Language, Resonance, and Embodied Meaning

J.Konstape,Leiden,18-5-2006.

Toward a Unified View of Mind, Sound, and Semantics

Why This Essay, Why Now

We are living through a paradox. The most sophisticated language-processing systems ever built — large AI language models — are demonstrating daily that it is possible to manipulate language at extraordinary scale and fluency without any body, any perception, any acoustic experience, or any genuine understanding of the world. They treat language exactly as the dominant theory says it should be treated: as a formal system of arbitrary symbols, processed by rules, optimized by pattern.

And yet something is clearly missing. These systems hallucinate. They confuse words with things. They produce sentences that are syntactically impeccable and semantically hollow. They do not *mean* — they predict. The gap between their performance and genuine understanding is precisely the gap this essay is about.

The timing of this survey is therefore not accidental. The question of where meaning comes from has never been more urgent — or more practically consequential. If meaning is not arbitrary, not purely symbolic, not detached from body and world, then the dominant paradigm of both linguistics and AI is built on an incomplete foundation. Understanding what is missing is the first step toward building something better.

Preface

Most of us rarely stop to wonder what language actually is. We use it constantly — to think, to argue, to comfort, to persuade — and its transparency seems to confirm that we understand it. But that transparency is deceptive. Beneath the ordinary surface of speech and writing lies one of the deepest unresolved questions in science and philosophy: where does meaning come from?

The dominant answer, inherited from twentieth-century linguistics and cognitive science, is surprisingly thin. Words, on this account, are arbitrary labels. The sound of the word "tree" has no intrinsic relationship to the thing it names. Meaning is a matter of social convention, encoded in a formal system and processed by the brain as a kind of biological computer. Language, in short, is code.

This essay argues that this picture is incomplete — and that a richer, more accurate account of meaning has been quietly assembling itself across several disciplines for decades. Drawing on philosophy, neuroscience, cognitive science, linguistics, and systems theory, a coherent alternative is emerging: one in which meaning is not arbitrary but embodied, not static but dynamic, not detached from physical reality but rooted in it. Sound, body, prediction, resonance, and relational structure may belong to a single continuous framework.

The thinkers surveyed here do not form a unified school. Many would disagree with one another on important points. But their convergences are striking — and together they outline an intellectual landscape that is quietly transforming how we understand mind, language, and reality itself.

1. The Crisis of Pure Symbolic Language

To understand what is at stake, it helps to understand what the dominant theory actually claims — and why it has become difficult to sustain.

Ferdinand de Saussure, the Swiss linguist whose lectures were posthumously published as *Course in General Linguistics* (1916), established what became the foundational principle of modern language theory: the **arbitrariness of the sign**. For Saussure, the connection between a word's sound (the *signifier*) and its meaning (the *signified*) is entirely conventional. There is nothing in the sound "dog" that is inherently dog-like. Different languages use entirely different sounds for the same concept, which demonstrates that no natural relationship exists between sound and meaning.

This principle was enormously productive. It allowed linguistics to become a rigorous formal discipline. But it also had a cost: it severed language from the body, from perception, and from the physical world.

When cognitive science emerged in the mid-twentieth century, it inherited this severance. The mind was modeled as an abstract symbol-processing machine — a computer running algorithms on meaningless tokens. Language became a formal system operating on arbitrary signs, and meaning became a property of the system's internal operations rather than of any relationship between organism and world.

The problems with this picture have accumulated steadily. Abstract symbolic systems struggle to explain how meaning *feels* — the difference between knowing the definition of "grief" and actually understanding what grief is. Bodily experience demonstrably shapes conceptual thought in ways the formal model cannot easily accommodate. Sound symbolism — the tendency for certain sounds to carry consistent emotional or perceptual associations across unrelated languages — keeps appearing in the empirical literature, refusing to go away. And human cognition, when examined carefully, behaves less like formal logic and more like dynamic, context-sensitive, embodied interaction.

What began as isolated objections has gradually become a sustained alternative tradition.

