate to architectural space through its different phenomenally manifested semantic features?

Based on the assumption that the cat perceives the wall through its visual sense upon first arriving at the in-between space, it can be argued that the initial engagement the cat forms with the wall, viewed as a trans-umwelt element, is shaped through the perception of physical and sensory elements reflected from the wall's existence, filtered through the cat's cognitive system. This initial perception can be seen as a form of meaning-making where the cat interprets the wall not as a complex object with multiple meanings but through a sensory-based understanding of the phenomena it produces. This suggests that the cat's interaction with the wall is guided by its pragmatic instincts, which rely on direct sensory input rather than abstract interpretation.

If Merleau-Ponty's definition of perception as a system of meanings implies that animals can interpret their surroundings beyond instinctive reactions, this could suggest that animals like the cat are capable of extending their perception processes into a semantic dimension. In this context, the cat's ability to interpret the wall might not be focused on the wall as "that wall" per se but on the sensory stimuli it provides. Considering Norberg-Schulz's object meanings and Panksepp's mind system, it can be speculated that the meaning found in an intermediary object—a wall, for instance—resonates within the animal's semantic process only if it corresponds with the sensory experiences and emotional responses of the animal. The architectural space, in this case, serves as an intermediary object that engages the animal through its phenomenally manifested features. If the animal cannot interpret the object as itself, this suggests that the morphological, tectonic, plastic, or aesthetic value created by the design elements of the architectural space may not find a meaningful counterpart in the animal's world. In addition to this, an architectural space with a trans-umwelt character can establish a relationship with an animal only to the extent that it contains elements, within the context of its design, that are accessible to the animal in its umwelt; elements and features of the architectural space that are not accessible in the animal's umwelt remain unconnected or *overlapped* rather than *intersected*, as they find no correspondence in the animal affectwise (Figure 7).

What assumptions can be made about the relationship between architectural space and an animal's emotional system when it is suggested that a space could act as a stimulant? How might Panksepp's emotional systems and Pallasmaa's focus on the body as an experiential instrument be considered to challenge or support these assumptions? In this manner, might the cat produce emotions according to the affective embodiment it has been forming with the wall?

If architectural space is considered to act as a catalyst for an animal's emotional system, it can be argued that such spaces serve as stimuli for specific emotional responses in animals. The semantic relationship that the animal forms with the space may define new interactions, depending on how and to what extent the space functions as a stimulant. To better understand the stimulating effect of architectural space, an animal's emotional systems can be broadly categorized into positive and negative groups. Certain emotional systems identified by Panksepp can be viewed as positive (such as seeking, care, play), while others as negative (such as fear, pain). Consequently, these emotional systems could influence the spatial relationships animals develop based on their experience of "being there." In this scenario, the cat perceiving the architectural space enclosed by walls and interpreting it as an environment that stimulates its seeking system might generate positive, exploratory emotions towards that space (Figure 8).

