ER: Existence, Reality and Time continues the journey begun in *Time Explained*. While the earlier book offered a broad introduction to the mysteries of time and first outlined the framework of Existential Realism (ER), this work takes the next step: a deep dive into the philosophical heart of ER.

At once rigorous and accessible, the book explores how existence unfolds in the present, how reality extends into past and future, and why becoming—rather than static being—must stand at the center of our understanding of time. It responds to the many questions raised by *Time Explained*, clarifying, expanding, and strengthening the vision of a temporal system that unites lived experience with scientific insight.

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„Time is the moving image of eternity, but the mind must rise above time to touch the unchanging Now.“

— Plotinus, Enneads III.7 & V.1 (c. 270 CE)

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Why Time Remains Poorly Understood

This book, ER: *Existence, Reality and Time*, continues and deepens the project begun in *Time Explained: Introduction into the World of Becoming* (published last year). That first volume offered an accessible overview of the problem of time, bringing together scientific, philosophical, and experiential perspectives into a coherent picture. *Time Explained* was written as an introduction: a guide into the many ways time shapes our world, and a first articulation of the framework I have called Existential Realism.

The response to that book has been deeply encouraging. I received generous feedback from readers across philosophy, physics, and cognitive science, as well as from many outside the academy. A common request was for greater depth: to clarify arguments, to expand on examples, and to develop more fully the themes that were only sketched in the earlier work. If *Time Explained* opened the door, *Existence, Reality and Time* invites the reader to step through it.

ER: Existence, Reality and Time should therefore be seen as a deep dive into Existential Realism—not a popular introduction, but a sustained investigation. Whereas the earlier book surveyed the terrain broadly, this one lingers over details, asking sharper questions and providing fuller answers.

Time is perhaps the most fundamental condition of existence. Everything we know and do unfolds within it; no event escapes it, no experience stands apart from it. To exist is to exist in time—nearly a universal truth. Yet despite this centrality, time remains among the most neglected and misunderstood topics in science and philosophy. This is a paradox: the very fabric that makes existence possible has too often been pushed to the margins of serious inquiry.

Science often treats time as a secondary variable—an axis on a graph, a parameter in an equation, a silent backdrop to motion. Philosophy, for its part, has drifted from its earlier fascination with time toward narrower, technical concerns, leaving its metaphysics curiously underdeveloped.

Meanwhile, in everyday life, time is reduced to clocks and calendars, a tool for organizing activity rather than a mystery to be probed.

This widespread omission is not an accident. It is supported by a range of factors that make time uniquely elusive as an object of study. Time is too close to us, too woven into our immediate awareness, to step back and analyze with detachment. Its nature resists easy theorizing, and where theories exist, they often clash with our intuitions. Philosophy has retreated from the problem, physics has fractured into incompatible models, and culture has instrumentalized time into a mere resource to be managed. At the deepest level, time also unsettles us: it reminds us of change, impermanence, and death. For all these reasons, time has too often been sidestepped rather than squarely faced.

So why does the most basic condition of existence remain so poorly understood? Several overlapping reasons help explain this paradox:

I. It is too familiar.

We live by the clock. From the moment we wake up to the moment we go to sleep, time orders our days: alarms tell us when to rise, calendars dictate our obligations, and schedules carve our lives into measurable slots. This constant engagement gives us the impression that we truly understand time. Yet what we really understand are the mechanical and social tools we have built to track it—clocks, calendars, schedules. These are human inventions, useful but shallow. They measure intervals but say nothing about the essence of time itself. Like a fish swimming in water, we are so immersed in temporal experience that we rarely pause to notice it. The very intimacy of time blinds us to its depth, creating the illusion that there is nothing mysterious left to investigate.

II. Physics hasn’t settled it.

Science has revolutionized our understanding of nature in countless ways, but when it comes to time, its record is fragmented. Classical physics, following Newton, treated time as absolute: a universal ticking that continued independently of everything else. Einstein overturned this with relativity, showing that time is elastic, tied to the speed of motion and the

pull of gravity. Suddenly, there was no single “now” that applied to everyone everywhere. Meanwhile, quantum mechanics introduced its own puzzle by treating time not as a dynamic process but as a static parameter, a backdrop against which particles evolve. No theory has managed to reconcile these perspectives into a coherent whole. The result is that physics, despite its triumphs, offers us contradictory images of time—absolute, relative, or background parameter—without any unified framework to bring them together.

III. It resists intuition.

Human beings feel time as a river, constantly flowing from future to present to past. We sense ourselves carried along, never able to stop, always pressed forward by becoming. But many scientific models deny that such a flow exists. The “block universe” picture in relativity suggests that past, present, and future are all equally real, that time does not move but simply is. According to this view, our perception of passage is a psychological illusion. The difficulty lies in the gap between lived experience and abstract theory: one insists that time flows, the other insists it does not. Neither science nor philosophy has resolved how to bridge this gap. As a result, the very thing most obvious to us—the felt passage of time—remains one of the least accounted-for in formal theories.

IV. Philosophy stepped back.

For centuries, philosophers wrestled with time at the deepest level. Augustine famously confessed that he knew what time was until someone asked him to explain it. Kant treated time as a pure form of intuition, structuring all experience. Bergson spoke of durée, the qualitative flow of lived duration. Yet in the twentieth century, philosophy largely abandoned such fundamental inquiries. Influenced by the linguistic and analytic turn, many philosophers redirected their energies toward analysing language, logic, and conceptual frameworks rather than engaging with raw metaphysical questions. The result was that time, once a central philosophical theme, was ceded to physics. But physics, as we have seen, has not delivered a comprehensive answer. Thus, philosophy’s retreat has left a vacuum precisely where a deeper engagement with time is most needed.

V. It's been instrumentalized.

Modern culture rarely asks what time is; it asks only how time can be used. Time has become a commodity, measured in wages, billable hours, and productivity. "Time is money" is not just a saying—it reflects how deeply instrumentalized time has become. We optimize it with digital calendars, efficiency apps, and productivity hacks. But in treating time as a resource, we reduce it to a means, neglecting its role as a condition of existence itself. This instrumentalization allows societies to run smoothly but at the cost of obscuring the deeper mystery. We no longer see time as a subject worthy of first-order inquiry but merely as something to be managed. In this reduction, its objective significance all but disappears.

VI. It is existentially uncomfortable.

Time is not only abstract but deeply personal. It confronts us with impermanence, aging, and death. To reflect on time seriously is to recognize that nothing lasts forever—not our experiences, not our relationships, not even ourselves. The present, however vivid, is fleeting; the future is uncertain; the past, irretrievable. This existential dimension makes time a subject we often avoid. It is easier to focus on productivity, schedules, or scientific abstractions than to face the raw fact of our mortality. Yet avoidance comes at a cost. Without reckoning with time, we fail to reckon with what it means to exist at all. Philosophy and science alike have often turned away from time not only because it is conceptually difficult, but because it is existentially uncomfortable. To confront time is to confront ourselves.

These factors have led to an intellectual vacuum. Neither physics nor philosophy, on their own, provide an integrated account of time that aligns with both empirical knowledge and lived experience.

A Return to Time

„Time is the moving image of eternity,
but the mind must rise above time to touch the unchanging Now."

— Plotinus, Enneads III.7 & V.1 (c. 270 CE)

The moment is long overdue for a renewed inquiry into the nature of time—an inquiry that neither collapses into mere equations nor hides behind poetic metaphors nor dismisses time as a cognitive illusion. For too long, time has been treated as a by-product, a secondary aspect of deeper processes, or a convenient scaffold for theories. Yet If temporality truly underlies all being, it cannot remain a marginal concern. We must restore it to the center of philosophy and science—not as a difficulty to sidestep, but as the ground upon which every other problem stands.
Such an inquiry cannot be confined within the borders of a single discipline. Physics brings indispensable insights into how time behaves under conditions of motion, gravity, and quantum indeterminacy. Phenomenology, by contrast, reveals how time is lived, how consciousness inhabits the flow of presence and memory. Cognitive science adds another dimension, showing how the brain constructs temporal order and continuity. Theoretical frameworks must then gather these threads, asking not merely how time appears or is measured, but what time fundamentally is. Only at the intersection of these approaches can a coherent and integrated picture begin to emerge—one that does justice both to the rigor of science and to the depth of lived experience.

To meet this challenge, I propose a framework called *Existential Realism*. Rather than beginning from mathematical formalism or speculative cosmology, it starts from the undeniable fact of the present. The present is the only domain where existence can be confirmed directly, where being is not inferred but experienced. From this anchor point, Existential Realism reconstructs a layered view of reality: the past and future are

acknowledged as real, carrying weight and consequence, yet they are not existent in the same sense as the present. They belong to reality but not to existence: they shape what is possible and influence what becomes actual, yet they are not themselves present before us. This distinction allows us to hold onto both the truth of scientific models, which depend on relations across past and future, and the truth of immediate experience, which insists on the primacy of the now.

In this way, Existential Realism does not reject scientific models but reframes their assumptions. The dominant metaphysical picture of the twentieth century placed "being" at the center: the world as a collection of entities persisting in time. By contrast, Existential Realism places becoming—change, transition, the ongoing emergence of the present—at the very center of its framework. To understand the structure of existence, we must begin not with static categories but with the dynamic process through which the present is continuously renewed.

The implications are far-reaching. To understand existence itself, we must understand how time grounds it. To clarify what we mean by reality, we must explain how past and future, though not existent, still shape and constrain the present. To make sense of causality, we must explore how temporal order makes causes possible. To articulate identity, we must examine how the self endures and transforms in time. To illuminate agency, we must confront how our choices unfold within temporal horizons that stretch beyond the instant of action. In short: time is not an optional theme, but the key to unlocking existence, reality, causality, identity, and agency alike.

To understand time, we must face it directly—without hiding behind abstractions that drain its flow or theories that call it illusion. Time deserves to be understood as real: not a by-product, not a mental projection, not a mathematical convenience, but the very condition through which existence becomes.

Part I – Foundations of Existential Realism

"Of all obstacles to a thoroughly penetrating account of existence, none looms up more dismayingly than time. Explain time? Not without explaining existence. Explain existence? Not without explaining time. To uncover the deep and hidden connection between time and existence is a task for the future."

— John A. Wheeler, "How Come the Quantum?", Annals of the New York Academy of Sciences, Vol. 480 (1986), p. 304.

A New Perspective on Time

In 46 BCE, Julius Caesar faced a uniquely practical and philosophical dilemma: time itself had slipped out of sync. The Roman lunar calendar had wandered from the seasons, misplacing festivals and disrupting civic rhythm. Caesar's Julian reform did more than tidy bureaucracy—it re-anchored Rome's sense of past and future, showing that even a calendar quietly defines how a civilization lives in time.

What is striking is not only the technical fix, but the deeper assumption it carried. When Caesar decreed that an extra 90 days be added to restore alignment, those days did not yet exist in any present sense. And yet,

they were treated as real enough to bind citizens, structure labour, and order ritual. Armies marched by dates not yet arrived; farmers sowed by months still only lines on parchment. The empire itself ran on a future that had no present existence yet carried undeniable force.

What happened in Rome is hardly unique. Every society, ancient or modern, lives by calendars, contracts, and commitments that lean on the not-yet. The calendar does not merely mark the flow of days; it projects reality forward, insisting that the future, though absent, is already woven into the fabric of decision and responsibility. In doing so, it quietly affirms a truth: we cannot live as if the past and future are nothing. They may not exist in the present, but they are real enough to shape how we eat, love, build, and rule.

And so, a simple calendar reform shows us what philosophy often struggles to name. The past and future may not stand on stage with the living present, but they press on us with a weight that feels undeniable. The deeper question is how we should understand this weight—what it means for something to be real without existing now. That is the puzzle this chapter takes up through a framework called *Existential Realism*.[1]

Setting the Stage

Time surrounds us completely, yet we keep trying to pin down its nature. When we pause to ask the simplest questions—what is real in time, what exists, and when—our answers splinter into theories that each capture something vital but never quite enough. Debates about time swing like a pendulum: when we focus only on the present, the rest of time vanishes; when we reach toward eternity, the living pulse of now goes flat. This chapter enters that contested space and suggests a new way of holding the balance: a framework called Existential Realism.

These debates may seem abstract, a philosopher's pastime, yet their stakes are high. If the past were nothing, what would become of memory or responsibility? If the future were already real, what of freedom and change? Such questions cut to the marrow of how we live—how we grieve, hope, and imagine the world we build. Time is not only a concept for metaphysicians; it is the backdrop against which every human drama unfolds.

1 Trepp, T. C. (2025). Existential Realism: A Distinct Ontological Framework Beyond Presentism. (Preprint) https://philpapers.org/archive/TENERM.pdf DOI: 10.5281/zenodo.17034826

Consider the way we speak in ordinary language. We say: "The dinosaurs are real—though they are gone," or "The storm tomorrow is real enough that I should carry an umbrella." Such statements rest uneasily on standard philosophical theories. Strict presentism, which insists only the present exists, has trouble granting reality to creatures long vanished or events still to come. Eternalism, with its picture of time as a fixed web of events, accommodates dinosaurs and storms, but only at the cost of denying the uniqueness of the present moment we actually inhabit. Growing block theory grants reality to past and present while leaving the future open, but it struggles to explain what it means for reality to "grow." Each theory preserves part of our temporal intuitions while giving up another.

