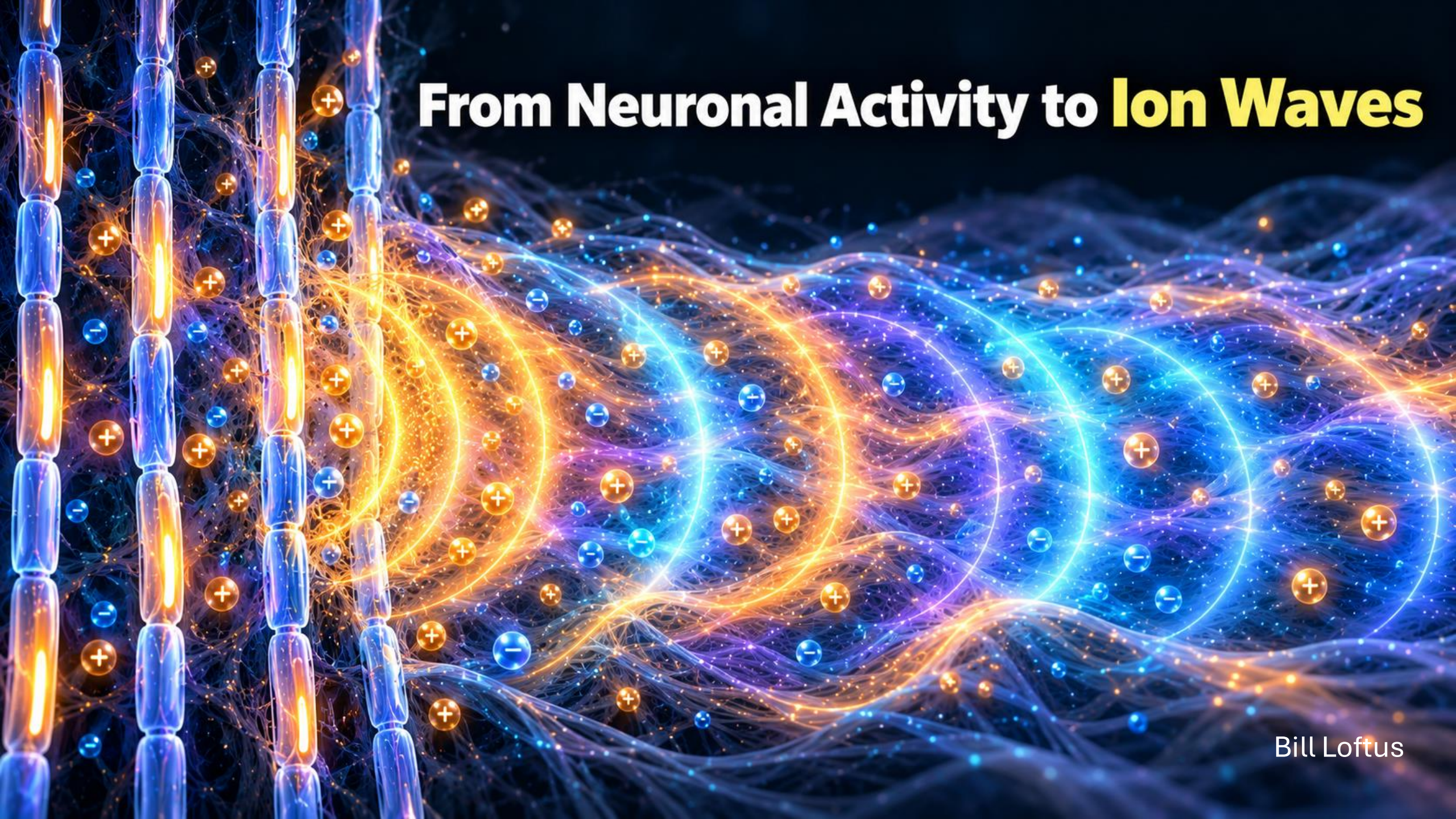
