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Semiotic Anarchy and Logical Fractures: The Collapse of Bivalence in Language and Reality

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Abstract

This paper interrogates the boundaries of classical logic by examining violations of the Law of Excluded Middle (LEM) and the Principle of Bivalence (PB) across two seemingly disparate domains: semiotic sand formal systems. Drawing from Frege's sense-reference distinction, Russell's theory of descriptions, and Wittgenstein's later pragmatism, we first deconstruct how natural language smuggles surplus meaning through implicature, metaphor, and performative utterances. We then demonstrate how quantum mechanics and mathematics dismantle LEM/PB by revealing ontic indeterminacy. The synthesis of these threads exposes a fundamental tension: while language thrives on ambiguity, classical logic demands binary precision. By bridging Gricean pragmatics with quantum logic, we argue that meaning and truth are emergent phenomena, requiring a pluralistic framework that accommodates gradient truth-values, contextual indeterminacy, and paradoxical utterances.

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Discussion

This paper introduces the phenomenon of algorithmically emergent ambiguity in AI-generated text as a novel case of bivalence breakdown in post-human semiotics. Language is not a ledger of facts but a palimpsest, a parchment where every utterance is overwritten with layers of intent, context, and cultural residue. To ask whether we can "mean more than we say" is to interrogate the ontological status of meaning itself. Is communication a cryptographic act where speakers encode subtext beneath syntactic surfaces? Or is meaning an emergent property of collective hermeneutic labor?

Each communicative act involves interpretive gaps that challenge binary truth assignment. When we say, "It's raining," we are not merely reporting meteorological data, but we are implying urgency ("Bring an umbrella"), nostalgia ("Remember our walk in the storm?"), or existential dread ("The world is weeping"). This chasm between what is said and what is meant implies that language is a shapeshifter that thrives in ambiguity.

Armed with Wittgenstein's early *Tractatus*, the logical positivists sought to mould language into

A. "Charles is the King"

B. "The King is the King"

The difference lies not in logic but in pragmatic implicature (Grice, 1975). To say "Charles is the King" is to imply a prior uncertainty ("You thought it was someone else?") or to assert authority ("Bow, peasants"). Frege's sense (*Sinn*) gestures toward this surplus, the unspoken

a frictionless machine of truth-conditions. Nevertheless, their project collapsed under the weight of irony, metaphor, and the human habit of lying poetically. While Carnap excluded metaphysical language from cognitive discourse, he acknowledged the legitimacy of poetic and expressive functions outside the domain of truth and falsity. Consider Jonathan Swift's *A Modest Proposal* (1697), in which he "suggests" the consumption of Irish infants to solve poverty. On its surface, the proposal is monstrous; yet the subtext reveals biting satire, exposing British colonial cruelty and systemic indifference. Here, the literal meaning is a decoy; meaning arises from the reader's recognition of irony. Non-literal language, in this case, functions through inversion, as saying one thing to condemn it. Here, meaning explodes beyond the literal, rendering Frege's distinction between sense and reference quaintly inadequate.

Frege's distinction between *Sinn* (sense) and *Bedeutung* (reference) is the first crack in the edifice of literalism. Consider his famous puzzle:

context that breathes life into dead signs. Frege's concept of *Sinn* is objective and tied to mode of presentation, not aesthetic or emotive variance. It merges into what Eco (1976) calls the "inferential walk", which is a labyrinth of connotations that exceed the propositional core.

Russell's 1905 *On Denoting* grapples with statements about non-existent entities, such as "The King of the United States is bald." For Russell, such phrases are not meaningless but quantificational:

Logical Form: $\exists x (Kx \wedge \forall y (Ky \rightarrow y=x) \wedge Bx)$

("There exists one and only one King of the United States, and he is bald.")

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When we utter, “The King of the United States is bald,” we are not referring to a non-existent monarch but performing a linguistic sleight-of-hand: “There exists one and only one entity that is King of the United States, and that entity is bald.” The sentence draws its meaning from its referential failure, highlighting language’s capacity to gesture beyond existing ontology. It exposes language’s power to conjure phantom referents, to evoke meaning through deliberate ambiguity or referential absence.