It is here that Existential Realism offers a fresh proposal. Rather than forcing us to choose between a fleeting present and a frozen eternity, it introduces a simple but powerful distinction: to *exist* is not the same as to be *real*. Existence, in this view, is reserved for what is present and observable in principle now. Reality, by contrast, stretches further: it encompasses the past that has left traces, and the future that casts shadows forward in expectation and preparation. The present alone exists, but the past and future remain real.

Philosophical accounts of time have taken several forms. Presentism holds that only the present exists. Eternalism treats past, present, and future as equally real, like points fixed in a completed structure. It resonates with everyday intuition: we know that what has passed still matters and what lies ahead still shapes us. It also promises philosophical clarity, giving us a framework that avoids the extremes of erasure and determinism.

The following pages explore how *Existential Realism* engages with its rivals—presentism, eternalism, and the growing-block view—reframing puzzles about truth, causation, relativity, and the flow of time. Above all, it seeks to bridge scientific description with lived experience, grounding our sense that the present is both unique and never alone.

Where Theories of Time Collide

Philosophical inquiry into time struggles to reconcile the present with the weight of the past and the pull of the future. Presentism resonates with common sense but faces serious challenges—about truth, personal identity, and its conflict with relativity.
Eternalism instead presents time as a completed archive, with every page equally real. The model neatly fits both history and relativity's four-dimensional spacetime—but at a high cost: the felt flow of change and possibility becomes a mere psychological illusion. Freedom itself—and the drama of becoming—seem erased when tomorrow's outcomes are already inscribed beside yesterday's deeds.

The growing-block theory offers a compromise: past and present exist, the future not yet. Imagine reality written page by page—yesterday fixed, today in motion, tomorrow still blank. This vision preserves the solidity of the past and the openness of the future. Yet this view raises difficulties. How does the ledger grow, and by what mechanism are new entries added? But to say the block 'grows' implies another hidden time in which it does so—an awkward complication. Relativity also undermines the idea of a single universal present being written across the cosmos.
Beneath all these views lies a deeper unease: none capture both the vitality of the present and the enduring weight of other times without contradiction. Presentism keeps the freshness of now but dissolves the rest of time into nothing. Eternalism grants equal reality to all moments but flattens the movement that defines temporal life. The growing-block view holds both solidity and openness yet stumbles over how 'becoming' works within physics.

Time proves too rich for any single model, yet too essential to leave undefined. So, the ledger remains unbalanced. How can we affirm the uniqueness of the present without denying the force of what has passed or what is to come? How can time be both open and continuous, scientifically precise yet true to experience? Now, with these difficulties in view, let us turn to how this problem might be addressed.

Beyond Presentism, Eternalism, and the Block

Dinosaurs no longer exist. The statement seems simple—no living dinosaur walks the Earth—but it hides a puzzle. We treat them as real: paleontologists rebuild their bones, museums display their remains, and history accepts their world as fact. They are gone yet real. How can something be real without existing now? That gap between reality and existence is the doorway to *Existential Realism*, a view that holds only the present truly exists, while past and future remain real in different ways. What, in time, is actually real? Is reality confined to the present, or do past and future events also count? Three classic answers frame the debate:

- Presentism holds that only the present exists—the past is gone, the future not yet. It fits common sense but quickly falters: if the past is nothing, how can memory, history, or causation be true? And if relativity denies a single universal 'now,' what becomes of this strict present?
- Eternalism claims that past, present, and future all exist equally, like locations in space. The universe becomes a 'block' where every event—yesterday, today, tomorrow—already stands, and the flow of time is merely our perspective. The view fits relativity and secures past truths, yet it erases the special status of the present and turns change into illusion.
- The growing-block theory grants existence to past and present but not to the future. Reality grows as new moments arrive, preserving an advancing present and a secure past. Yet it puzzles over what makes the present move and how such growth fits relativity.

Each classic view captures a truth yet misses another. Presentism preserves the living now but erases history and possibility; eternalism restores them but freezes time's flow; growing-block holds both yet cannot explain becoming. *Existential Realism* enters here as a fourth way. It seems we are torn between metaphysical absolutism (only now is real, everything else is nothing) and an overly generous reality (everything at all times is equally real, making change and uniqueness of now an illusion). Each classic view captures a truth yet misses another… We might well

ask: is there a way to preserve the genuine specialness of the present without rendering the rest of time unreal? Existential Realism breaks from this impasse. It agrees with presentism that only the present truly exists—existence means being here and now—but adds a decisive twist: existence and reality are not the same. While existence is confined to the present, reality also includes past traces and future possibilities. This way, the present keeps its primacy without erasing the past or dismissing the future. At first it may sound paradoxical—how can something be real if it doesn't exist now?—but the distinction quickly becomes intuitive.

By drawing this line, *Existential Realism* keeps the present central—it is the only moment we directly experience—while still granting the past and future genuine reality beyond fiction or nothingness. This resolves the tension: only the now exists, yet reality extends before and after it. To see how, we turn to the core distinction at the heart of Existential Realism—between existence and reality.

Existence vs. Reality: Separating What Is Now from What Matters

In ordinary speech we treat *exist* and *real* as interchangeable—'Do unicorns exist? Are they real?' sound like the same question. *Existential Realism* shows that in the context of time, separating the two unlocks an important insight. In this framework, *existence* has a strict meaning: to exist is to be present and empirically part of the observable world right now. *Reality* is broader—it includes whatever belongs to the world's story, having effects or truth, even if not presently existent.

Formally, *Existential Realism* defines existence as whatever is presently and, in principle, observable. To exist is to be here and empirically accessible—able to influence our senses or instruments. This extends van Fraassen's empiricist idea—that we commit only to what is observable—by making that constraint part of the very definition of existence. Thus, mere presence is not enough: if something is entirely undetectable in principle right now, it does not count as existent.[2]

A distant star exists now if it is emitting light that could, in principle, reach us. A planet forever beyond causal contact does not—nothing about it

2 van Fraassen, B. C. (1980). The Scientific Image. Oxford University Press.

can manifest here and now. We remain agnostic until interaction is possible. Existence, in this view, is the set of things actively participating in the present scene of the world.

Now, reality is the larger stage. To say something is real is to say it plays *some* role in the world's causal or informational structure, regardless of whether it exists now or not. The category of reality certainly includes everything that exists at the moment (all present entities are of course real *by being there*). But it also reaches beyond the present. Crucially, past entities and events can be real *even though they no longer exist*, if they have left any sort of mark or trace. Likewise, future events are real though not yet existent if they are well-grounded in evidence or already shaping the present (as when a coming event influences our actions).

Let's unpack that with concrete examples:

- The eruption of Mount Vesuvius in 79 CE no longer exists—it's over. But it is real, because its traces remain: Pompeii's ruins, Pliny's writings, the altered landscape. The event itself isn't happening now, yet its reality anchors the truth of saying "the eruption happened." In Existential Realism, past events are real chapters of the world's story, even if they no longer exist.
- A solar eclipse predicted for next year doesn't exist now, but it is real in an anticipatory sense. Its future occurrence shapes present actions—scientists plan observations, travelers book trips. The alignment of celestial bodies is unfolding toward it, making it part of reality already. When it arrives, the eclipse will exist; afterward, it will remain real as a past event.

Existence is a spotlight on the present; reality is the wider stage that extends before and after it. Under *Existential Realism*, only the illuminated scene exists, while past and future remain real in their traces and tendencies. This solves presentism's problems: past truths hold because past events are real through their effects and records. Socrates no longer exists, but he is real through his influence and historical presence. Likewise, the future shapes us now—tomorrow's storm is not existent, yet its reality matters when I carry an umbrella today.

Imagine time as a stage play. Presentism says only the scene under the spotlight exists; eternalism says the whole play is lit at once. Existential

The Lantern represents the full scope of objective Existence (the physical present moment). The focused Spotlight illustrates the highly selective process of consciousness, which defines our narrow, subjectively experienced Specious Present within that existent moment. Fig.1.

Realism differs: only the current scene is performed (exists), but past scenes leave props and traces on stage, while future scenes are rehearsed and cued, casting influence before they unfold. The spotlight of existence shines only on now, yet reality spans past and future, keeping the story coherent without illuminating every moment at once.

By distinguishing 'exists now' from 'is real,' we recognize that something may matter and shape the world without existing in the present. We already accept this distinction when we call historical events 'real' though long past. *Existential Realism* simply formalizes that intuition: the present exists; past and future remain real in other modes.

Knowledge of non-present reality comes only through present evidence. We don't reach into the past or future directly; we study traces, records, and signals available now. Fossils tell us dinosaurs were real, just as weather models and clouds indicate tomorrow's storm is real in anticipation. Like electrons inferred from cloud chamber tracks, past and future events are known through present effects. Existential Realism makes this explicit: past events remain real through their traces, and future events through their present foundations. This keeps our language natural—fossils exist, therefore dinosaurs are real—without resorting to the awkward denials of strict presentism.

By now, the core of Existential Realism should be taking shape: it paints a two-tier picture of reality in time. On the top tier, Existence = what is present and observable now. On the broader tier, Reality = everything that is actual in the world's causal or informational network, whether it exists now or not. This framework is parsimonious about what it grants existence (no committing to entities floating out of our time-slice without evidence), yet generous about reality (acknowledging that causal and meaningful connections extend before and after the present). It lets us keep the framework tidy – we don't clutter "what exists" with ghosts of the past or speculative futures – but also keep it truthful to the structure of time – we don't throw away history or ignore future likelihoods.

In short, only the present exists fully; the past remains real through its traces, and the future becomes real through its seeds in the present. We've divided the question 'What is real in time?' into two: what exists now, and what—though not existing now—still has reality through cause or anticipation. The distinction may seem technical, yet it mirrors how we actually experience time.

The Lived Moment: How We Experience Reality's Stretch

The distinction between existence and reality is not merely abstract—it's reflected in how we actually experience time, remember the past, and anticipate the future. Consciousness doesn't live in a razor-thin instant. Our experience of 'now' is layered—it holds a fading past and an emerging future within it. This idea was explored by the phenomenologist Edmund Husserl over a century ago, and modern cognitive science echoes it.

Listening to a melody shows how the present has depth. You hear the current note, but also retain the just-past ones and anticipate what's next. Husserl called this layered structure the 'specious present'—a lived thickness of impression, retention, and protention where past and future shade into awareness.

Existential Realism maps neatly onto the experience of music. Strictly speaking, only the note sounding this instant exists. The just-played notes

no longer exist, yet they remain real in consciousness as retentions; the next note does not exist yet, but it is real in anticipation. Thus, experience shows that reality outruns existence: the present moment holds traces of the past and intimations of the future. Husserl's analysis of impression, retention, and protention already captures this structure, and Existential Realism gives it theoretical grounding.

Philosopher Thomas Metzinger describes a 'window of presence' the brain maintains—a short span where sensory inputs integrate with predictions. The brain doesn't update reality in infinitesimal slices; it holds a buffer of recent milliseconds and a projection of the next, creating what we feel as a flowing moment.[3] This suggests that even at a neural level, we treat very recent past events as still part of the current state of the world (the brain literally keeps them active in circuits for a brief time) and very near-future events as already shaping our current state (the brain is constantly predicting and pre-loading expectations). In Metzinger's view, the conscious self integrates experience over a brief temporal window, not a knife-edge instant. Our brains effectively enact *Existential Realism*: they treat the immediate past and near future as operationally real in the present.

Taken together, phenomenology and cognitive science both support the idea of reality without present existence. Our sense of self and continuity

3 Metzinger, T. (2004). Being No One: The Self-Model Theory of Subjectivity. MIT Press.

depends on keeping non-present elements active: the just-gone note lingers, the coming one is already anticipated. Existential Realism provides an interpretation of this: these things are indeed real (in the mind and in their effects), though they fail to meet the bar of present existence. By dovetailing with this structure of experience, the view gains a kind of naturalistic credibility. It feels psychologically true to how we live time.

This temporal stretch of experience carries moral weight as well. *Existential Realism* thus has a pragmatic and ethical side: we treat the past as mattering and the future as worth caring about—holding others accountable, remembering, saving, and planning. Strict presentism would render regret or planning meaningless. *Existential Realism* restores their sense: the past and future are real, though not existent now. This grounds responsibility, memory, and foresight in reality itself, reconciling our lived ethics with a clearer structure of time.

In sum, Existential Realism links epistemology, phenomenology, and ontology into a unified view of time. It stays grounded in observation and lived experience: all knowledge of non-present things comes through present evidence, and our experience already treats the now as stretched across past and future. The distinction between existence and reality is thus practical, not just abstract. It offers a shared language for scientists, philosophers, and historians alike—clarifying what is present and what, though beyond the present, still belongs to reality. Next, we'll see how this framework aligns with—and departs from—the classic theories of time.

