

# We Are Never Having a Mathematical Experience: Resolving the Schrödinger Confusion

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## Abstract

*Schrödinger introduced his famous cat not as a discovery but as a reductio ad absurdum—an argument designed to expose the limits of applying quantum superposition literally to macroscopic systems. The thought experiment was meant to be a critique. It became, instead, a celebration of the very confusion it was meant to dissolve. This paper locates the source of that confusion: a systematic category error in which a property of our mathematical descriptions is mistaken for a property of physical reality. The model requires two states because the observer does not yet know the outcome. The cat does not. The universe is always resolving—collapse as continuous record-writing, with each record reshaping the constraints under which the next resolution occurs. Superposition is an epistemic condition—a feature of the observer’s relationship to the system—not an ontological feature of the system itself. Recognizing this distinction dissolves the apparent paradox without requiring new physics, hidden variables, or parallel worlds. We are never, and the cat is never, having a mathematical experience.*

**Keywords:** *Schrödinger’s cat; measurement problem; quantum measurement; wavefunction; superposition; decoherence; quantum foundations; interpretations of quantum mechanics; epistemic vs. ontological*

## Scope and Claim Level

This paper makes a single interpretive claim (Level 2): that the measurement paradox associated with Schrödinger’s cat arises from a category error—mistaking a property of our representational layer for a property of the macroscopic world. The claim is interpretive, not dynamical. The Schrödinger equation remains intact. The Born rule remains intact. No hidden variables are introduced, no new quantum dynamics are proposed, and no modifications to the formalism are required.

What follows is not a theory of quantum mechanics. It is a philosophical correction to how we read the existing formalism—specifically, to the habit of treating representational multiplicity as ontological multiplicity. The paper sits within the broader architecture of Universal Collapse Theory but does not require prior exposure to UCT. Readers can evaluate the argument entirely on its own terms.

## 1. Introduction: What Schrödinger Actually Meant

In 1935, Erwin Schrödinger published a thought experiment that has since become perhaps the most recognized icon in all of physics. A cat is placed in a sealed box with a radioactive atom, a Geiger counter, and a mechanism that releases poison if the atom decays. Quantum mechanics describes the atom as existing in a superposition of decayed and undecayed states until measured. By extension, the Copenhagen interpretation appears to commit us to saying that the cat is simultaneously alive and dead—until someone opens the box.

This is routinely presented as one of the deep mysteries of quantum mechanics: that reality itself exists in multiple states at once, that observation collapses a genuinely bifurcated universe into one branch, and that consciousness or measurement does something strange and fundamental to the fabric of the world.

What is rarely noted is that Schrödinger himself found this conclusion absurd. The thought experiment was not a discovery. It was a philosophical weapon—a *reductio ad absurdum* aimed directly at the Copenhagen interpretation. Schrödinger's point was precisely that no defensible physics should require us to say a cat is simultaneously alive and dead. If the formalism produces that conclusion, something has gone wrong in the formalism, or in how we are reading it.

The experiment was meant to be an embarrassment. It became, instead, a mystical fixture. Schrödinger's cat escaped its creator's intentions entirely and took on a life—or rather, a superposed life-and-death—of its own. The question this paper pursues is: how did that happen, and what does it tell us about a deeper confusion in how we read mathematical models?

## 2. The Category Error

Mathematics is extraordinarily good at describing the world. So good, in fact, that a subtle but consequential slide tends to occur: we begin treating the requirements of the model as requirements of reality itself.

Consider what it means for a quantum system to be in superposition. The wavefunction assigns probability amplitudes to different possible outcomes. It does not say “both outcomes exist simultaneously in the world.” It says, “given what we currently know about this system, here is the structure of our uncertainty about what we will find.” The superposition is a property of our epistemic relationship to the system—of what has not yet been written into record from the observer's perspective.

When we open Schrödinger's box, the cat is not “collapsing” from two states into one. The cat has been one thing the entire time. What changes upon observation is our knowledge—and a record is written. The wavefunction was always a description of unresolved potential relative to what has not yet been recorded, not a description of two coexisting physical realities.