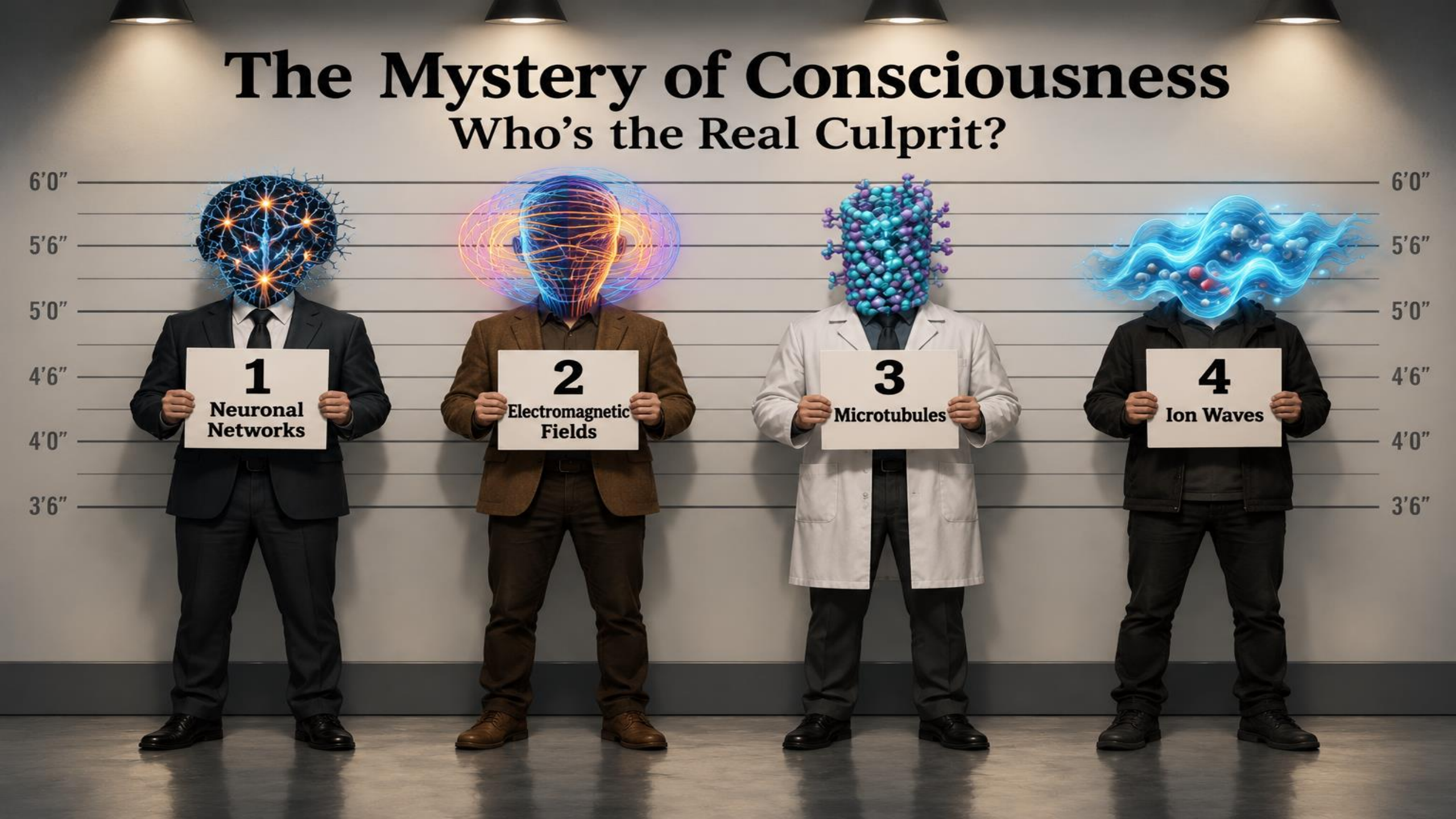