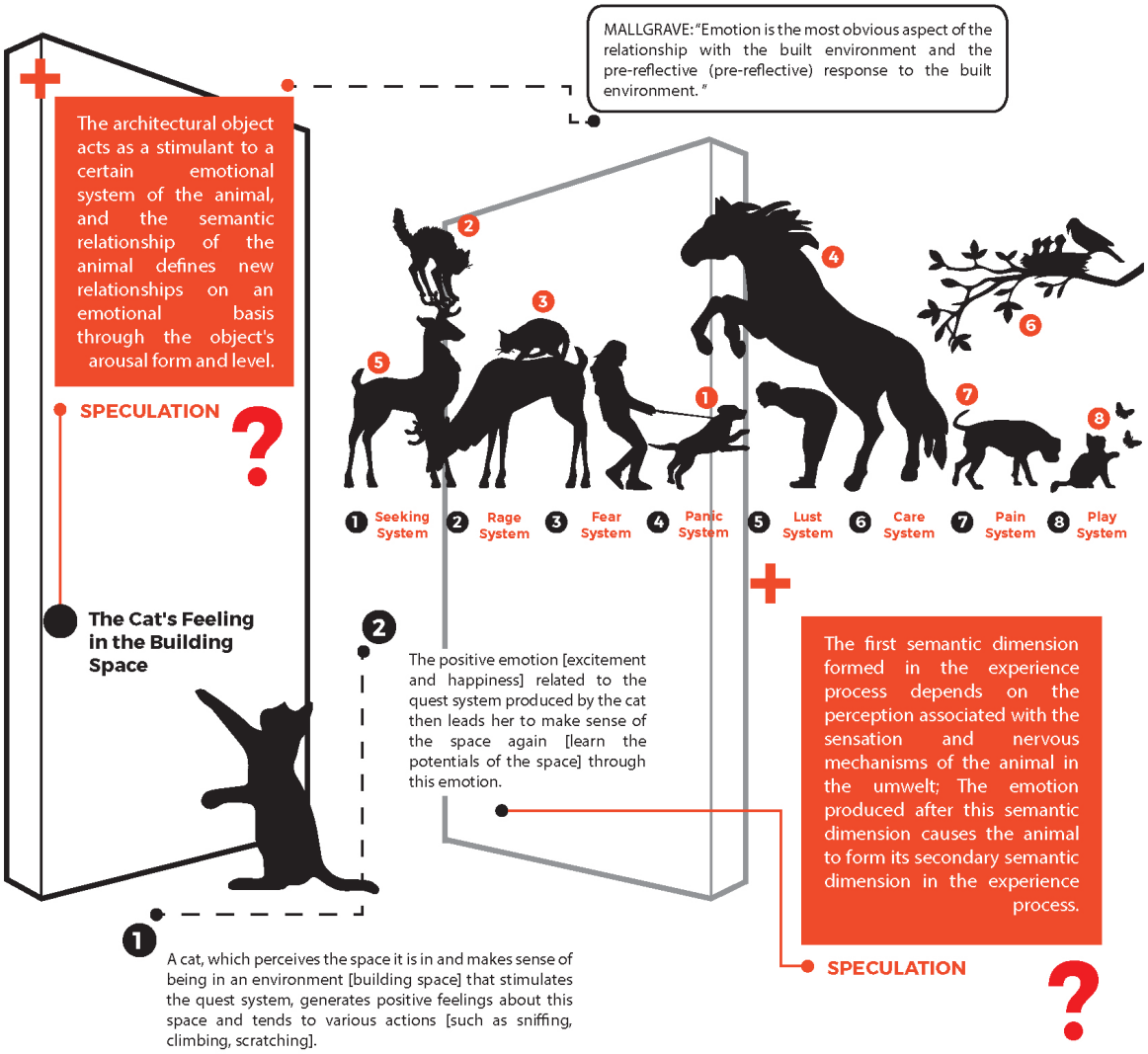

Figure 8. *Emotion in Affective Embodiment of the Cat.*

4.2. Speculative layer II: Behavior, learning, selecting, place-making

What can be understood about an animal's affective response to architectural space to determine its influence on behavior and learning? Can it be reasoned that such emotional engagements are capable of transforming a neutral environment into a meaningful 'place' by selection, within the animal's experiential world?

To understand how an animal's affective response to architectural space influences its behavior and learning, it seems essential to consider how the emotional system, triggered by the semantic process, facilitates the animal's production of actions, embodying the concept of affective embodiment. When an animal experiences a negative emotion, such as fear, in response to an architectural space, this emotion may lead to the termination of its spatial experience at that moment, manifested through its embodied action. Conversely, if the animal experiences a positive emotion, such as those associated with the seeking system, it may continue to engage with the architectural space through various behaviors, thereby extending its experiential relationship with the environment.

These embodied experiences can subsequently initiate a secondary semantic process in the animal, representing a learning phase shaped by the affective states that have emerged. For example, the cat, guided by the positive emotions generated in a space, might engage in behaviors such as sniffing, climbing, or scratching—behaviors tied to its seeking system—thus experiencing the space in a manner influenced by both its semantic relationship with the environment and the affective states activated. The positive emotion linked to the seeking system, arising from the cat's interpretation of the space, such as excitement over the potential for exploration, can facilitate learning about the possibilities that the space offers through the cat's embodied affective responses (Figure 9).

Uexküll's concepts of perception and affect images further illustrate this process. A perception image is formed by the mere existence of an element within the organism's umwelt, while an affect image arises when the organism interacts with this element and attributes a specific meaning to it. For instance, when a dragonfly circles a particular branch and lands on it, the branch is considered to become an affect image, as it is interpreted not merely as a visual object but as a suitable place to land. Using Norberg-Schulz's object-meaning framework, the branches perceived by the dragonfly can be viewed as potential landing spots, with the selected branch becoming an intermediary object that serves as an affect image.