Following Wittgenstein's *Tractatus* (1921), the logical positivists sought to eradicate such ambiguity via the principle of verisimilitude, wherein language should mirror reality with isomorphic precision. However, this project implodes when faced with metaphor. Neruda's line, “I want to do with you what spring does with the cherry trees,” is empirically false (spring does not “do” anything intentional) yet phenomenologically true. The positivist demand for empirical correspondence collapses under poetry's epistemic violence.

Grice's 1957 bifurcation of meaning into natural (smoke → fire) and non-natural (traffic light → stop) has its basis in intentionality. Natural signs are causal and mind-independent, whereas non-natural signs are conventional and suffused with human design. These natural signs are prisoners of causality. They cannot lie. Non-natural signs, however, are anarchic. A red traffic light does not merely indicate “stop”; it commands it. This distinction, per Grice, hinges on intention. When I say, “Nice weather,” during a hurricane, I am not describing meteorology but weaponizing sarcasm. The gap between utterance and intent becomes a canvas for meaning.

But Grice's schema fractures under irony. When Swift writes “A Modest Proposal,” his literal suggestion to eat Irish children is a non-natural sign pointing to British exploitation. The text's illocutionary force (Austin, 1962) lies not in its propositional content but in its satirical intent, which is only accessible through shared

historical trauma. Wittgenstein's later language games (1953) recognize that meaning is not fixed but performed. A meme like “This is fine” (the dog in a burning room) transcends its literal depiction to critique collective denial. It means more than it says because we conspire to make it so.

Metaphor isn't mere linguistic decoration. They do not merely adorn thought but reshape its structure by occasionally disrupting entrenched conceptual schemas. Lakoff and Johnson (1980) demonstrated that metaphors structure thought itself. When Kafka writes, “A cage went in search of a bird,” he doesn't just defy literalism but rewires ontology, forcing us to entertain a world where agency inverts. Sometimes, we don't just play with meaning but wage war with it.

The logical positivists’ “principle of verisimilitude”, that language should mirror reality with photographic precision, suffocates under the weight of human creativity. The principle of verisimilitude, introduced by Popper in the context of scientific theories, should not be conflated with general language-use norms espoused by logical positivists. Consider Borges’ “The Library of Babel,” where every possible book exists, including those that are pure gibberish. The library is a metaphor for language itself. It is a chaotic archive where meaning is not discovered but imposed.

Wittgenstein’s later work, “*Philosophical Investigations*” (1953) dynamites the *Tractatus*’s rigid logic. Language, he argues, is a toolkit for playing games, like social practices where meaning is enacted, not encoded. Wittgenstein’s pivot to ordinary language philosophy concedes this. “Don’t ask for the meaning; ask for the use,” he writes. The logical positivists’ failure was their allergy to this performative chaos. They wanted language to be a scalpel, but humans use it as a flamethrower instead.

Modern large language models (LLMs) like GPT-4 problematize intentionality. When an AI

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generates, “The King of the United States is bald,” it parrots Russellian syntax without aboutness (Brentano, 1874). The sentence is meaningful (it obeys grammar) yet meaningless (lacks intentional anchor). Humans, however, tend to retrofit intent. Hungry for subtext, they project meaning onto the void. Some interpret this as evidence of hidden power structures, projecting conspiracy where none is overtly intended. Meaning, therefore, becomes a projection.

From Frege’s Sinn to viral memes, language is a hall of mirrors where every reflection distorts and enriches. We tend to overload signs with smuggled significance, not because we are irrational, but because human cognition relies on metaphorical schemas to process abstract concepts. The logical positivists’ dream of semantic hygiene died when we realized that ambiguity is not noise but a signal since humans are hermeneutic animals, compulsive seekers of subtext.

