

The Social Algorithms of Thought: A Neuro-Evolutionary Perspective on the "Cave"

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Abstract

Cognition has historically been modelled as a solitary information-processing event, yet converging evidence from evolutionary anthropology and systems neuroscience suggests the brain is fundamentally architected for social coordination. This perspective synthesizes research to propose that human neural architecture is not merely influenced by society but is constitutively shaped by the pressures of social synchronization. Using Plato's Allegory of the Cave as a heuristic framework, I trace the "thinking process" from its metabolic hardware (Dunbar, 1998) and resting-state dynamics (Geisler and Meyer, 2025) to its transmission mechanisms (Hasson et al., 2012; Yuan et al., 2018) and cultural scaffolding (Valsiner, 2026). I argue that the tension between social compliance and individual cognition represents an evolutionary trade-off—a circuit-level prioritization required to maintain the physical and functional integrity of the mammalian brain (Liu et al., 2012).

1 Introduction: The Biological Cave

In *The Republic*, Plato describes prisoners chained in a cave, perceiving only shadows cast on a wall and accepting them as reality. While traditionally interpreted as a metaphor for philosophical ignorance, this allegory offers a compelling model for human cognitive architecture when viewed through the lens of mechanistic neuroscience.

Despite the fact that complex coordinated behaviour in humans is defined by obligate sociality, cognitive science has often treated the brain as a solitary processor optimizing for the analysis of the physical environment (Hasson et al., 2012). However, recent findings suggest that social constraints are not merely external variables but are central to the constitution of the thinking process itself (Hasson et al., 2012). A fundamental gap remains in understanding how our biological "resting state" and executive faculties are optimized for social survival, potentially at the expense of objective accuracy. This essay proposes that human neural architecture functions as a system built for social coordination, operating as a "negotiated settlement" between biological empathy and the imperative for synchronization (Valsiner, 2026).

2 The Hardware: Metabolic Constraints and Computational Demands

The "Cave" is likely a structure built from within, driven by specific evolutionary constraints. The adult human brain creates a significant metabolic demand, consuming 20% of total energy intake despite comprising only 2% of body weight (Dunbar, 1998). Evolutionary theory implies that such a high "energy tax" is unlikely to be selected for general-purpose problem solving alone. The Social Brain Hypothesis provides a functional explanation: neocortex size in primates correlates exponentially with social group size rather than ecological factors like foraging range (Dunbar, 1998). This suggests the brain is specialized for the computational demands of "tactical deception" and "coalition formation" within groups of roughly 150 individuals (Dunbar, 1998). Consequently, human cognition may be biologically biased to track the shifting intentions of conspecifics—the "shadows"—rather than static physical facts.

3 The Chains: Endogenous Circuit Dynamics

Neuroscience reveals that the brain's "fixation" on the social world is driven by active circuit dynamics. Research by Geisler and Meyer (2025) challenges the view of the brain's "resting state" as passive. They review evidence that the Default Mode Network (DMN) engages strongly during rest, utilizing downtime for "Social Guiding" and "Social Consolidation" (Geisler and Meyer, 2025).

Much like locomotor state facilitates the acquisition of sensory-motor associations in the cerebellum (Albergaria et al., 2018), the DMN appears to provide a "state-dependent" bias for cognition. Data indicates that even in brief pauses of 2–6 seconds, the brain switches states to "shape immediately following social cognition and behavior" (Geisler and Meyer, 2025). Furthermore, the DMN prioritizes committing social information to memory over non-social data (Geisler and Meyer, 2025). This suggests that our preoccupation with "others" is not a volitional choice but a consequence of endogenous circuit dynamics that default to social processing when attention-demanding tasks cease.

4 The Projections: Signal Transmission and Neural Coupling

How are constructs transmitted between individuals to form a shared reality? Hasson et al. (2012) propose Brain-to-Brain Coupling as a mechanism, arguing that cognition materializes in an "interpersonal space." During successful communication, a listener's brain activity mirrors the speaker's with temporal delays matching information flow (Hasson et al., 2012). Crucially, in areas like the medial prefrontal cortex, the listener's activity can precede the speaker's, indicating active prediction of the social script (Hasson et al., 2012). This coupling reflects temporally aligned neural dynamics driven by shared stimulus structures and predictive modeling.

