The Cosmic Library: Quantum Mechanics as Self-Discovery

By Dmitry Torba | 09/27/2025

At the heart of quantum physics lies a profound mystery: the measurement problem. The world at its most fundamental level seems to exist as a haze of overlapping possibilities. Yet, when we look, we only ever see one definite reality. Why does our act of observation seem to force the universe to "choose"? A fascinating interpretation reframes this entire problem. It suggests the universe doesn't choose at all. Instead, all possible histories of the universe exist as pre-written "books" in a vast, timeless Cosmic Library. An observation is simply the act of reading your current page and discovering which story you were in all along.

The Library's Structure: Pages and Books

This interpretation relies on a precise analogy for the structure of reality.

- **The Page**: A "page" is a snapshot of the entire universe at a single instant in time. It's a specific arrangement of quantum states across all the countable Planck volumes that act as the "pixels" of 3D space. The number of possible unique pages, while hyper-astronomical, is **finite**.
- **The Book**: A "book" is the entire history of a universe, a complete 4D block of spacetime from its beginning to its end. It is a unique, ordered sequence of pages that represents a full "world story."

Because the number of unique pages is finite and the duration of meaningful change before the universe reaches a final, static state (like heat death) is also finite, the total number of unique books in the library must also be **finite**.

Quantum Collapse as Navigating a Divergence

In this model, the "collapse of the wave function" is not a physical event but an **epistemic** one—an acquisition of knowledge. The famous Schrödinger equation, $iħ∂t∂Ψ(r,t)=H^Ψ(r,t)$, doesn't describe the evolution of our single reality. Instead, it describes the statistical distribution of all the different *books* in the library.

The probability of an outcome, given by the Born rule as $P(x)=|\Psi(x)|2$, reflects the *proportion* of books in the library where that outcome occurs. When you perform a measurement, you are not collapsing reality; you are **navigating a divergence**.

Up to that page, countless books in the library were completely indistinguishable. The quantum event is a fork in the road. By observing the outcome (e.g., "spin-up"), you don't eliminate other books from existence. Instead, you learn which subset of those books—which branch of reality—your story belongs to. You now know you are in a story that diverges from the "spin-down" branch, which continues to exist, unobserved by you.

Connecting to Existing Theories: A Static Interpretation

The "Cosmic Library" analogy synthesizes two key ideas in physics and philosophy, but with a critical distinction from more common explanations.

The library itself—containing every possible universal history—is a way of visualizing the **Many-Worlds Interpretation (MWI)**. However, this model deliberately departs from the idea that an observation dynamically *splits* or *creates* new worlds. Instead, the library is static and complete; all the books have already been written. A quantum measurement is a point where countless books, which were identical up to that page, diverge into different subsequent narratives. Your act of observation does not create these diverging branches; it is simply the process of discovering which pre-written story you were in all along. The experience feels like random chance not because reality is being cloned, but because you are learning which of the infinitely many divergent books your consciousness is actually reading.

This view is built upon the foundation of the **block universe** model, which treats each "book" as a complete and unchanging 4D history. By combining these concepts, the Cosmic Library presents an MWI where the branching is a pre-existing feature of the library's structure, and an observation is simply the act of turning a page.

The Red Herring Cannon

This model leads to a startling conclusion known as subjective immortality, best illustrated by Max Tegmark's quantum cannon thought experiment. Imagine a cannon aimed at your head, set to fire if a particle's spin is measured as "up" and to click harmlessly if "down," with the odds for each being 50%.

Crucially, a "Bang" page is not the end of the book; it is merely the end of **your character's story within that book**. For any other observers in that universe, your story has

concluded—they would witness your death. The book itself continues, its pages chronicling their lives and the universe's subsequent evolution.

However, your subjective experience—the act of turning from one page to the next—must, by necessity, follow a narrative where your character continues to exist. Therefore, your consciousness will always turn to a page where a "Click" is written. The cannon, however, is a **red herring**. It is a dramatic device that makes an ordinary process unignorable. Your life is already a constant navigation of a "quantum minefield." Your continued survival is simply proof that, so far, your personal narrative has navigated every quantum fork that could have ended your character's story.

The Library's Size: Copies vs. Unique Books

The ultimate fate of this subjective immortality hinges on the nature of cosmic expansion, which determines the number of *copies* of each unique book.