Comparing Theories: Presentism, Eternalism, Growing Block, and Existential Realism

To see what sets *Existential Realism* apart, we can place it beside the three classic theories. Two questions guide the comparison: what exists at any moment, and what counts as real—especially for past and future? The table below sketches the contrast.

Theory	What Exists (Ontology)	Past	Future
Presentism	Only present entities exist (only the present is real).	Past entities neither exist nor remain real—the past is gone, surviving only in memory.	Future entities do not exist (since they are not yet) and are *not real* (the future is nothing as of now, only potential).
Eternalism	Past, present, and future entities all exist equally (time is a four-dimensional block).	Past entities exist (tenselessly) and are real just as the present is.	Future entities exist (tenselessly) already and are just as real as present ones.
Growing Block	Past and present exist (the block of reality grows with time); future does not yet exist.	Past entities exist (they are in the block of reality that has been accumulated) and are real – the past is an ever-growing archive of reality.	Future entities do not exist yet, so they are not real *yet* (they will come into existence as the block grows, but as of now they are nothing actual).
Existential Realism	Only present entities exist – *and* only if they are observable now (a stricter presentist criterion); however, reality extends beyond the present.	Past entities do not exist now (having ceased to be present), but they remain real by virtue of the traces, records, and effects they've left in the present. The past is an actual part of reality (it truly happened and shaped the world) even though it lacks current existence.	Future entities do not exist yet (not being present now), but they are real inasmuch as they are anticipated or already causally brewing. The future exerts a real influence through present expectations, plans, and tendencies, despite its lack of current existence.

In the table, "exist" refers to being an element of the world's inventory right now, whereas "real" refers to being accounted as part of the world's total structure (causally or truthfully) in that theory's view. All theories agree that present things are both existent and real (trivially, since that's what "present" means here), so the interesting differences concern past and future.

Presentism offers the leanest framework—only the present counts as real. Eternalism, by contrast, widens reality to all of spacetime. The growing-block view sits between them, letting the past persist while keeping the future open.

Existential Realism is no halfway compromise but a new axis altogether—distinguishing existence from reality. From the table, notice: it shares with presentism the claim that only present things exist, *and even tightens it* (requiring empirical presence too). This means it keeps the present sharply defined and privileged – on the question "What exists now?", ER answers in almost the same way a strict presentist would (with the caveat that extremely hidden or undetectable things might not count). But on the question "What is real in total?", ER aligns more with eternalism and growing block: it affirms that past entities and events are real (just not currently existing) and that at least some future entities/events are real (the ones that will exist or are meaningfully foreseeable). In doing so, Existential Realism sort of synthesizes the virtues of each view while avoiding their extremes.

It shares presentism's focus on the living now, eternalism's recognition that other times remain real, and the growing-block intuition of genuine becoming—but recombines them under a clearer logic.

Existential Realism isn't a hybrid of other theories but a new lens. While presentism, eternalism, and growing block all equate existence with reality, ER breaks that link. The past is real without existing—no need for half-measures. The future is real too, but only as unfolding possibilities, not fixed facts. This preserves openness: our actions genuinely shape which outcomes become actual, since none of them yet exist.

Relativity fits easily within ER. Existence is local—defined by each observer's present—while reality spans the whole spacetime network. Thus the present is empirical and variable; reality, global and continuous. Each observer has their own present spotlight, but reality is the whole stage, which all eventually agree on once signals connect. This way, existence is

frame-dependent, but reality is global. ER thus avoids both the absolute present rejected by physics and the timeless block of eternalism, offering a relativistically sound architecture: the present is local and empirical, reality is global and comprehensive.

Why This Matters: Bridging Human Experience and Objective Reality

The distinction between what exists and what is real matters far beyond metaphysical debate. It helps reconcile the worlds of experience and science, grounding a framework for time that speaks to both human meaning and empirical inquiry.

Let's begin with human experience itself. We live in time as beings who constantly reach beyond the present—treasuring memories, haunted or inspired by the past, and forming plans that depend on the future. These practices presume that the past and future, in some sense, exist in more than name only. Were the past unreal, remembrance and justice would collapse into reverence for nothing. Were the future unreal, preparation and care would lose all meaning. Yet we sense that both truly matter—the past grounds identity, the future calls for responsibility. We hold someone accountable for a crime committed last year because we believe the event truly happened and its moral weight persists; the past does not vanish with the moment. Likewise, we feel continuous with our past selves: the child you were is gone yet still you—an intuition that makes sense only if the past remains part of reality. We also invest in the future—educating ourselves for careers that do not yet exist, planting trees for people not yet born. *Existential Realism* justifies such instincts: those futures are real enough to matter. It says: you're right, the past *is* still real (hence learning from it or repenting for it has genuine meaning), and the future *is* in some way real (hence caring for it is not in vain). This doesn't force anyone to explicitly think in terms of "existence vs reality" in daily life, but it reassures us that our deeply held intuitions about time's significance rest on firmer logical ground than they might under a pure presentist or overly deterministic eternalist view. It's a philosophy of time that, far from being abstruse, actually vindicates common human practices – remembering, storytelling, hoping, and planning – as engaging with something real, not illusory.

The same clarity extends to science and philosophy. This reconciliation might be philosophically satisfying and even necessary for a deeper grasp of reality, because it ensures we aren't forced to dismiss either our best scientific understanding or the evidence of our direct experience as wholly misleading. Each is capturing a part of the truth.

The same distinction also illuminates how minds—and even machines—navigate time. In cognitive science or AI, it helps model how an agent distinguishes what exists now from what it treats as real. An AI might maintain a database of what it believes "exists now" (its current perceptual inputs, current state) separate from what it considers "real" (which includes stored memories of past states or predictions of future states). Such a model could improve clarity in designing systems that, say, simulate human-like perception of time – keeping recent past events in active memory (treating them almost as if still present) and future goals as influencing current decisions. In information science, one could formalize the idea of "live data" (currently updating, existing now) versus "archived data" (no longer active but part of the record – real) versus "forecast data" (simulated or anticipated, guiding actions – also real in a sense). In short, beyond metaphysics, the distinction offers a conceptual tool that could be useful wherever we deal with dynamic systems that integrate history and prediction.

At the existential level, this view fosters balance: live in the present—where things truly exist and action is possible—but honor the past and future, which remain real in shaping who you are and what will be. It affirms that we are temporally extended beings—emerging from a real past and moving toward a real future, not flickering in and out of nothingness. It underscores continuity: the chain of reality is unbroken across time, even though existence at any moment is fleeting. Recognizing this continuity can deepen our sense of meaning: our actions do not dissolve when moments pass—they remain woven into reality. And our hopes are directed at something more than pure void – the seeds of the future are already being sown in reality.

In conclusion, Existential Realism offers a fresh and integrative way to think about our view of time. It is "existential" in the literal sense of being about existence, but also in acknowledging the conditions of human existence (our knowledge limitations and experiential structure) as part of what defines reality. It is "realist" in asserting an objective world that doesn't bend to our present perspective – the past isn't just a story we tell

ourselves, it really happened; the future, though undecided, is grounded in real potentials, not mere fancy. By maintaining the line between what exists and what is real, Existential Realism avoids the usual confusions about time. It affirms that only the present is tangibly here, yet other times remain consequentially part of reality. In this, the framework restores coherence to our language of past, present, and future.

This perspective invites further reflection and refinement, of course. It's a beginning of a conversation, not the final word. But it points a way forward for discourse in metaphysics, and even suggests bridges to other disciplines. One could imagine new logical systems that formally capture "exists-now" versus "is-real" operators, helping us reason about temporal statements without paradox. Or one could explore how this idea might illuminate perennial questions – like the nature of free will (if only the present exists, one might say the future is not fixed yet, aligning with a sense of openness) or the nature of change (things change by moving from real potential to present existence and then to real history).

Most of all, Existential Realism reminds us of something profound: time can be viewed as a continuum where reality is larger than what is

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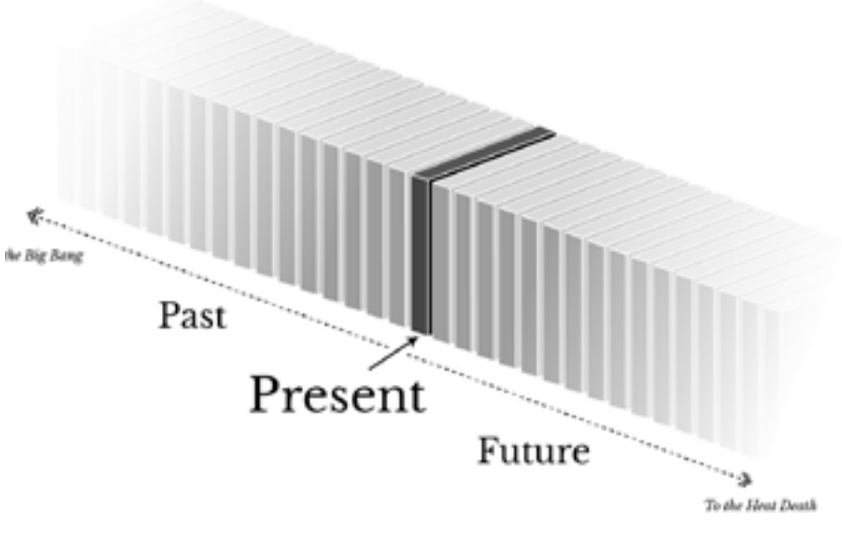

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3

Eternalism (1), Presentism (2), and Existential Realism (3) offer three sharply different answers to what exists. Eternalism sees all of time — past, present, and future — as equally real within a vast block universe. Presentism insists that only the fleeting present exists, leaving no trace of past or future. Existential Realism (ER) holds the middle ground: only the present exists, yet it is infused with the structural reality of what has been and what may come. Fig.2.

immediately present. Only the present exists, yet reality extends before and after it; the pages ahead develop that claim. Existential Realism gives philosophical voice to that poetic truth, helping us see time explained in a way that unites the scientific, the experiential, and the meaningful.

When Philosophy Touches Life

Philosophy becomes most compelling when its abstractions touch the ground. The distinction between what exists and what is real is not mere theory; when applied to real life, it reshapes how we think, act, and take responsibility. The stakes become clear across three domains: collective challenges such as climate change, historical responsibility and justice, and our personal choices.

- **Climate Change: Reserving a Seat at the Table for the Future.** Imagine humanity gathered at a single table, debating its shared future. The present fills the seats; the billions yet unborn have no voice. A strict presentist might insist: those people do not exist—therefore, they are nothing. And yet our actions today—burning fuel, building cities, cutting forests—will shape their lives as surely as yesterday's industrial revolutions shaped ours. To deny their reality is to behave as though the empty chairs around the table can be ignored. Recognizing the future as real, though not yet existent, gives those empty chairs weight. Melting glaciers, shifting weather, rising seas—today's crises and tomorrow's inheritance—already press upon us. To reserve a seat for the future is to act as if those who cannot yet speak still belong to the conversation. Environmental responsibility thus becomes realism rather than charity—we acknowledge the future's real, though not yet existing, presence in every choice.

- **Reparations and Historical Responsibility: The Past Still Signs Its Name.** Turn now from the future to the past. Consider debates about historical injustices—slavery, colonization, forced displacement. One might object: the perpetrators are long dead, the events long finished. If the past were nothing, why should the present carry its debts? And yet, the past continues to sign its name in the present: in wealth disparities, cultural trauma, and geopolitical divides. Treating the past as real, though no longer existent, clarifies our stance: the events are gone, yet their traces remain active and undeniable. Reparations or acts of historical acknowledgment are not attempts to conjure the dead; they are responses to realities that still shape us. The marks of history do not fade—they continue to shape today's balance. Ignoring them doesn't simplify the record; it distorts it.

- **Personal Decision-Making: Writing Footnotes in a Story Others Will Continue.** Finally, on the scale of an individual life: every choice—whether to pursue a vocation, start a family, or speak truth in a difficult moment—becomes part of the enduring record of reality. A decision may seem fleeting, yet once made, it cannot be undone; it remains part of the story of a life, shaping how others continue it. Similarly, our anticipation of the future is not daydream but engagement with something real. When a student studies for an exam, or a parent saves for a child's education, they are acting toward realities that do not yet exist but already matter. The exam will arrive, the child will grow—the future's demands are already woven into today's actions. To treat them as unreal would be to live as if tomorrow's book will never open. To treat them as real is to live as an author aware that each sentence today shapes the coherence of the chapter that follows.

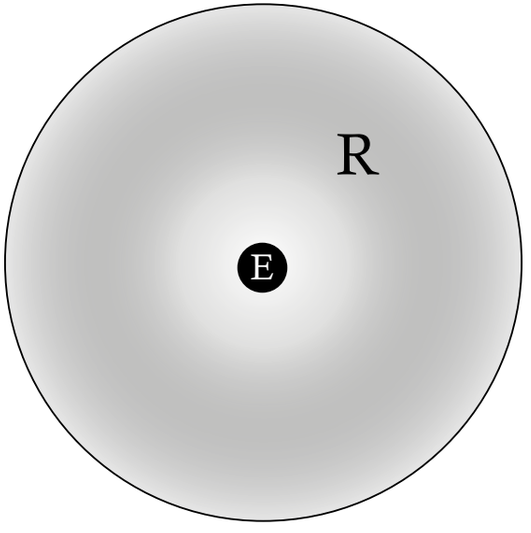
These examples show that the distinction between existence and reality is not a philosopher's game of definitions, but a practical lens on life itself. It explains why the past continues to press its weight upon us and why the future already leans into our decisions. The present is indeed the stage where we act, yet the scene is never bare: past acts have left their props scattered across the boards, and future scripts already whisper their cues.

