Consciousness: A Dual-Component Computational Architecture of the Self

Alfredo Bregni

Independent researcher / retired electronic engineer and business consultant

abregni@iperv.it

Abstract

A dual-component computational architecture of consciousness and the emergence of the "self" based on asymmetric inter-brain communication is proposed. Self-awareness is modelled not as a localized quality, but as an integrated subject-object system emerging from the structural translation between the brainstem / autonomic networks (dedicated to closed-loop visceral monitoring) and the cerebral cortex (dedicated to open-loop environmental mapping). It's argued that the "self" acts as a computational reference coordinate required to synthesize these distinct information flows under localized resource constraints.

Preliminary distinction

For an effective discussion, we must clearly separate *three distinct meanings*:

1. *Medical*: biological on/off switch of being awake vs. fainting or being in a coma.
2. *Cognitive*: biological information system monitoring our body, processing data, and guiding our movements within the environment (this is our only focus).
3. *Moral*: social / cultural understanding of right and wrong (clearly outside the scope of this paper).

Introduction

Philosophers often speak of the "hard problem" of human consciousness, i.e. the purported mystery of not just processing data, but also *feeling experiences from the inside,* with the purported twin problems of "*self*" and "*qualia*". This paper argues that the former has a quite direct explanation, while the latter is apparent.

Intertalk between brains

A living organism must constantly guard its physical boundaries, in order to stay alive and avoid decay. In vertebrates, this survival mechanism relies on *two separate "non-twin" brains*, *grown from different embryonic lines*, sharing the same skull:

- *Brainstem and autonomic system*, which only sense the internal state of the body. If there is damage, it generates raw data: "Damage occurring. Pain."

- *Cerebral cortex / intellect*, which looks outward, mapping sensory details and physical movements. It calculates: "The moved arm collided with a solid object."

The concept-and-feeling of the "self" is modelled not merely as a passive information reference, but as an integrated subject-object architecture emerging from the asymmetric dialogue between these two systems.

Faced with an environmental threat, the two brains operate with distinct logical structures:

- The inside-dedicated brain functions as a closed biological loop of "feeling-and-felt". It is an existential subject-object deeply experiencing its own states, yet it lacks the meta-cognitive capacity to know it(self).

- The outside-dedicated brain operates strictly as a "knowing" subject. It maps external geometries and computes spatial relationships, detached from the visceral reality of the flesh.

The intertalk between them is therefore more complex than a simple data exchange; it is a process of translation and structural integration. When the outside-dedicated brain translates an external event to its non-twin — "*You feel pain because I moved the arm and hit a sharp corner*" — it recognizes the internal system as a feeling subject-object. To resolve this equation, the intellect projects a common reference point.

Within this shared reference — the "me" — the open loop of external knowing and the closed loop of internal felt-feeling collapse into each other. The "self" ceases to be a static label and becomes a dynamic entity that is simultaneously knowing-known and feeling-felt.

While this dual embryonic hardware is conserved across all vertebrates, the explicit transition where the common reference shifts from a communication shortcut into a fully integrated subject requires a specific threshold of recursive symbolic computation. In the language of predictive processing, this can be modelled as a minimization of variational free energy:

- Coordinate synthesis: the internal dialogue forces the system to instantiate a unique reference coordinate to unify the internal state-space maps with external spatial geometries when both share the same physical boundaries (the skull).

- Recursive loop: self-awareness operates as a single recursive feedback loop where the intellect processes its own state-monitoring data as an objective input, resolving the subject-object dichotomy through linguistic and symbolic shortcuts.

Qualia

Within this framework, the purported mystery of "qualia" disappears. Qualitative experiences are just the perceived output of a local specific biology, physically settling down when responding to a specific input. If the biology is broken or genetically different (such as in color blindness), the way it settles changes, and the internal experience shifts. Our agreement on these sensations is purely linguistic and social: we agree to call a certain wavelength "red" to communicate effectively, not because our biologies are identically tuned.

Potential direction for future comparative research

To verify this dual-hardware framework, we must look outside the vertebrate lineage. The optimal model for expanding this theory is an intelligent organism that completely lacks the shared cranial interface of separate embryonic nervous systems: the order Octopoda.

The octopus possesses 1 central brain and 8 independent, highly complex nerve centers inside each arm. Every arm processes sensory data and executes movements locally, sending only high-level summaries to the center. This internal communication is a decentralized group discussion rather than a linear duetto between two cranially enclosed systems.

The octopus represents the ideal comparative control: since it lacks the vertebrate single, centralized geometric interface between internal and external guarding, a permanent, monolithic "self" should not exist. Investigating the intertalk of this decentralized network will test how a biological system can achieve high intelligence and environmental integration without possibly developing a central ego.

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