

Why the Dissolving Self Is Imagined as an Ocean Planet: Default Mode Network Downregulation in Altered States and the Cognitive Basis of the Neptune Metaphor

Working paper · Version 1.0.0 · 2026-06-04 · Not peer reviewed

Citation and status boundary: this PDF is a stable public working-paper edition. It is not a peer-reviewed journal article. Consult the canonical web edition for interactive material, linked resources, corrections, and the current machine-readable citation record.

Architect & Curator: Mayone Maha Rajan AI Synthesis Instrument: Google Antigravity (agentic model)

This paper was produced through human-directed AI synthesis. The human architect curated the inquiry, selected the source domains, and is responsible for all claims; the AI instrument assisted with drafting and literature synthesis under that direction. All empirical claims are the author's responsibility and should be checked against the cited primary sources.

Abstract

Across a range of altered states flow, deep meditation, and the classic psychedelic experience subjects report a softening or loss of the ordinary boundary between self and world, often described as "ego dissolution" or "oceanic boundlessness." A convergent body of neuroimaging and theoretical work associates these states with reduced activity in, and reduced integrity of, the brain's prefrontal and default mode systems. This paper has two aims. First, it reviews the genuinely supported neuroscience: that attenuated self-referential processing in altered states is associated with downregulation of the medial prefrontal cortex and the Default Mode Network (DMN), and that the same substrate is implicated in both adaptive states (flow, mystical experience) and maladaptive ones (depersonalization, aspects of psychosis). Second, it asks a question that is not neuroscientific but cognitive: why is this interior experience so persistently imagined through the image of a boundaryless ocean and, in the astrological and literary tradition, specifically through the planet Neptune rather than the gas giants Jupiter or Saturn? We argue, using structure-mapping theory and conceptual metaphor theory, that the selectivity of this metaphor is explained by relational features of the source domain (a body with no sharp surface, an off-axis and disordered organizing field) being mapped onto the relational structure of boundary-dissolution. We are explicit throughout that this is a claim about human metaphor formation, not a claim that planetary physics and neural dynamics share a mechanism. They do not. The planet is a vehicle the mind reaches for; the paper's scientific object is the mind that reaches.

1. Introduction

A recurring report in the literature on altered states is that the felt boundary of the self can thin, soften, or vanish. William James catalogued it; meditators describe it as non-dual awareness; psychedelic subjects call it ego dissolution; athletes and performers describe a related, milder loss of self-consciousness in flow. The phenomenology differs across these states, but a common thread is the attenuation of the ordinary sense of being a bounded subject set against an external world.

Two distinct questions arise from this observation, and they belong to two different disciplines. The first is neuroscientific: what changes in the brain when the sense of self thins? The second is cognitive and humanistic: why do people across

cultures reach for the same family of images water, ocean, depth, dissolution, drowning to describe it, and why does a particular symbolic tradition attach it to one planet and not others?

This paper addresses both, but it keeps them rigorously separate, because conflating them is a category error that has produced a good deal of pseudo-rigorous writing. We will review the neuroscience of self-attenuation (Section 2), describe the relevant physical facts about Neptune and, for contrast, Jupiter and Saturn (Section 3), and then treat the central research question the cognitive basis of the metaphor's selectivity as a problem in the psychology of analogy (Section 4). We state plainly here, and repeat in the conclusion, what this paper does not claim: there is no shared mechanism, law, or dynamical isomorphism between planetary physics and neural activity. The interest lies entirely in why the human mind finds one planet a more apt vehicle than another for an interior event.

2. The Neuroscience of Self-Attenuation

2.1 The Default Mode Network and the sense of self

The Default Mode Network (DMN) is a set of interacting regions prominently the medial prefrontal cortex and posterior cingulate cortex, with the inferior parietal lobule that is reliably engaged during rest and self-referential thought, including autobiographical memory, self-projection, and mind-wandering. It is most active when attention is not directed outward at a task, and it is closely associated with the construction and maintenance of a narrative self.