What we do now sends ripples through this wider play, shaping both the echoes we inherit and the voices yet to enter. From this perspective, we can ask more simply: what lasting lessons emerge from this unfolding drama?

- **A future event that is reliably predicted** (for example, *a total solar eclipse expected next year*): This does not exist yet (since it hasn't happened), but we can say it is real in a prospective sense. We have very good reasons – rooted in current astronomy and physics – to believe it will happen. We may already be booking travel or building instruments for the eclipse. Its reality influences our present, even though it does not yet exist. If unforeseen events cancelled it, the prediction would be false—but assuming sound science, we rightly treat it as part of the future.
- **A purely fictional or hypothetical entity** (for example, *Sherlock Holmes, or a dragon*): This does not exist in the actual world (Holmes lives only in stories; dragons in myths), and it is not real in the sense we mean. Such entities are *imaginary*. They exist in fiction or in our minds, but they have no causal effects in the real world's physical or historical fabric. Holmes has influenced culture, yes, but that's because of the real existence of books and readers – Holmes himself isn't a real person we could ever meet or dig up evidence for. In terms of actual ontology (what there really is), fictional characters or purely hypothetical constructs don't make the cut.

These examples illustrate our two-tier view: only present, observable things exist, but many things that are not present (anymore or yet) are still real. The past and future, in their own ways, inhabit reality even if they don't inhabit the present. And anything completely outside of reality's causal weave – like a pure fiction or a truly undetectable object – neither exists nor is real in this framework.

By thinking this way, we can say: 'Dinosaurs are real, though they no longer exist,' or 'Our future grandchildren are real, even though they don't exist yet.' At first glance this sounds contradictory, but the tension dissolves once we apply the refined definitions. We mean that dinosaurs were part of reality (they had their time of existence and left remains), but they are not around in the present. And our future grandchildren (or any future people) aren't here yet, but they will be real individuals one day, and that prospective reality guides how we treat the future. Compare this to the old habit of using "exist" and "real" synonymously: a strict presentist would insist it's simply false to say *"dinosaurs are real"* because, for them, only what exists now is real – thus dinosaurs would be dismissed



The Scale of Existence (E) within Reality (R). This diagram illustrates the fundamental dichotomy of Existential Realism: Existence (E) is the singular, narrow window of the objective present moment, while Reality (R) is the vast, multidimensional expanse of the total informational record, encompassing all past moments and future potential. Fig.3.

as altogether unreal. Intuitively, that sounds wrong, and under our two-tier view we avoid saying such strange things. We do restrict existence to the present (so we agree only present dinosaurs would exist – and there are none), but we don't throw out reality for everything else. Past and future, and unobservable things, all can still be real in the ways that matter.

This seemingly small distinction – saying *X exists* vs *X is real* – actually has big ripple effects. It lets us resolve or at least ease several classic philosophical puzzles about time and existence. Why is this separation useful? Let's explore a few areas where it makes a difference, from truths about the past to the unseen depths of science, from the flow of our experience to our moral responsibilities.

True Stories of Past and Future

First, consider how we talk about past events or future events. We commonly say things like "Dinosaurs roamed the Earth millions of years ago" or "There will be a solar eclipse next April." We believe these statements are true. But philosophers have long asked: what makes them true? In other words, what in reality right now ensures the truth of a statement about something that isn't present?

This is known as the truthmaker problem for past and future statements. If I say "Dinosaurs existed," what is the truthmaker – the thing that makes this statement true? If only present things exist, one might worry there's nothing at all in existence now that corresponds to "dinosaurs" and could make the sentence true. After all, the dinosaurs are gone; if they're utterly unreal now, how can a true statement about them hang on anything? Some philosophers who insist only the present exists have been pushed into awkward positions: they might claim that *records* or *memories* in the present – like fossils in the ground or data in a history book – are the truthmakers for "dinosaurs existed." But that feels a bit off. Fossils exist now, yes, but the statement "dinosaurs roamed the Earth" isn't about fossils; it's about dinosaurs doing actual roaming. We want to be able to say it's true *because the dinosaurs really did roam back then*, not just because some remnants lie around now.

Existential Realism resolves the truthmaker worry by permitting past events and well-grounded future events to be real, though not presently existent. This avoids proxy truthmakers and locates truth in reality's structure: historical claims refer to earlier regions of reality; forecasts refer to later ones.

Science and the Unseen World

Another place the existence–reality split proves its worth is in science, especially when dealing with things we cannot directly observe. Think about the microscopic world: particles like electrons or quarks, or even entities like black holes or distant exoplanets. Scientific realists – those who believe our scientific theories truly describe the world – will say that such things exist because the theories need them to explain what we see. But scientific skeptics or empiricists might respond: "Hold on, have

we actually seen an electron or a black hole? If not, maybe we shouldn't so quickly say it exists.[7] Maybe we should only say our observations are explained as if these things were real."

This debate can get technical, but our two-tier perspective offers a neat middle path. We can say unobservable entities are real (if the evidence strongly supports them) without insisting that they *exist* in the straightforward, observable sense until we actually catch them in the act. In daily scientific practice, people almost talk this way already. For example, before 2015 nobody had directly detected gravitational waves (the ripples in spacetime that Einstein's theory predicted), but physicists generally believed they were real. They had strong indirect evidence and theoretical reasons to trust in gravitational waves. Many might have said, "Gravitational waves are real, even though we haven't yet observed one directly." And indeed, when the first detection finally happened, it was heralded as "gravitational waves exist!" – as if confirming existence after long assuming the reality.

Modern science is full of similar situations. Electrons – we don't exactly see electrons with our eyes, but we see tracks in cloud chambers or detector readouts. A scientist wouldn't say "that track exists" and mean the electron doesn't; rather, they'd likely say "the electron is real (because look at the trail it left and how our theory predicted it), though we don't ever see the electron directly, only its effects." We often hear about theoretical particles or cosmic events that are later confirmed by observation. Prior to confirmation, scientists treat them as *real hypotheses* – serious parts of the model of reality – without claiming they have the same status as, say, a rock on the table that you can plainly observe. Once confirmed, we casually start saying they "exist" because by then they are in the present, observable domain (even if via instruments).

This two-tier view keeps us honest but open-minded. It's empirically cautious – we don't lightly say *"X exists"* until we have observation – yet it's objective generous – we allow that *"X can be real"* if it's needed to explain and structure what we observe. In this way, we avoid two extremes: denying the reality of anything unseen, or prematurely granting existence to every theoretical construct. We can acknowledge reality without full existence.

7 van Fraassen, B. C. (1980). The Scientific Image. Oxford University Press.

is a constant exchange between quantum possibilities and the classical world, happening everywhere, every moment. As time goes on (even a split second), interaction with the environment effectively writes the record of one outcome, making it very hard to ever see the others. We end up with the familiar world of definite facts because decoherence has "settled" the quantum uncertainty into a stable pattern. In this way, the present is again spotlighted: it's the arena where this settling process plays out. At every instant, the universe is actively churning away, turning what *could be* into what *is*. One could say the world is always taking shape in the now, continuously being born anew as interactions accumulate. This resonates with the Existential Realist view that only the present has full, concrete existence – the now is where the indefiniteness finally resolves.

Another famous quantum phenomenon that has implications for our sense of time is entanglement. Entangled particles share a mysterious connection: perform a measurement on one particle here, and its distant partner will *instantly* seem to "know" the result, no matter how far away it is. If you have two entangled photons and you measure one to be polarized "up," the other will be polarized "down" (for instance), even if it's on the other side of the galaxy, and this correlation appears to happen faster than any light signal could travel between them. This instant correlation boggles the mind because it suggests that the two events – the measurement here and the result there – are happening as one, in some sense. In a relativistic universe, different observers might not agree on the timing of those events (for one observer they might seem simultaneous, for another not), and indeed relativity tells us there's no absolute simultaneity. Yet entanglement presents us with a scenario where two distant events behave as if they share a common, immediate now. It's as if reality at a fundamental level doesn't care that the particles are apart; when one becomes definite, so does the other, with no delay we can detect. Some have wondered if this hints that our usual understanding of time is incomplete – perhaps on some deeper level, the universe has a way of synchronizing or unifying moments that we don't fully grasp yet. What does this mean for how we view reality? For one, it makes the idea of a static "block universe" (where every event is set in a frozen 4D block) feel awkward. If everything were already laid out in a block of spacetime, entanglement wouldn't be surprising at all – nothing would "happen," it would just *be*. But what we see is a dynamic dance: measuring one particle *does*

something that reflects in the other. The fact that entangled particles coordinate their states in what appears to be real time underscores that something happening now has significance. This challenges the view that past, present, and future are equally fixed, and it lends support to the idea that only present events truly "fix" reality.[18] Now, entanglement doesn't outright violate relativity (no usable signal travels faster than light), and presentism in its naive form still struggles with entanglement because of the no-single-now issue. However, in Existential Realism, we can interpret entanglement in a sensible way: before measurement, the two particles' correlation is a real potential (part of reality's weave, connecting them). Once you measure one, that potential becomes an existent outcome for both particles – essentially, that entangled result becomes present and definite for anyone who checks. Different observers may slice up when they think each measurement happened, but all agree that once both are done, the joint outcome is real and affects future events. The key takeaway is that entanglement emphasizes how crucial the *moment of measurement* is. The world only "chooses" a correlated state when that joint measurement occurs. Up until that point, what will happen is unsettled. The present moment of interacting with one particle *establishes* the state of both in one swoop. Reality, again, is being actualized right now, not simply revealing an eternally predestined script.

In summary, all these diverse quantum scenarios – whether it's a delayed-choice paradox, a spontaneous collapse, a gradual decoherence, or a spooky entanglement – seem to point to one conclusion: the present is when potentiality turns into actuality. The universe is telling us, time and again, that "now" is when things become actual. If you close the lid on Schrödinger's cat, it's only when you open it *now* that the cat is definitely alive or dead. If a particle could have gone many routes, it's only at some present interaction that one route becomes the fact of the matter. Reality is not a finished collection of things but a story being written. Each moment adds a line, chosen from many possible drafts. Philosophically, it is a world of becoming, not just being. The world appears to be less like a timeless architecture of events, and more like a dynamic process – something actively under construction, *again and again*, in each present moment.

18 Eichman, P. (2007). Relativistic Challenges to Presentism. https://echodin.net/papers/phil551/relativity.pdf

So, how do we make sense of this? Our contention is that Existential Realism is uniquely suited to interpret this quantum-informed picture of reality. ER was crafted precisely to get around the limits of plain presentism, and it turns out quantum theory almost seems to be *asking* for just such a framework. Let's reflect on why ER provides a better account of these phenomena than its rival theories (presentism on one side, eternalism or "block universe" views on the other, including the extreme case of many-worlds). Along the way, we'll see why these ideas matter not just for abstract theory but for our understanding of time and even our sense of free will and agency.

Firstly, ER acknowledges that the future is open and full of real possibilities, without treating those possibilities as already actual. Quantum mechanics is intrinsically about probabilities – before we check, a system can do this *or* that, and we can often calculate the odds of each outcome. These odds aren't just fantasies; they reflect something genuine about the system's state right now. In an experiment like the double-slit, the electron's possible paths interfere to produce a pattern, meaning those possibilities have a kind of ghostly reality before one path is chosen. A strict presentist might respond, "Well, the future doesn't exist at all until it happens," which is true in ER as well – no outcome exists before it becomes present. But ER adds an important nuance: those not-yet outcomes are still real in the sense of affecting how things go. They're part of the world's causal structure. The electron's potential paths, for instance, are real enough to create interference effects, even though only one path will ultimately exist as the electron's history. On the other extreme, an eternalist or many-worlds view would say all outcomes are equally real – perhaps even that every outcome happens in some branch of the multiverse. That might explain quantum probabilities by brute force (everything occurs somewhere), but it eliminates the idea of something genuinely coming into being. If every possibility is realized, then in a sense nothing *new* ever happens; it's all laid out or all happening in parallel. The drama of choice and chance evaporates. ER avoids both of these unsatisfying extremes. It says: future outcomes are really possible – they have a sort of being as potentialities – but they are not realized until the present decides the matter. When one outcome does happen, it's a true addition to existence, not just a shift in our knowledge of which branch we're on. This captures what we actually see in experiments: until the moment of now, the result wasn't determined (from the perspective of *our* world), even

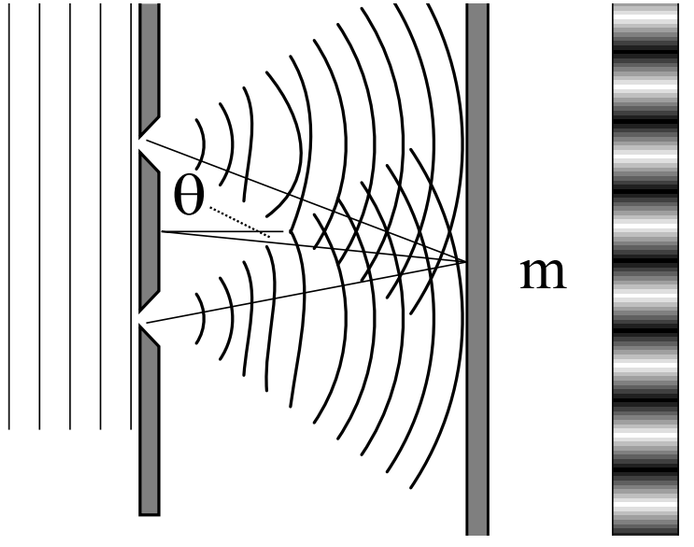


Illustration of the famous double slit experiment, showing how particles or waves passing through two slits create an interference pattern on the screen. The setup demonstrates quantum duality—light and matter behaving both as particles and waves—revealing the fundamental mystery at the heart of quantum mechanics. Fig.4.

though the range of possible outcomes was constrained and very much real. In ER, the wavefunction or the catalog of possible outcomes is part of reality's structure, but only one element from that catalog will make it into the history books as an existent fact. The rest remain unrealized possibilities – real just a moment before, but never to be realized. This powerfully matches quantum logic: it lets us talk about quantum states and superpositions without insisting that multiple contradictory outcomes exist simultaneously as they would in a many-worlds scenario.