2. George Lakoff and Mark Johnson: Meaning Begins in the Body

The most influential challenge to abstract cognition came from the American linguist George Lakoff and the philosopher Mark Johnson, whose collaboration produced *Metaphors We Live By* (1980) and later *Philosophy in the Flesh* (1999).

Their central claim is simple to state but radical in its implications: **abstract thought is not abstract at all**. It is systematically structured by bodily experience.

Consider how we actually talk and think about time. We say we are "looking forward" to something, that a deadline is "approaching," that we need to "put the past behind us." Time, which is entirely abstract, is understood through the metaphor of spatial movement. Or consider how we think about

emotions: someone can be "cold" or "warm," relationships can be "close" or "distant," arguments can be "solid" or "shaky." These are not decorative figures of speech. They are, Lakoff and Johnson argue, the actual architecture of thought.

The body provides what they call **image schemas** — recurring patterns of physical experience (container, path, force, balance, up/down, inside/outside) that become the cognitive scaffolding for abstract reasoning. We understand causation through the experience of physical force. We understand categories through the experience of containers. We understand morality through the experience of verticality (higher values, falling short, elevating oneself).

Meaning therefore does not begin in the dictionary or in formal rules. It begins in the lived, moving, sensing body interacting with a physical world. The symbolic layer of language is built on top of this deeper bodily foundation — it does not replace it.

Lakoff and Johnson stopped short of developing a full acoustic theory of meaning. But they established its most important premise: the body is not peripheral to thought. It constitutes thought.

3. Maurice Merleau-Ponty: Perception as Participation

The French philosopher Maurice Merleau-Ponty arrived at a similar conclusion by a different route — and pushed it further philosophically.

In his masterwork *Phenomenology of Perception* (1945), Merleau-Ponty argued that the entire tradition of Western philosophy had made a foundational error: treating consciousness as something separate from the body that then *uses* the body as an instrument. For Merleau-Ponty, this gets things exactly backward. Consciousness is not inside the body — it *is* the body as lived from within. The body is not an object in the world; it is the condition through which a world appears at all.

This has profound consequences for how we understand language. If consciousness is fundamentally embodied and situated, then speech is not a detached symbolic layer imposed on top of perception. It is a continuation of embodied engagement with the world. When we speak, we are not encoding inner mental representations into an external code. We are extending our bodily presence into a shared world through sound.

Meaning, on this account, is **enacted** rather than encoded. It happens in the act of engaged participation rather than in the manipulation of detached symbols.

This phenomenological perspective remained largely philosophical in Merleau-Ponty's own work. But it provided the ontological foundation that later cognitive scientists, neuroscientists, and linguists would build on — often without realizing how closely their empirical findings tracked his philosophical analysis.

4. Francisco Varela and Evan Thompson: Enactive Cognition

Francisco Varela, Evan Thompson, and Eleanor Rosch brought Merleau-Ponty's insights into dialogue with biology and cognitive science in *The Embodied Mind* (1991), creating what they called **enactivism**.

Their core thesis: cognition does not occur inside the brain alone. Mind emerges through dynamic interaction between organism and environment. Perception is not a passive recording of an

independently existing world. It is an active process of world-construction — the organism and its environment co-determine each other in an ongoing loop.

This matters because it relocates meaning. Meaning is not stored in the brain as a symbolic representation. It is generated in the dynamic coupling between a living system and its surroundings. A bee's relationship to a flower is not a matter of the bee "representing" the flower internally. It is a matter of mutual structural coupling — each shaping the other's behavior over time.

For language, the implication is significant: **meaning is relational and participatory**. It does not precede interaction and then get communicated through it. It arises in and through interaction. Language is less a transmission system and more a coordination system — a way of aligning the embodied attentions of organisms with one another and with the world.

Evan Thompson continued developing these ideas in *Mind in Life* (2007), tracing the continuity between the self-organizing processes of biological life and the meaning-generating processes of conscious experience. The boundary between "being alive" and "having a mind" turns out to be surprisingly porous.

