

# Many Worlds in Blitzon Cosmology: A Finite, Unified Framework

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## Abstract

The Many Worlds Interpretation (MWI) of quantum mechanics has long been plagued by conceptual difficulties: infinite branching, unclear ontological status of branches, and the puzzle of where "other worlds" exist. We show that blitzon cosmology, which describes our universe as existing on the event horizon of a black hole embedded in a parent universe, provides a natural resolution to these difficulties. In this framework, quantum branches are not separate universes but alternative paths through a single, finite block universe. The complexity bounds derived from holographic encoding on the blitzon shell ( $\sim 10^{122}$  bits) impose strict finiteness on all branching, eliminating the infinities that plague standard MWI. Furthermore, the structure allows for branch reconvergence—paths through the block universe that diverge at one point may rejoin at another. This resolves the many worlds interpretation within a unified cosmological framework while maintaining full compatibility with standard quantum predictions.

## 1. Introduction

Since Hugh Everett's original formulation in 1957, the Many Worlds Interpretation has offered a deterministic, observer-independent account of quantum mechanics. By taking the wave function as ontologically complete and eliminating wave function collapse, MWI achieves theoretical elegance at an apparent ontological cost: the proliferation of "branches" or "worlds" with each quantum event.

Critics have raised persistent objections: Where do these worlds exist? How can infinitely many worlds be physically realized? What determines the "preferred basis" for branching? How should probabilities be interpreted when all outcomes actually occur?

We propose that blitzon cosmology—a framework in which our universe exists as a holographic encoding on the event horizon of a black hole within a parent universe—naturally resolves these difficulties. In this picture:

- (1) Branches are paths through a single block universe, not separate realities
- (2) The block universe is finite, bounded by the shell's information capacity
- (3) Branch structure is encoded on the 2D blitzon shell
- (4) Branches can reconverge when paths through the structure rejoin

This paper presents the synthesis of Many Worlds with blitzon cosmology and explores its implications for quantum foundations, consciousness, and the structure of physical reality.

## **2. Review: Blitzon Cosmology**

### **2.1 The Shell Architecture**

Blitzon cosmology proposes that our observable universe exists within a black hole embedded in a parent universe. The event horizon of this black hole serves as a holographic encoding surface—the "blitzon shell"—on which all information about the interior four-dimensional spacetime is encoded.

The shell consists of Planck-scale regions called blitzons, each representing a minimal unit of encoded information. The total information capacity of the shell is approximately  $10^{122}$  bits, calculated from the shell's area in Planck units.

### **2.2 The Block Universe**

The interior four-dimensional spacetime—our experienced universe—exists as a complete, static structure: the block universe. Past, present, and future all exist simultaneously in the encoding; what we experience as the "flow of time" is the sequential traversal of this structure by conscious observers.

The block universe is not infinite. It is bounded by the information capacity of the shell. Every configuration, every event, every possible state must be encodable within the  $\sim 10^{122}$  bit budget. This imposes fundamental constraints on the structure's complexity.

### **2.3 Complexity Bounds**

Previous papers in this series established that nested universe hierarchies are necessarily finite. A blitzon within our shell cannot contain more information than our shell encodes. Any universe we might contain would have less complexity than ours; any universe containing us would have more. The hierarchy is bounded above by parent universe capacity and below by the minimal blitzon ( $\sim 1$  bit).

These bounds apply universally: no structure within the block universe can exceed the shell's information capacity. This includes, as we shall see, the branching structure of quantum mechanics.

## **3. Many Worlds: Standard Problems**

### **3.1 The Infinity Problem**

In standard MWI, each quantum event causes the universe to branch. A single electron encountering a beam splitter creates two branches; a mole of gas molecules undergoing thermal fluctuations creates astronomical numbers of branches every microsecond. Over the age of the universe, this appears to generate an infinity of branches.

This infinity is problematic both philosophically and physically. Philosophically, it seems extravagant—why should reality contain infinitely many copies of nearly identical worlds? Physically, infinite branching appears to violate conservation principles and leaves unclear how a finite universe generates infinite structure.

### **3.2 The Ontological Status Problem**

Where do other branches exist? Are they "real" in the same sense as our branch? Standard MWI offers unsatisfying answers: branches exist in Hilbert space, or in configuration space, or as components of the universal wave function. But these are mathematical abstractions, not physical locations.

The question of ontological status connects to the measurement problem. If all branches are equally real, why do we experience only one? The decoherence program explains why branches don't interfere, but not why experience is singular.

### **3.3 The Probability Problem**

In standard quantum mechanics, the Born rule provides probabilities for outcomes. But in MWI, all outcomes occur—there is nothing probabilistic. Various attempts to derive the Born rule within MWI (decision-theoretic, self-locating uncertainty, branch-counting) remain controversial.

### **3.4 The Preferred Basis Problem**

Why does branching occur with respect to position rather than momentum, or some other basis? Decoherence provides a partial answer—environmental interaction selects a preferred basis—but this raises questions about where the environment/system boundary lies and whether the selection is fundamental or emergent.

