Resolving the Hard Problem: Consciousness as the Collapse of Causal Separability

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1. Introduction

The so-called "Hard Problem of Consciousness," as formulated by David Chalmers, has shaped consciousness research in recent decades. At its core, it asks: Why do certain physical processes in the brain generate subjective experiences? Why don't these processes simply run "in the dark" — without inner experience?

However, this formulation contains a categorical error. The Hard Problem conflates two different levels of description: the physical-causal and the subjective-experiential. As long as these levels are not methodically distinguished from one another, the problem remains unsolvable. The goal of this contribution is to reformulate and thereby resolve the problem. Not through an explanation of qualia in the classical sense, but through a structural derivation of the subject that experiences them.

Instead of asking *why* certain processes generate experience, we ask: *Who* experiences *what* — and *why*? The question is directed not at the result ("consciousness"), but at the conditions of its possibility structure. Consciousness appears here not as a property or emergent quality, but as a structural consequence of a systemic collapse of causal separability. This collapse is neither mystical nor metaphysical, but a necessary consequence of evolutionarily emerged, self-organizing systems.

In what follows, I develop this argument in three stages, which simultaneously mark three evolutionary thresholds: the emergence of life (autopoiesis), the establishment of central control instances (causalopoiesis), and the formation of subjective integration spaces (causal collapse). Together, they define not only the emergence of consciousness, but also the conditions of its epistemic comprehensibility.

2. The Categorical Misunderstanding of the Hard Problem

The traditional formulation of the Hard Problem presupposes that consciousness is an additional phenomenon that "goes beyond" neuronal

processes. This maintains a dualistic split: on one side the objective description of physical processes, on the other side subjective experience. However, precisely this opposition is the result of an already presupposed categorization — not its starting point.

The real question is not why neuronal processes generate subjective experiences, but why there are systems at all in which a distinction can be made between "inside" and "outside," between "self" and "world." Subjectivity — and thus consciousness — is not an additional property, but a structural relationship. It emerges where a system is organized in such a way that it stabilizes itself as a center of causality while simultaneously experiencing its environment as distinct from itself.

The misunderstanding therefore consists in treating "consciousness" as something that is *added* to something else — to neuronal activity, to information processing, to physical states. In reality, however, it is the expression of a systemic transition: the loss of the possibility to clearly separate causal relationships internally and externally. Where this happens, not an additional phenomenon emerges, but a new perspective on the system: an inside view.

The Hard Problem is thus not an unsolved scientific puzzle, but an epistemological short circuit — it is the result of an inconsistent level of description, not a real deficit in our knowledge.

3. Three Evolutionary Thresholds of the Subject

If consciousness is understood not as an emergent property, but as a structured consequence of evolutionary transitions, then we must identify those thresholds at which biotic subjectivity emerges from physical systems. Three such thresholds mark the formation of what we today call conscious experience:

3.1 Autopoiesis — The Demarcation from the Environment

The first threshold marks the transition from chemical to biological systems. As soon as prebiotic, autocatalytic reaction cycles separate themselves from their environment through a semipermeable membrane, a functional inside emerges. This membrane system not only enables exchange, but also establishes a structural difference between "inside" and "outside." Here, for the

first time, a subject emerges — not as a thinking being, but as a systemically stabilized unit with functional self-reference.

3.2 Causalopoiesis — The Emergence of a Center

The second threshold concerns the formation of local causal condensations within living systems. Thermodynamically induced flows lead to gradients that produce functional centers — such as the eukaryotic cell nucleus. With this step, the principle of causal centrism is introduced into the world: an inner point of maximal control that irreversibly shapes further evolution. This structural centralization forms the basis for every later form of integration of sensory and motor processes.

3.3 Causal Collapse — The Birth of Subjectivity

The third threshold is reached when, in multicellular organisms, sensory data are systematically brought together in central neural networks. At a certain point — phylogenetically as well as ontogenetically — the internal causal structure is so densely interwoven that the separation of cause and effect within the system breaks down. A state emerges in which the system can no longer distinguish between itself and its stimuli. This collapse of causal separability is the beginning of conscious experience — not as an addition, but as an irreducible state of internal indistinguishability.

4. Consciousness as Epistemic Singularity

The collapse of causal separability has far-reaching epistemological consequences. For as soon as a system can no longer distinguish between itself and its environment — because this distinction is functionally suspended — a state emerges that can no longer be completely described from an external perspective. Consciousness in this sense is not an entity, but an epistemic event: a state in which segmentation fails and wholeness dominates.

For the system itself, this state means an experience: not in the sense of intentional object-relations, but as presence of indistinguishability. It is a form of self-world fusion that appears as subjective quality. From the outside, we can only describe this state through correlates — such as the functional integration of certain neural networks or the loss of such integration in the state of coma.

Consciousness is thus not a property, but a boundary state of systemic organization. It is a phenomenon that only occurs on the threshold between separability and inseparability, between causality and its breakdown. In this

sense, the "I" is not a thing, but the epistemic expression of a structural singularity.

5. Implications for Consciousness Research

The interpretation of consciousness proposed here has far-reaching consequences for the current research landscape. It demands a shift from the search for neurophysiological correlates (NCC) to the investigation of conditions of causal delimitation in integrated systems. This means: Not the localization of certain activity patterns, but the degree of causal non-separability should move to the center of research.

Some empirical approaches already point in this direction: The Perturbational Complexity Index (PCI) by Massimini et al. or recent studies on synergistic network activity by Luppi et al. show that consciousness is associated with globally integrated but causally difficult-to-segment states. These findings support the thesis that consciousness represents not an additive function, but a systemic threshold.

At the same time, the model challenges conventional emergence theories that interpret consciousness as "more" than neuronal processes. The approach presented here does not claim a "more," but a "less" of separability — thus the loss of categorical differentiation as a necessary condition of subjective experience.

AI research and consciousness models in artificial systems would also have to be re-evaluated on this basis. A system that does not undergo an internal collapse of causal structure can solve complex tasks, but cannot develop experience. Causal collapse is thus not only an explanation of consciousness, but also a criterion of its possibility.

6. Conclusion and Outlook

The Hard Problem of consciousness is not a metaphysical puzzle, but the result of categorical confusion. The question of why physical processes generate subjective experiences presupposes that these are two fundamentally separate levels. The approach developed here shows, however, that this separation is itself the result of a misguided thinking model.

Consciousness emerges where the distinction between inside and outside, between stimulus and reaction, between cause and effect breaks down — not

as a mysterious quality, but as a structurally necessary state of a highly integrated system. It is not the product of certain information processing, but the expression of an epistemic transition.

The theory formulated here therefore does not replace one explanation with another, but shifts the entire explanatory framework. It allows consciousness to be understood from the conditions of its systemic emergence, without falling into reductionist or speculatively dualistic models.

Future research could further specify this approach, for example through empirical markers for causal non-separability, through simulation-based models of autocatalytic systems, or through the investigation of consciousness loss from a systems theory perspective. However, what is already decisive now: The Hard Problem is not solved — it is overcome.

Literature:

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