

Differentiation as the Ontological Condition of Actualization

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Abstract

This article advances an ontological principle: coherent systems achieve determinate reality only through internal acts of differentiation. In the absence of such acts, what appears as a system is merely an undifferentiated substrate—operationally indistinguishable from noise for any would-be decoder, a field of potential without structured actuality. Drawing on information theory, quantum mechanics, and systems theory (particularly Luhmann’s operative constructivism), the argument treats differentiation not as a descriptive tool or secondary process, but as the generative condition under which reality, as structured for a system, emerges from substrate. Modeling and observation are thus not mere representations of pre-existing being; they are constitutive of being’s determinate form for those systems that enact them.

1 The Priority of Differentiation over Existence

Traditional ontology and science often presuppose that systems—physical, biological, or social—exist as determinate entities prior to observation, description, or modeling (Quine, 1948; Armstrong, 1997). Reality is taken as given, and our task is to map it accurately.

This article inverts that assumption. Systems do not function as coherent entities independently of differentiation; they become actual as systems only when an internal or coupled element introduces and stabilizes distinctions. Without differentiation, there is no determinate boundary, no identifiable component, no event—only an undivided field of variation. What we retrospectively call a “system” is the product of distinctions enacted within and around it (Spencer-Brown, 1969; Luhmann, 1995).

2 Differentiation as Ontological Genesis

The principle can be stated succinctly:

Systems emerge as coherent systems through differentiation.

Differentiation is not an optional refinement of pre-existing entities. It is the process that constitutes them as entities at all, in their structured form. Absent differentiation:

- No operational boundaries separate inside from outside.
- No components can be identified as distinct.
- No processes acquire stable identity or direction.

- No events can be marked as beginning or end.

What remains is substrate: a continuum of fluctuations, interactions, and potentials without articulated form. Differentiation is the ontological genesis of systemhood ([Deleuze, 1994](#); [Simondon, 2020](#)).

3 Substrate, Information, and Noise

Information theory provides a precise lens for this claim. In Shannon's framework, information arises only when differences are registered and encoded relative to a receiver or decoder ([Shannon, 1948](#)). A signal without such registration is indistinguishable from random noise from the receiver's perspective—pure entropy, devoid of usable structure.

This insight generalizes ontologically:

Undifferentiated substrate is operationally equivalent to noise for any system that lacks mechanisms of differentiation.

Physical processes may abound—quantum fields, thermal fluctuations, particle collisions—but without an internal mechanism to register differences (a “decoder” in a broad sense), these remain unstructured variation. They do not constitute objects, events, or phenomena for that system. They are potential without actualization ([Bateson, 1972](#)).

Modeling is therefore not simply posterior to reality; it is a condition of reality's determinacy for any given system. Differentiation translates substrate into structured actuality.

4 Quantum Indeterminacy and Measurement

Quantum mechanics offers an instructive example at the foundational level. In standard textbook presentations inspired by the Copenhagen interpretation, quantum systems are treated as not possessing definite values of certain observables prior to measurement; they are described instead by superpositions of possibilities ([Bohr, 1935](#); [Heisenberg, 1958](#)). Measurement—an interaction that registers a difference—selects a determinate outcome from among these possibilities.

On such views, indeterminacy is not merely epistemic. Determinate values emerge through measurement interactions themselves ([Wheeler, 1983](#); [Zurek, 2003](#)). Before differentiation in the form of measurement, there is a manifold of potential outcomes; after, there is an actual result. Even at the most basic physical scale, structured reality is tied to elements capable of enacting distinctions.

This does not settle interpretive debates, but it reinforces the general thesis: acts that register differences are central to the emergence of determinate states.

5 Biological and Social Extensions

The same logic extends upward. Living organisms do not passively inhabit environments; they actively construct *Umwelten* through sensory and metabolic differentiation ([von Uexküll, 1934](#)). What registers as food, threat, or mate is defined by the organism's

internal organization and its capacity to carve distinctions into the surrounding substrate ([Maturana & Varela, 1980](#); [Varela et al., 1991](#)).

In social domains, Niklas Luhmann's theory illustrates the principle at scale. Social systems such as law, economy, or science arise through operative distinctions—binary codes like legal/illegal or true/false ([Luhmann, 1995, 2012](#)). Without these self-referential selections, there is no domain-specific reality for law or science; there is only an undifferentiated flow of communication that does not yet function as “legal” or “true.” Luhmann's operative constructivism converges with the present argument: reality, for a system, is what it constructs and accepts as given through its distinctions, not a pre-given external world simply mirrored by communication.

6 Substrate vs. Reality: Levels of Being

To avoid misunderstanding, the argument distinguishes two ontological levels:

Substrate: the field of undifferentiated physical variation and potential interactions—persistent, regardless of whether any system differentiates it.

Reality: the structured, determinate domain that emerges when substrate is differentiated and modeled internally by a system.

The claim is not that substrate vanishes without differentiation, nor that reality is illusory or mind-dependent in a solipsistic sense. Rather, structured, coherent being—the world of objects, events, systems, and processes as they can function for any observer or system—requires differentiation to become actual ([Whitehead, 1929](#)). Substrate persists; reality is actualized through it.

7 Plural Actualizations from a Shared Substrate

Different differentiating elements produce different realities from the same substrate. A human perceptual system, a bat's echolocation ([Nagel, 1974](#)), a quantum detector, or a social subsystem each enact distinct boundaries and codes, yielding legitimate but non-identical actualizations. Reality is thus plural: an ensemble of structured worlds grounded in a shared but undifferentiated potential ([Goodman, 1978](#)).

This plurality does not imply arbitrariness. Each mode of differentiation is constrained both by the substrate and by the internal organization of the system that enacts it.

8 Key Implications

Several implications follow:

1. **Boundaries are emergent, not fundamental:** they arise only where differentiation draws them.
2. **Objects are relative to differentiators:** no object exists as a determinate object independently of the distinctions that identify and stabilize it.

3. **Events require temporal scaling:** without chosen distinctions of before/after, processes do not resolve into discrete beginnings or ends.
4. **Reality is channel-dependent:** multiple, equally valid actualizations coexist, each relative to specific modes of differentiation and coupling.

9 Conclusion: From Substrate to World

The ontological sequence can be summarized as:

$$\text{Substrate} \longrightarrow \text{Differentiation} \longrightarrow \text{Coherent System} \longrightarrow \text{Actualized Reality} \quad (1)$$

Without internal differentiation, there is only noise-like potential for a given system—fluctuations without articulated form. Through acts of differentiation, coherent systems emerge as structured actualities. Determinate reality does not precede its modeling; it arises with and through it.

This principle reframes ontology: being is not a static given but the outcome of generative distinctions. Coherent reality is not simply discovered; it is enacted.

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