5. Karl Friston: Active Inference and the Predictive Brain

If the enactivists provided a biological and philosophical framework, the neuroscientist Karl Friston has provided the most mathematically rigorous version of a related idea: the **Free Energy Principle** and its associated framework of **Active Inference**.

Friston's central proposal is that the brain is fundamentally a prediction machine. It does not passively receive sensory data and then compute a response. Instead, it continuously generates predictions about what it expects to sense, compares those predictions to actual sensory input, and updates its internal model to minimize the discrepancy. This process — minimizing "prediction error" or "free energy" — is, Friston argues, the organizing principle of all biological cognition.

This framework is technically demanding, drawing on statistical physics, information theory, and Bayesian inference. But its implications for understanding meaning are profound and accessible.

Meaning, in Friston's framework, is inherently **predictive**. To understand something is to have a good generative model of it — a model that successfully anticipates its behavior. Comprehending a sentence is not just decoding its symbols. It is updating a continuously running prediction about what kind of world you are in, what the speaker intends, and what is likely to happen next.

Friston's mathematical vocabulary — attractors, state spaces, generative models, hierarchical inference, dynamic stability — provides exactly the formal toolkit that a dynamical theory of meaning requires. Although Friston himself has not focused on phonosemantics or acoustic structure, his framework is the closest thing currently existing in science to a rigorous, mathematically grounded semantic field theory.

6. Roman Jakobson: Sound Is Not Neutral

While the cognitive scientists and neuroscientists were dismantling abstract cognition from one direction, the linguist Roman Jakobson had already begun dismantling it from another — by questioning the arbitrariness of the sign at the level of phonetics.

Jakobson argued, controversially, that phonetic structure contains **systematic semantic tendencies**. Certain sounds cluster statistically with certain semantic domains across languages. The relationship between sound and meaning, while not deterministic, is not entirely arbitrary either. Phonology encodes relational contrasts that carry meaningful weight.

This was deeply unpopular in mainstream linguistics, which had organized itself around Saussure's arbitrariness principle. But the empirical evidence for sound symbolism — the tendency for certain phonetic patterns to associate consistently with shapes, sizes, textures, and emotional qualities — has proved surprisingly robust across cultures and unrelated languages.

The implication Jakobson pointed toward, without fully developing it, is that language may preserve ancient perceptual and acoustic mappings beneath its later symbolic abstraction. Sound is not a neutral carrier of meaning. It participates in meaning-making from the beginning.

7. V. S. Ramachandran: The Bouba/Kiki Effect

One of the most striking demonstrations of non-arbitrary sound-meaning coupling came from the neuroscientist V. S. Ramachandran and his colleagues through what became known as the **Bouba/Kiki effect**.

When shown two abstract shapes — one rounded and blobby, one jagged and angular — and asked which is "bouba" and which is "kiki," people across cultures reliably give the same answer: the rounded shape is bouba, the angular shape is kiki. No one teaches this. It emerges spontaneously from the cross-modal structure of human perception.

The effect suggests that the human perceptual system creates systematic correspondences between acoustic qualities (the rounded versus sharp feel of different sounds in the mouth and ear) and visual qualities (the rounded versus angular appearance of shapes). These correspondences are not learned conventions. They are grounded in the sensorimotor structure of perception itself.

The implications are significant. If the mapping between sound and meaning has any systematic basis in perception, then the story of language as purely arbitrary convention is incomplete. Beneath the diversity of human languages, there may be universal perceptual anchors — acoustic-sensorimotor correlations that form the non-arbitrary substrate on which conventional symbolic systems are built.

8. Gilbert Simondon: Individuation and the Emergence of Form

The French philosopher Gilbert Simondon offers something different from the cognitive scientists and linguists: a process ontology in which the emergence of form and meaning can be situated within a broader metaphysics.

Simondon's central idea is that Western philosophy has made a persistent error by starting with fully-formed individuals — objects, substances, entities — and then trying to explain how they

relate. He inverts this: individuation comes first. Beings do not precede their becoming. They emerge from fields of tension, from metastable states that resolve into temporary structures through dynamic processes.

