

# Intrinsic Quality Theory

A Geometric Theory of Phenomenal Experience

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## The core claim

Consciousness is not produced by brains. It is what physical states are, from the inside.

Every bounded region of spacetime has a complete physical description: the set of all observations you could make inside that region, paired with the actual values those observations would return. Physics calls this the *algebra-state pair*. IQT identifies this object with phenomenal quality. Not "gives rise to." Not "correlates with." The algebra-state pair and the qualitative character of experience are the same thing under two descriptions, the way "the morning star" and "the evening star" are both Venus.

This is not arbitrary. If you ask what properties "the intrinsic nature of a physical region" must have, four independently motivated constraints converge on a single mathematical object. The algebra-state pair is the only candidate. The identification with consciousness is still a postulate — but it is a postulate on the only option available.

## Five things the theory says

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### 1. Quality is universal. Experience and selfhood are not.

IQT separates three levels:

- **Level 0 — Quality.** The intrinsic state of any bounded spacetime region. Everything has it. A rock has quality the way everything has a temperature; that does not make it hot.
- **Level 1 — Experience.** A quality-stream that persists over time and is causally semi-autonomous (its future depends partly on its own past, not just on outside forces). A mouse has this. A thermostat does not.

- **Level 2 — Report.** A self-thread that builds a compressed self-model and controls a readout channel. This is the "I" that can say "I see red." Humans have this. Mice probably do not.

The "so rocks are conscious?" objection conflates Levels 0 and 2. The Hard Problem is dissolved at Level 0 by the identity thesis. The interesting scientific questions live at Levels 1 and 2, and those are empirical.

## **2. Every bounded region has quality. No region is privileged.**

Your visual cortex is a causal diamond (a bounded spacetime region). Your whole brain is a larger diamond containing it. A single neuron is a smaller one inside that. All three have quality simultaneously. The neuron's quality is simple. The whole brain's quality includes cross-regional correlations invisible to the neuron. Neither is "the real one."

This is *perspectival relativity*. There is no correct level at which consciousness happens. Multiple overlapping regions bear quality at the same time. IQT calls this the **democracy of diamonds**, in contrast with IIT's exclusion postulate (which selects one maximally integrated region and declares the rest non-conscious).

## **3. The shape of a spacetime region determines the character of its quality.**

The human brain's effective diamond is spatially wide (~15 cm) and temporally shallow (~100 ms to ~1 s). This geometric asymmetry has a direct consequence: the algebra is rich in spatial correlators (wide visual field, distributed body sense) and poor in temporal ones (the present feels instantaneous, the past is gone).

The felt asymmetry between panoramic space and fleeting time follows from the diamond's shape under the identity thesis. Change the shape and you change the experience. Psilocybin widens temporal depth (time dilates). Ketamine narrows it (time fragments). DMT flattens the timescale hierarchy (time dissolves). These are testable predictions.

## **4. The "flow" of time is what finite-bandwidth narration feels like.**

The narrative operator — the system that compresses quality into a self-model and drives report — can only hold a thin temporal slice at once. Each update sheds trailing content and acquires leading content. That sequential shedding-

and-acquiring is the phenomenology of passage. Time does not move. The narrator's window slides.

An infinite-bandwidth narrator (a thought experiment, not a real system) would still run forward — computation at macroscopic scales is irreversible — but it would not feel time passing. It would hold its entire trajectory at once. The direction of time is constituted by thermodynamics. The *texture* of passage is constituted by finite bandwidth.

## 5. Composition is correlation structure, not a binding force.

The quality of a composite region is not the sum of its parts' qualities. The "missing ingredient" is the pattern of correlations between parts. Knowing the state of Region A and the state of Region B does not determine the state of A+B. The cross-boundary correlations carry quality that belongs to the whole but not to either part. This is a mathematical fact about states on algebras, not a special mechanism.

## The constraint argument

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Why the algebra-state pair and nothing else? Four requirements on "the intrinsic nature of a bounded physical region":

1. **Completeness.** Must fix every measurement outcome and every correlation internal to the region.
2. **Isotony (nesting consistency).** The nature of a subregion must be derivable from the nature of any containing region by restriction.
3. **Covariance.** Must transform appropriately under physical symmetries.
4. **Perspectival completeness.** Must depend on nothing outside the region.

The algebra-state pair satisfies all four. Nothing else does. This is a mathematical result within algebraic quantum field theory (AQFT), not a philosophical preference.

The Quality Identity (QI) — that this intrinsic nature *is* phenomenal quality — is a separate postulate. It is justified abductively: QI generates composition for free (Section 3), dissolves subject selection (Section 4.4), predicts temporal phenomenology from geometry (Section 2.6), and yields three pre-registerable experiments (Section 5). No other identification of quality with a mathematical object currently delivers comparable explanatory yield.

## The effective-theory bridge

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The identity thesis is formulated in AQFT. Brains operate at scales roughly 35 orders of magnitude above the Planck length. The gap is bridged the same way particle physics bridges the gap between fundamental theory and detector readings: through effective field theory.

The fundamental algebra is coarse-grained to an effective neural algebra whose generators correspond to mesoscopic quantities — local field potentials, population firing rates, spatiotemporal correlations. The coarse-graining is constrained by physical locality (observables in one region cannot map to a different region), algebraic structure (the embedding preserves products and adjoints), and instrumentation (generators are fixed by what the electrodes physically access, not by what would make predictions come out right).

The effective algebra is still a local algebra. It satisfies isotony, approximate microcausality, and covariance. The full interpretive framework — perspectival relativity, composition via correlation, the identity thesis — carries over at neural scale. The EEG/iEEG metrics in the experimental protocols are computable functionals of a state on this algebra.