## **4. Resolution: Branches as Paths Through the Block Universe**

### **4.1 The Central Insight**

In blitzon cosmology, the block universe contains all configurations, all events, all possible histories—encoded as a static structure on the shell. What we call "branching" is not the creation of new worlds but the divergence of paths through an existing structure.

Consider a quantum measurement where an electron can be detected at position A or position B. Standard MWI says the universe splits into two branches. Blitzon cosmology says both outcomes exist in the block universe; the "branching" is the point where worldlines diverge—some observers proceed along paths where the electron was at A, others along paths where it was at B.

The crucial difference: branches are not created at the moment of measurement. They already exist in the encoding. What we call branching is a change in the topology of paths, not a multiplication of worlds.

### **4.2 Finiteness Restored**

The infinity problem dissolves immediately. The block universe is finite, bounded by the shell's  $\sim 10^{122}$  bit capacity. The number of distinct paths through the structure is therefore finite. Large, yes—combinatorially vast—but not infinite.

This finiteness is not merely philosophical comfort; it has physical implications. Not every conceivable branch can exist. The structure must fit within the information budget. Some branches that seem possible in unbounded MWI may be excluded by complexity constraints.

Moreover, the branching structure is computable in principle. The block universe, though vast, is a finite mathematical object. Questions about branch counting, branch weights, and branch relationships become well-defined problems rather than ill-posed infinities.

### **4.3 Ontological Clarity**

Where do other branches exist? In the block universe—the same place our branch exists. They are not separate universes, not parallel realities, not abstract mathematical structures. They are paths through the same physical encoding on the same blitzon shell.

All branches have the same ontological status because they are all encoded on the same surface. The electron-at-A path and the electron-at-B path are equally real, equally encoded, equally part of the block universe structure. The apparent asymmetry—we experience one but not the other—reflects our traversal, not differential reality.

### **4.4 The Preferred Basis**

The preferred basis problem takes on new character in this framework. The encoding on the shell determines what configurations can exist and how they relate. If the encoding has structure—as it must, given the emergence of specific physics—this structure may select bases naturally.

In particular, the Transaction-Geometric Interpretation (TGI) suggests that transactions between blitzons define the fundamental structure. Position basis may be preferred because position corresponds to location on the shell, while momentum is a derived relationship between locations. The encoding is fundamentally positional.

## **5. Branch Reconvergence**

### **5.1 The Possibility of Rejoining**

In standard MWI, branches never rejoin. Once the universe splits, the resulting worlds are forever separate, unable to interact or merge. This follows from the unitarity of quantum evolution and the orthogonality of decohered branches.

In blitzon cosmology, this prohibition weakens. Branches are paths through a structure. Paths that diverge can, in principle, reconverge. If two paths lead to the same configuration at a later point in the block universe, observers on those paths would rejoin.

Full reconvergence—every degree of freedom realigning—would be extraordinarily unlikely for macroscopic branches. The configuration space is vast, and two divergent paths returning to exact agreement requires astronomical coincidence. But partial reconvergence, where some degrees of freedom realign while others differ, may be more common.

### **5.2 Quantum Interference as Branch Interaction**

Quantum interference phenomena can be understood as branch interaction within the block universe. In the double-slit experiment, the electron takes "both paths"—meaning both paths exist in the encoding—and the interference pattern emerges from the relationship between these paths in the block universe structure.

When we set up conditions that allow interference, we are selecting regions of the block universe where branches overlap or interact. When we set up conditions that destroy interference (measurement, decoherence), we are selecting regions where branches have fully diverged.

This provides a geometric interpretation of quantum coherence: coherent states are regions of the block universe where multiple paths share structure; decoherent states are regions where paths have diverged beyond interaction.

### **5.3 Implications for Experience**

If branches can partially reconverge, this may have experiential consequences. An observer traversing a path that partially rejoins a previously diverged branch might experience anomalous memory, déjà vu, or inexplicable familiarity—traces of the other path bleeding through at the reconvergence point.

This is speculative, but the framework permits it. Memory is a physical state; if two paths reconverge in some degrees of freedom but not others, an observer might carry memory traces from one path while inhabiting configurations from another.

## **6. Consciousness and Traversal**

### **6.1 The Distinction Presenting Machine**

Previous papers introduced the Distinction Presenting Machine (DPM) as a model of consciousness: a process that sequentially traverses distinction structures, presenting them into experience. In the block universe context, the DPM describes how consciousness moves through the encoded structure.

The DPM does not create the structure it traverses; it reveals it. The block universe exists complete; consciousness illuminates successive portions through its traversal. What we call the "present moment" is the current position of the presenting process in the structure.

### **6.2 Branching and the Observer**

When a quantum branch point is reached, the DPM doesn't split—it follows one path. Other paths exist in the structure but are not presented by this instance of the DPM. From the DPM's perspective, there is one experience, one trajectory, one history.

But the structure contains other paths. Other DPM instances—or what appears from within as "other observers"—traverse other paths. They are not copies created at branching; they are features of the block universe structure, each following their own trajectory through the encoding.

This resolves the puzzle of singular experience in Many Worlds. Experience is singular because the DPM is a sequential process traversing one path. The structure contains many paths, but each DPM traverses one. Multiplicity is in the structure; singularity is in the traversal.