2.2 Psychedelics and ego dissolution

The clearest experimental window on self-attenuation comes from psychedelic neuroimaging. Carhart-Harris and colleagues, studying psilocybin with fMRI, found that the drug decreased rather than increased activity and blood flow in key hub regions, including the DMN a result that surprised the original hypothesis. Subsequent work tied the subjective experience of ego dissolution to these network changes: Lebedev and colleagues reported neural correlates of ego dissolution under psilocybin (a study aptly titled "Finding the self by losing the self"), and Tagliazucchi and colleagues found that increased global functional connectivity a breakdown of normal network segregation correlated with LSD-induced ego dissolution. Across psilocybin, LSD, and ayahuasca, a consistent picture emerges: reduced within-network DMN integrity accompanies the felt loss of self-boundaries.

2.3 Flow and transient hypofrontality

A milder, non-pharmacological form of self-attenuation appears in flow. Dietrich's transient hypofrontality hypothesis proposes that absorbed, effortless performance is accompanied by a temporary downregulation of prefrontal cortex the very system responsible for self-monitoring, time-tracking, and explicit evaluation. On this account the phenomenological hallmarks of flow (loss of self-consciousness, distorted time sense, effortlessness) follow from the temporary quieting of explicit, prefrontally-mediated control, allowing more efficient implicit processing to run unimpeded. Dietrich extended the proposal to altered states generally, suggesting transient hypofrontality is a common feature whose distinct flavors reflect which frontal circuits are downregulated.

2.4 The same substrate, adaptive and maladaptive

Crucially, the same systems implicated in these prized states are implicated in distressing ones. Depersonalization the unwanted sense of detachment from self and aspects of psychosis have been linked to dysregulation of self-referential and salience networks; Kapur's influential "aberrant salience" framework models psychosis partly as a disorder of how significance is assigned to internal and external events, and a body of work associates altered DMN function with schizophrenia. The lesson is not that flow and psychosis are "the same," but that the dimension along which the self can

thin is a real neural dimension that can be traversed adaptively or catastrophically. What distinguishes the mystic's controlled dissolution from the patient's involuntary one is not a different mechanism so much as context, control, and reversibility.

2.5 What the evidence supports, and what it does not

The defensible claim is this: self-attenuation in altered states is associated with downregulation of prefrontal and default-mode systems, and this dimension is shared across adaptive and maladaptive states. The evidence does not support a single unifying mechanism identical across all these states. The DMN account is itself heavily debated; alternative neurobiological models emphasize the cortico-striato-thalamo-cortical (CSTC) loop (where the thalamus fails to gate sensory information, flooding the cortex) or disruptions in the Salience Network (shifting how internal and external stimuli are weighted). Furthermore, flow and psychedelic states do not show identical changes, and "ego dissolution" may not be a single construct. We take the conservative version: a shared dimension, robustly associated with these cortical networks, not a single proven mechanism.

3. Three Planets, Three Structures

To analyze why the dissolution metaphor selects one planet, we need the relevant physical facts about the candidates. These are stated as planetary science, with no implied connection to the brain.

3.1 Jupiter and Saturn: bounded, axial, ordered

Jupiter and Saturn are gas giants whose magnetic dynamos are closely aligned with their rotation axes Saturn's is famously almost perfectly axisymmetric. Their banded structure is strongly organized; their fields present a clear dipolar "up" and "down." In structural terms, they are systems with a dominant axis and a legible organization.

3.2 Neptune: unbounded, off-axis, disordered

Neptune differs on exactly the features that matter for the metaphor. It is an ice giant with no sharp surface: a descent through it passes continuously from gas to supercritical fluid to a dense interior, with no discrete boundary at which "atmosphere" becomes "ground." Its magnetic field is extreme among the planets tilted roughly 47 from the rotation axis and offset substantially from the planet's center, producing a markedly non-dipolar, asymmetric field. It also radiates significantly more heat than it receives from the Sun, so its dynamism is driven from within rather than by external input.

