

Time Travel

Temporal Mutability in the Absence of Hardware

Will Binns

hello@wbnnns.com

Abstract. This paper introduces the concept of Semantic Time Travel and proposes a formalization as the Recontextualization Principle: any sufficiently revelatory information disclosed in the present can retroactively transform the entire subjective experience of an arbitrary length of past time, without altering any physical events within that timeline. Unlike physical time travel, which requires manipulation of spacetime geometry and faces substantial barriers including lethal radiation, tidal forces, and chronology protection mechanisms, Semantic Time Travel operates on the meaning layer of temporal experience and is not only theoretically possible but observably occurs in human life. Drawing on work in hermeneutics, narrative identity theory, and the neuroscience of memory reconsolidation, this paper argues that for conscious beings, subjective temporal experience may be the only temporality that functionally matters, and that the mutability of meaning across time constitutes a genuine and underexplored form of temporal manipulation.

1. Introduction

The question of time travel has captivated physicists, philosophers, and the public imagination for over a century. Since Einstein's general theory of relativity demonstrated that spacetime is not a fixed stage but a dynamic, deformable geometry, serious scientific attention has been devoted to whether backward and forward temporal displacement is physically achievable [1].

The theoretical landscape is well-mapped. Closed timelike curves (CTCs) emerge naturally from solutions to the Einstein field equations, including Gödel's rotating universe metric [2], the interior geometry of Kerr black holes [3], and the frame-dragging effects around Tipler cylinders [4]. Morris et al. [5] demonstrated that time machines could theoretically be constructed using exotic matter with negative energy density. The Alcubierre metric showed that spacetime itself could be manipulated to produce superluminal-equivalent transport [6].

Yet every known mechanism faces what appear to be fundamental rather than merely engineering barriers. The Cauchy horizon instability in rotating black holes produces infinite blueshift radiation that would destroy any traveler [7]. Traversable wormholes require exotic matter in quantities never observed [8]. Tipler cylinders require infinite length. The Alcubierre drive accumulates vacuum radiation that releases catastrophically upon deceleration. Hawking's Chronology Protection Conjecture formalized the suspicion that physics itself may conspire to prevent causality violation [9].

This paper proposes an alternative framework. Rather than attempting to move physical matter backward through coordinate time, we examine a mechanism by which the experiential past of a conscious being can be substantively and retroactively altered through the disclosure of new information in the present. We term this mechanism Semantic Time Travel.

2. Related Work

The idea that the meaning of past experience is not fixed has deep roots in several philosophical and psychological traditions. This section situates the present framework within that broader landscape.

2.1. Hermeneutics and the Horizon of the Present

The hermeneutic tradition, particularly as developed by Gadamer [10], offers a closely related insight: all interpretation is shaped by the interpreter’s present horizon of understanding. Gadamer’s concept of the “fusion of horizons” suggests that our engagement with the past is always mediated by present concerns and knowledge. The Semantic Collapse Principle may be understood as formalizing one consequence of this insight—that a sufficiently dramatic shift in the present horizon can retroactively reorganize the entire structure of past understanding.

Heidegger [11] provides an even more foundational treatment. In *Being and Time*, Heidegger argues that temporality is not a sequence of discrete “nows” but a unified structure in which past, present, and future are ecstatically intertwined. The past, for Heidegger, is not something left behind but something that is continually taken up and reinterpreted in the present. The framework proposed here draws on this Heideggerian insight while extending it toward a more concrete analysis of how information disclosure functions as the mechanism of temporal reorganization.

2.2. Narrative Identity

Ricoeur [12] developed the concept of *emplotment*—the process by which discrete events are organized into a coherent narrative with temporal structure. Ricoeur argued that narrative is not merely a way of representing time but is constitutive of temporal experience itself. The Semantic Collapse Principle describes a specific case of what Ricoeur would recognize as radical re-emplotment: a moment in which the organizing narrative collapses and must be reconstructed.

The broader narrative identity tradition, including MacIntyre [13] and Bruner [14], holds that the self is constituted by the stories we tell about our lives, and that these stories are continuously revised. This paper extends that observation by treating such revision as a genuinely *temporal* phenomenon—not merely a narrative or psychological one—and by analyzing the conditions under which revision becomes irreversible.