This differentiation, as seen in Uexküll's crab narrative, can open the door to exploring the connection between affective embodiment and spatial experience. The crab's simple spatial schema, with objects of a certain size and cylindrical or conical design becoming significant in its semantic world, may suggest that the crab distinguishes between its embodied engagement with these specific forms and its interactions with other objects. This *selection* process is likely triggered by the activation of positive affective states, interpreting such objects as "something to fit inside,".

Moreover, an animal's negative emotional response to an embodied experience in a space may prevent it from initiating a new experience with a semantically similar space, even if this space is defined as a perception image. However, if the initial experience yields a positive emotion, encountering other architectural spaces with similar semantic characteristics can encourage the animal to re-engage with these spaces, driven by the positive affective states. In such cases, these spaces could become affect images, prompting new experiences based on this embodied affective relationship. If the animal chooses to re-experience the same architectural space, this act can be seen as a process of "placing" that space, further embedding its affective embodiment within that environment.

Applying this framework to the cat, during its experience of an in-between space enclosed by walls, positive emotional processes might be triggered, leading the cat to generate a secondary meaning—such as interpreting the space as one that can meet its sheltering

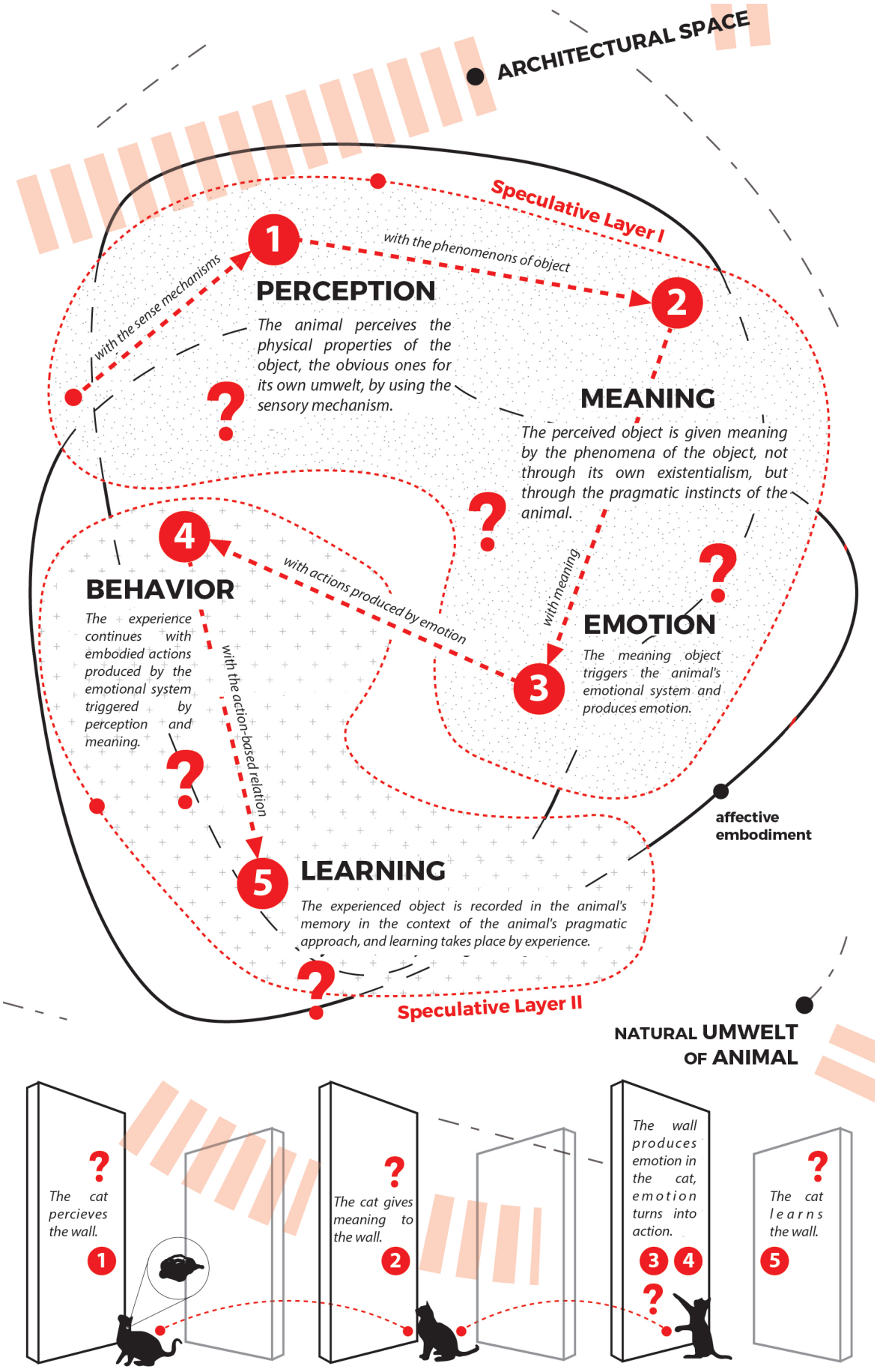

Figure 9. *Layers of Affective Embodiment Process of the Cat with the Wall.*

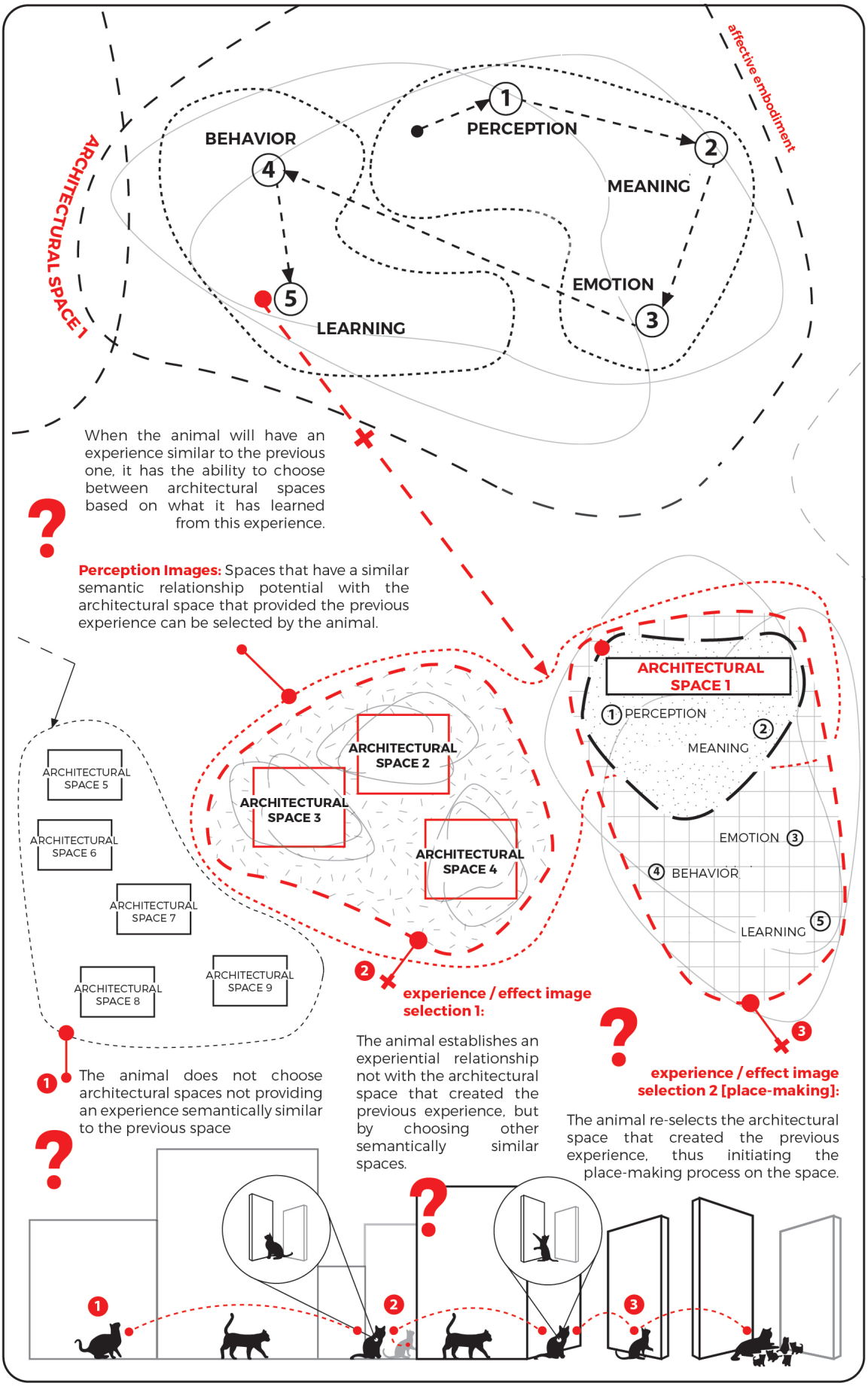

Figure 10. *Selection and Place-Making of the Cat.*

needs. This learning process, shaped by the cat's positive emotions associated with the space, can transform this space into a meaningful "place," start dwell there or even give birth. This can demonstrate how affective embodiment shapes spatial experience and contributes to the transformation of a neutral environment into a significant part of the animal's experiential world (Figure 10).

5. Conclusion