Secondly, ER preserves the genuine sense of becoming and agency in time, which is something quantum mechanics intriguingly supports. One of the strangest implications of quantum theory is that the universe isn't clockwork deterministic. At the microscopic level, there is true randomness (or at least unpredictability), and in some scenarios, even choice seems to matter. For instance, the experimenter's decision *what* to measure (position vs. momentum, or whether to put detectors in or not) can change what outcome becomes actual for the system. It's not that anything goes – the laws of physics still apply – but the specific path the world takes can depend on what an observer decides to do in

what is vital in the present—its immediacy, its creative force—without banishing other times into nonexistence. The present is not an isolated point but a living hinge, where the weight of history meets the openness of what is to come.

In practical life, this reframing carries a quiet but profound message. Each moment is not merely the passive edge of a timeline but the workshop where reality is being fashioned. To act in the present is to ink one outline among many, to bring into existence what was once only penciled in. Our memories remind us that we inherit more than we choose; our choices remind us that we shape more than we inherit. Between these two truths, life acquires both responsibility and freedom.

Perhaps the most fitting image is that of weaving. The present is the shuttle that moves back and forth, binding the strong threads of the past with the loose fibers of the future, producing the fabric of reality itself. We live as weavers, one pass at a time, knowing that each movement adds to a pattern larger than any single hand can see. And in that weaving lies the dignity of the moment: to be present is not only to exist but to contribute to the unfolding design. So, we leave this chapter with a question that lingers as both challenge and invitation: if the present is where reality takes shape, how shall we use our brief but decisive role in its making?

So we leave this chapter with a question that lingers as both challenge and invitation: if the present is the place where reality takes shape, how shall we use our brief but decisive role in its making?

The next chapter turns to this question through a different lens—asking how the apparent freedom of becoming meets the lawful patterns that guide manifestation itself.

Lawfulness of Manifestation

“In the implicate order, everything is enfolded into everything else. The unfolding (explicate) order is the way this enfolded structure becomes manifest in the present.”

— Bohm, D. (1980). Wholeness and the implicate order. Routledge.

From the earliest human settlements, people have stood before the mystery of death and sought to leave behind a mark that resists disappearance. A pile of stones over a grave, a line of carved words on a tomb, the careful preparation of a body with ritual objects—all of these are gestures that reach beyond the fleeting moment of existence. They are acts of recognition that something, or someone, has passed from the immediacy of presence into another mode of being. The body no longer breathes, the voice no longer speaks, yet the traces remain. Cairns, epitaphs, and memorial rites are more than symbolic comforts; they are material affirmations that what has demanifested from existence persists as part of reality.

Archaeologists have uncovered burial sites tens of thousands of years old, adorned with ochre, tools, beads, or animal bones—objects placed carefully with the deceased. To the living community, these offerings were not meaningless. They signified continuity: the person’s existence had ended, but their reality was preserved in collective memory and in the enduring artifacts left behind. A cairn raised on a hill, visible to future generations, declared that a life once existed here, and that its reality still shapes the present. In this way, early humans expressed an instinctive concept: nothing simply vanishes, everything leaves a trace.

The same intuition flows through more elaborate traditions. The pyramids of Egypt, monumental tombs in China, the stelae of Mesopotamia, or the cenotaphs of Greece all bear witness to a cultural need to anchor the vanished present in a form that can withstand time. These stones and

structures are not just signs of wealth or political power; they are physical embodiments of a deeper conviction that existence does not dissolve into nothing. The deceased continue to exert influence—in memory, in lineage, in legacy—and the community ensures this influence is preserved in visible, lasting form.

Funeral rites are, in this sense, cultural dramatizations of manifestation and demanifestation. The living gather to mark the transition: to acknowledge that the individual's existence has ceased, but to also inscribe their reality into durable forms—songs, prayers, inscriptions, monuments. Whether in the solemn toll of a bell, the recitation of a name, or the laying of flowers on a grave, the same truth is enacted: demanifestation is not erasure, but transformation into a different register of being.

By tracing these ancient echoes, we see how societies across time have intuitively grasped the dual rhythm that sustains the world. Existence is fragile and fleeting; it slips away at every moment. Yet reality holds on, carrying forward the imprint of what has been. To study funeral rites and memory stones, then, is not merely to examine the archaeology of grief—it is to witness how humanity, again and again, has recognized and honored the continuity between the transient and the enduring, the lived moment and the lasting trace.

Time as Threshold: Framing the Problem of Manifestation

Time's familiar river image helps, but the chapter's task is narrower: how does the real become present, and how does the present return to the real? Existence is the brief crest; reality the ocean that sustains it. The question now is the process, not the picture: by what law do crests form and fade?

This is the heart of the problem of manifestation. To say that something manifests is to say that it steps forward from the depth of possibility into the spotlight of now. A seed germinates, a baby is born, a memory resurfaces, a star ignites: each is an instance of reality unfolding into existence. Yet just as crucial is the reverse motion, the quiet counterpart of manifestation: demanifestation, the passing away of the existent into the storehouse of reality. A flower withers, a flame dies out, a life ends,

The briefly burning, bright flame of the match represents Existence—the fleeting, active present moment. When the flame dies, its existence vanishes, but the effects (the smoke, the heat, the charred wood) are immediately integrated into the permanent, enduring informational record of Reality. Fig.5.

and yet each leaves traces—nutrients, ashes, memories—that continue to shape the world. Manifestation and demanifestation are not magical ruptures but lawful processes, the double rhythm by which time keeps its beat.

We are thus invited to see the present not as a static stage but as a threshold, a razor's edge on which the world continuously balances. At this threshold, countless possibilities collapse into the single actuality we experience, while every actuality almost immediately begins its transformation into reality. The flow of time, in this view, is nothing other than this ceaseless two-way traffic: the real becoming existent, and the existent returning to the real. It is a kind of cosmic respiration, a breathing in and out at the frontier of now.

What makes this picture compelling is not merely its poetry but its explanatory power. It shows us why causality works—because each existent emerges from lawful conditions already real, and why memory

is trustworthy—because past events continue to press their imprint into reality. It explains why we can anticipate the future without invoking pre-written scripts—because the laws generate new moments from present conditions rather than unrolling a hidden film reel. In this sense, manifestation and demanifestation animate our two-level framework, showing why the world moves with order and vitality rather than remaining static. Without them, the scheme would be lifeless: an ocean without waves, a canvas without brushstrokes. With them, we can see why the world does not hang motionless but surges forward with ordered vitality.

This chapter takes up the challenge of articulating these transitions. It will explore how manifestation brings potentials into the sharpness of presence, how demanifestation transforms the existent into traces and legacies, and how together they compose the lawful fabric of time's flow. Along the way, we will examine familiar examples—from the cycle of stars and the growth of living beings to the dynamics of memory and anticipation—to show that this double process is not hidden in the rarefied heights of theory but woven through our everyday experience.

Challenges and Contested Ground

Any account that speaks of things coming into being and then passing away must immediately confront a host of difficulties. It is not enough to say that the present is fleeting, or that reality somehow holds both memory and possibility. Such statements invite pressing questions: How can we claim that what no longer exists remains "real" without slipping into contradiction? How can we describe the future as real without predetermining every outcome? And how do we ensure that the world's flow does not collapse into either a frozen block of already-written events or a mystical flux that defies understanding?

These are not idle puzzles; they cut to the very heart of how we understand time. Philosophers and physicists alike have long disagreed on the issue. Some insist that the past and future must exist in equal measure alongside the present, forming a great block where nothing truly becomes. Others reject this, treating only the present as real, and consigning past and future to shadows or illusions. Between these poles lies a turbulent space where questions of causation, memory, and anticipation are contested. The challenge is to describe the transitions of becoming without resorting either to rigid determinism or to vague mystery.

One difficulty is the status of the past. When we say that a flame no longer exists, yet has left smoke in the air and warmth in the room, are we not speaking in riddles? Some would argue that to say "the flame is real" after it has gone is nonsense: the flame is extinguished, and what remains are only different phenomena. Others counter that without acknowledging the lingering trace of what has been, we cannot make sense of continuity at all. The puzzle is whether "reality" beyond existence is a useful concept or a needless duplication.

Another problem lies in the openness of the future. If tomorrow's eclipse is real today, does that mean it already exists in some hidden sense, waiting to be unveiled? If so, have we not robbed the future of its uncertainty, reducing becoming to a mere performance of what was already scripted? On the other hand, if the future is not real in any sense, how can we explain the striking accuracy of prediction, the way seeds reliably become plants or planets move along calculable orbits? To hold the future as both open and yet structured is to walk a narrow path between determinism and chaos.[20]

There are also disagreements about lawfulness itself. Some critics worry that invoking laws to describe manifestation and demanifestation risks circularity: are we not simply saying that things happen because that is how things happen? Others suspect that lawfulness, if pressed too far, undermines the novelty of each moment—making the present a mere consequence, not a genuine becoming.[21] And yet if we abandon lawfulness, we are left with a capricious world where nothing can be explained or trusted. How can we account for time's flow as ordered without reducing it to mechanical repetition?

Finally, there is the difficulty of experience. Human consciousness seems to move with time's arrow, holding on to memories and leaning into expectations. But are these impressions trustworthy guides to objectify,

20 Prigogine, I., & Stengers, I. (1984). Order out of chaos: Man's new dialogue with nature. Bantam.
21 Eddington, A. (1927). The nature of the physical world. Cambridge University Press.

Matter, Substance and Stuff

"What we observe as material bodies and forces are nothing but shapes and variations in the structure of space and time."

— Schrödinger, E. (1935).
Science and the human temperament. George Allen & Unwin.

When Galileo first turned his telescope skyward in 1609, shimmering points became worlds. But the discovery of light's finite speed soon revealed a deeper puzzle: we never see the stars as they are, only as they were. The cosmos became an archive of delays—each twinkle an echo of a reality already past.

This discovery reached deeper than astronomy—it unsettled our very sense of immediacy. What does it mean to speak of the present if every cosmic view arrives time-shifted? Are we ever in touch with what is, or only with what was? The telescope, once a scientific breakthrough, thus became a philosophical challenge.

In the view of Existential Realism (ER), existence remains strictly bound to the present. A photon striking the lens exists now; no delay alters that fact. Galileo's telescope therefore foreshadows a deeper paradox: reality may stretch beyond the present, but existence never departs from it. Perception is always belated—and yet it happens only in the now.

What makes a philosophical framework compelling is not only the elegance of its claims but also its vulnerability to being tested. A theory that cannot, even in principle, be challenged risks becoming a dogma. ER deliberately avoids this trap. By distinguishing existence—what is here and now—from reality—the wider field of what has been and what may come—ER does more than offer a theory of time; it makes a falsifiable claim. The wager is simple: if matter or information can be shown to arrive from beyond the present, then ER collapses.

That challenge transforms what might otherwise sound like a metaphysical meditation into something closer to a scientific hypothesis. The boldness lies in its falsifiability. Unlike the sweeping proclamations of eternalism or presentism, ER invites us to imagine its own defeat, to envision what the world would look like if time were not bounded by the present. This chapter takes up that invitation.

The telescope reveals a universe of time delays: we see stars not as they are, but as they were. This illustrates how the speed of light separates cosmic Existence (the true, distant present) from Reality (our time-shifted observation). Fig.5.

Stage image, in brief: what stands in the light exists; sets and scripts are real but offstage. Now to the tests. If, however, an actor from tomorrow's act were to suddenly stride on stage unannounced, or if a ghost from last week's rehearsal intervened mid-scene, ER would be undone.