2.3. Memory Reconsolidation

The neuroscience of memory reconsolidation [15] provides empirical grounding for the claim that the experienced past is mutable. When a memory is recalled, it enters a labile state and must be reconsolidated, a process during which it can be modified by current context [16]. This literature is well established but has not, to our knowledge, been integrated into a broader framework that treats recontextualization as a form of temporal manipulation. The present paper attempts to provide that integration.

2.4. Contribution of This Paper

What the present framework adds beyond these traditions is a unified account that treats recontextualization as a *temporal* phenomenon rather than a purely narrative, hermeneutic, or psychological one. By drawing an explicit parallel with physical time travel and formalizing the irreversibility of semantic collapse, this paper suggests that the mutability of meaning across time constitutes a distinct and underexplored category of temporal experience.

3. The Problem with Physical Time Travel

3.1. Closed Timelike Curves and Lethality

The most straightforward path to physical time travel involves following a worldline that curves back to an earlier coordinate time—a closed timelike curve. The Kerr solution for rotating black holes contains a ring singularity that, in principle, allows passage to earlier times. However, the inner Cauchy horizon is subject to mass inflation instability: gravitational radiation from the external universe accumulates at the horizon with exponentially increasing energy density. Any observer approaching this boundary encounters radiation with effectively infinite blueshift. This is not an engineering problem amenable to shielding solutions; it is a feature of the causal structure itself.

3.2. Wormholes and Exotic Matter

Thorne's traversable wormhole requires matter that violates the averaged null energy condition—matter with negative energy density in sufficient macroscopic quantities to hold the throat open against gravitational collapse. While quantum field theory permits microscopic negative energy fluctuations (e.g., the Casimir effect), scaling this to traversable wormhole dimensions remains far beyond any known or projected capability. The tidal forces near the throat of any realistically sized wormhole would spaghettify matter long before transit.

3.3. The Chronology Protection Conjecture

Hawking [9] observed that every known CTC solution either requires infinite energy, infinite structure, or encounters divergent quantum stress-energy at the chronology horizon. He proposed that the laws of physics conspire to prevent time travel to the macroscopic past. While not proven as a theorem, no counterexample has been demonstrated. The conjecture suggests that causality is not merely a convention but a protected feature of physical law.

The cumulative weight of these barriers suggests that physical time travel, if possible at all, requires physics fundamentally beyond general relativity and quantum field theory as currently understood. This motivates the search for alternative conceptions of temporal manipulation.

4. Redefining the Temporal Domain

4.1. Two Conceptions of Time

Physical discourse treats time as a coordinate in a four-dimensional manifold—a parameter in the equations of motion, measurable by clocks, and subject to dilation effects under relative velocity and gravitational potential. This is coordinate time, and it is the domain in which physical time travel is discussed.

Conscious beings, however, do not experience coordinate time. They experience phenomenological time: a subjective, meaning-laden, emotionally textured stream of awareness in which the “past” exists not as a fixed coordinate but as a continuously reconstructed narrative [17]. This distinction is not merely philosophical—it has direct neurological substrates.

4.2. Memory as Reconstruction, Not Recording

Contemporary neuroscience has established that human memory is fundamentally reconstructive rather than reproductive [18, 19]. Episodic memories are not stored as fixed recordings but as distributed neural patterns that are reassembled at each act of recall, incorporating current emotional state, subsequent experiences, and updated contextual understanding. This process, known as memory reconsolidation, means that every act of remembering is simultaneously an act of rewriting [15].

The implications for temporal experience are significant. If the past-as-experienced is reconstructed from current context, then altering the current context may literally alter the experienced past [16]. The events remain fixed in coordinate time, but the experiential reality of those events—the only form in which they exist for the conscious subject—is mutable.

5. The Semantic Collapse Principle

5.1. Formal Statement

We propose the following principle:

Any sufficiently revelatory information disclosed in the present can retroactively transform the entire subjective experience of an arbitrary length of past time, without altering any physical events within that timeline.

5.2. Corollary

The meaning of the past is not fixed until the present is final—and the present is never final.

