

Wigner's Friend and Wittgenstein's Universe

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The pursuit of objective reality has long been the central preoccupation of both physics and philosophy. For centuries, the prevailing assumption was that the universe exists as a fixed entity, entirely independent of the mind, waiting to be discovered.

This classical worldview, rooted in Newtonian mechanics, posited an **absolute space and time**, a stage upon which the drama of matter unfolded regardless of whether anyone was watching. Immanuel Kant attempted to reconcile this empirical reality with human perception by positing the *Ding an sich*, or the thing in itself, a hidden underlying reality that exists beyond our sensory experience. However, the twentieth century introduced profound ruptures in this classical paradigm.

In quantum mechanics, Eugene Wigner proposed a thought experiment that challenged the very notion of a single, objective physical state. Simultaneously, in the realm of analytic philosophy, Ludwig Wittgenstein dismantled the idea of a hidden, underlying reality in his seminal work, the *Tractatus Logico-Philosophicus*. This essay explores the striking parallels between the quantum paradox of Wigner and the logical universe of Wittgenstein, arguing that both frameworks ultimately reject the Kantian 'thing in itself' in favour of a perspectival reality grounded in observation and language.

Introduction

To understand the magnitude of the intellectual shifts brought about by Wigner and Wittgenstein, we must first situate their work against the backdrop of nineteenth-century positivism and classical realism.

The classical view assumed a strict separation between the observer and the observed. The universe was a collection of objects possessing definite properties, and the role of the scientist or philosopher was to act as a passive mirror, reflecting these properties accurately. Objectivity was synonymous with the removal of the human perspective.

Eugene Wigner, a foundational figure in quantum mechanics, disrupted this passive mirroring with his 1961 paper, *Remarks on the Mind and Body Question*. By extending the Schrödinger's cat paradox to include human consciousness, Wigner demonstrated that the act of observation is not a passive recording of pre-existing facts but an active participation in the determination of physical reality.

Earlier, Ludwig Wittgenstein was dismantling the philosophical foundations of this classical worldview. In the *Tractatus Logico-Philosophicus*, published in 1921, Wittgenstein argued that the world is not a collection of hidden objects, but the totality of facts. He radically redefined the relationship between language, thought, and reality, ultimately concluding that the metaphysical subject, the observer, does not belong to the world but is its limit.

Both thinkers, working in entirely different domains, arrived at a startlingly similar conclusion. The universe is not a monolithic, observer-independent entity. Reality is fundamentally **perspectival**. This essay will trace the development of these ideas, exploring the mechanics of Wigner's paradox and the logical architecture of Wittgenstein's universe, before reconciling them in a unified framework of

participatory reality.

Development

To grasp the implications of Wigner's thought experiment, we must first understand the measurement problem in quantum mechanics.

The foundational equations of quantum theory, specifically the Schrödinger equation, describe the evolution of a quantum system as a smooth, deterministic wave function. This wave function represents a superposition of all possible states. However, when a measurement is made, this superposition appears to collapse into a single, definite outcome. Erwin Schrödinger famously illustrated the absurdity of applying quantum rules to macroscopic objects with his **cat paradox**, wherein a feline in a sealed box is simultaneously alive and dead until observed.

Wigner extended this paradox to include human consciousness. In his setup, a friend is inside a sealed laboratory measuring a quantum system, such as the spin of a particle. Upon measurement, the friend observes a definite outcome, and from their perspective, the wave function collapses. However, Wigner, standing outside the laboratory, must describe the entire system, including his friend, using the Schrödinger equation. From his external perspective, the friend and the particle remain in a superposition of states until Wigner himself opens the door and makes an observation.

This creates a profound paradox regarding objective reality. If quantum mechanics is a universal theory, both descriptions **must** be valid within their respective frames of reference. The friend possesses the fact of a collapsed wave function, while Wigner possesses the fact of a superposition. Modern extensions of this thought experiment, notably the impossibility theorem formulated by Frauchiger and Renner in 2018, suggest that if quantum mechanics applies universally, different observers can record contradictory facts. Their theorem demonstrates that a single-world interpretation of quantum theory cannot be internally consistent when multiple agents are involved. This implies that there is no single, objective state of affairs that exists independently of the observer.