From Neuronal Activity to Ion Waves
Bill Loftus

The Mystery of Consciousness

Who's the Real Culprit?



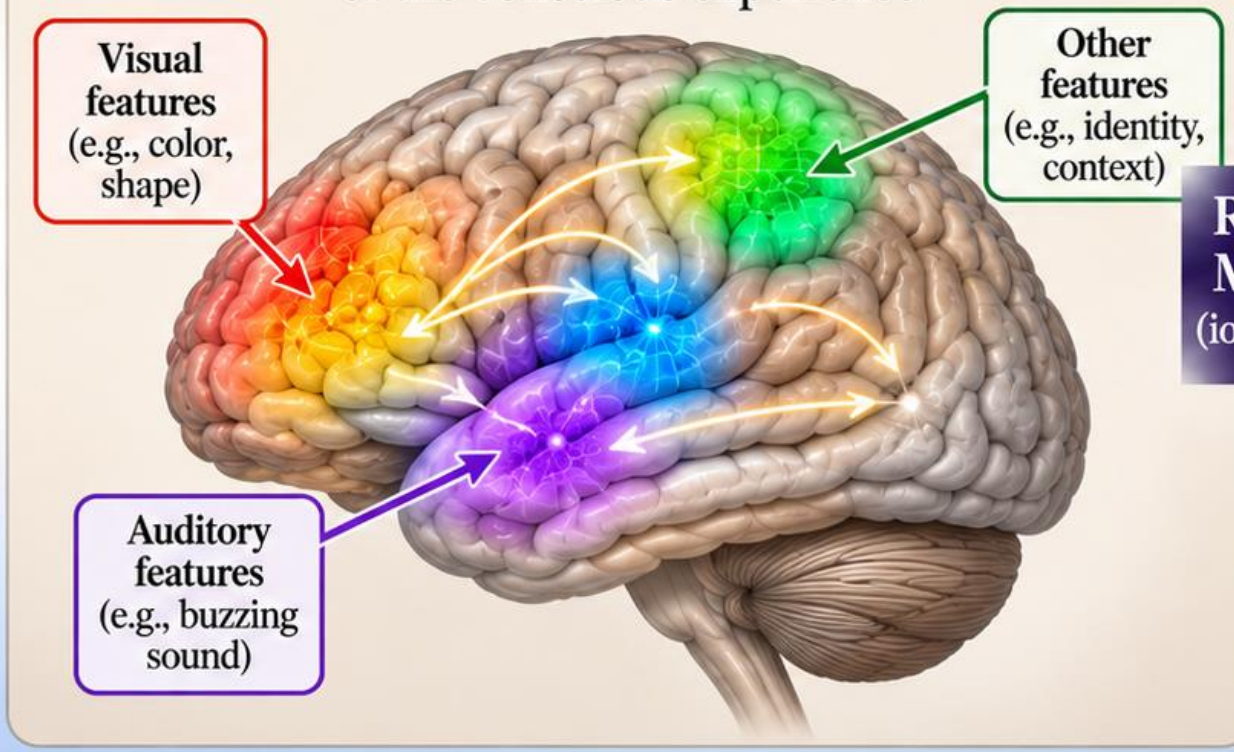
From Specification to Realization

Information vs. Conscious Experience

Specification

"What the conscious experience should be *like*"

Distributed patterns of neuronal activation carry information specifying the content of the conscious experience.



