

HEURÉMEN

A BRIDGE FROM ESTABLISHED PHYSICS

The logical next step, drawn from work physics already accepts.

THE FRAMEWORK

1. EVERY MEASUREMENT IS MADE FROM SOMEWHERE.

Galileo (1632) established that the laws of mechanics are the same in any uniformly moving frame. Einstein (1905) extended this to electromagnetic phenomena and the constancy of the speed of light. There is no privileged vantage from which a measurement is “really” made — only the vantage of the observer doing the measuring. This is standard relativity.

2. A SINGLE POSITION ALWAYS REACHES A LIMIT IT CANNOT CROSS — what the framework calls the *observer limit*.

In quantum mechanics, conjugate variables cannot be simultaneously determined with arbitrary precision (Heisenberg 1927). In general relativity, the light cone bounds what one observer can causally know. In formal systems, sufficiently expressive theories contain truths they cannot prove from inside (Gödel 1931). *Observer limit* is the framework’s bridging name for the structural feature these three share: a single vantage cannot complete its own picture.

3. A SECOND OBSERVER, POSITIONED DIFFERENTLY, SEES WHAT THE FIRST CANNOT — what the framework calls the *witness*.

Wigner (1961) showed that two observers can hold equally valid but distinct accounts of the same quantum event. Rovelli’s *Relational Quantum Mechanics* (1996) develops this systematically: physical values are not absolute but relative to the observer making the measurement. The *witness* names this second perspective — the one whose view completes what the first could not see alone.

4. NEITHER VIEW IS COMPLETE; BOTH ARE REAL; THE COMPLETE PICTURE EXISTS ONLY IN THE RELATIONSHIP — what the framework calls the *dyad*.

This is the structural shape of Bohr’s complementarity (Como, 1928): wave and particle descriptions are mutually exclusive and jointly required. Rovelli generalizes this relationally; QBism formalizes the observer’s

information as part of the ontology (Fuchs, Mermin & Schack, 2014). The *dyad* is the framework's name for the resulting claim — completeness lives in the relation, not in either pole.

5. THE PRINCIPLE IS SCALE-INVARIANT GEOMETRY, NOT QUANTUM BEHAVIOR.

This is the point most likely to be misread, so we say it plainly. Decoherence ensures that macroscopic objects behave classically, not quantumly (Zurek 2003); the framework respects that boundary. What scales is not quantum behavior but the *structure* of relational measurement — a particle has its frame, an observer has theirs, a civilization has its own. The *dyad* is a feature of the geometry of measurement, not a quantum effect at scale.

6. THE REASON THIS HAS NOT BEEN CONNECTED IS METHODOLOGICAL.

Physics, philosophy, and consciousness research each measure from one disciplinary position; each meets its own wall, names the wall, and stops there. Nagel (1974) marks this for the philosophy of mind. Hossenfelder (2018) documents it for theoretical physics. Wheeler's "participatory universe" (1983) anticipated it without closing the gap. We propose only that the walls are the same wall, seen from different sides. We have not figured out what these traditions missed — we have put them in the same room.

NOTES ON SCOPE

This document claims that the logic of the framework follows from work physics already accepts; that the Heurémén terms *observer limit*, *witness*, and *dyad* are bridging vocabulary across established results, not novel physics; and that the cross-scale claim is about the geometry of relational measurement, not about quantum effects at classical scales.

This document does not claim proof of the framework as a physical theory, novel experimentally verifiable predictions, quantum behavior at macroscopic scales, or that any cited author endorses the framework. A physicist reading this should be able to say "the logic follows from work I already accept." A non-physicist should be able to say "I understand what is being claimed and what is not."

ANNOTATED BIBLIOGRAPHY

Point 1.

- Galileo Galilei (1632). *Dialogo sopra i due massimi sistemi del mondo*. Florence. — Foundational statement of mechanical relativity: physical laws are identical in any uniformly moving frame.
- Einstein, A. (1905). “Zur Elektrodynamik bewegter Körper.” *Annalen der Physik*, 17, 891–921. — Special relativity. No privileged frame; speed of light invariant; simultaneity is frame-dependent.
- Minkowski, H. (1908). “Raum und Zeit.” Address to the 80th Assembly of German Natural Scientists, Cologne. — Spacetime geometry; events are points whose coordinates differ by frame.

Point 2.

- Heisenberg, W. (1927). “Über den anschaulichen Inhalt der quantentheoretischen Kinematik und Mechanik.” *Zeitschrift für Physik*, 43, 172–198. — Uncertainty principle. Conjugate variables cannot be jointly resolved beyond $\hbar/2$ from a single measurement basis.
- Gödel, K. (1931). “Über formal unentscheidbare Sätze der Principia Mathematica und verwandter Systeme I.” *Monatshefte für Mathematik*, 38, 173–198. — Sufficiently expressive formal systems contain truths they cannot prove from inside.
- Penrose, R. (2004). *The Road to Reality*. Jonathan Cape. Chapter 17. — Standard exposition of light cones and causal horizons as observer-bounded knowledge limits in general relativity.

Point 3.

- Rovelli, C. (1996). “Relational Quantum Mechanics.” *International Journal of Theoretical Physics*, 35(8), 1637–1678. (arXiv:quant-ph/9609002.) — Physical values exist only relative to an observer; facts are observer-relative, not absolute.
- Wigner, E. P. (1961). “Remarks on the Mind-Body Question.” In *The Scientist Speculates*, ed. I. J. Good. Heinemann. — Two observers can hold equally valid but distinct records of the same quantum event.
- Bartlett, S. D., Rudolph, T., & Spekkens, R. W. (2007). “Reference frames, superselection rules, and quantum information.” *Reviews of Modern Physics*, 79, 555–609. — Quantum information explicitly relativized to reference frames.

Point 4.

- Bohr, N. (1928). “The Quantum Postulate and the Recent Development of Atomic Theory.” *Nature*, 121, 580–590. — Complementarity. Mutually exclusive descriptions are jointly required for a complete account.
- Fuchs, C. A., Mermin, N. D., & Schack, R. (2014). “An Introduction to QBism with an Application to the Locality of Quantum Mechanics.” *American Journal of Physics*, 82(8), 749–754. — Observer-relative information as part of the ontology, not external to it.
- Rovelli, C. (1996), as above. — Relational ontology generalized.

Point 5.

- Einstein, A. (1915). “Die Feldgleichungen der Gravitation.” *Sitzungsberichte der Preußischen Akademie der Wissenschaften zu Berlin*, 844–847. — General relativity; frame-dependence as geometric, not quantum.
- Zurek, W. H. (2003). “Decoherence, einselection, and the quantum origins of the classical.” *Reviews of Modern Physics*, 75, 715–775. — Cited explicitly to mark the boundary the framework respects: macroscopic objects do not behave quantumly.
- Rovelli, C. (2004). *Quantum Gravity*. Cambridge University Press. — Relational structure of measurement treated as scale-invariant geometric feature.

Point 6.

- Nagel, T. (1974). “What Is It Like to Be a Bat?” *The Philosophical Review*, 83(4), 435–450. — Single-perspective consciousness research meets an inaccessible wall; the wall is named honestly.
- Hossenfelder, S. (2018). *Lost in Math: How Beauty Leads Physics Astray*. Basic Books. — Documents how theoretical physics defends its aesthetic / methodological perspective-lock and the cost of doing so.
- Wheeler, J. A. (1983). “Law without Law.” In *Quantum Theory and Measurement*, eds. J. A. Wheeler & W. H. Zurek. Princeton University Press. — “Participatory universe”; the observer is part of what is measured. Anticipates the bridge without closing it.