As sentient beings, we are condemned to mean beyond our words, to speak in riddles, to let silence scream. In this semiotic anarchy, meaning is not something we find but something we stage. To silence implicature would be to lobotomize language itself by reducing it to a corpse of propositions. We mean more than we say because we must. The answer, then, is not just “yes” but a defiant, Dionysian “How could we not?”

The law of excluded middle and the principle of bivalence offer us a neat, binary world: every statement is either true or false, with no middle ground. Yet, drawing from modern insights into language, logic, and even the disruptive ideas of philosophers like Wittgenstein, we find that this neat binary may not be as impermeable as once thought.

At its heart, classical logic posits two indispensable principles: the law of excluded middle (LEM) and the principle of bivalence. LEM states that for any proposition P, either P is

true, or its negation (not-P) is true. The principle of bivalence, meanwhile, holds that every declarative statement has exactly one truth value: true or false.

Consider the elegant simplicity of a basic mathematical statement: “ $2+2=4$.” Here, bivalence holds true; the statement is undeniably true, and there is no room for any intermediate status. But what about more complex propositions like “This statement is false”? Enter the notorious liar paradox, a conundrum perplexing logicians for centuries. If the statement is true, then what it asserts must hold, and thus it must be false. Yet, if it is false, then it must be true. Here, the binary system seems to break down, hinting at the possibility that our strict dichotomy might collapse under certain conditions.

Our inquiry must take us beyond pure logic and into language, where the signs and symbols we use are imbued with layers of meaning. Drawing on the work of H. P. Grice, whose 1957 essay “Meaning” (Grice, 1957) underscores the importance of conversational implicature and the cooperative principle, we begin to see that language itself does not always subscribe to a strict binary. Grice argued that what is meant often transcends the literal meaning of words, suggesting that our conversational practices are riddled with implied meanings and assumptions that can blur the lines between true and false. Thus, when we consider statements from natural language, it is no wonder that our classical binary might be challenged. A statement like “I may travel tomorrow” does not assert a clear truth or falsehood but expresses possibility. While modal logic accounts for such expressions formally, natural language routinely traffics in these non-binary modalities. The utterance’s meaning unfolds within a space of potentiality, resisting classical logic’s demand for fixed truth-values. The analysis of language further complicates our understanding of truth when we delve into the theories of Gottlob Frege and Bertrand Russell on names and descriptions. Frege’s distinction between sense and reference

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allows us to see that a statement's meaning (its sense) may be detached from its actual reference. For example, the statement, "The King of France is bald." Frege's analysis reveals that while the phrase "The King of France" has a sense, it lacks a proper reference since there is no current King of France. Russell's theory of definite descriptions extends this inquiry by proposing that such statements are not simply about the existence of an entity but about a particular set of conditions.

This puzzle demonstrates that when language references non-existent entities, our binary model of truth may struggle to provide an adequate answer. The problem challenges both the principle of bivalence and the law of excluded middle by revealing that the truth value of certain statements might be indeterminate. Such a state clearly resists simple classification as merely true or false.

In the early 20th century, logical positivists sought to cleanse the philosophy of metaphysical vagueness by grounding all meaningful statements in empirical verification and logical analysis. They held that a rigorous analysis of language could resolve many traditional philosophical problems, including those concerning truth and meaning. The principle of verisimilitude, the idea that our statements approximate truth was central to this enterprise. Yet, as subsequent thinkers have shown, this principle has its limitations.

Wittgenstein's early work, especially in the *Tractatus Logico-Philosophicus*, posited that language mirrors reality in a way that neatly aligns with binary logic. However, his later work in *Philosophical Investigations* complicates this picture, revealing that language is a living, evolving practice where meaning is not fixed by strict logical form. This shift underscores the tension between our desire for clear-cut truth values and the inherently fuzzy nature of human communication. If language is fundamentally more fluid than the static formulas of classical logic suggest, then it follows that the law of

excluded middle might not be universally applicable. After all, if the meanings of our statements are in constant flux, then the conditions under which they are true or false might also be subject to change.