## Three experimental protocols

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Each protocol specifies predictions, metrics, and explicit failure conditions. The protocols test the *bridge hypotheses* (self-threads, narrative operators, democracy of diamonds), not the core postulate directly. A protocol failure falsifies the conjunction of QI with the relevant bridge hypothesis. The identity thesis could survive with revised bridges, but a QI that generates no successful predictions has stopped earning its keep.

### Protocol 1: Titrated propofol anesthesia

IQT predicts that general anesthesia fragments self-threads module by module, at different rates and depths. Prefrontal persistence declines earliest; primary sensory modules decline last. At intermediate depths, some modules retain structured activity while others have collapsed.

The alternative (consistent with single-locus views like IIT or GNW): all modules decline in lockstep, with no partially-fragmented intermediate state.

**Failure condition:** Within-subject correlation of persistence trajectories  $> 0.9$  across module pairs in 80%+ of subjects.

## Protocol 2: Within-hemisphere overlapping parcellations

This is the direct test of democracy versus exclusion. Two brain regions sharing physical substrate (lateral parietal cortex) each perform an independent cognitive task. Three converging lines of evidence:

- **Observational.** Both regions maintain high persistence independently; perturbations to one task do not propagate to the other.
- **Synergy analysis.** The overlap zone does not create synergistic binding between the exclusive zones (tripartite O-information near zero or positive).
- **Perturbational.** Single-pulse electrical stimulation in one region's exclusive electrodes does not evoke responses in the other region's exclusive electrodes.

The SPES (single-pulse stimulation) result is the most decisive. If a focal electrical pulse in Region A stays contained while both regions independently perform complex tasks, the regions are causally semi-autonomous. Exclusion does not naturally accommodate this.

**Failure condition:** SPES propagates uniformly across both regions, or persistence metrics show anti-correlated switching dynamics.

## Protocol 3: Psychedelic temporal phenomenology

IQT predicts that the peak of the multi-scale persistence curve tracks the effective temporal integration window:

- **Psilocybin:** peak shifts toward longer windows (expanded present)
- **Ketamine:** peak shifts toward shorter windows (fragmented time)
- **DMT:** curve flattens (no preferred timescale)
- **Midazolam** (active control, non-psychadelic sedative): scales the curve vertically without shifting the peak, dissociating arousal from integration-window changes

Neither IIT nor GNW generates multi-scale temporal structure predictions in this form.

**Failure condition:** Peak position does not differ across compounds, or shows no correlation with self-reported temporal experience.

## How IQT differs from IIT and GNW

	IQT	IIT	GNW
What is consciousness?	The algebra-state pair of bounded spacetime regions	Integrated information (Phi)	Global broadcasting via recurrent amplification
Conscious regions per brain	Many, overlapping	Exactly one (exclusion postulate)	One workspace at a time
Composition	Correlation structure	Phi + exclusion	Not addressed (consciousness = access)
Temporal experience	Derived from diamond geometry	No specific mechanism	Workspace dynamics, without structural account of passage
Testability	Three protocols with failure conditions at each layer	Phi is intractable at brain scale	Tested via ignition paradigms

The primary axis of divergence from IIT is overlap. Protocol 2 targets this directly.

IQT treats GNW and higher-order theories as correct descriptions of Level 2 (how the narrative self works, how report happens) but silent about Levels 0 and 1. The global workspace is the readout mechanism, not the source of quality.

## Where to disagree

IQT is built in layers. You can reject a later layer while keeping earlier ones.

**Reject QI (the identity of intrinsic nature with phenomenal quality).** The constraint argument still gives you a novel characterization of "intrinsic nature" in AQFT. The formalism of Sections 2-3 stands as a contribution to the metaphysics of local physics. You are a property dualist. The cost: you need

separate mechanisms for composition, subject selection, and temporal phenomenology — three things QI handles with one postulate.

**Accept QI, reject democracy.** You accept that quality is the algebra-state pair but want an exclusion principle selecting one region per brain. You are doing IIT with a different ontology. Protocol 2 adjudicates.

**Accept QI and democracy, doubt the narrative operator.** The bridge hypotheses (Sections 4.4–4.5) are the most revisable component. The experimental predictions are what fail for you, not the ontology.

**Doubt the effective-theory bridge.** The jump from AQFT to neural-scale metrics is the weakest structural element. The paper flags this as an open problem (Section 7). The protocols test the effective-level predictions. The fundamental-to-effective bridge is a separate research program.

## Status and open problems

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Draft v1.6. Mature enough for concrete experiments, with open problems across three fronts:

**Mathematical.** The boundary data problem (minimal composition datum). Presheaf cohomology on the poset of causal diamonds. Rigorous AQFT on causal sets.

**Computational.** A biophysically realistic narrative operator (neural-field model, not the toy 6-qubit pipeline). Tractable unity-functional approximations. Efficient Phi surrogates for direct IIT comparison.

**Empirical.** Protocol execution. Priority: Protocol 1 (propofol, straightforward clinical logistics) and Protocol 2 (overlap, requires iEEG patients). Protocol 3 requires psychedelic research licensing.

Collaboration sought with clinical anesthesiology, epilepsy surgery, and psychedelic research groups.

## Reading the paper

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The full paper is [iqt\\_v1\\_6\\_0.docx](#).

Three reading paths:

- **Philosophers.** Section 1 (core thesis, constraint argument) → Section 4 (subject selection, phenomenological puzzles) → Section 6 (Russellian monism, IIT, process philosophy).
- **Neuroscientists.** Section 5 (protocols, metrics) → Section 2.6 (effective-theory bridge) → Section 4 (levels of consciousness, split-brain predictions).
- **Physicists / mathematicians.** Sections 1-3 sequentially (formal architecture) → Section 5 (empirical grounding) → Section 7 (open mathematical problems).

## License

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