

Is Consciousness Multiscale?

Microtubules, mitochondrial energetics and neural networks

A comparison framework and questions for testing cross-scale mechanisms. MCIH candidate v0.1.

The useful question is not whether everything connects. It is which connection matters, how it can be measured, and what result would distinguish competing explanations.

Status: exploratory editorial candidate. Consciousness mechanism and ontology remain unresolved.

Prepared for a possible conversation at TSC 2026. No affiliation, invitation, presentation acceptance or endorsement is implied.

Full webpage: <https://akashicnet.org/akashicomni/multiscale-consciousness>

1. The question worth taking to the conference

If neuronal microtubules contribute to consciousness, what measurable process connects their activity to cellular energetics, membrane electrophysiology and network dynamics? Which result would distinguish a specifically Orch OR contribution from conventional intracellular explanations?

This is an invitation to refine an experiment. It is not a claim that the listed structures jointly constitute consciousness, a proposed replacement for Orch OR, or an endorsement by Stuart Hameroff or the conference. The working label Multiscale Consciousness Interface Hypothesis (MCIH) is retained as an editorial candidate name; interface here means a relationship between explanatory levels, not demonstrated reception from an external consciousness field.

The broad idea that several scales matter is too flexible to be a discriminating theory on its own. A useful next version must name a mechanism, variables, a timescale, an expected effect and an outcome that would weaken that particular branch. No originality claim is made.

2. What the source anchors actually support

Orch OR proposes quantum processes in neuronal microtubules linked to objective reduction. Hameroff already describes a multiscale account connecting proposed microtubule events and neuronal activity. Asking how the coupling can be measured is more accurate than presenting multiscale thinking as something absent from his theory. [S1-S2]

The 2024 rat study reports delayed loss of righting reflex under isoflurane following epothilone B, a microtubule stabiliser. That behavioural endpoint is used as a proxy for unconsciousness. It does not directly measure subjective experience, coherent quantum computation or objective reduction. Drug effects and conventional cellular mechanisms remain alternatives. [S3]

Picard describes energy transformation and organelle-to-organism relationships within mitochondrial psychobiology. This motivates attention to energetic conditions, while leaving the claim that mitochondria generate consciousness unestablished. [S4]

Cogitate compared preregistered IIT and GNWT predictions about conscious visual content using multiple recording methods. Its findings aligned with some predictions and challenged important predictions of both. It neither tested Orch OR nor settled consciousness across all states. [S5]

3. A map of questions, not a ladder of proof

Molecular/cytoskeletal: Which microtubule property is proposed to matter? A change in polymer stability, optical response or vibration must not be relabelled quantum coherence without a suitable measurement.

Organelle/energetic: Which measure of mitochondrial function is relevant, in which cells, and at what timescale? An energetic change may enable ordinary neural function rather than identify a consciousness-specific mechanism.

Cellular/electrophysiological: Does the candidate process predict a membrane or synaptic change beyond what established physiology already predicts? Account for cell viability and general excitability.

Network: Is the outcome a change in conscious content, wakefulness, attention, reportability or task performance? These are not interchangeable. Oscillation frequency alone is not a consciousness marker.

Body/environment: Treat physiological and environmental conditions as possible inputs and confounds. Causal influence on experience does not establish that the whole environment is part of its constitutive substrate.

Experience: Reports and behavioural proxies require operational definitions and limitations. Experience is the target being explained, not another organelle or a final rung reached by adding biological scales.

4. Compare claims at the right level

Orch OR makes a proposed physical mechanism central. GNWT links conscious access to global broadcasting. IIT concerns intrinsic causal organisation and has proposed neural implementations. These theories differ in scope and can make incompatible claims; placing them on one map does not reconcile them. [S1, S5]

Mitochondrial psychobiology is a research field, not a competing complete theory of consciousness. Embodied approaches also span several positions rather than one uniform prediction. Compare specific statements rather than treating fields, theories and metaphysical positions as equal evidence units.

Panpsychism, cosmopsychism, idealism and physicalism concern ontology. Keep them in a separate unresolved question set. Some formulations may imply testable predictions; others are underdetermined by the available observations. An experiment on microtubules cannot, by itself, establish cosmic awareness or survival after death.

Quantum chemistry underpinning life is not equivalent to a demonstrated role for sustained quantum coherence in consciousness. Decoherence objections and responses involve contested assumptions; reading both abstracts identifies a debate, not its resolution. A candidate must specify the relevant quantum degree of freedom and how it survives and matters in the proposed setting. [S6-S7]

5. An illustrative test-development worksheet

Research question: Does a specified microtubule perturbation change a defined conscious-state endpoint through a pathway that is not fully accounted for by measured energetic and electrophysiological changes?

Before collecting data: define the species or human setting, intervention, primary endpoint, temporal ordering, exclusion criteria, analysis plan, clinically appropriate safeguards and independent replication target. This is a conceptual worksheet, not a ready-to-run protocol or a self-experiment.