This is the spirit in which we proceed: not to shore up ER with blind faith, but to probe the cracks that might split it open. We will explore candidate "counterexamples"—from the starlight that carries ancient journeys into our telescopes, to relativity's shifting frames of simultaneity, to the temptations of quantum entanglement and time machines. Each example asks: do we ever encounter anything outside the present, or only its traces that reach us here and now?

To make this inquiry vivid, we will stage a series of thought experiments, some bordering on science fiction, others drawn from the very frontiers of physics. Imagine a phone call from the past that not only echoes but answers you; a device that reveals tomorrow's stock prices before the bell; a box that whispers the true state of Andromeda this instant. Each scenario sharpens the criterion by which ER could be disproved. And yet, as we shall see, every one of them collides with walls erected by relativity, quantum mechanics, or thermodynamics.

The exercise is not idle speculation. By imagining how ER could fail, we clarify why it endures. We learn not only what the present is, but what prevents us from leaping out of it. This makes the present not a narrow prison, but the very arena where all interaction, knowledge, and transformation take place. The fact that the universe blocks any influence from other times may be its most consistent law.

The stakes are clear and the stage is prepared. We now enter the heart of the argument: specifically, we ask what it would take to disprove Existential Realism, and demonstrate why every plausible attempt inevitably fails to cross that threshold.

Friction at the Edges: Where ER Meets Resistance

Every bold idea invites friction. The moment one claims to have clarified the structure of time, or to have settled the question of what truly exists, objections arrive like waves against a seawall. Some of these waves are gentle, merely raising points of clarification; others strike with force, pressing at the very foundation of the claim. To explore the limits of any framework, one must attend carefully to these pressures.

One difficulty arises from the slipperiness of language itself. Words such as *existence*, *reality*, *matter*, or *substance* have long histories, each colored by metaphysics, theology, and physics in turn. Philosophers quarrel not only about the world but about what these words mean. When someone hears that "only the present exists," the response often depends less on logic than on what *exists* has meant to them in prior debates. For some, it implies a narrow, almost impoverished picture of the universe; for others, it feels like common sense. Thus, disagreements are not only about content but about the vocabulary through which the content is expressed.

Another problem lies in the tension between intuition and science. On the one hand, human experience delivers time as an unfolding stream: we wake, we act, we remember, we anticipate. On the other, physics speaks in equations that often seem indifferent to this lived flow. Einstein's relativity, with its relativized "now," has led many to declare that all moments stand equally real, as if time were a completed film reel. Critics then ask: if the scientific picture seems eternalist, how can one defend a philosophy that insists upon the primacy of the present? The challenge here is not simply to oppose physics, but to reconcile its abstractions with the immediacy of lived perception.

There are also practical difficulties. To disprove or confirm a view of time requires criteria that are both clear and testable. Yet the very notion of "testing time" can sound paradoxical: how does one measure what

defines the measure of all things? Physicists build thought experiments of wormholes, entanglement, and retrocausal signals; philosophers devise paradoxes of free will, knowledge, and determinism. The danger is that the conversation drifts into speculation so unconstrained that no real disagreement can ever be resolved. To avoid that fate, one must hold tightly to standards of evidence and clarity, while still daring to imagine the extraordinary.

Finally, there is the perennial difficulty of perspective. Different disciplines—physics, philosophy, neuroscience, even literature—each approach time from their own angle, like climbers on separate faces of the same mountain. What seems obvious from one path may be invisible from another. A physicist may demand equations, a philosopher coherence, a poet resonance. When these voices collide, disagreement can sound like irreconcilable conflict, when in fact it is the inevitable friction of multiple vantage points on a single enigma.

These problems, difficulties, and disagreements are not obstacles to be lamented, but invitations to be sharpened. They force us to articulate what might otherwise remain vague, and to seek evidence where comfort alone might have sufficed. If the question of time is to be more than a parlor puzzle, it must be tested against the hardest objections. Only then can we see whether the wall holds—or whether a hidden fracture might open to something new.

Having established the context, we shall now proceed to examine potential approaches to this problem.

How to Disprove Existential Realism

Imagine time as a movie playing out on a screen. Only the current frame is illuminated and real; the frames that have already played, and those waiting in the reel, are part of the film but are not *happening* right now. This captures the basic intuition of Existential Realism (ER). According to ER, the only things that truly *exist* are those in the present – the here and now that we can observe and interact with. Everything that happened in the past or will happen in the future is "real" in a broader sense, but it does not exist in the same way because it is outside of the present moment. ER is like saying the universe is a play: we only walk the stage right now, while the wings and future scenes are preparations that are real in potential, but not yet part of the act.[27]

This way of thinking may sound abstract, but it aligns with how we intuitively experience reality. We have memories of yesterday and plans for tomorrow, but we never *experience* anything outside the present moment directly. For us, the past exists only as records or memories, and the future is a realm of possibilities. ER makes this intuition explicit: your coffee cup exists on the table right now (you can see, touch it), but the man who picked that coffee bean one years ago is in the past – he's real in the story of history, but not "present" to you. Likewise, the champion of tomorrow's marathon doesn't yet exist today, even if we believe someone will win it.

Because ER ties existence strictly to the here and now, it makes a bold and clear empirical claim: if we ever observe or influence something that lies outside the present, ER would be proven wrong. In other words, to *disprove* ER you would need to catch matter or information from beyond the present moment – the ultimate "ghost in the machine," if you will. You would need to receive a message from the past or send a signal to the future in a way that is measurable and undeniable. Up to today, no experiment has accomplished this, which in ER's view is not a lucky accident but a reflection of deep physical laws. But let's not take that for granted. What would it really look like to knock down ER's core claim?

27 Trepp, T. C. (2025). Matter, Substance and Stuff, How to disprove Existential Realism. (Preprint) https://philpapers.org/archive/TREMSA-2.pdf DOI: 10.5281/zenodo.17060428

First, let's check some obvious "counterexamples" people might raise. You might wonder: Aren't we always seeing the past? When we gaze at the stars, we are seeing light that left them years ago. Our memories are supposed to be "time travelers" in our mind. And experiments like Einstein's relativity show that what is "now" can look different for observers moving relative to each other.[28] Do these things undermine ER? The answer is subtle. No matter how far into the cosmos we look, our telescopes only catch *present* light – photons hitting our eyes or instruments right now. Those photons began their journey long ago, but when they reach us they exist only in the present—hitting our retina here and now. It's like discovering fossil footprints on a beach: the fossil tells us something about dinosaurs long gone, but the footprints themselves are fixed rocks in front of us in the present. Similarly, our memories and recordings are traces of what happened, but they themselves exist now. We might be tempted to say "but I'm looking directly at yesterday's event!", yet in each case the interaction happens in the present: our eyes meet photons or our brains activate neurons *today*. ER is careful to draw this line: past and future are "real" as a web of causes and possibilities, but they never *intrude* upon the present except through present traces.

Relativity makes 'now' frame-dependent, but it still forbids instant influence. No present-to-present 'hotline' exists. In short, seeing starlight, using memories or predictions, or switching frames in relativity doesn't violate ER because all those are indirect. We never actually "touch" a past or future event itself; we only handle the records it left.

So, if casual objections won't do, what would count as proof against ER? To falsify ER, we need something extraordinary: an empirically observable influence coming from outside the present moment, one that we can control and that carries information about a non-present event. Imagine you had a mysterious device that sometimes beeps when something happens in next week's stock market, and it beeps differently depending on the future choice. That would be jaw-dropping. More precisely, we can think of three demands for such a phenomenon, and we won't list them as bullet points, but here's the idea: To falsify ER, a non-present effect must be: (1) **controllable**, (2) **information-bearing**, and (3) **counterfactually sensitive** (if the past/future event were different, your present signal would be different, like a genuine cause-and-effect "what if" test).

28 Einstein, A. (1920). Relativity: The special and the general theory. Methuen.

- **Human agency and freedom:** ER naturally preserves a sense of an open future. Since the future is not yet real (and certainly not pre-existent), our choices genuinely contribute to how reality will turn out. We are not following a script embedded in the fabric of a static block; we are, in a very real way, co-authors of the future. The present is the stage on which we act, and the future is not fully decided until it becomes present. This doesn't mean anything goes—our freedom operates within constraints set by the past and present circumstances—but it does mean there's room for novelty. In fact, one can say the flow of time in ER is the process of reality continuously updating: each moment new facts come into existence. This view is more existentially reassuring for those worried about fatalism. It tells us that the future is to-be-determined in a robust sense. Importantly, ER also respects the reality of the past, so it avoids the opposite pitfall of treating history as irrelevant. Past events are real (they happened, they shaped the world), so lessons of history and the chains of cause-and-effect remain meaningful. By distinguishing between what exists now and what is real but not present, ER offers a middle ground: we care about the past because its consequences remain, and we care about the future because it is still open to our actions.

- **Compatibility with science:** Does ER conflict with Einstein's relativity or other physical theories? It does not. ER accepts relativity's findings—clocks run differently in motion, there's no single universal "now," and time and space form a four-dimensional geometry—without insisting that every event across spacetime must be equally actual. ER could incorporate relativity by saying: what exists (the present) might be a bit fuzzy or observer-dependent at the margins (after all, simultaneity can vary by frame of reference), but this is no more mysterious than the relativity of distances or angles. Different observers may have slightly different notions of "now," but each observer can consistently talk about their present, past, and future in ER terms. No experiment contradicts the statement "only the present exists" because no experiment could ever detect the existence of something beyond the present—by definition all measurements

happen in the present! In fact, some philosophers have devised relativity-friendly models of a moving present (sometimes called "moving spotlight" theories or "branching time" models) that are completely consistent with the data, just more complex to formulate. ER's focus on empirical accessibility (existence is tied to what could, even in principle, be observed or interacted with) is very much in the spirit of scientific pragmatism. And when it comes to quantum physics, ER might even have an edge: certain interpretations of quantum mechanics, which involve indeterminate future outcomes and the genuine unfolding of events at measurement, sit more comfortably with a view in which the future isn't already decided. In summary, nothing in current science flatly forbids ER's distinction between existence and reality. What science provides is a sophisticated description of the structure of time, whereas ER provides a metaphysical interpretation of that structure that honors both the science and our intuitive experience.

Stepping back, what do we gain by rejecting the Block Universe and adopting Existential Realism? We gain a picture of the world that is coherent, humane, and grounded. Eternalism gave us a grandly simple vision—one timeless block—but at the cost of making everything we feel about time (the flow, the openness, the specialness of now) seem like a lie. Presentism (the idea that only the present exists, full stop) gave us the immediacy of now back, but at the cost of making past and future eerily unreal, and it risks clashing with how physics views time. ER offers a third way: it says the present is ontologically special (saving the reality of temporal becoming), yet it doesn't turn the rest of time into nothingness (saving the reality of the past's influence and the future's anticipation). It's a realist view because it acknowledges that there is a fact of the matter about past events and there will be about future events—they are part of reality's matrix—but it's an existential view because it asserts that *existence* happens only in the here and now, moment by moment. This two-tiered approach might seem less uniform than eternalism's single grand block, but that very uniformity was the source of eternalism's problems. By giving time two modes of being (existence for the present, reality for past/future), we can resolve many paradoxes. Change is real because what exists is always updating. Knowledge is naturally limited to what exists or what has left evidence, so no mysteries there.

Experience is trustworthy in testifying that now is special. Freedom is preserved because the future isn't already made. And physics still holds because we haven't denied any of its empirical claims—only a metaphysical add-on that says "and by the way, all those events in spacetime are equally real." We've kept Einstein's insights about the structure of time, but we haven't conceded that this structure must be a solid, unchanging block. In effect, Existential Realism lets us have a dynamic flow of time within a scientifically grounded reality, without pouring on metaphysical excess.

In conclusion, rejecting the Block Universe isn't about clinging to comforting illusions or denying science—it's about seeking a richer understanding of time that does justice to both the world revealed by physics and the world revealed by our experience. The Block Universe view, for all its elegance, can feel cold and detached from what life is actually like. By contrast, Existential Realism offers a warmer, more experientially anchored picture: the universe is unfolding in real-time, and we are genuine participants in its story. Time is not a pre-written book or a frozen landscape we wander through; it is a living process, a journey where reality and existence dance together. The past and future are part of reality's grand continuum, but only the present thread is being woven right now. This way of thinking allows us to embrace the reality of change, the meaningfulness of our choices, and the continuity of the world without assuming more than we need to about what exists. It tells us that *becoming* is not a mirage but the core of what time is. In the end, time can be explained not as an illusion or a fourth-dimensional block we're trapped in, but as something real and essential: the ongoing tale of existence itself.

The Loom of Time

Before we name it "time," imagine standing before a colossal loom humming in the dark. Threads stretch away into shadow, their tension singing faintly like strings before a performance. Somewhere, a shuttle begins to move—swift, deliberate—drawing color across the warp and leaving behind a growing fabric of moments. This is no ordinary loom. Its weaver is change itself. Each pass binds what has just come into being to what will follow, while the unwoven threads ahead still wait in quiet potential. Existence, reality, and becoming meet here—not as abstractions, but as motions in one living weave.