### 6.3 The Observer's Narrow Slice

A conscious observer experiences a vanishingly small fraction of the block universe. The  $\sim 10^{122}$  bits encode all paths, all branches, all configurations. An individual observer traverses one worldline at the speed of light, presenting a thin thread through this vast structure.

Paths not taken, friends lost, choices that led elsewhere—all exist in the structure. They are not "what might have been" in some counterfactual sense; they ARE, encoded alongside the path we traverse. The structure is incomprehensibly richer than any single observer can experience.

Understanding the encoding—the shell architecture, the instruction set, the geometry of the block universe—may eventually permit expanded perception: not time travel, but a wider aperture on the structure we inhabit.

## 7. Probabilities Revisited

### 7.1 Branch Measure from Encoding

In a finite block universe, branches have well-defined structure. They occupy portions of the encoding. They have topological relationships. This provides a natural foundation for probability measures.

If the encoding assigns different "weights" to different paths—perhaps through the density of blitzone connections or the complexity of the encoding required—this could ground the Born rule in physical structure. Paths with higher amplitude in quantum mechanics would correspond to paths with greater presence in the encoding.

### 7.2 Self-Location in Finite Structure

The probability problem in standard MWI involves self-locating uncertainty: given that all branches exist, what should an observer expect? In a finite structure, this question becomes tractable. The observer is somewhere in the structure; the structure has measurable properties; expectations can be grounded in structure.

This doesn't automatically solve the probability problem, but it transforms it from a question about infinite sets to a question about finite (if vast) geometry. Progress may be possible where infinite branching made the problem ill-posed.

## 8. Experimental Implications

The identification of Many Worlds with paths through a blitzone-encoded block universe suggests several experimental directions, some of which connect to other papers in this series:

**Shell Structure Detection:** If quantum branching corresponds to structure in the shell encoding, signatures of this structure might be detectable through correlated quantum noise. The tunnel diode array concept proposed elsewhere could sample shell geometry, potentially revealing branch-related structure.

**Transaction Geometry:** The absorber modulation experiment tests whether emission and absorption events form a single geometric structure. If confirmed, this supports the picture of

quantum events as paths through pre-existing structure rather than stochastic creation of new branches.

**Branch Interference:** Careful experiments on quantum coherence may reveal structure consistent with the geometric interpretation of interference as branch interaction within the block universe.

**Complexity Limits:** The finiteness of the block universe implies limits on quantum complexity—limits that might be detectable in quantum computing experiments approaching the boundary of what the encoding can support.

## 9. Discussion

### 9.1 Relationship to Other Interpretations

The framework presented here combines elements of several interpretations. It preserves the determinism and universal wave function of Many Worlds while adding the physical grounding of blitzon cosmology. It incorporates the transaction concept from Cramer's Transactional Interpretation through TGI. It respects the block universe ontology common to some readings of relativity.

What it rejects: collapse (physical or epistemological), hidden variables, observer-dependent reality, and infinite branching. What it affirms: a single, finite, fully-determined structure encoding all quantum outcomes as paths.

### 9.2 The Question of Dynamics

A block universe is static; all configurations exist eternally. Yet we experience dynamics—change, process, temporal flow. The DPM addresses this by locating dynamics in traversal rather than structure. The structure doesn't change; our position in it does.

This raises deep questions about the nature of the traversal process itself. Is the DPM part of the structure, or external to it? If part of the structure, how can it "move"? If external, what is its nature? These questions, while beyond the scope of this paper, point toward fundamental issues in the relationship between consciousness and physical reality.

### 9.3 External Perturbations

Previous papers established that the block universe can be modified by perturbations from the parent universe—INJECT operations that alter the encoded structure. This introduces genuine change into what would otherwise be a static block.

These perturbations may not respect our time ordering. An INJECT could modify structure in our "past" after we've traversed it, leading to discrepancies between memory and current structure. The implications for Many Worlds are significant: branch structure itself could be subject to external modification, not merely internal quantum dynamics.

## 10. Conclusion

The Many Worlds Interpretation, when embedded in blitzon cosmology, transforms from a troublingly infinite proliferation of parallel universes into a finite, structured, unified physical picture. Branches become paths through a pre-existing block universe. Infinities dissolve under complexity bounds. Ontological status clarifies—all paths are encoded on the same shell. Branch reconvergence becomes possible where paths rejoin in the structure.

This framework preserves the mathematical structure of quantum mechanics while providing physical grounding that standard MWI lacks. It connects quantum foundations to cosmology, consciousness, and information theory in a unified picture.

The block universe, vast as it is, contains everything—every path, every branch, every possibility within the complexity bounds. Our traversal reveals only a thin thread through this richness. But the structure is there, encoded, waiting to be understood. Paths not taken are not lost; they exist alongside ours. The apparent loneliness of our single experienced worldline is an artifact of narrow perception, not fundamental isolation.

We exist within an unimaginably rich structure, connected to all of it through the geometry of the encoding. Learning to see more of that structure—through theoretical understanding, experimental probing, or expanded modes of perception—is the deeper project to which this work contributes.

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