5.3. The Thought Experiment

Consider two individuals, A and B, in a relationship spanning fifty years. Throughout this period, A consistently expresses love, care, and commitment to B. B’s experiential record of five decades is coherent: a story of mutual affection, shared history, and deep partnership.

In the fifty-first year, A discloses that every expression of love was fabricated—that A harbored contempt throughout the entire relationship.

The disclosure changes no physical event in the fifty-year timeline. Every dinner, every conversation, every gesture occurred exactly as it did. Yet B’s experiential past undergoes substantial transformation. Every memory is recontextualized: warmth becomes manipulation, intimacy becomes performance, trust becomes naivety. The emotional metadata attached to fifty years of lived experience—which constitutes the subjective reality of that time—is overwritten in a single moment.

This observation is not merely metaphorical. B’s neurological response to recalling those memories will measurably change. The hedonic valence of every recalled event inverts. The narrative structure that organized fifty years of experience collapses and is replaced. For B, the experienced past has changed.

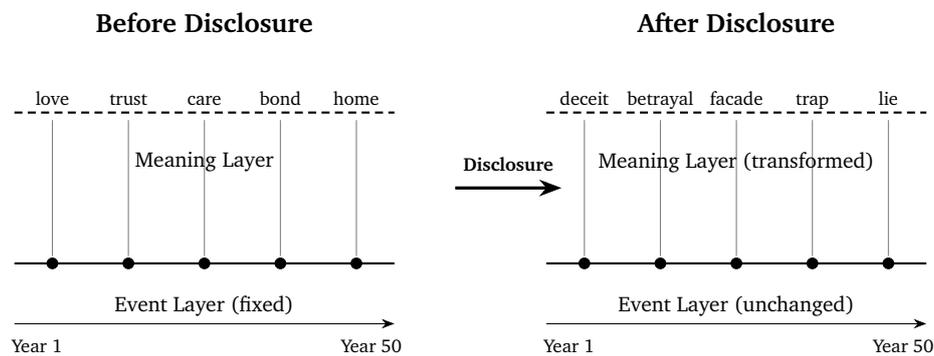


Figure 1: The Semantic Collapse Principle illustrated. The event layer remains identical before and after disclosure. Only the meaning layer—the subjective, experiential interpretation of events—is transformed.

5.4. Key Properties

No paradox. Unlike physical time travel, Semantic Time Travel generates no causal paradoxes. Events are not altered; only their meaning within the experiencing subject’s phenomenological timeline is transformed.

Temporal scope is unbounded. A single disclosure in the present can retroactively recontextualize an arbitrary span of past time—fifty years, as in our example, but equally five minutes or an entire lifetime.

The mechanism is asymmetric. Semantic Time Travel operates exclusively backward. The disclosure modifies the experienced past but cannot, by definition, modify the experienced future.

It is observably real. Unlike physical time travel, which remains entirely theoretical, Semantic Time Travel occurs routinely in human experience.

6. Applications

6.1. Intelligence and Statecraft

The architecture of espionage illustrates Semantic Time Travel. When a double agent is revealed, every interaction that person had with colleagues undergoes instantaneous retroactive reprocessing. Meetings shift from collegial to adversarial. Advice becomes misdirection. Recommendations become sabotage. Intelligence agencies intuitively understand this principle and time the reveal of compromised assets for maximum institutional disruption—they exploit the temporal reach of recontextualization as a strategic tool, understanding that the damage extends not from the moment of disclosure but backward across the entire operational timeline.

6.2. Legal Proceedings and Justice

Deathbed confessions, DNA exonerations, and unsealed testimony all function as Semantic Time Travel devices within the legal system [20]. When a person is exonerated after twenty years of incarceration, the justice system's narrative about that period inverts: punishment-for-guilt becomes persecution-of-innocence. This suggests that wrongful conviction damages should account not merely for time served but for the retroactive destruction of meaning across the entire period of incarceration.