The protocol for this transmission appears to be narrative. Yuan et al. (2018) identified a "Narrative Hub" in the mentalizing network (Temporoparietal Junction, Posterior Superior Temporal Sulcus, Posterior Cingulate Cortex) that activates across speech, mime, and drawing. They argue that narration is the production counterpart to the perceptual process of theory of mind (Yuan et al., 2018). Given that 96% of languages place the Agent before the Object, Yuan et al. (2018) suggest human neural circuits are biased to process the world through a simulation of "Other-Agency." Thus, we do not just process events; we

simulate minds to predict social outcomes.

5 The Programming: Cultural Scaffolding of Logic

The constructs perceived are often culturally installed "software." Valsiner (2026) argues that thinking is a process where "personal subjectivity... is constantly negotiated with societal norm systems" (p. 231). Within Valsiner's theoretical framework, formal schooling—particularly in Western-style educational models—is argued to prioritize a Deductive Frame (accepting a Major Premise provided by authority) over natural Inductive Reasoning (relying on direct sensory experience) (Valsiner, 2026).

Luria's "White Bear" experiments illustrate this distinction. When asked to deduce the color of bears in the North based on a provided rule, uneducated subjects refused, stating, "I've never seen one and hence I can't say" (Valsiner, 2026). They relied on induction. Schooled minds, however, readily accepted the rule as truth. This suggests that "logic" acts as a cultural scaffold, ensuring compliance with the "Universe of Causes" provided by society (Valsiner, 2026).

6 The Trade-Off: Maladaptive Plasticity and the Cost of Dissent

The tension between social connection and individual moral truth is likely an evolutionary trade-off rather than a "glitch." Liu et al. (2012) provide evidence for the physiological stakes of isolation: prolonged social isolation in adult mice causes hypomyelination (thinner insulation) and epigenetic chromatin changes in the Prefrontal Cortex. While animal models must be interpreted with caution, this suggests that the mammalian brain's executive hardware requires social input to maintain structural integrity (Liu et al., 2012).

This biological imperative for connection frames the results of Milgram (1963). Milgram described obedience as the "dispositional cement" binding men to authority. In his study, subjects displayed extreme tension, including "nervous laughing fits" that seemed "bizarre" (Milgram, 1963). This reaction can be interpreted as a behavioural manifestation of competing regulatory systems: the affective drive for empathy versus the normative drive for obedience. In 26 of 40 cases, the normative pressure prevailed (Milgram, 1963). Adherence to a "deductive frame" can allow individuals to bypass moral qualms

because their actions fit an accepted social premise, prioritizing the preservation of the social bond over executive control (Valsiner, 2026).

7 Limitations and Alternative Perspectives

While this synthesis emphasizes the social constitution of thought, it is important to acknowledge competing frameworks. Cognition is also shaped by ecological pressures, tool use, and energy minimization independent of sociality. Furthermore, the extrapolation from murine myelination (Liu et al., 2012) to human complex thought requires nuance; extreme social deprivation has been associated with measurable neural changes in mammalian models, highlighting the biological importance of social environments, but this does not imply that intellectual independence or dissent inherently leads to cognitive decline. Additionally, this framework relies primarily on secondary synthesis rather than novel empirical testing. Future empirical work should aim to test specific predictions generated by the "Cave" framework, particularly regarding spontaneous cognition and social learning dynamics.

8 Conclusion: Adaptive Behaviour in the Cave

The dilemma is clear: social environments are biologically essential for maintaining neural hardware (Liu et al., 2012), yet staying within the social fold carries the risk of collective irrationality. The solution is likely not escape, but awareness of these circuit-level constraints.

Freedom of thought may be best understood as a "negotiated settlement" (Valsiner, 2026). Breaking the cycle of deductive obedience likely benefits from Abductive Reasoning—the creative leap that synthesizes observation with theory to generate novel ideas (Valsiner, 2026). Recognizing that the "Default Mode" is biased toward social consolidation allows the individual to actively seek the friction of "thinking together" to challenge the shadows. True cognitive agency lies in recognizing that the thinking process is a tool that must be consciously negotiated, rather than a program blindly run.

References

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