Realization Mechanism (ion wave system)

Realization

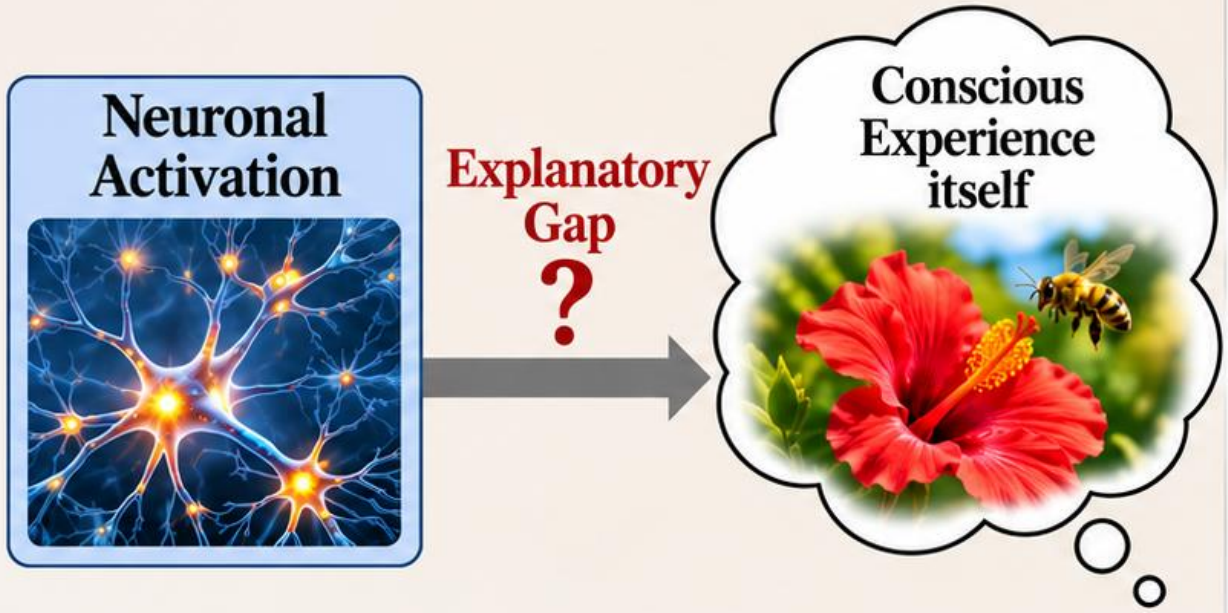
The conscious experience itself.