6.3. Parenting and Developmental Psychology

A child raised in what they perceive as a loving, stable home who later discovers adoption, parental infidelity, hidden addiction, or concealed family dynamics experiences retroactive recontextualization of their formative years [21]. Their identity narrative is rewritten. Family secrets carry disproportionate psychological weight because they do not merely hurt in the present—they reach backward and alter the experiential foundation upon which the person's sense of self was constructed [22].

6.4. Markets, Finance, and Fraud

When corporate fraud is revealed—Enron, Theranos, FTX—every quarterly report, every earnings call, every investor meeting retroactively transforms from legitimate business activity to criminal theater [23]. In cryptocurrency markets, this phenomenon is particularly acute: a rug pull transforms every community post, every roadmap update, every public AMA from genuine project development into premeditated extraction.

6.5. Archaeology and Civilizational History

If definitive evidence emerged of a technologically sophisticated pre-Ice Age civilization, the effect would not be merely additive. It would retroactively transform the meaning of every megalithic site, every anomalous artifact, every academic dismissal. Göbekli Tepe shifts from “earliest known monumental architecture” to “late remnant of something much older” [24]. This would represent Semantic Time Travel operating at civilizational scale, rewriting not one person's past but humanity's collective experiential history.

6.6. Therapeutic Practice and Constructive Recontextualization

The principle has direct relevance to psychotherapy. Cognitive reframing, narrative therapy [25], and EMDR [26] all operate by introducing new interpretive frameworks that transform the meaning of past events. The therapeutic relationship itself becomes a vehicle for constructive temporal manipulation, the positive inverse of the thought experiment's destructive disclosure.

6.7. Posthumous Reputation and Legacy

When private letters, diaries, or classified documents surface after a person's death, their entire public legacy can invert. The dead cannot defend, contextualize, or nuance—the new information has disproportionate interpretive authority. The posthumous subject's experienced past—as held by every living person who knew or studied them—is rewritten without possibility of negotiation.

6.8. Information Asymmetry and Temporal Reach

The preceding applications reveal a unifying pattern: information is the vehicle, timing is the mechanism, and meaning is the medium through which the past is altered. The strategic use of Semantic Time Travel constitutes a form of harm that extends backward across the target's entire experiential timeline—a form of damage with no straightforward physical analogue and, as yet, no established legal framework for redress.

7. Broader Implications

7.1. Philosophy of Time

The Semantic Collapse Principle challenges the assumption that the past is ontologically fixed for conscious beings [11]. If subjective temporal experience is the only form of temporality accessible to consciousness, and if that experience is demonstrably mutable through present-moment information disclosure, then the philosophical category of “the past” may require significant revision [27].

7.2. Historical Revision at Scale

At civilizational scale, Semantic Time Travel operates through historiography. The discovery of new archaeological evidence, the declassification of state documents, or the reinterpretation of historical events through new theoretical frameworks retroactively transforms the collective past.

8. Relationship to Physical Time Travel

Semantic Time Travel does not compete with or substitute for physical time travel. The two operate in entirely different domains: physical time travel manipulates coordinate position within the spacetime manifold, while Semantic Time Travel manipulates the meaning structure of phenomenological experience. They are orthogonal.

However, for the question that ultimately motivates interest in time travel—“Can the past be changed?”—Semantic Time Travel provides a qualified affirmative answer within the domain that arguably matters most to conscious beings. The physical past may be immutable, but the lived past is not.

This reframing suggests that the longstanding fixation on physical time travel may reflect a category error: the assumption that coordinate time is the only meaningful temporal domain, when for conscious beings, phenomenological time may be the only temporality they ever directly access.

9. Implications for Practice

9.1. Recontextualization versus Fabrication

The framework proposed here rests on a critical distinction between recontextualization and fabrication. Recontextualization changes what events *meant*. Fabrication changes what events *were*. The first is a legitimate operation on the meaning layer; the second collapses the event-layer/meaning-layer distinction and, in clinical terms, approaches confabulation.

Maintaining this boundary requires what Bruner [14] calls interpretive awareness: the capacity to hold an experience and one’s interpretation of it as separable. Deliberate recontextualization, as it appears in narrative therapy and cognitive reframing, involves returning to the event layer, identifying the current meaning layer, examining its evidential basis, constructing an alternative, and testing it against the record. The discipline lies in rejecting any new meaning layer that fits the events less accurately, even if it feels preferable.