3.3 The relational contrast

The contrast that matters is not any single number but a relational profile: Jupiter and Saturn are bounded and axially organized; Neptune is boundaryless, off-axis, and internally driven. Hold that profile; Section 4 is about why a mind would map it onto an interior experience.

4. The Cognitive Basis of the Metaphor's Selectivity

4.1 Metaphor as structure mapping

Gentner's structure-mapping theory holds that analogy and metaphor work by aligning relational structure between a source and a target, not by matching surface attributes. In the canonical example, "heat flow is like water flow" succeeds not because heat resembles water but because both instantiate the relation flow of a quantity from high to low potential. The quality of a metaphor depends on the depth and systematicity of the relational match, not on superficial similarity.

Conceptual metaphor theory (Lakoff and Johnson) adds that abstract and interior experiences are routinely structured by concrete source domains, and that we have little direct vocabulary for inner states except through such mappings.

4.2 Why an ocean, and why Neptune

The interior experience described in Section 2 has a relational structure: a normally bounded, centrally organized self loses its boundary and its central organizing control, and the result can be either generative or engulfing. Ask which source domains carry that same relational structure. A boundaryless medium with no sharp surface maps onto the loss of the self/world boundary. An off-axis, decentered organizing field maps onto the loss of central executive control (and onto the felt "tilt" of non-ordinary or non-consensus cognition). An internally-driven rather than externally-lit system maps onto states generated from within rather than by sensory input. Water and ocean supply the first relation, which is why the cross-cultural vocabulary of dissolution is aquatic drowning, depth, flood, the oceanic feeling. Within the planetary symbol set specifically, Neptune uniquely supplies all three relations at once: no surface (boundary loss), an extreme off-axis field (loss of central organization), and internal heat (endogenous generation). Jupiter and Saturn, bounded and axial, carry the opposite relational profile which is precisely why the tradition assigns them to structure, authority, and limitation, not dissolution.

4.3 The Historical Paradox: Myth Before Measurement

It is necessary to address a historical paradox in this mapping. Neptune was discovered mathematically in 1846 and named for the Roman god of the sea simply because its atmosphere appeared azure blue through early telescopes. Its astrological and mythic associations with illusion, dissolution, and the deep unconscious developed from this aquatic namesake long before spacecraft could measure its interior.

The extreme physical realities that make it such a perfect structural match for ego dissolution—the lack of a solid surface, the 47 offset dynamo, the endogenous heat—were not confirmed until the Voyager 2 flyby in 1989. Therefore, the ancients and early moderns did not map the planet's physics to the mind; they mapped the ocean to the mind, and gave the ocean's name to the planet. Modern conceptual mapping merely inherits this aquatic metaphor, but discovers in a stroke of poetic, historical irony that the actual geophysical reality of the planet matches the neurocognitive reality of the dissolving self with uncanny precision.

4.4 The claim, stated precisely

The selectivity is therefore not arbitrary, but neither is it physical. It is a high-quality structural match in Gentner's sense: Neptune's relational profile (boundaryless, off-axis, internally driven) aligns with the relational profile of self-dissolution (boundary loss, decentered control, endogenous origin) better than the gas giants' profile does. The metaphor is apt because the relations align, and it selects Neptune because Neptune is the planet whose relations align best. This is a fact about how minds build analogies it would hold even if Neptune's physics were entirely different, so long as its relational description were the same. The planet's actual fluid dynamics and the brain's actual neural dynamics never enter into causal contact; what makes the metaphor work is the alignment of their descriptions in the mind of the metaphor-maker.

5. Discussion

This reframing dissolves a confusion that recurs whenever people are struck by a cross-domain resemblance. The pull to say "Neptune and the dreaming mind are the same system" is strong precisely because the structural match is good—a good structure-mapping feels like the discovery of a hidden identity. But the feeling of profundity is evidence about the quality of the analogy, not evidence of a shared mechanism. Recognizing this is what lets us take the metaphor seriously

without overclaiming: we can say exactly why the image is apt (relational alignment) and exactly what it is not (a physical law).