This article has studied Jakob von Uexküll's concept of "Umwelt" and expanded it through the theoretical lenses of trans-umwelt and affective embodiment, offering a more nuanced understanding of how animals experience and interact with their environments. Utilizing a speculative inquiry methodology with transdisciplinary research and Socratic questioning, this study examines how these concepts intersect to provide new perspectives on architectural spatial experience of the animal.

The concept of trans-umwelt introduces a critical extension to Uexküll's framework by suggesting that an animal's environment is not limited to its immediate sensory world but includes elements outside of it that have the potential to intersect with its experiential reality. These elements, whether natural or designed, can be spaculated to become part of the animal's world if they resonate with its affective capacities, thus becoming accessible through a process of affective engagement. Architectural spaces, for instance, can be seen as designed trans-umwelts, crafted to evoke specific affects and thereby intersect with the animal's subjective world.

Building on this, the notion of affective embodiment is crucial in understanding how these intersections occur. Affective embodiment posits that an animal's engagement with space is not a passive observation but an active, embodied process shaped by emotional and sensory responses. This perspective emphasizes that environments are dynamic fields of affect that can influence and be influenced by the organisms inhabiting them. Through this lens, architectural spaces are understood as affective spaces that play an active role in shaping an organism's -animal's- existential experience.

In light of these concepts, it can be speculated on the layers of spatial experience that an animal might undergo when interacting with an architectural space conceived as a trans-umwelt:

Perceptual Engagement involves the animal's initial sensory encounter with the space. For example, a cat entering an in-between space surrounded by the walls would perceive the walls visually and perhaps through other senses, like smell or touch. This perception may be the animal's first step in engaging with the space, turning it into a sensory-based understanding of the environment's elements. Affective Response concerns the affective response generated by this initial perception. If the