The category error is this: taking a feature of the model—the necessity of holding two possibilities open because no record has yet been written—and reading it as a feature of the world. The state vector is a tool for generating probabilities for possible records under possible interventions; it is not, by itself, a literal inventory of what exists. The model requires both states because the observer-record interface has not yet resolved. The world does not share this suspension. Interpretations differ precisely because the formalism underdetermines ontology: one may choose wavefunction realism (as in Everett), but that is an additional metaphysical commitment rather than a consequence of the Schrödinger equation.

This error is easy to make because the mathematics works so well. The equations are accurate. The predictions are precise. The temptation is to conclude that if the model describes superposition, reality

must contain superposition. But this inference is not valid. A weather model describing a 60% chance of rain does not mean the atmosphere is 60% raining. The probability lives in the model. The rain, when it comes, is either falling or it is not.

A structural test sharpens the point. Mathematical formalisms carry symmetries and redundancies—global phase, basis choices, coarse-grainings—that can be changed without altering any physical prediction. If what supposedly “exists” changes when we change representation, we have reified the representation. Ontology should not depend on bookkeeping choices. The formalism underdetermines what is real; multiple ontological stories can ride on the same predictive machinery. That is a sign the machinery is not identical to the ontology, and treating it as such is a philosophical step, not a physical inference.

A clarification is necessary here, because quantum probability is not the same as classical ignorance. The interference structure of the wavefunction is real—it produces empirically distinct predictions from any classical probability distribution over definite but unknown states. This paper does not deny the nonclassical character of quantum probability. It argues something more specific: that the interference structure describes how unresolved potential behaves in the representational layer, relative to the record-interface, and that this does not require macroscopic systems to be in states of literal dual-being. Representational multiplicity is not ontological multiplicity—not unless that claim is made explicit and paid for with a clear ontology and discriminators.

This is an interpretive claim about representational layers, not a proposal for new quantum dynamics. The Schrödinger equation remains intact. The Born rule remains intact. No hidden variables are introduced. The claim is simply that the formalism is a tool for tracking unresolved potential relative to an observer-record interface—and that this tracking function does not commit us to the existence of macroscopic superposed states in the world.

### **3. We Are Never Having a Mathematical Experience**

Here is the central claim of this paper, stated as plainly as possible: nothing in the universe is having a mathematical experience. Not the cat, not the observer, not the particle, not us.

Mathematics is a conceptual system—an extraordinarily powerful tool for describing, predicting, and navigating physical reality. It is not the medium in which reality operates. Electrons do not calculate their probability clouds before arriving at a detector. Cats do not experience superposition. Observers do not collapse realities by looking; they resolve their own uncertainty about a reality that was already actual.

The universe is always resolving. Collapse is not a punctuated event triggered by observers—it is the continuous process by which potential resolves into record, records reshape constraints, and updated constraints guide the next resolution, at every scale. The macroscopic world is always definite because record-writing is always underway. The question of which state a system is in may be genuinely uncertain from any finite observer’s perspective—and quantum mechanics gives us the correct tools for navigating that uncertainty—but this epistemic situation does not require or imply that the world itself is suspended between states, waiting to be actualized by observation. (In the formal language of Universal Collapse Theory, this is the kernel in action: structured potential ( $\Omega$ ) resolving under constraint (K) via  $C^K$  into a realized outcome ( $x^*$ ), writing records (R) that update constraints (U) for the next cycle. The formalism is developed in WP01 and WP02; the interpretive claim here requires only the intuition.)

Superposition, in other words, is a property of the representational layer—of what has not yet been written into record relative to the observer-record interface. It is not a property of the macroscopic system itself. The distinction matters enormously: one places the multiplicity where it belongs—in the gap between

unresolved potential and written record—and the other displaces it onto the world, making reality itself the site of a dual-being that properly belongs to our description.

When this is seen clearly, the measurement problem looks different. The question “why does measurement collapse the wavefunction?” rests on a picture in which the wavefunction is the world, and collapse is something that happens to the world. But if the wavefunction tracks unresolved potential relative to the record interface, then what happens during measurement is record-writing: one outcome is actualized, a record is produced, and the constraints under which the next resolution will occur update accordingly. The world was always resolving. We were always catching up.

The next section sharpens the distinction between the representational multiplicity that quantum mechanics requires and the macroscopic dual-being that it does not.