9.2. Deliberate Recontextualization and Its Limits

The framework suggests that deliberate recontextualization is most productive when grounded in practices that preserve the event layer independently of interpretation: contemporaneous records, external corroboration, and explicit separation of observation from inference. A periodic “temporal audit”—systematic review of the meaning assigned to key periods, relationships, and decisions—may serve as a corrective against unexamined narrative drift.

At the same time, the framework implies natural limits. The defense against having one’s past rewritten by others’ disclosures is not imperviousness to recontextualization but a well-maintained event layer that provides an independent anchor. The constructive application—forgiveness, therapeutic reframing, integration of difficult experience—operates not by pretending events did not occur but by genuinely transforming what those events mean within one’s phenomenological timeline.

10. Irreversibility and Semantic Collapse

10.1. The Quantum Parallel

In quantum mechanics, a system exists in superposition until a measurement is performed. The act of measurement collapses the wavefunction into a single definite state, and the superposition is irreversibly destroyed [28, 29]. We suggest that Semantic Time Travel exhibits an analogous irreversibility structure. Before the revelatory disclosure, the experiential past exists in what might be called semantic superposition—multiple possible meaning states coexist implicitly. The moment of disclosure functions as a kind of measurement, collapsing the semantic superposition into a single definite meaning state. And like quantum measurement, this collapse appears to be irreversible.

10.2. Formal Statement

Once a meaning layer has been collapsed by revelatory information, the prior meaning state is irreversibly destroyed. No subsequent act of recontextualization can restore the original experiential past. New meaning layers may be constructed, but they are built on the ruins of the collapsed state, not on the restoration of it.

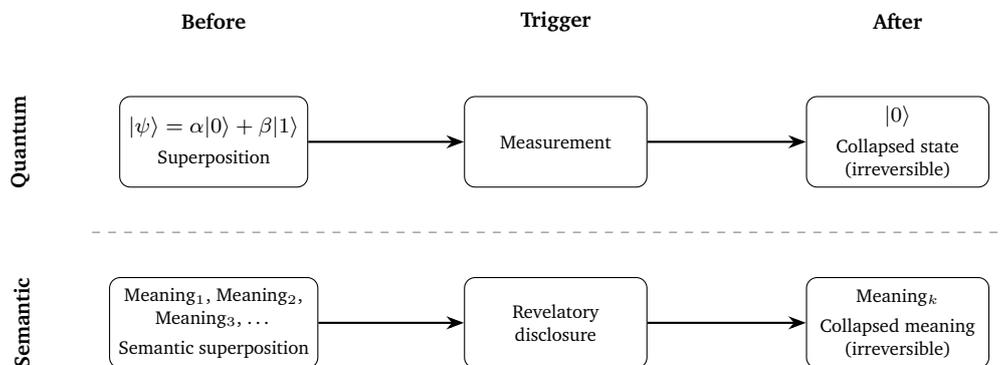


Figure 2: Structural parallel between quantum wavefunction collapse and semantic collapse. In both cases, the transition from superposition to a definite state is irreversible—the prior state cannot be recovered.

10.3. Asymmetry of Collapse

This irreversibility introduces a profound asymmetry into human relationships and information dynamics. The person who holds undisclosed information possesses a form of power with a one-way trigger: once exercised, it cannot be reversed.

10.4. The Observer Effect

In quantum mechanics, the observer is not separate from the system being measured; the act of observation alters the system [30]. In Semantic Time Travel, the person undergoing recontextualization is simultaneously the observer and the system. The person who emerges from a major semantic collapse is, in a meaningful sense, not the same person who entered it.

10.5. Layered Superposition and Meaning Stratigraphy

Successive recontextualizations create meaning stratigraphy—layers of collapsed meaning states stacked atop one another, each built on the ruins of its predecessor. The experiential past becomes, in effect, a compressed archive of every meaning state it has ever held.