So far, we have seen that both language and logic present challenges to the binary system. But could it be that our entire conception of truth is due for a disruptive revision? Let us entertain a more radical idea: what if the truth is not a static property at all but an emergent phenomenon, something that evolves as our understanding deepens?

In many ways, this idea resonates with developments in other fields of inquiry, such as complexity theory and emergent systems in science. Just as the behavior of complex systems cannot be reduced solely to the properties of their individual components, perhaps truth itself is a dynamic, emergent property that transcends binary classification.

While classical logic remains a powerful tool for many forms of analysis, by opening ourselves to the possibility of emergent truth, we can begin to see that the law of excluded middle and the principle of bivalence might not be violated in the sense of being "wrong" or "inadequate". Still, we might simply be approximations that hold in many contexts but not all. This is not to say that we should abandon these principles entirely; instead, we should recognize them as part of a broader tapestry of logical tools, each with its own domain of applicability.

At this point, one might wonder: if logic and language are so intertwined, what role does human intention play in determining truth? This question brings us back to the work of Grice, who famously argued that meaning is a product of both what is said and what is implicated. In everyday conversation, we rely on a shared set of assumptions and contexts to fill gaps that logical form alone cannot capture.

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Imagine a scenario where someone says, "It's cold outside." Without additional context, one might simply take this as a factual statement about temperature. However, suppose the statement is made on a sweltering summer day. In that case, it may be intended as a metaphor or even a subtle critique of someone's behavior (perhaps suggesting that they are emotionally distant). Here, the truth value of the statement is not a straightforward matter of fact but is deeply entwined with human intention and interpretation. This example illustrates that the binary classification of truth may sometimes be a poor fit for the rich, layered nature of human communication.

When we sign a contract, the signature is a non-natural sign; it is a deliberate, conventional mark that carries meaning precisely because of an agreed-upon system. In contrast, natural signs, such as a change in weather, carry meaning in a more immediate, context-dependent fashion. The reliability and clarity of truth values in these two realms can differ significantly, suggesting that our logical frameworks might require adjustment when applied to natural language phenomena.

Returning to the insights of Frege and Russell, we see that even the most rigorous attempts to ground truth in logic encounter challenges. Frege's distinction between sense and reference reminds us that the meaning of a statement is not always aligned with its external referents. This is particularly evident in cases of non-existent entities, where a statement might be syntactically complete but semantically ambiguous. Russell's theory of definite descriptions attempted to resolve this by reformulating such statements in a way that preserves logical clarity. Yet, it still leaves us with uncomfortable questions about the nature of truth.

For instance, when we say, "The King of the United States is bald," Russell's analysis requires us to unpack this statement into components that address existence, uniqueness,

and the predicate of baldness. In doing so, we see that our seemingly straightforward binary options, such as true or false, are not always sufficient. The statement might be deemed false, but only after a complex analysis that exposes its underlying assumptions. This process shows that the principle of bivalence is not violated in a straightforward manner; rather, it is subjected to layers of interpretation that reveal its limitations in capturing the full richness of meaning.

The very notion of approximation suggests that our current truth claims are provisional. In light of this, it is worth considering whether the principle of bivalence might be a provisional heuristic rather than an absolute law. In a world where our understanding of language, reality, and even logic constantly evolves, the binary model of truth might best be seen as a useful tool rather than a final word. This perspective aligns with the view advanced in logical pluralism, particularly by Beall and Restall (2006), who argue that there are multiple, equally legitimate logics suited to different contexts. Haack (1978) similarly advocates for a pragmatic approach that tailors logical systems to the needs of inquiry, rather than insisting on a monolithic standard.

Philosophers such as Susan Haack have argued for a more pragmatic approach to logic, one that acknowledges the limitations of classical systems while still striving for clarity and precision. This perspective aligns with the idea that truth is a process, a continuous negotiation between our conceptual frameworks and the complex, dynamic world we inhabit. From this viewpoint, any violation of the law of excluded middle or the principle of bivalence is less a failure of logic and more a reflection of the evolving nature of our understanding.