#### 4. Epistemic vs. Ontological Superposition

The distinction this paper is drawing can be stated precisely. There is epistemic superposition—a feature of our state assignments relative to what has not yet been recorded—and there would be ontological superposition—macroscopic systems literally inhabiting dual states simultaneously. Only the former is required to account for the cat paradox, and it is sufficient for the purposes of this paper.

Epistemic superposition, understood as representational multiplicity relative to an unresolved record interface, is real, useful, and exactly what quantum mechanics describes. Before we open the box, we genuinely do not know whether the cat is alive or dead. The wavefunction correctly encodes that unresolved potential. The interference structure of quantum probability correctly describes how that potential behaves and evolves. The non-classical character of quantum probability—the fact that it is not reducible to classical ignorance over definite hidden states—is entirely compatible with this reading. Representational multiplicity can be non-classical without requiring macroscopic dual-being.

Ontological superposition would mean that the cat is literally, physically, in two states at once—that both “alive” and “dead” are simultaneously actual in the macroscopic world. This is the reading that produces the paradox, and it is the reading that Schrödinger himself found indefensible. Adopting it requires a genuine ontological commitment and earns the burden of explaining how two macrostates coexist, interact, and then produce a single observed outcome.

Most of the exotic interpretive apparatus that has grown up around quantum mechanics—the many-worlds interpretation, branching universes, observer-dependent reality—emerges from treating representational multiplicity as if it were ontological. If we are willing to maintain the distinction, much of this apparatus becomes unnecessary. The many-worlds interpretation, in particular, can be read as the result of taking the wavefunction’s representational structure too literally—treating every term in the superposition as a separate real branch, rather than as a compact representation of unresolved potential relative to a record interface.

This does not dissolve all open questions in quantum foundations. The deep question of why the specific outcome that occurs does occur—why this record rather than that one—remains genuinely open. What dissolves is the paradox of the cat. That paradox was never about the world. It was about a misreading of what our models are doing. Section 5 draws out what follows once the misreading is corrected.

A parsimony discriminator follows from this framing: if macroscopic superposition is genuinely ontological, we should find measurement outcomes that cannot be accounted for by decoherence and record-formation alone—without additional ontic branching commitments. If instead all macroscopic definiteness tracks record-writing under decoherence, the ontological superposition claim adds nothing.

The interpretive correction offered here predicts the latter: macroscopic outcomes are always record-mediated, and no macroscopic ontic superposition claims are needed to explain them.

#### 4.1 Locating the claim: an interpretation map

The following table locates this paper’s position relative to major interpretive programs in quantum foundations. The purpose is not to adjudicate between interpretations but to make explicit where the present analysis agrees, diverges, and remains agnostic.

| Interpretation                       | What the wavefunction is                                                                                                                                                                                            | Relationship to this paper                                                                                                                                                                                                                               |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Copenhagen</b>                    | A calculational tool; collapses upon measurement. Ontological status deliberately left open.                                                                                                                        | Compatible in spirit. This paper makes the “tool” reading explicit and grounds the measurement event in record-writing rather than leaving it unanalyzed.                                                                                                |
| <b>Many-Worlds (Everett)</b>         | Literally real and universal. All branches exist; no collapse occurs. Wavefunction realism is the ontology.                                                                                                         | Diverges. Everett’s move is principled but constitutes an additional metaphysical commitment—not a deduction from the                                                                                                                                    |
|                                      |                                                                                                                                                                                                                     | formalism. This paper treats the branching structure as representational, not ontological.                                                                                                                                                               |
| <b>QBism</b>                         | An agent’s personal probability assignment. No objective quantum state exists independent of the agent.                                                                                                             | Shares the epistemic orientation. Differs in grounding: QBism locates probability in agent credences; this paper locates it in unresolved potential relative to a record interface—a structural, not subjective, distinction.                            |
| <b>Relational QM</b>                 | Describes relations between systems, not absolute states. State assignments are observer-relative.                                                                                                                  | Closest alignment. The record-interface framing is structurally similar to relational state assignments. Differs in vocabulary and in grounding the relational structure in records and constraint-update rather than in bare observer-system relations. |
| <b>Objective Collapse (GRW)</b>      | Physically real; collapses via a new dynamical mechanism (spontaneous localization). Modifies the Schrödinger equation.                                                                                             | Diverges. This paper does not modify the formalism or introduce new dynamics. The resolution is interpretive, not dynamical.                                                                                                                             |
| <b>This paper (record-epistemic)</b> | Tracks unresolved potential relative to the observer-record interface. Representational, not ontological. Non-classical structure (interference) is a feature of the representation, not of macroscopic dual-being. | No new physics. Dissolves the cat paradox by placing multiplicity in the representational layer. Compatible with existing formalism. Grounded in record-writing and constraint-update as the structural basis for actualization.                         |