Two Views of the Path to Consciousness

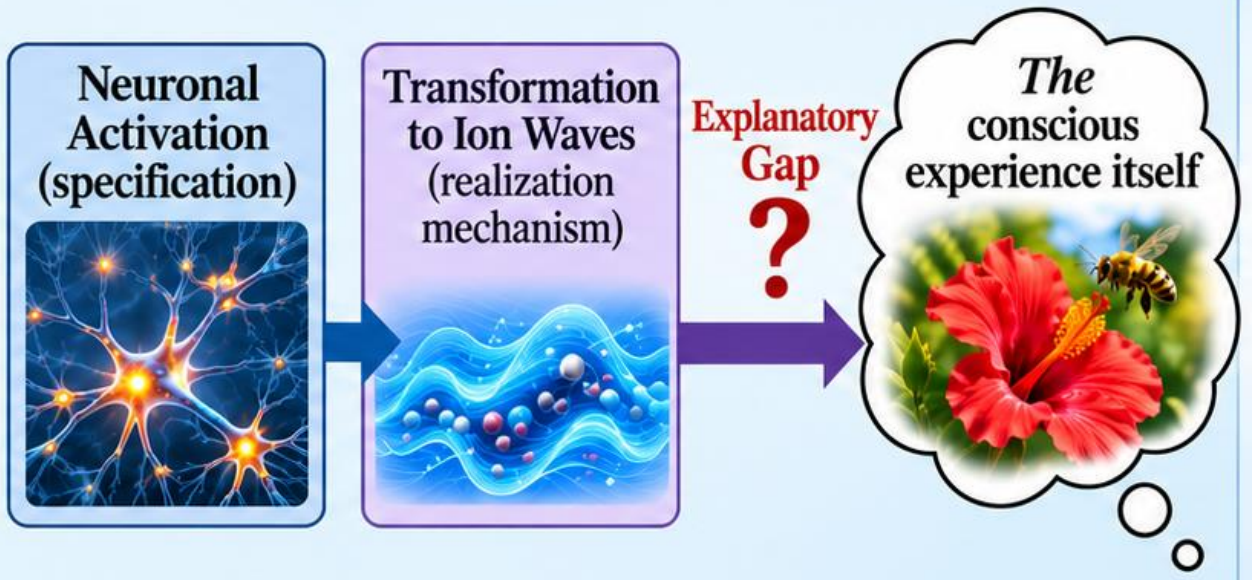
The Older View

Specification and realization are assumed to occur with neuronal activation *per se*.



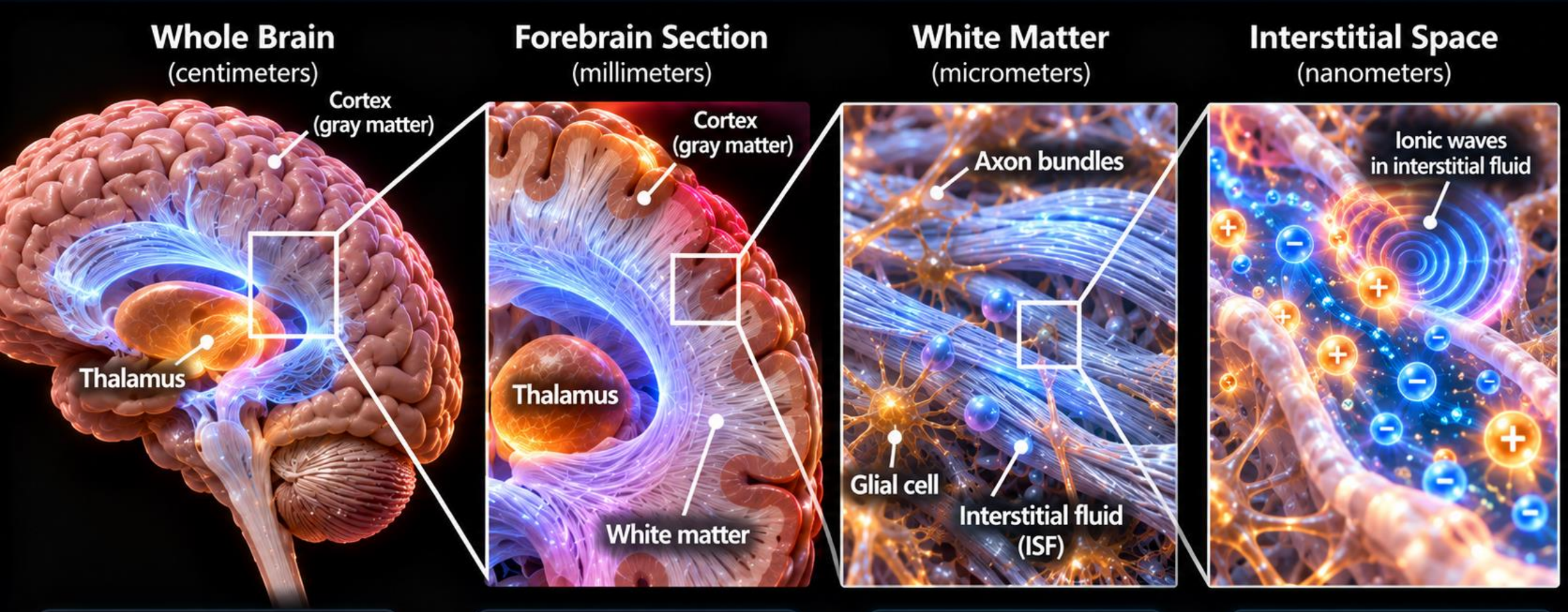
Proposed Ion Wave View

Neuronal activation specifies the experience, but realization may occur through ion waves in the interstitial fluid of the white matter.



The hard problem is *relocated*, not resolved.