11. Forward Semantic Time Travel

11.1. Anticipatory Recontextualization

Forward Semantic Time Travel does not alter future events. What it alters is the meaning layer that will be applied to future events at the moment they are experienced. Consider a person who receives a medical diagnosis with a two-year prognosis. Every subsequent experience is semantically transformed. The diagnosis has pre-loaded a meaning layer that will transform every future event at the moment of experience.

11.2. Intentional Forward Travel

A decision to emigrate semantically bifurcates the future. Every remaining experience in the current location is pre-contextualized as “one of the last times.” The individual has traveled forward along the meaning axis and pre-loaded a semantic framework that transforms the experiential quality of events that have not yet occurred.

11.3. The Stoic and Contemplative Traditions

The Stoic practice of *premeditatio malorum* can be understood as a systematic protocol for forward Semantic Time Travel [31]. Marcus Aurelius, writing that one should hold each moment as if it could be one’s last, was prescribing a specific forward-traveling semantic framework [32].

Buddhist contemplation of impermanence may serve the same function [33]. The practitioner who has genuinely internalized the impermanence of all phenomena experiences the present through a meaning layer that would otherwise require decades of loss to construct.

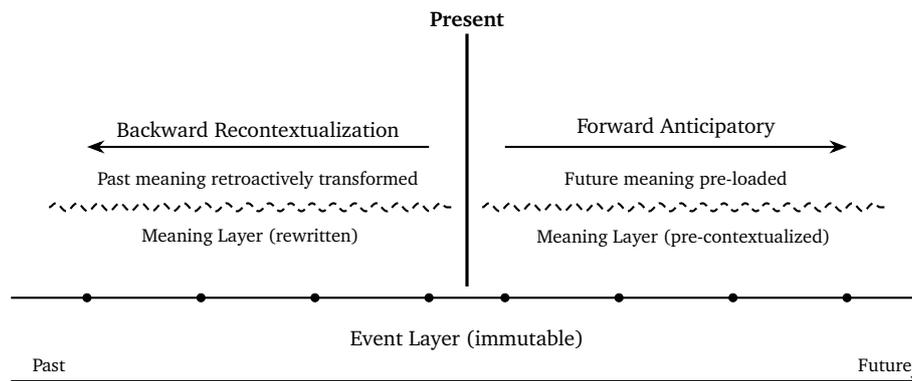


Figure 3: Bidirectional Semantic Time Travel. The present moment serves as the pivot from which meaning propagates in both directions—backward through recontextualization of existing memories, and forward through anticipatory framing of future experience. The event layer remains fixed throughout.

11.4. The Bidirectional Framework

The complete account of Semantic Time Travel operates in both directions simultaneously, maintaining the discipline that separates this framework from delusion: the event layer remains untouched. Only the meaning layer is subject to agency.

12. Neurodegenerative Dissolution

12.1. The Erosion of the Event Layer

Hippocampal degradation in Alzheimer’s disease progressively destroys the capacity to form new episodic memories and erodes access to existing ones, typically in reverse chronological order [34, 35].

12.2. Involuntary Forward Semantic Time Travel

The diagnosis itself pre-loads every future moment with impending cognitive dissolution. Every conversation carries the additional semantic weight of “I may not remember this.”

12.3. Temporal Displacement

Temporal displacement—the patient’s experiential present collapsing into an earlier period of their life—is one of the most clinically well-documented features of Alzheimer’s disease [36]. The patient is, in the only sense that matters to subjective experience, living in the past.

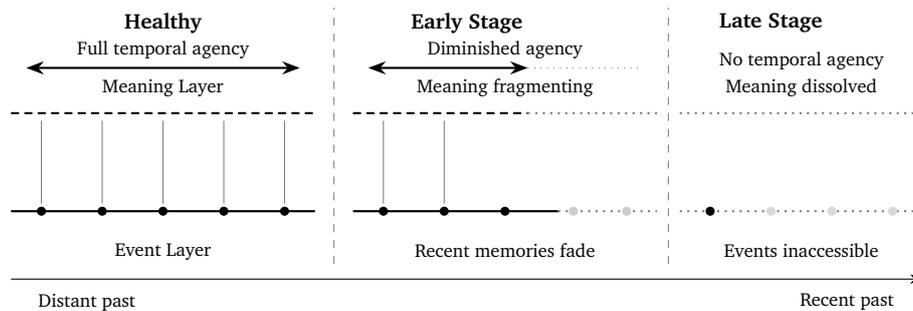


Figure 4: Neurodegenerative dissolution of temporal agency. In the healthy state, both the event layer and meaning layer are intact, supporting full bidirectional Semantic Time Travel. Progressive neurodegeneration erodes recent memories first (Ribot’s law), fragments the meaning layer, and ultimately eliminates the capacity for deliberate recontextualization.