The table is not exhaustive, and some positions (pilot-wave / Bohmian mechanics, consistent histories, modal interpretations) are omitted for brevity. The point is structural: this paper’s claim occupies a specific region of the interpretive landscape—epistemic orientation, no new dynamics, record-grounded—and that region is distinguishable from each major alternative.

## 5. Implications

### 5.1 The measurement problem reframed

The measurement problem has always been framed as: “how does observation turn a superposition of possibilities into a single actual outcome?” This framing assumes the superposition is a feature of the world that observation collapses. If superposition is instead a feature of the representational layer—unresolved potential relative to a record interface—the question reframes: “what constitutes record-writing, and what are the physical conditions under which it occurs?” This is a question about the conditions for actualization, not about a mysterious reduction event. It is harder than it might first appear, but it is tractable—and it does not require us to posit macroscopic dual-being as a starting point.

### 5.2 Decoherence and its proper role

Decoherence theory has shown how interaction with an environment suppresses quantum interference and produces stable, classical-looking outcomes. This is genuine and important progress. But decoherence has sometimes been presented as if it solves the measurement problem—as if showing why interference disappears also explains why one outcome occurs. It does not, and its proponents generally acknowledge this. Decoherence explains why superposition becomes practically invisible at macroscopic scales and why stable pointer states emerge. It does not explain the actualization of a specific outcome.

The present analysis suggests this is not a failure of decoherence but a correct understanding of its scope: decoherence is doing real work at the level of record-embedding and constraint-stabilization. It prepares the conditions under which a record can be written. The question of which record is written—why this outcome—remains open. But that is a question about the structure of resolution, not evidence that macroscopic dual-being is real.

### 5.3 The cat was always one thing

This may sound deflationary, but it is worth stating plainly: the cat in Schrödinger’s box is always, at every moment, either alive or dead. Under ordinary decoherence conditions, its macrostate is definite. It is not in a superposed macrostate. We do not know which state it is in—and quantum mechanics gives us the correct tools for reasoning about that unresolved potential. But our representational uncertainty is not the cat’s physical condition.

The universe is always resolving. Records are always being written. Observation is not an act of creation—it is the extension of the record-writing process to include the observer’s own state. What changes when we open the box is that a record enters our record-set. The cat’s outcome was already a record in the world. We simply did not yet hold it.

This is what Schrödinger was trying to tell us. It took the physics community most of a century to take him seriously, and the work is still not fully done.

## 6. Conclusion

The Schrödinger’s cat thought experiment was designed as a critique, not a discovery. It was meant to show that the Copenhagen interpretation, taken literally, produces absurd results. The absurdity was supposed to motivate a correction. Instead it was absorbed into physics as a feature of reality.

The source of this confusion is a category error: treating a property of our representational layer—the multiplicity of unresolved potential relative to the record interface—as a property of the macroscopic world that representation describes. The model holds two states open because no record has yet been written from the observer’s position. The world does not share this suspension. The universe is always resolving; records are always being written; macroscopic outcomes are always definite under decoherence conditions.

Once this is seen, the paradox dissolves. Not because we have introduced new physics, hidden variables, or expanded the universe into many branches—but because we have correctly placed the multiplicity where it belongs. Representational multiplicity is not ontological multiplicity. The resolution was always underway. We are the ones catching up.

We are never—and the cat is never—having a mathematical experience. The mathematics is ours. The cat is real.

For the formal physics articulation of this distinction, see WP02 (Collapse in Physics) and Structural Physics (forthcoming).

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