Anatomy of the Proposed Ion Wave System



Cerebrum with cortex and white matter, and thalamus at center

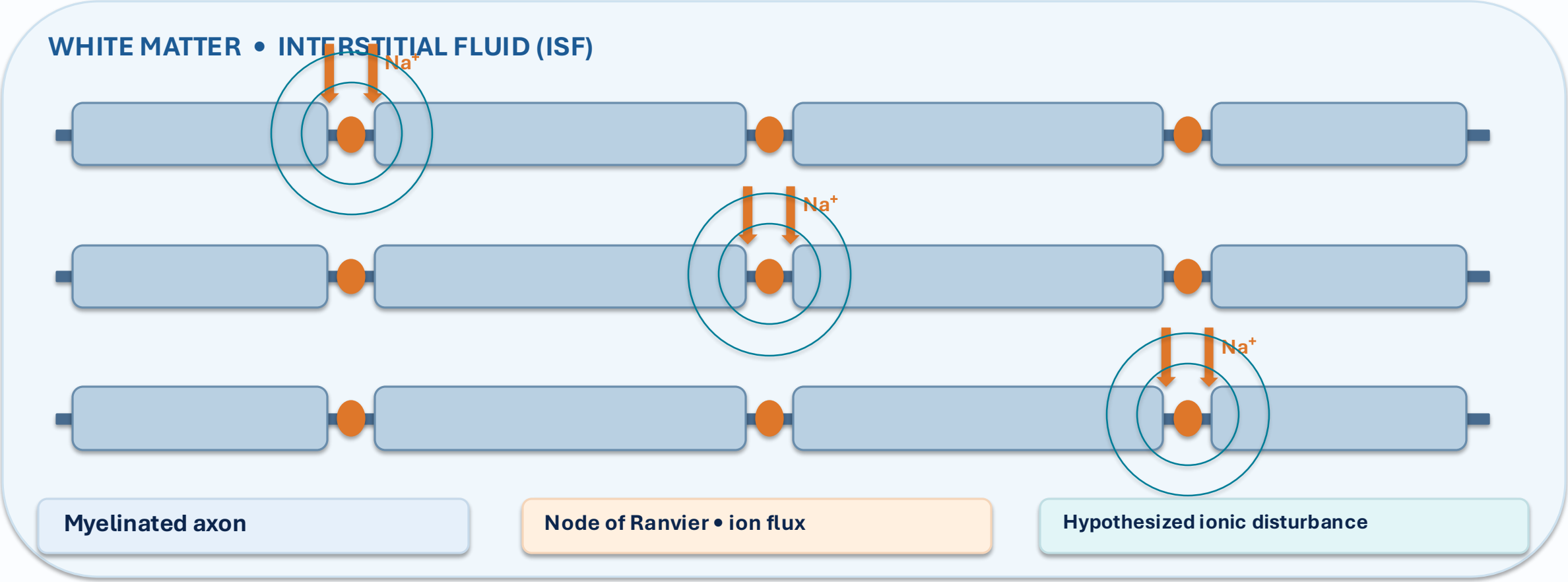
Gray matter (cortex) surrounds white matter with thalamus at center