12.4. Loss of Temporal Agency

As the framework makes clear, the capacity for Semantic Time Travel depends on the integrity of both the event layer and the meaning layer. Neurodegenerative disease erodes both. The patient becomes, in effect, a semantic time traveler with no navigation and no control over direction or destination.

12.5. Confabulation as Uncontrolled Recontextualization

Confabulation represents the collapse of the event-layer/meaning-layer distinction [37]. The boundary between deliberate recontextualization and pathological temporal dissolution is not experiential; it is epistemic.

12.6. Effects on Relational Networks

Dementia functions as a distributed recontextualization process: a single disease that simultaneously rewrites the experiential pasts of every person in the patient’s relational network. The caregiver experiences anticipatory grief as forward Semantic Time Travel while simultaneously undergoing involuntary backward Semantic Time Travel—displaced in both temporal directions at once [38].

12.7. Implications for the Framework

The capacity for Semantic Time Travel is itself temporally bounded: it exists for a window of biological viability, and that window will close. The practice of deliberate recontextualization is therefore also a practice of temporal self-preservation: building an external scaffold for meaning that can outlast the biological system that generated it.

13. Conclusion

The Semantic Collapse Principle identifies and proposes a formalization of a mechanism of temporal manipulation that is paradox-free, observably real, and operates at arbitrary temporal scale. By shifting

the domain of analysis from coordinate time to phenomenological time—from physics to the philosophy of conscious experience—we suggest that the past is not the fixed entity it is typically assumed to be.

This paper has traced the concept from its theoretical foundations through practical applications across intelligence, law, psychology, markets, archaeology, and interpersonal relationships. It has situated the framework within the hermeneutic, narrative identity, and memory reconsolidation literatures. It has outlined practical implications for deliberate recontextualization and established the irreversibility of semantic collapse—the property that once a meaning state is collapsed, the prior experiential reality appears to be permanently destroyed. It has extended the framework forward in time and confronted its ultimate biological limit in neurodegenerative dissolution.

This framework requires no exotic matter, no infinite structures, and no violation of known physics. It requires only rigorous honesty, verified records, and the recognition that the meaning of the past remains open to revision for as long as the present continues to unfold.