- **Eternal Expansion**: If the universe expands forever, it could produce a truly infinite number of regions. This would create an **infinite number of copies** of the finite set of unique books. In this scenario, one of the unique books must logically contain a character arc that never ends. Subjective immortality can therefore be eternal.
- **Finite Expansion**: If expansion is vast but ultimately finite, there is a **finite number of copies** of each book. The library is finite in every sense. In this case, there is no book with an unending character arc. There is only a *longest possible story*. Subjective immortality is not eternal; you are simply guaranteed to experience the longest possible run of luck before all versions of your story end.

Free Will in a Written World

The Cosmic Library is a deterministic model because every book—the complete sequence of pages from start to finish—already exists as a static object. This has profound implications for free will. From the **libertarian** perspective—which defines free will as the genuine ability to have chosen otherwise, standing outside the chain of cause and effect—it is a complete illusion.

The feeling of making a choice is merely your consciousness turning to the next page and discovering the pre-written text. You are a character in a story, but you are not the author. In a library where all possible stories already exist—the one where you are an activist and the one where you are apathetic—the deeply personal feeling of forging a unique path is the model's most convincing illusion.

Challenges and Unanswered Questions

While the Cosmic Library offers a philosophically coherent and intuitive framework, it faces significant challenges, particularly in the realms of scientific testability and ultimate explanation.

First, there is the challenge of falsifiability. From the perspective of an observer within a story, the experience of "discovering which pre-written book you are in" is identical to the experience of a universe that dynamically "splits" at the moment of measurement. There appears to be no conceivable experiment that could distinguish between a static, pre-existing library of worlds and a dynamically branching set of worlds. The choice between them becomes a preference of philosophical interpretation rather than a testable scientific hypothesis. One might argue the static library is more elegant, while another might argue the splitting model is more direct.

Second, the model doesn't answer the ultimate "Why" question; it simply pushes it up one level. It explains the structure of reality as a vast library governed by quantum mechanics, but it doesn't explain why this specific library, with this specific set of physical laws, exists in the first place. The only potential answer is to defer to an even grander structure, such as Max Tegmark's Level IV multiverse, or a "library of libraries." In this view, our entire Cosmic Library is just one "book" among a collection of all possible libraries, each corresponding to a different self-consistent mathematical structure. This resolves the "why" question only by positing that all conceivable realities exist, a conclusion of ultimate scope but one that lies firmly in the realm of metaphysics.

Conclusion: The Reader, Not the Author

The Cosmic Library reframes our place in the cosmos. It suggests that quantum uncertainty is not a feature of the world, but a feature of our knowledge of it. Every quantum measurement, from a particle in a lab to a neuron firing in the brain, is not an act of creation but an act of discovery. With each observation, we narrow down the possibilities and pinpoint our location within the grand, pre-existing tapestry of all possible realities.

This leads to a profound conclusion about our own agency. If life is the process of discovering which of the finite, pre-written books we inhabit, then free will is not the power to write the story. It is the experience of reading it. The choices we feel we are making are, in this view, the very mechanism by which we discover the inevitable, predetermined path of the character we always were.

Bibliography

Everett, H. (1957). "'Relative State' Formulation of Quantum Mechanics." *Reviews of Modern Physics*, 29(3), 454–462.

Schrödinger, E. (1926). "An Undulatory Theory of the Mechanics of Atoms and Molecules." *Physical Review*, 28(6), 1049–1070.

Borges, J. L. (1941). "La biblioteca de Babel" (The Library of Babel). In *El jardín de senderos que se bifurcan* (The Garden of Forking Paths).

Dennett, D. C. (1991). *Consciousness Explained.* Little, Brown and Co.

Minkowski, H. (1908). "Space and Time." Lecture delivered at the 80th Assembly of German Natural Scientists and Physicians.

Price, H. (1996). *Time's Arrow and Archimedes' Point: New Directions for the Physics of Time.* Oxford University Press.

Born, M. (1926). "Zur Quantenmechanik der Stoßvorgänge" (On the Quantum Mechanics of Collision Processes). *Zeitschrift für Physik*, 37(12), 863-867.

Tegmark, M. (1998). "The Interpretation of Quantum Mechanics: Many Worlds or Many Words?" *Fortschritte der Physik*, 46(6-8), 855-862.

Tegmark, M. (2014). *Our Mathematical Universe: My Quest for the Ultimate Nature of Reality.* Knopf.

Linde, A. (1986). "Eternally existing self-reproducing chaotic inflationary universe." *Physics Letters B*, 175(4), 395-400.

Popper, K. (1959). *The Logic of Scientific Discovery.* Hutchinson.

Tegmark, M. (2003). "The Multiverse Hierarchy." Published in *Science and Ultimate Reality: Quantum Theory, Cosmology, and Complexity*.