One disruptive approach to synthesizing these insights is to advocate for a more holistic view of logic, one that recognizes multiple layers of truth. Such a view might allow for statements to be analyzed both in terms of their formal, logical structure and their pragmatic, context-dependent

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meanings. In this framework, the law of excluded middle and the principle of bivalence remain valid within their respective domains, but they are not assumed to capture the entirety of truth across all realms of discourse.

In an era of information overload and a proliferation of perspectives, the idea that a single, all-encompassing truth can be neatly partitioned into true or false becomes increasingly untenable. Instead, we must acknowledge that truth, like language, is multifaceted, and our logical tools must be flexible enough to accommodate this complexity.

In Schrödinger's famous thought experiment, a cat is simultaneously alive and dead until observed—a macroscopic metaphor for quantum superposition. The Copenhagen interpretation posits that particles exist in indeterminate states until measured, violating PB by rendering propositions like "Electron E has spin-up" neither true nor false pre-measurement.

Quantum logic, formalized by Birkhoff and von Neumann (1936), replaces classical truth values with lattices of subspaces. Here, LEM fails spectacularly: a particle's position and momentum cannot both have determinate values (per Heisenberg's uncertainty), making statements like "The electron is at position x OR not at x " non-trivially true. This is not epistemic ignorance but ontic indeterminacy—a direct assault on classical bivalence.

Brouwer's intuitionism rejects LEM as a metaphysical fantasy. For the intuitionist, a proposition is valid only if constructively proven and false only if its negation is proven. Consider the Twin Prime Conjecture (infinitely many primes p where $p+2$ is also prime). Until a proof or refutation exists, intuitionists deem the statement neither true nor false—a direct violation of PB.

Heyting's formalization (1930) replaces truth-conditions with proof-conditions. In

intuitionistic logic, $\neg\neg P$ does not entail P ; double negation elimination requires a constructive method. This mirrors legal systems where "not guilty" $\neq$ and "innocent"—a third, undecided category fracture bivalence.

Classical theorems like the Intermediate Value Theorem (every continuous function attains every value between $f(a)$ and $f(b)$) rely on LEM. Intuitionists reject such non-constructive proofs, demanding explicit algorithms. The result? A parallel mathematical universe where LEM is locally suspended.

The Sorites Paradox asks: When does a heap of sand cease to be a heap after removing grains? Vague predicates ("bald," "tall") defy sharp boundaries, rendering statements like "Person X is bald" neither true nor false in borderline cases.

Fuzzy logic (Łukasiewicz, 1920) formalizes this by allowing truth values in $[0,1]$. A man with 100,000 hairs might be "bald" to a degree of 0.2, violating PB. Similarly, legal thresholds (e.g., "18 years old" for adulthood) create penumbral cases where PB falters.

Therefore, the violations of LEM and PB aren't merely formal curiosities but reflect deep metaphysical fissures. Realists argue that bivalence holds in principle (Dummett, 1991), while anti-realists see truth as epistemically constrained. Quantum mechanics and intuitionism tilt toward anti-realism; paraconsistent logics suggest an inconsistent reality.

In contemplating whether the law of excluded middle or the principle of bivalence is ever violated, we are led to a broader, more profound realization: our conceptual frameworks are not immutable edicts but evolving tools that must adapt to the intricacies of reality. Classical logic, with its clear-cut binaries, has served us well in many domains. Yet, when confronted with the fluidity of natural language, the ambiguity of human intention, and the evolving nature of

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truth itself, these principles reveal their limitations.

LEM and PB are not inviolable laws but negotiable conventions, shattered by quantum indeterminacy, vagueness, and paradox. Their violations reveal a more prosperous, messier reality that demands a toolkit of

context-sensitive systems. The future of logic lies not in dogmatic adherence to Aristotle but in embracing the chaos of the excluded middle, where truth is gradient, contradictions breathe, and reality refuses to be boxed. We must create a logic that is as dynamic and multifaceted as the reality it seeks to describe.

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