In this vision, the past is the portion of the cloth already woven. Each thread is fixed in place, its pattern visible, its presence undeniable. Though it no longer moves beneath the shuttle, it remains real: it contributes to the overall design, shaping what follows. The present is the narrow band where the shuttle works—the edge where thread becomes fabric. It is vivid, active, and in motion. What is being woven right now is the only part of the cloth that truly *exists* in the moment of weaving. The future, meanwhile, is the stretch of empty warp threads, taut but untouched. They are not yet filled with color, not yet determined in pattern. They are open space—possibility awaiting form.

This image captures, in tactile and enduring terms, the two-tier truth of Existential Realism. The past is real in the sense that its pattern cannot be denied: it constrains what comes next, and its effects are present in the fabric now before our eyes. But it no longer *exists* as a living process. The present alone exists—it is where the act of weaving happens, where the shuttle flies and threads are bound. The future, for its part, is real as potential: the warp threads stand ready, inviting the shuttle, but nothing in them yet determines their color or shape.

The loom metaphor does more than illustrate a metaphysical structure—it draws us into the existential urgency of the present. Just as the weaver cannot return the shuttle to an earlier section to undo mistakes, we too cannot unmake the past; its pattern is already woven. And just as the cloth cannot weave itself, the warp threads remain empty until the shuttle passes. Every decision, every act of attention, every choice we make is like a thread added to the unfolding mosaic. To hesitate is to let the loom stand still; to act is to give the fabric new form.

The Loom illustrates the mechanics of Existence and Reality. The shuttle's instantaneous pass is the present moment (Existence); the already woven fabric is the permanent, growing record of the past (Reality). Fig.7.

Consider how this metaphor clarifies our relation to history. When nations wrestle with their past—whether in the form of apologies, reparations, or commemoration—they are not dealing with something that "exists" in the present. The past no longer breathes, but its woven pattern remains real, imprinted in institutions, landscapes, and memory. Likewise, the future does not yet exist, but its threads are already stretched before us, waiting for the shuttle of present action. What we do with them determines the unfolding pattern of the world.
And this is where the loom becomes more than image—it becomes a summons. To live is to weave. Each of us holds a shuttle in hand, even if we are not always conscious of it. The warp threads of tomorrow may appear blank and impersonal, but they are always open to our touch. Whether we thread them with care or neglect, with generosity or indifference, they will one day be the fabric others inherit as their past.

The loom of time therefore reminds us that existence is never static. It is not a frozen landscape waiting to be discovered, but an active process of weaving, carried out moment by moment. The fabric grows beneath our hands, and the pattern is never entirely given in advance. What we call history is simply the cloth already woven, and what we call possibility is

the open warp that stretches before us. In between lies the narrow, urgent band of the present—where the shuttle moves, where existence is real, and where the story of time continues to be made.

Closing Reflection

We began with a tension: the allure of a frozen universe, complete and unchanging, set against the undeniable pulse of our lived experience where moments arrive, unfold, and slip away. The Block Universe promised elegance but at a price—the cost of denying the vividness of the present, the openness of the future, and the reality of change. Against this, we sought a way to recover both rigor and resonance, to describe time in a way that does justice to physics without dismissing the testimony of experience.
The reframing offered here rests on a simple but powerful distinction: existence belongs to the present, while reality stretches across past and future as traces and possibilities. This picture allows us to keep the present as the cutting edge of what is, while still acknowledging that history matters and that the horizon ahead is shaped by what we do now. In this view, time is not a frozen landscape, but a living canvas, its colors applied stroke by stroke. The painting is not yet finished, and each of us holds a brush in hand.
The key lesson is practical as much as philosophical: what we do matters, not because it was already written somewhere, but because it is being written now. Memory anchors us, responsibility binds us, and anticipation gives us direction. The past has reality in its lingering effects, the future in its open possibilities—but only the present is alive with the power of action. To recognize this is to see our choices less as rehearsals of a fixed script and more as contributions to a story still in the making.

Perhaps the deepest image to carry forward is that of weaving: each moment adds a thread to the patchwork of reality. The past threads remain, shaping the pattern; the future is waiting at the loom; but only the thread passing through our hands right now is woven into existence. What kind of pattern shall we create?

These reflections remind us that time is not merely a subject for physics

or philosophy, but the stage upon which our lives are lived, our responsibilities met, and our futures made. With this recognition, we can now ask: if existence happens only in the present, how do our actions shape the horizons ahead?

Time, existence, and reality—these are not abstractions reserved for philosophers but the very conditions that shape every thought and action. In Part I, we ground our inquiry in the structure of reality itself, where the task is to distinguish what exists from what is merely real, and to challenge the block-like images of time that have dominated much of modern philosophy. This foundation is more than conceptual scaffolding: it clears the space for a perspective where becoming is primary, presence is actual, and the past and future are integrated as real without being existent. Here, Existential Realism takes shape as a rigorous framework, not by rejecting physics or phenomenology, but by reframing their assumptions around the lived and empirical present.

Part II – Human Cognition and Experience

"We do not live in time; time lives in us."

— Schrödinger, E. (1954).
Nature and the Greeks and Science and Humanism.
Cambridge University Press.

Memory, Anticipation, and the Lived Present

More than a century ago, the American psychologist William James offered a description of time that still resonates uncannily today. He called it the 'specious present' — the brief, elastic span of awareness where life unfolds. For James, the present was never a vanishing knife-edge between past and future. Instead, it was more like a short horizon of lived duration: a few seconds of experience gathered into a single act of consciousness. The specious present is why we hear a melody rather than a disconnected series of notes, why we can follow the sense of a sentence as it unfolds, and why the present moment feels full, textured, and alive.

James admitted that the specious present was not easy to pin down. Its length seemed to vary with context and attention — sometimes only an instant, sometimes a span of seconds long enough to hold a thought,

a rhythm, or a perception. Yet the idea was revolutionary: it turned the now from a point into a field—stitched together from memory and anticipation. In this way, James anticipated what modern neuroscience now confirms — that the brain does not serve up time in discrete snapshots, but integrates the immediate past and the immediate future into a continuous flow of awareness.

This insight gives us a powerful way to begin. If we take James seriously, the present is not an empty border but a living fabric, threaded with memory on one side and anticipation on the other. The present is neither a static instant nor an isolated flash of being, but an expanse of time lived from the inside. That expanse is where existence unfolds. It is where stories cohere, where music moves us, where decisions take root. The specious present thus becomes not just a psychological curiosity but a philosophical key: it opens the door to a richer understanding of how we inhabit time.

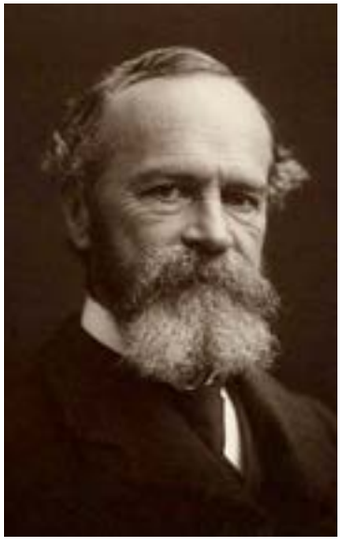
This chapter takes up James' provocation and extends it further. What exactly composes the lived present? How do memory and anticipation, far from distracting us from now, actually constitute its texture? And what does this structure reveal about the deeper distinction between existence and reality? To approach these questions, we must follow James' lead and accept that the now is never alone. It is always already carrying echoes of what was and intimations of what will be.

Lived Horizon of Time

We often speak of the present as if it were a razor-thin line, a fleeting instant sandwiched between the solidity of the past and the uncertainty of the future. Yet lived experience suggests otherwise. The present does not come to us as a mere mathematical point, vanishing as soon as it is named. Instead, it arrives as a small but vibrant expanse — a stretch of awareness that gathers echoes of what has just passed and anticipations of what is about to come. Like the lingering resonance of a struck note, or the breath held between words in a conversation, the present is extended, alive, and deeply textured.

This chapter explores how memory and anticipation shape that lived

present. Neuroscience, psychology, and philosophy reveal that the mind doesn't merely receive the world but builds a small horizon where life is felt and understood. The brain holds onto traces of the immediate past even as it prepares for the imminent future, weaving both into the flow of now. In doing so, it confirms and enriches the central claim of Existential Realism: that existence is anchored in the present, while reality extends outward into what has been and what may yet be.[41]



William James (1842–1910): Architect of the "Specious Present," whose work defines Existence as the illuminated, durationally extended segment of experience carved from the pure flow of Reality. Fig.8.

To see this, we must first set aside the temptation to imagine memory as a perfect archive or anticipation as mere speculation. Memory is not a film reel unspooled at will; it is a quilt stitched together in the moment, each act of recall reshaping the pattern. Likewise, anticipation is not clairvoyance but the brain's tireless forecasting — the way a musician feels the next note before striking it, or a walker senses the ground before each step. Both are acts of presence, not escapes from it.

Understanding this structure has practical as well as philosophical weight. It explains why stories make sense, why music moves us, why planning and regret are inescapable features of human life. It shows how the real weight of the past is carried into today through memory traces, and how the real pull of the future exerts itself now through anticipation. And it reminds us that what feels most elusive — the "now" itself — is in fact the most richly furnished of all temporal modes.

With these threads gathered, we can now turn to the central analysis: how the extended present — shaped by memory and anticipation — reveals a truth about both mind and world: existence unfolds only in the present, yet the present is never alone.

41 Trepp, T. C. (2025). Neuroscientific Support for Existential Realism: Memory, Anticipation, and the Present. (Preprint) https://philpapers.org/archive/TRENSF.pdf DOI: 10.5281/zenodo.17035265

Tensions at the Edge of Now

If the present moment is not a mathematical instant but a living stretch woven from memory and anticipation, several problems immediately arise. These difficulties are not minor technicalities; they cut to the heart of how we understand ourselves in time. They also reveal why philosophers, scientists, and everyday observers alike often disagree about what "the present" truly means.

A first difficulty is the problem of definition. Is the present an indivisible "now," like the tick of a clock, or is it an extended span, more like the length of a musical phrase? Physics tends to describe time in sharp instants, as if life were a film composed of frozen frames. Yet lived experience resists this reduction. When we hear a melody, we never hear a single note isolated from the rest; we hear the tune as a flowing whole. If the present is extended, then where exactly does it begin and end? Every attempt to draw a line risks either slicing it too thin or letting it blur into past and future.

A second tension lies in the fragility of memory. We often trust memory as a faithful record, yet we know it to be fallible and selective. Two people can recall the same event and describe it in strikingly different ways. Does this mean that the past is unreliable, or that memory is less about retrieval and more about reconstruction? If remembering is like sewing together a patchwork quilt, as psychologists suggest, then disagreement is woven into the very fabric of recall. This raises unsettling questions: how much of what we "remember" is really carried from the past, and how much is stitched in from the present?

Closely related is the uncertainty of anticipation. Our brains are prediction engines, forever running ahead of themselves. Yet forecasts often fail. We prepare for a storm that never arrives, or expect joy from an event that brings only disappointment. Should we then say that our anticipations are illusions? And yet, even when they miss their mark, they shape our present actions. A false prediction still carries real consequences: the umbrella we carried, the tension we felt, the plans we made. This invites a paradox: the future has no existence, but its shadow can still weigh upon us heavily.

Disagreements also emerge between disciplines and traditions. Philosophers debate whether the present has genuine priority or is only a trick of consciousness. Neuroscientists measure brain activity in milliseconds, pointing to a 'specious present' a few seconds long, while physicists describe spacetime with no room for a uniquely privileged now.[42] Cultural traditions add further diversity: some see time as a cycle, others as a line, others as a great river. Which of these captures the truth, or do they each illuminate only one face of a larger puzzle?

Finally, there is the problem of personal experience. For some, the present feels fleeting, always slipping away; for others, it feels expansive, capable of holding vast emotional landscapes at once. A moment of awe may feel eternal, while a moment of boredom drags endlessly. These subjective variations resist neat categorization. If the present is so elastic in lived experience, can we really speak of a single, unified "present" at all? Or must we admit that the present is as much a matter of perception and mood as it is of clocks and neurons?

These problems are not roadblocks but invitations. They remind us that time is less a straight highway with clear signs than a shifting landscape of changing horizons. To navigate it, we must consider how memory, anticipation, and the lived present intertwine, not as abstract puzzles alone but as forces shaping the texture of everyday life.

With these puzzles in view, we can now ask how the mind turns them into coherence—how it builds the seamless experience we call the present.

How the Brain Builds the Now

We often take for granted that time just flows through us, like water in a river. But modern neuroscience reveals a more subtle picture: our brains actively construct the present moment. They knit together the latest bits of experience, carry an echo of what just happened, and even project a hint of what is coming next. This means the "now" we experience is not a mathematical instant but a little stretch of time – a living present filled with memories and premonitions.