space stimulates positive affective states [such as seeking], it may encourage further exploration. Conversely, negative affects [such as fear] could lead to avoidance. Behavioral Interaction and Learning involve the animal's behavioral responses to its affective states, leading to learning and adaptative post-behavior situations like selecting or place-making. If the cat feels safe and seeked, it might explore the space more fully, learning about its features and potential uses [e.g., shelter, escape routes]. This interaction helps the animal to form a deeper semantic relationship with the space, turning it into an element with specific, learned meanings based on embodied experience. Spatial Integration and Place-Making reflect the integration of the space into the animal's experiential world as a "place" with defined meaning and significance. If the cat finds that the space meets its needs or evokes positive emotions consistently, it might begin to regard this space as a shelter or a home. This transformation illustrates how architectural spaces, through their design and affective potential, can become integral parts of an animal's lived experience.

By utilizing speculative inquiry to explore these layers of spatial experience, this study demonstrates how the concepts of trans-umwelt and affective embodiment together provide a com-

prehensive framework for understanding an animal's experiential engagement with an architectural space. This framework highlights the transformative potential of spaces as relational environments that are constantly negotiated through the embodied experiences of the organisms that inhabit them.

The strategy of using transdisciplinary research and Socratic questioning to build speculative theories shows potential for academic discussions, particularly on topics that are not directly accessible to human understanding. It serves as a valuable tool for exploring areas where traditional empirical methods might fall short, enabling a more flexible and imaginative approach to research. In this way, the speculative use of Socratic questioning and transdisciplinary research can be seen as pedagogical tools, promoting a continuous process of reflection, critical thinking, and engagement with complex topics.

Acknowledgements
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