Axon bundles in white matter bathed in interstitial fluid

Ions in interstitial fluid between axons and glial cells propagate as waves

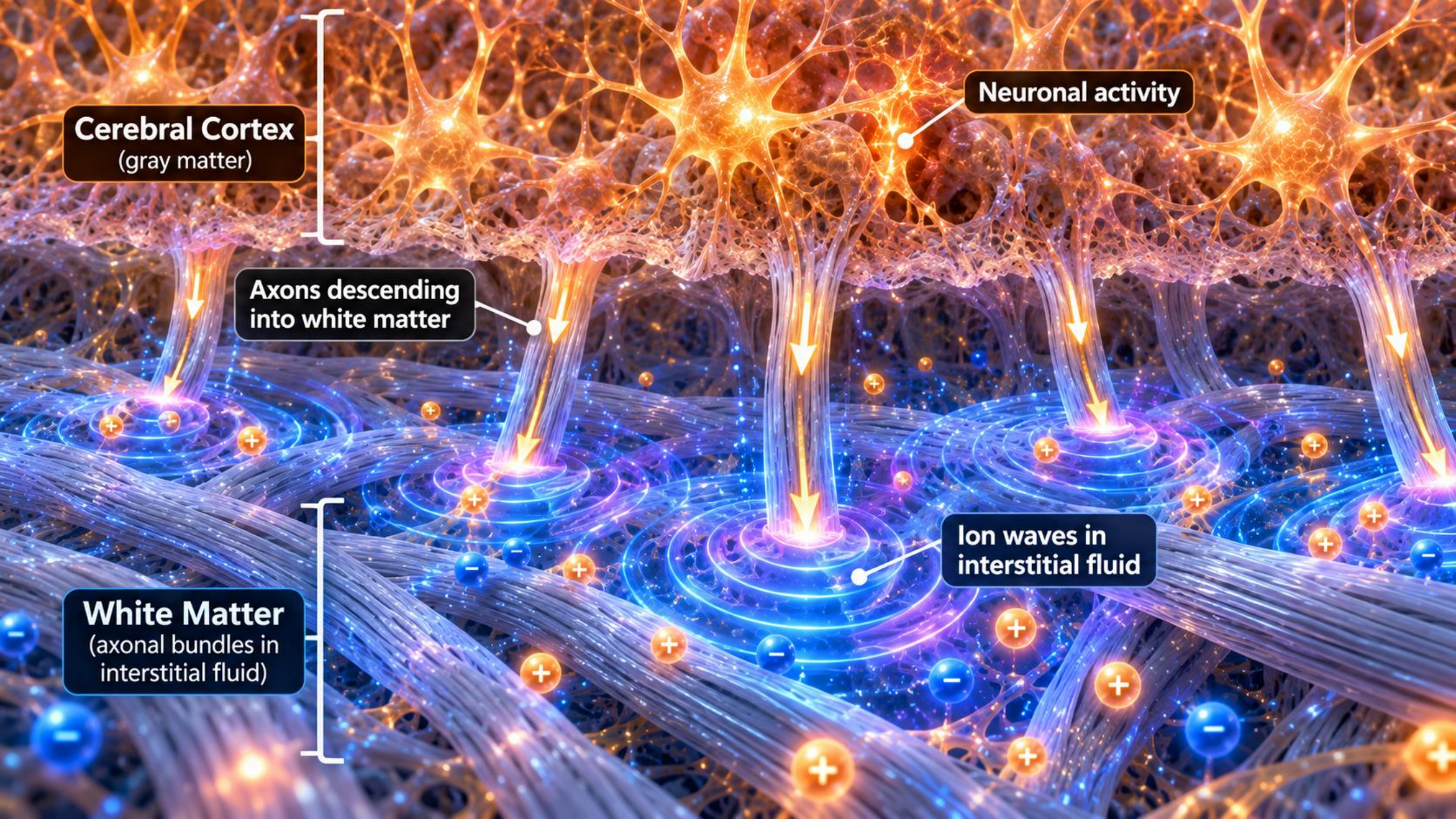
Are Ion Waves Biologically Plausible?

Proposed coupling between axonal action potentials and interstitial ionic dynamics



Relevant data Jiang-Xie et al., Nature 627, 157–164 (2024): neuronal dynamics generate ionic waves in brain ISF.

Schematic hypothesis—not direct evidence for nodal initiation, conscious content, or consciousness.


Cerebral Cortex
(gray matter)
Neuronal activity
Axons descending
into white matter
Ion waves in
interstitial fluid
White Matter
(axonal bundles in
interstitial fluid)

Realization may rely on both classical and extraclassical physical behavior within the ion wave system.