For Simondon, **form crystallizes through resonance and interaction**. A crystal growing in a supersaturated solution is his paradigm case: the structure that emerges is not predetermined in the solution, nor imposed from outside. It arises from the resonant interaction between the solution's internal tensions and the growing crystal face.

Applied to meaning, this ontology is illuminating. A word does not carry a fixed meaning that it "contains" and then "delivers." Meaning crystallizes in the interaction between acoustic pattern, bodily state, relational context, and predictive model. It is a process of transduction — a term Simondon uses for the propagation of a structuring activity through a previously metastable medium.

Simondon provides the philosophical vocabulary for understanding meaning not as a property of symbols but as an emergent stabilization within a dynamic relational field.

9. Susanne Langer: Sound, Feeling, and the Birth of Symbol

One of the most important — and most neglected — contributions to this synthesis comes from the American philosopher Susanne Langer. While her contemporaries were building formal logic and linguistic structuralism, Langer was asking a different question: how does raw felt experience become meaning?

In *Philosophy in a New Key* (1942), Langer argued that the distinctively human capacity for meaning does not begin with language in the conventional sense. It begins with **symbolic transformation of feeling** — the process by which living experience is shaped into forms that can be shared, remembered, and built upon. And crucially, she argued that the primary medium for this transformation is not word or grammar but **rhythm and sound**.

Music, for Langer, is not decoration. It is the most direct symbolic form through which the dynamic structure of felt experience — its tensions and resolutions, its rising and falling, its anticipation and release — can be made perceptible. Music is not about emotion in the way a description is about a thing. It *presents* the logical form of emotional life: its rhythm, its momentum, its directionality.

This matters enormously for language. Langer argues that human speech never fully separates from this musical substrate. Prosody — the rhythm, pitch, stress, and timing of spoken language — carries meaning that grammar and vocabulary alone cannot convey. The same sentence spoken with different prosodic contours means different things, and speakers know this immediately without needing to analyze it. The body hears what the symbol cannot say.

Langer therefore provides what no other thinker in this survey offers as explicitly: **a direct philosophical bridge between acoustic experience, bodily feeling, and symbolic abstraction**. The path from sound to symbol is not a rupture — a miraculous leap from animal noise to human meaning. It is a continuous transformation, with feeling as the medium and rhythm as the organizing principle.

This places Langer squarely at the center of the gap identified in this essay. She connects the structural-linguistic layer (Jakobson, Ramachandran) to the process-ontological layer (Simondon) through the experiential layer that both tend to leave implicit. Meaning crystallizes not from

arbitrary convention imposed on neutral sound, but from the symbolic transformation of felt acoustic structure that living organisms are already performing before they learn a single word.

10. Terrence Deacon: From Signal to Symbol

A persistent risk in embodied and resonance-based accounts of language is that they might make symbolic language seem unnecessary or epiphenomenal. Terrence Deacon's work corrects this.

In *The Symbolic Species* (1997), Deacon traces the evolutionary emergence of genuinely symbolic reference — reference that is not tied to perceptual resemblance (as in icons) or causal contiguity (as in indices) but that operates through systems of mutual constraints that create stable meaning independently of any direct resemblance to the world.

This is a real achievement of human evolution, Deacon argues, and a difficult one. Symbolic systems are not simply more complex versions of animal signaling. They represent a qualitative shift in the kind of reference that is possible. But — and this is the crucial point — that shift did not arrive from nowhere. It emerged gradually through increasingly complex relational processes, building on earlier biological signaling systems.

This matters for a resonance theory of meaning because it provides an evolutionary account of how embodied, acoustic, and relational processes could have gradually organized themselves into the symbolic systems human beings actually use. The symbolic layer is real and consequential. But it is built on — not disconnected from — the deeper substrate of embodied resonance.

11. Andy Clark: The Extended and Predictive Mind

The philosopher and cognitive scientist Andy Clark rounds out this survey by extending the boundaries of mind beyond the skull entirely.