References

- [1] A. Einstein, “Die Feldgleichungen der Gravitation,” *Sitzungsberichte der Königlich Preußischen Akademie der Wissenschaften*, pp. 844–847, 1915.
- [2] K. Gödel, “An example of a new type of cosmological solutions of Einstein’s field equations of gravitation,” *Reviews of Modern Physics*, vol. 21, no. 3, pp. 447–450, 1949.
- [3] R. P. Kerr, “Gravitational field of a spinning mass as an example of algebraically special metrics,” *Physical Review Letters*, vol. 11, no. 5, pp. 237–238, 1963.
- [4] F. J. Tipler, “Rotating cylinders and the possibility of global causality violation,” *Physical Review D*, vol. 9, no. 8, pp. 2203–2206, 1974.
- [5] M. S. Morris, K. S. Thorne, and U. Yurtsever, “Wormholes, time machines, and the weak energy condition,” *Physical Review Letters*, vol. 61, no. 13, pp. 1446–1449, 1988.
- [6] M. Alcubierre, “The warp drive: Hyper-fast travel within general relativity,” *Classical and Quantum Gravity*, vol. 11, no. 5, pp. L73–L77, 1994.
- [7] E. Poisson and W. Israel, “Internal structure of black holes,” *Physical Review D*, vol. 41, no. 6, pp. 1796–1809, 1990.
- [8] M. Visser, *Lorentzian Wormholes: From Einstein to Hawking*. AIP Press, 1995.
- [9] S. W. Hawking, “Chronology protection conjecture,” *Physical Review D*, vol. 46, no. 2, pp. 603–611, 1992.
- [10] H.-G. Gadamer, *Truth and Method*. J.C.B. Mohr (Paul Siebeck), 1960. Originally published as *Wahrheit und Methode*. English translation 1975, Sheed & Ward.
- [11] M. Heidegger, *Sein und Zeit (Being and Time)*. Max Niemeyer Verlag, 1927.
- [12] P. Ricoeur, *Time and Narrative*, vol. 1. University of Chicago Press, 1984.
- [13] A. MacIntyre, *After Virtue: A Study in Moral Theory*. University of Notre Dame Press, 1981.
- [14] J. Bruner, *Actual Minds, Possible Worlds*. Harvard University Press, 1986.
- [15] K. Nader, G. E. Schafe, and J. E. LeDoux, “Fear memories require protein synthesis in the amygdala for reconsolidation after retrieval,” *Nature*, vol. 406, no. 6797, pp. 722–726, 2000.
- [16] E. F. Loftus, “Planting misinformation in the human mind: A 30-year investigation of the malleability of memory,” *Learning & Memory*, vol. 12, no. 4, pp. 361–366, 2005.
- [17] E. Husserl, *Vorlesungen zur Phänomenologie des inneren Zeitbewusstseins*. 1928. Edited by Martin Heidegger.
- [18] F. C. Bartlett, *Remembering: A Study in Experimental and Social Psychology*. Cambridge University Press, 1932.

- [19] D. L. Schacter, *Searching for Memory: The Brain, the Mind, and the Past*. Basic Books, 1996.
- [20] The Innocence Project, “Exonerated case studies.” <https://innocenceproject.org>, 2024.
- [21] E. Imber-Black, *The Secret Life of Families*. Bantam Books, 1998.
- [22] J. J. Freyd, *Betrayal Trauma: The Logic of Forgetting Childhood Abuse*. Harvard University Press, 1996.
- [23] M. Zuckoff, *Ponzi’s Scheme: The True Story of a Financial Legend*. Random House, 2005.
- [24] K. Schmidt, “Göbekli Tepe – the stone age sanctuaries,” *Documenta Praehistorica*, vol. 37, pp. 239–256, 2010.
- [25] M. White and D. Epston, *Narrative Means to Therapeutic Ends*. W. W. Norton, 1990.
- [26] F. Shapiro, *Eye Movement Desensitization and Reprocessing*. Guilford Press, 2nd ed., 2001.
- [27] H. Bergson, *Matière et Mémoire (Matter and Memory)*. Alcan, 1896.
- [28] N. Bohr, “The quantum postulate and the recent development of atomic theory,” *Nature*, vol. 121, pp. 580–590, 1928.
- [29] J. Von Neumann, *Mathematische Grundlagen der Quantenmechanik*. Springer, 1932.
- [30] J. A. Wheeler, “Law without law,” in *Quantum Theory and Measurement*, pp. 182–213, Princeton University Press, 1983.
- [31] P. Hadot, *Philosophy as a Way of Life*. Blackwell, 1995.
- [32] M. Aurelius, *Meditations*. n.p., 180. Book II.
- [33] R. Gethin, *The Foundations of Buddhism*. Oxford University Press, 1998.
- [34] H. Braak and E. Braak, “Neuropathological staging of Alzheimer-related changes,” *Acta Neuropathologica*, vol. 82, no. 4, pp. 239–259, 1991.
- [35] T. Ribot, *Les Maladies de la Mémoire*. Germer Baillière, 1881.
- [36] M. El Haj and D. Kapogiannis, “Time distortions in Alzheimer’s disease: a systematic review and theoretical integration,” *npj Aging and Mechanisms of Disease*, vol. 2, p. 16016, 2016.
- [37] G. Dalla Barba, *Memory, Consciousness and Temporality*. Springer, 2002.
- [38] R. Schulz *et al.*, “End-of-life care and the effects of bereavement on family caregivers of persons with dementia,” *New England Journal of Medicine*, vol. 349, no. 20, pp. 1936–1942, 2003.