Conventional comparator: predict the endpoint from anaesthetic exposure, cellular health, membrane activity and network measures without a specifically quantum mechanism. Measure plausible pharmacokinetic, motor and physiological confounds rather than assuming them absent.

Candidate branch: specify the additional microtubule variable and its predicted contribution. If a quantum mechanism is claimed, identify a validated quantum-sensitive measurement and a way to separate it from classical dynamics. A unique prediction must be supplied before the branch becomes a genuine test.

Weakening result: a reliable perturbation of the named variable fails to change the preregistered endpoint within a justified sensitivity range, or its apparent contribution disappears after relevant controls. State which branch is weakened; do not declare an entire metaphysics falsified.

Supporting result: the preregistered prediction replicates and exceeds the conventional comparator. Even then, establish measurement specificity and rule out alternatives. A better predictor is not automatically the causal mechanism.

6. Five questions for Stuart Hameroff

1. Which microtubule-to-neuron coupling is most concretely specified in the current Orch OR model, and where is it described quantitatively?
2. What role, if any, do mitochondrial energetics play in maintaining the proposed quantum process rather than ordinary neuronal activity?
3. What measurement could distinguish the proposed quantum process from classical microtubule dynamics in a relevant biological setting?
4. Which endpoint and control would best separate a consciousness-related effect from sedation, motor impairment, attention or reportability?
5. Which feasible result would most strongly weaken your preferred version of the mechanism, and which independent laboratory could replicate the test?

Opening wording: Professor Hameroff, I understand that Orch OR already connects microtubule processes with activity across scales. I am mapping the proposed links rather than offering a replacement theory. Which experiment would most convincingly distinguish an Orch OR-specific contribution from conventional intracellular and network explanations?

7. Editorial review and limits

Pass 1 - Discern: checked the central source anchors and distinguished established biological structures, reported results, proposed mechanisms and ontological questions. Corrected the description of the anaesthesia endpoint and recognised the existing multiscale scope of Orch OR.

Pass 2 - Deepen: replaced a broad synthesis claim with a comparison framework and test-development questions. Distinguished enabling conditions from constitutive mechanisms; separated conscious state, conscious content and reportability; made absent predictions and measurement limitations visible.

These are two AI-assisted editorial passes, not independent peer review, expert endorsement or a systematic literature review. No new experiment, dataset, formal mathematical model or evidence promotion is introduced. Current AkashicOMNI framework version and Big Question conclusions remain unchanged.

Prepared by AkashicNET / u/NeuronsToNirvana with OpenAI assistance, 30 September 2026. Candidate v0.1. References checked on that date. Source access is described individually below. Readers should consult the original research and its critiques before adopting a claim. No source figures, extended quotations or private material are reproduced.

8. Source ledger

S1 | Hameroff & Penrose (2014), Consciousness in the universe: a review of the Orch OR theory. *Physics of Life Reviews* 11, 39-78.

<https://doi.org/10.1016/j.plrev.2013.08.002>

Publisher search record inspected; full review not inspected in this pass. Used to identify the proposal, not validate it.

S2 | Stuart Hameroff, University of Arizona, Orch OR research overview.

<https://hameroff.arizona.edu/research-overview/orch-or>

Proponent overview inspected. Useful for accurately representing the theory; not independent corroboration.

S3 | Microtubule-Stabilizer Etoposide B Delays Anesthetic-Induced Unconsciousness in Rats (2024). *eNeuro* 11(8).

<https://doi.org/10.1523/ENEURO.0291-24.2024>

Journal abstract and indexed methods/figure excerpts inspected; full article retrieval blocked. No numerical effect estimate adopted.

S4 | Martin Picard (2022), Energy transduction and the mind-mitochondria connection. *The Biochemist*.

https://www.picardlab.org/uploads/7/7/8/4/77845210/biochemist_2022_energy_transduction.pdf

Five-page author-hosted article inspected. Perspective on bioenergetic psychobiology, not an experiment establishing a consciousness generator.

S5 | Cogitate Consortium (2025), Adversarial testing of global neuronal workspace and integrated information theories of consciousness. *Nature* 642, 133-142.

<https://doi.org/10.1038/s41586-025-08888-1>

Article text inspected, including abstract, theory comparison and limitations. This report does not independently reanalyse the data.

S6 | Max Tegmark (2000), Importance of quantum decoherence in brain processes. *Physical Review E* 61, 4194.

<https://arxiv.org/abs/quant-ph/9907009>

Author abstract inspected. A theoretical objection dependent on modelling assumptions.

S7 | Hagan, Hameroff & Tuszynski (2002), Quantum computation in brain microtubules: decoherence and biological feasibility. *Physical Review E* 65, 061901.

<https://arxiv.org/abs/quant-ph/0005025>

Author abstract inspected. A theoretical response, not an in-vivo demonstration.

S8 | AkashicOMNI gateway and Cogitate claim-review trial.

<https://akashicnet.org/akashicomni/claim-review-trial-01>

Public pages inspected for editorial method and boundaries. AkashicNET commentary is not independent scientific evidence.