In *Supersizing the Mind* (2008) and *Surfing Uncertainty* (2016), Clark argues that the brain is not a self-contained processor that receives input from the world and generates output into it. It is part of a **distributed cognitive system** that includes the body, the immediate environment, tools, technologies, and other people. Cognition is not something that happens in the brain and then interfaces with the world. It is something that happens at the interface between brain, body, and world simultaneously.

Clark's predictive processing account — related to but distinct from Friston's — holds that perception is not passive data reception but a form of **controlled hallucination**: the brain generates a model of expected experience and updates it when prediction errors arise. What we perceive is not the raw world but the brain's best ongoing hypothesis about it, continuously corrected by sensory feedback.

For language, this means that meaning is not stored statically in symbols. It emerges from the dynamic interaction of internal predictive models, bodily states, acoustic patterns, environmental affordances, and social coordination. The mind that understands a word is not a contained decoder. It is a distributed system reaching out into the world.

12. Toward a Unified Framework

Taken together, these thinkers — working independently, in different disciplines, often disagreeing with one another on specific points — converge on a coherent picture.

Meaning is not arbitrary. It is not primarily symbolic. It is not stored inside individual words or inside individual brains. It is an emergent property of dynamic interaction between embodied organisms and their physical and social worlds — interaction that is structured by bodily experience, shaped by perceptual resonance, organized through predictive dynamics, and progressively crystallized into symbolic systems.

This does not make symbols unimportant. Deacon's evolutionary account makes clear that symbolic reference is a genuine and powerful achievement. But symbols are compressed, higher-order structures built on a deeper substrate of embodied, acoustic, and relational process. To understand language fully, you need to understand both the substrate and the structure.

The synthesis that emerges has six identifiable layers:

Embodiment layer — Lakoff, Johnson, Merleau-Ponty: meaning is grounded in bodily interaction with the world.

Enactive layer — Varela, Thompson: cognition is active coupling between organism and environment; meaning is enacted, not encoded.

Dynamical layer — Friston, Clark: prediction, state spaces, attractors, and free energy minimization provide the formal structure of meaning as process.

Structural-linguistic layer — Jakobson, Ramachandran: sound is not neutral; phonetic structure carries systematic semantic tendencies grounded in cross-modal perception.

Evolutionary layer — Deacon: symbolic systems emerge gradually from embodied, relational, and acoustic foundations; the symbolic layer is real but not foundational.

Process-ontological layer — Simondon, Whitehead: being is becoming; form crystallizes through resonance within dynamic fields.

13. The Gap — and What It Points Toward

Despite the remarkable convergence across these traditions, a critical gap remains. No existing framework provides a fully integrated account that connects acoustic structure, embodied cognition, semantic geometry, and symbolic language in a single formal chain.

Each layer of the synthesis is well developed in its own domain. Embodied cognition is philosophically sophisticated. Predictive processing is mathematically rigorous. Sound symbolism is empirically documented. Process ontology is conceptually rich. But the connections between these layers remain informal, suggestive, analogical rather than formally specified.

This gap is not a failure of the individual thinkers. It reflects the genuine difficulty of the problem and the institutional fragmentation of disciplines that makes cross-layer synthesis rare. But it also marks the location of the next significant intellectual advance — a formal theory capable of connecting the acoustic structure of language to the embodied dynamics of cognition to the geometric structure of semantic space to the evolutionary emergence of symbolic systems.

What this survey makes clear is that the raw materials for such a synthesis already exist. The question is whether the connective framework — mathematical, philosophical, and empirical — can be built.

Language, it turns out, may not be something humans invented and imposed on a mute physical world. It may be a dynamical structure that living systems naturally develop as they participate in a reality that is itself organized by resonance, periodicity, and relational structure. If that is right, the study of language is not peripheral to physics, biology, and mathematics. It is continuous with them.

Annotated Reference List

The following annotations are organized by thematic layer and are designed to serve as entry points for deeper investigation. Each entry identifies the core claim of the work and its relevance to the framework developed in this essay.

I. Embodied Cognition

Lakoff, George, and Mark Johnson. *Metaphors We Live By*. University of Chicago Press, 1980. The founding text of conceptual metaphor theory. Argues that abstract thought is systematically structured through physical, sensorimotor experience. Essential starting point for any embodied account of meaning. Accessible and clearly written.