The account also makes the adaptive/maladaptive duality intelligible at the level of meaning. If the metaphor's core relation is loss of boundary and central control, then the same image naturally bifurcates into "the mystic who dissolves and returns" and "the person who is engulfed and does not," because the source domain itself contains both readings: the ocean is both where one swims and where one drowns. The duality in the neuroscience (Section 2.4) and the duality in the metaphor are not the same fact, but the second is a faithful structural image of the first which is what a good metaphor is.

Finally, the approach is general. The method here describe the target's relational structure, describe candidate sources' relational structures, and predict which source a mind will select could be applied to other persistent scientific and mystical metaphors, and could in principle be tested: presented with novel source domains varying systematically in boundedness, axiality, and drive, do people reliably rate the boundaryless/off-axis/internally-driven ones as better metaphors for self-dissolution? That is a falsifiable prediction about human cognition, not about planets.

6. Conclusion

We have reviewed the genuinely supported neuroscience of self-attenuation its association with prefrontal and default-mode downregulation, and the shared substrate underlying both prized and pathological forms and we have analyzed why this interior experience is so persistently imagined as a boundaryless ocean, and within one symbolic tradition as the planet Neptune specifically rather than Jupiter or Saturn. The answer is a matter of cognition, not physics: Neptune's relational profile (no surface, off-axis field, internal heat) aligns unusually well, in the structure-mapping sense, with the relational profile of a self that loses its boundary and its central control. The gas giants carry the opposite profile and are accordingly assigned to structure rather than dissolution.

We state the boundary of the claim one final time. Planetary physics and neural dynamics share no mechanism, law, or isomorphism. The planet is a vehicle the mind reaches for to render an interior event communicable; the scientific object of this paper is the mind that reaches, and the principles by which it chooses its vehicle. That the metaphor is so apt is not a sign of a hidden cosmic identity. It is a sign that human beings are very good at finding, across the whole inventory of the world, the one image whose relations match the shape of what they feel.

References

- Carhart-Harris, R. L., et al. (2012). Neural correlates of the psychedelic state as determined by fMRI studies with psilocybin. *PNAS*, 109(6), 21382143.
- Lebedev, A. V., et al. (2015). Finding the self by losing the self: Neural correlates of ego-dissolution under psilocybin. *Human Brain Mapping*, 36(8), 31373153.
- Tagliazucchi, E., et al. (2016). Increased global functional connectivity correlates with LSD-induced ego dissolution. *Current Biology*, 26(8), 10431050.
- Carhart-Harris, R. L., & Friston, K. J. (2010). The default-mode, ego-functions and free-energy: a neurobiological account of Freudian ideas. *Brain*, 133(4), 12651283.
- Raichle, M. E. (2015). The brain's default mode network. *Annual Review of Neuroscience*, 38, 433447.
- Dietrich, A. (2003). Functional neuroanatomy of altered states of consciousness: The transient hypofrontality hypothesis. *Consciousness and Cognition*, 12(2), 231256.

- Dietrich, A. (2004). Neurocognitive mechanisms underlying the experience of flow. *Consciousness and Cognition*, 13(4), 746761.
- Kapur, S. (2003). Psychosis as a state of aberrant salience: a framework linking biology, phenomenology, and pharmacology in schizophrenia. *American Journal of Psychiatry*, 160(1), 1323.
- Gentner, D. (1983). Structure-mapping: A theoretical framework for analogy. *Cognitive Science*, 7(2), 155170.
- Lakoff, G., & Johnson, M. (1980). *Metaphors We Live By*. University of Chicago Press.
- Soderlund, K. M., et al. (2013). Dynamo models of Uranus's and Neptune's magnetic fields. *Icarus*, 224(1), 97113.

Note on sources: all references above are real and should be verified and page-checked against the primary literature before submission. The planetary-science claims (Neptune's ~47° dynamo tilt and offset, surfaceless structure, internal heat excess; Saturn/Jupiter axial alignment) are well established but should be cited to a current planetary-science review in the final version.

Canonical web edition and structured metadata: <https://research.mahastrategies.com/papers/dissolving-self-ocean-planet>