This relational nature of quantum facts finds a profound echo in the philosophy of Carlo Rovelli, who proposes **Relational Quantum Mechanics**. In this interpretation, quantum states are not absolute properties of systems but are relative to the observer. The core tenets of this approach can be summarised as follows:

- Every physical system is an observer relative to every other physical system.
- There is no global, observer-independent state of the universe.
- Facts are not universal; they are local and perspectival.

While Wigner was grappling with the physical limits of observation, Ludwig Wittgenstein was establishing the logical limits of language. In the *Tractatus*, Wittgenstein opens with a definitive proposition: "*The world is all that is the case*" (Wittgenstein, 1922, p. 3). He immediately clarifies that **the world is the totality of facts, not of things**. For Wittgenstein, reality is not composed of hidden, underlying substances but of logical structures that can be pictured by language. This is the picture theory of meaning, wherein a proposition is a logical picture of a state of affairs. The proposition and the reality it depicts share a common logical form, an **isomorphism** that makes representation possible.

This framework explicitly rejects the Kantian notion of the thing in itself. Wittgenstein argues that we cannot speak meaningfully about anything that lies outside the logical space of facts. The limits of our language dictate the limits of our world. As he famously concludes, "*What we cannot speak about we must pass over in silence*" (Wittgenstein, 1922, p. 74). The universe, therefore, is not a mysterious, inaccessible realm of hidden objects but the sum total of verifiable, language-bound facts.

Furthermore, Wittgenstein radically redefines the subject. In the classical view, the subject is a thing in

the world, a psychological or physical entity that observes other entities. Wittgenstein argues that the subject does not belong to the world. Instead, it is a limit of the world. He uses the analogy of the visual field: **the eye sees the world, but the eye itself is not within the visual field**. Just as the eye is the boundary of sight, the metaphysical subject is the boundary of the world, not a part of it. This means that the perspective from which the world is seen cannot itself be seen as an object within the world.

When we place the quantum observer of Wigner alongside the logical universe of Wittgenstein, a fascinating reconciliation emerges. Both paradigms dismantle the classical assumption of a monolithic reality. In the scenario of Wigner, the friend and Wigner possess different sets of facts. Under classical realism, one of them must be wrong. Yet, quantum mechanics suggests both are correct within their respective observational frameworks.

Wittgenstein's philosophy provides a robust conceptual architecture for this quantum strangeness. If the world is the totality of facts, then the world of the friend and the world of Wigner are indeed different. Each observer's reality is bounded by their specific logical and physical interactions. There is no absolute perspective, no divine vantage point (*sub specie aeternitatis*) that can seamlessly merge the collapsed state of the friend with the superposition of Wigner.

This reconciliation is further illuminated by Thomas Nagel's exploration of objectivity in *The View from Nowhere*. Nagel argues that the pursuit of absolute objectivity, the attempt to view the world from no particular perspective, is an impossible ideal. True objectivity is not the abandonment of perspective but the rigorous accounting of views **from** somewhere-or-other. We take our initial, subjective perspective and then correct for its specificities, but we can never leave perspective behind entirely. In the quantum realm, this means that the 'view from nowhere' is physically impossible. **Every fact is a fact for an observer.**

Conclusion

The convergence of quantum mechanics and logical atomism offers a profound shift in our understanding of existence. Both Wigner and Wittgenstein demonstrate that the universe is not a static collection of hidden objects waiting to be uncovered. Instead, reality is an active, participatory domain. It is shaped by the act of measurement in physics and by the structure of language in philosophy.

By abandoning the search for an inaccessible thing-in-itself, we are left with a universe that is deeply intertwined with the observer. **We do not merely inhabit the universe; through our observations and our language, we actively constitute it.**

The implications of this reconciliation extend far beyond the confines of theoretical physics and analytic philosophy. They challenge the very foundation of scientific objectivity, suggesting that objectivity is not the view from nowhere but the rigorous accounting of views from somewhere. It demands a humility in our epistemic claims, recognising that our knowledge is always situated, always perspectival, and always bound by the limits of our interaction with the world.

The paradox of Wigner's friend is not a flaw in quantum mechanics, but a profound insight into the nature of reality itself, perfectly mirrored by the logical boundaries established by Wittgenstein.

Coda

The quest for absolute, objective reality may well be a philosophical illusion. We are forever embedded within our own logical and physical perspectives. The beauty of this realisation is not that we are isolated from the universe, but that we are inextricably woven into its very fabric.

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