Lakoff, George, and Mark Johnson. *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought*. Basic Books, 1999. Extends the argument of *Metaphors We Live By* into philosophy of mind, ethics, and epistemology. More technical than its predecessor but rewarding for readers who want to understand the full philosophical scope of embodied cognition.

Johnson, Mark. *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason*. University of Chicago Press, 1987. Develops the concept of image schemas — recurring patterns of bodily experience (container, path, force, balance) that structure abstract reasoning. Provides the structural vocabulary for the embodiment layer.

Stanford Encyclopedia of Philosophy. "Embodied Cognition." https://plato.stanford.edu/entries/embodied-cognition/ A rigorous, regularly updated philosophical overview of the embodied cognition tradition. Covers major figures, debates, and connections to adjacent fields. Ideal for readers wanting philosophical depth without committing to a single monograph.

II. Phenomenology

Merleau-Ponty, Maurice. *Phenomenology of Perception*. Trans. Donald Landes. Routledge, 2012 [1945]. One of the twentieth century's most important philosophical works. Argues that consciousness is fundamentally embodied and that the body is not an instrument of consciousness but its very medium. Difficult but transformative. The Landes translation is the most accessible in English.

Dreyfus, Hubert. *What Computers Can't Do: The Limits of Artificial Intelligence*. Harper & Row, 1972. An influential application of Merleau-Ponty's phenomenology to the critique of

classical AI. Argues that human intelligence is irreducibly bodily and situational. Historically important and still relevant.

III. Enactivism and Cognitive Biology

Varela, Francisco, Evan Thompson, and Eleanor Rosch. *The Embodied Mind: Cognitive Science and Human Experience*. MIT Press, 1991. The founding text of enactivism. Bridges phenomenology, cognitive science, and Buddhist philosophy. Proposes that cognition is enacted through organism-environment coupling rather than stored as internal representation. Foundational.

Thompson, Evan. *Mind in Life: Biology, Phenomenology, and the Sciences of Mind*. Harvard University Press, 2007. Extends enactivism into a comprehensive philosophy of life and mind. Argues that the processes constituting biological life and those constituting conscious experience form a continuum. Rigorous and philosophically ambitious.

Maturana, Humberto, and Francisco Varela. *The Tree of Knowledge: The Biological Roots of Human Understanding*. Shambhala, 1987. An accessible introduction to autopoiesis — the concept that living systems are self-producing organizations — and its implications for cognition and language. More accessible than Varela's technical papers.

IV. Predictive Processing and Active Inference

Friston, Karl. "The Free-Energy Principle: A Unified Brain Theory?" *Nature Reviews Neuroscience* 11 (2010): 127–138. The most readable of Friston's technical papers. Provides an accessible overview of the Free Energy Principle and its application to perception, action, and cognition. A required text for understanding the dynamical layer.

Clark, Andy. *Surfing Uncertainty: Prediction, Action, and the Embodied Mind*. Oxford University Press, 2016. The most comprehensive and accessible book-length treatment of predictive processing. Clark is a superb writer; this is the recommended first text for readers unfamiliar with the framework.

Clark, Andy. *Supersizing the Mind: Embodiment, Action, and Cognitive Extension*. Oxford University Press, 2008. Argues that cognition extends beyond the brain into body and environment. Provides the extended mind complement to the predictive processing account. Accessible and well-argued.

Hohwy, Jakob. *The Predictive Mind*. Oxford University Press, 2013. A careful philosophical analysis of predictive processing. More technically philosophical than Clark; useful for readers who want to understand the epistemological implications of the framework.

V. Sound Symbolism and Linguistic Structure

Jakobson, Roman, and Morris Halle. *Fundamentals of Language*. Mouton, 1956. Jakobson's most accessible presentation of his structural linguistics, including his account of phonological oppositions and their semantic correlates. Entry point into his challenge to strict arbitrariness.

Ramachandran, V. S., and Edward Hubbard. "Synaesthesia — A Window into Perception, Thought and Language." *Journal of Consciousness Studies* 8.12 (2001): 3–34. The key paper

establishing and analyzing the Bouba/Kiki effect and its implications for cross-modal correspondence in human perception. Clearly written and empirically rich.

Nuckolls, Janis. "The Case for Sound Symbolism." ***Annual Review of Anthropology*** **28 (1999): 225–252.** A survey of cross-linguistic evidence for sound symbolism. Provides the empirical breadth to complement Ramachandran's neuroscientific account.

Saussure, Ferdinand de. ***Course in General Linguistics*****. Trans. Wade Baskin. Columbia University Press, 2011 [1916].** The foundational text of modern linguistics and the source of the arbitrariness principle this essay critiques. Essential reading for understanding what the embodied and resonance traditions are arguing against.

VI. Evolutionary Semantics

Deacon, Terrence. ***The Symbolic Species: The Co-evolution of Language and the Brain*****. W. W. Norton, 1997.** Argues that symbolic reference is a qualitatively distinct achievement of human evolution, emerging from increasingly complex relational processes. Essential for understanding how embodied and acoustic foundations could give rise to genuine symbolic language. Clearly written and wide-ranging.

Deacon, Terrence. ***Incomplete Nature: How Mind Emerged from Matter*****. W. W. Norton, 2011.** A more ambitious and technically demanding sequel. Develops a general theory of how intentionality and meaning emerge from physical processes through constraint and absence. Challenging but important.

VII. Process Philosophy and Systems Theory

Simondon, Gilbert. ***Individuation in Light of Notions of Form and Information*****. Trans. Taylor Adkins. University of Minnesota Press, 2020 [1958].** Simondon's major philosophical work, now available in English. Argues that individuation — the process of form-emergence — is ontologically prior to individuals. Dense but conceptually transformative for understanding dynamic meaning formation.

Whitehead, Alfred North. ***Process and Reality: An Essay in Cosmology*****. Free Press, 1978 [1929].** The foundational text of process philosophy. Argues that reality consists fundamentally of events and processes rather than static substances. Philosophically demanding but provides the deepest ontological grounding for dynamic theories of meaning.

Stengers, Isabelle. ***Thinking with Whitehead: A Free and Wild Creation of Concepts*****. Harvard University Press, 2011.** An accessible and intellectually generous guide to Whitehead's philosophy. Recommended for readers who want to engage with process philosophy without immediately tackling *Process and Reality* directly.

VIII. Overlooked Contributions

Langer, Susanne. ***Philosophy in a New Key: A Study in the Symbolism of Reason, Rite, and Art*****. Harvard University Press, 1942.** A greatly underappreciated work arguing that human meaning arises from symbolic transformation of feeling, with rhythm and sound playing a central role.

Langer provides a direct philosophical bridge between acoustic experience and symbolic abstraction that no other thinker in this survey offers as explicitly. Highly recommended.

Cassirer, Ernst. *The Philosophy of Symbolic Forms* (3 vols.). Yale University Press, 1953–1957. A monumental account of human culture as fundamentally symbolic — organized through forms including language, myth, and science. Less grounded in embodiment than the other works here but provides an important macro-framework for understanding symbolic mediation.

IX. Mathematical and Formal Extensions

Amari, Shun-ichi. *Information Geometry and Its Applications*. Springer, 2016. Introduction to information geometry — the application of differential geometry to probability theory and statistical inference. Provides the mathematical vocabulary for formalizing "semantic manifolds" and the geometric structure of meaning space. Technical but foundational for anyone wanting to formalize the dynamical layer.

Friston, Karl, et al. "Active Inference: A Process Theory." *Neural Computation* 29.1 (2017): 1–49. A comprehensive technical treatment of active inference. For readers wanting to engage with the formal mathematical machinery underlying the predictive processing account of meaning.

This essay and reference list were prepared as a survey of an emerging interdisciplinary synthesis. The convergences identified here point toward a research agenda rather than a completed theory. Readers are encouraged to follow the references into their home disciplines and judge the degree of convergence for themselves.