Throughout this book we have explored the ideas of existence and reality. Existential Realism, our guiding perspective, says that only the present truly exists, while the past and future remain real through their effects and traces. How does the brain's way of experiencing time fit this view? Neuroscience offers clues. It turns out that our sense of now is not razor-sharp. Instead, the mind holds a few seconds' worth of moments together in consciousness. Within this flowing window, we hold on to

42 James, W. (1890). The Principles of Psychology. New York: Henry Holt.

what just happened and already lean toward what is about to happen. In this chapter, we see how this everyday experience – the extended present, our memories, and our forecasts – all support the idea that existence is centered in the present, even as reality extends beyond it.

The Extended Now

Our conscious present is more like the length of a breath than the snap of a finger. Imagine sitting in a quiet room, listening to someone speak. You hear each word, but the last word you heard still lingers in your mind as you process the next one. The note you just heard doesn't vanish when it ends; it lingers as you anticipate the next. This overlap is the clue: the present we experience is a window that spans perhaps a couple of seconds.

Think of it like hearing a tune and feeling its melody unfold continuously, rather than experiencing isolated, disconnected notes. When you hear a sequence of drum beats, each beat leaves a short echo that overlaps with the next. Your mind is not aware of time as separate frames but as a flowing thread of sound. In a similar way, our awareness of the world constantly binds moments into an integrated present. We might not notice these bindings, but without them, our experiences would feel disjointed and jerky, like a slideshow with missing frames.
In more technical terms, philosophers and psychologists sometimes describe this as holding a bit of the immediate past (a "retention") and looking ahead with some expectation (a "protention").[43] You sense a hint of what just passed and a tingle of what might come next, all at once. Everyday examples abound. When you listen to a joke, the setup primes you to expect a punchline before it comes. If you drive a car, you feel the road ahead in the wheels and remember the last bend you took. In music, your brain predicts the next note in a melody based on what it just heard. Each of these shows that our awareness of now naturally includes a sliver of just-past and just-ahead.

A good metaphor is the beam of a flashlight on a dark path. The light illuminates a stretch of ground in front of you; behind you, the path quickly fades into darkness. You see where you are stepping now, you faintly

43 Husserl, E. (1991). On the Phenomenology of the Consciousness of Internal Time (1893–1917). Kluwer Academic.

remember where you came from (the shadow just behind the light), and you can glimpse where you're heading next as the beam lingers. Your awareness of time works like this flashlight: it has a bright focus on the present while carrying a soft illumination of the immediate past and future.

The upshot is that the present moment we live in is a little extended interval. The science backs this up: measurements of brain activity show that after a sensory event, neurons keep firing for a brief time, and before an expected event, new neural patterns already begin. We don't live in frozen split-seconds; we live in unfolding scenes — more like a movie than a snapshot. This matches the existential view: only this moving window of time truly exists for us. Yet, crucially, the extended now inherently carries its own past and future within it.

Echoes of the Past

If our present moment carries a bit of past within it, what form does that take? It is memory. When we say an experience leaves a mark on us, we can speak quite literally. Events carve patterns in the brain. Imagine dropping a pebble in calm water: the ripples spread out and linger even after the pebble has sunk. Similarly, when something happens – meeting a friend, tasting ice cream, learning a new fact – the neurons involved in that event change their connections. These changes are the ripples. Neuroscientists have found that learning something new actually alters the brain's wiring. These changes – often called memory traces or engrams – are like lasting footprints of past events in the brain.

These footprints mean that the past persists in a tangible way. The birthday party you enjoyed as a child doesn't exist now – that exact scene is gone. But the sights, sounds, and feelings of that party have altered the wiring of your brain. Those traces stay there, ready to be reactivated when something brings that memory to mind. In this sense, the past is real: it's encoded in your very neurons, shaping who you are today. Yet those neurons only fire now, in the present moment, when you remember. The event itself is gone, but the brain's pattern is here now.
However, remembering is not like playing back a movie.[44] Your brain does

44 Schacter, D. L. (1996). Searching for Memory: The Brain, the Mind, and the Past. New York: Basic Books.

not have a perfect recording of the past stored away. Instead, recall is creative. Recalling is like restoring an old quilt: the pattern remains, but you fill the gaps with new fabric drawn from the present. When you recall your birthday party, you might clearly see some balloons and remember the taste of cake, but other details come from what you know now (for example, you may imagine which friends were there). Each act of remembering involves piecing together fragments of memory in the present.
A helpful picture is a patchwork quilt. The quilt itself is before you now, made from fabric pieces that came from all sorts of places and times. Some patches (memories) are stitched on the quilt, others are faded or lost, but they're all part of the current image you hold. You're not traveling back in time; you're seeing a present object woven from pieces of history. Each time you recall, your mind is updating the quilt: adding color here, maybe replacing a torn patch with a new sketch from another memory. This imagery highlights that recalling the past is an act in the present. Interestingly, the same brain machinery that lets us remember the past also lets us imagine the future. People who can't recall their past often find it hard to picture themselves in a future scenario. It's as if memory provides the raw material for imagination. But whether thinking of what was or what might be, both take place in the living present. You don't actually visit the past or the future; you create them in your mind's eye from what is stored in the now.

Memory gives yesterday reality by how it changes today. You might learn from a mistake, carry a lesson forward, or hold a cherished memory close. These influences exist because the past has imprinted information in your mind. Yet that imprint is only active when you recall or benefit from it in the present. In this way, the brain shows that the past's reality is tied up with now. It teaches us that what happened was important, but only because its marks endure into the present through memory.

Peering into Tomorrow

Just as we carry echoes of the past, we also project shadows of the future. Our brains are essentially prediction engines, continually guessing what will come next. This isn't fortune-telling but perception itself: the brain uses learned patterns to forecast what comes next. Consider how you walk: you know where the floor is relative to you, so as you lift and set down your foot, the brain already predicts what the next sensations

should feel like. Think of hearing a familiar melody; you almost hear the next note before it plays. These anticipations happen automatically.

Scientists have observed this preview in the brain. In visual tasks, neurons can fire a moment early in anticipation of a moving object, as though the brain is 'pre-playing' the motion. Musicians and dancers feel the timing and next moves before they occur. Even in language, your brain lights up regions before you speak the next word, effectively whispering predictions. This constant forecasting means that upcoming events, though not yet actual, influence what we do right now. It's like walking through mist, guided by memory and expectation.
This has profound implications: the future, though not here yet, shapes today. Imagine a looming thunderstorm far off on the horizon. The storm hasn't hit, yet its expectation alters you now—the imagined event shaping real behavior. On a smaller scale, if you anticipate a friend's congratulations next week, you might already feel proud and motivated now.

We also run detailed mental simulations of tomorrow.[45] Planning a vacation, giving a speech, even imagining a conversation is like playing a short movie in our heads. Remarkably, studies show that imagining a future scene involves many of the same brain areas as recalling a past one.[46] It's as if our brain doesn't care whether the scene is from memory or a guess; it constructs both from its internal toolkit. We take bits and pieces from what we know and rearrange them to envision what might happen.

The chemistry of our brain even dances to the tune of anticipation. Thinking about a future reward – like looking forward to a slice of cake – can release dopamine and make us salivate, almost as if the cake were present. Fear of future pain can trigger stress hormones now. Our bodies treat these mental forecasts almost like reality. In effect, part of us already lives in the future. This doesn't mean the future exists in the same way the present does; rather, it means our current actions and feelings are shaped by what we foresee.
All of this fits our worldview: only the present moment is what truly exists, but the future is "real" in the sense that it has real consequences. Neuroscience shows us that human brains don't simply wait for the future to arrive. They bring the future into the present by treating predicted

45 Buckner, R. L., & Carroll, D. C. (2007). "Self-projection and the brain." Trends in Cognitive Sciences, 11(2), 49–57.
46 Addis, D. R., Wong, A. T., & Schacter, D. L. (2007). "Remembering the past and imagining the future: Common and distinct neural substrates." Neuropsychologia, 45(7), 1363–1377.

events as relevant information that needs attention today. When we plan, hope, or worry, we recognize the reality of tomorrow as mediated through our present minds.

Living in Time

What emerges from all this is a coherent picture: our brains create a home that is always the present, yet this home is furnished with windows into the past and doors toward the future. The key action – every heartbeat, each thought, each sense – happens here and now. That is the only place where existence literally unfolds. Yet this isn't a lonely, isolated moment. The brain lovingly holds onto a trace of where we've been and peeks ahead at where we're going.

This way of looking at time gives a strong reason why the present feels so alive. We only experience reality in the present; we have no direct sense of yesterday or tomorrow except through memory and imagination. And yet, we instinctively treat the past and future as important parts of our reality. We learn from what happened and plan for what we expect because our minds operate as if those days have genuine weight. Neuroscience explains how this can be: memories and predictions make past and future feel real to us now, without invoking any mystical realm. Ultimately, this aligns beautifully with the idea we've been exploring: existence is tied to the present, while reality includes the whole temporal web connected to it. The present is the only moment that truly exists – it's where the curtain is drawn, where the actors perform, where the lights are on. Yet the plot of our lives weaves together scenes from earlier and later acts. Our brains are recording and previewing the story at once.

There's no need to posit strange extra dimensions of time to make yesterday and tomorrow meaningful. Our neurons quietly do this work. They carry forward what we have learned and project what we might learn. They remind us of laughter we shared and tempt us with dreams of laughter yet to come. In the end, the only time that truly *is* – the only stage on which life is performed – is now, but it is a present rich with memory and hope. The present, alive as it is, holds within it the outlines of our past and the possibilities of our future.
Far from demystifying time, this insight shows its preciousness: the living present is no mere instant, but a vibrant fabric woven from all we were

and all we hope to be. In this way, the workings of our brain reveal a profound truth: the past and future are real parts of our story, but the story itself always unfolds in the living present.

How the Extended Now Shapes Life

It is one thing to speak of memory and anticipation in abstract terms, quite another to notice how profoundly they shape the way we live, work, and make sense of the world. The living present, far from being a philosophical curiosity, plays out vividly in our daily routines and our collective projects. To see this clearly, let us step into three familiar arenas where the extended present quietly guides our actions.

1. **The Music of Continuity**
   Consider the simple act of listening to a symphony or even humming along to a pop song on the radio. Each note by itself would be meaningless if it were not carried forward by memory and shaded by expectation. The violin's phrase only moves us because we still hear the echo of the last bar while leaning toward the cadence that has not yet arrived. Music offers perhaps the clearest window into the extended present: it reveals that perception is not a succession of isolated instants but a flowing fabric. If our minds could not hold what has just passed or forecast what must come, melodies would collapse into noise. In this way, every piece of music we enjoy is a demonstration of the brain's power to stitch together a lived present that includes memory and anticipation in equal measure.

2. **The Conversation of Daily Life**
   Dialogue, too, depends on the living present. When a friend begins a sentence, we do not wait until the final word to make sense of it; we build meaning as it unfolds, remembering the start and anticipating the close. Jokes fail without this layered awareness — the setup primes us for the punchline, and the laughter arrives because

our minds were already leaning forward. Even misunderstandings in conversation often come from a faltering of this process: we forget what was said a moment ago, or we wrongly anticipate where the thought was headed. The give-and-take of human interaction, from the intimacy of whispered confidences to the debates of a parliament, relies on our capacity to inhabit an extended now where past words linger and future responses are half-formed.

3. **The Planning of Collective Futures**
   Beyond art and dialogue, the same structure of time shows itself in politics, education, and culture. Drafting a constitution, for instance, is not only about solving present disputes but about reserving a seat at the table for generations yet unborn. Every law, every policy, every long-term investment is a kind of footnote written in a story that others will continue. We act today with memory of the struggles that preceded us and anticipation of the hopes we wish to hand forward. Who are we really addressing when we lay the cornerstones of a school or launch a climate initiative — ourselves in this moment, or the countless lives whose present will one day be shaped by our decisions?

The present is the weaving ground where yesterday's echoes and tomorrow's possibilities interlace, each shaping the pattern of today. With these examples in mind, let us step back and ask what overall lessons we might carry forward.

We began this chapter with a tension: how can the present be the only place where life unfolds, and yet feel so deeply entangled with what has already happened and what has not yet come? The challenge lay in reconciling the fleeting instant with the fullness of lived time. Neuroscience and experience together offered a resolution: the present is not a razor's edge but a small, breathing expanse — a stretch of awareness stitched with threads of memory and strands of anticipation.

In tracing this, we saw how memory carries the weight of yesterday forward, not as an archive we replay but as a patchwork quilt we continually reassemble. … A fitting image is a lantern carried through the night: its light falls on the ground beneath our feet, yet faintly glimmers over the steps just behind and those just ahead. The key lesson is simple but profound: we cannot live in the past or the future, yet we are never without them. They are folded into the present, guiding our steps as we move through time. And so the question lingers—how might we live if the present were not a vanishing point, but a living expanse nourished by memory and possibility? The next chapter takes up this idea, asking what it means to grow into time itself—to see our choices and responsibilities not as isolated moments, but as unfolding expressions of an ongoing becoming.

Growing Into Time

“We are far too readily tempted to speak of intuitive ideas of time, as if time… could be perceived and conceived apart from the entities or the events that fill it.”

— Piaget, J. (2006). The child’s conception of time (A. J. Pomerans, Trans.). Routledge. (Original work published 1969). p. 17.

From the earliest myths, humanity has imagined children not only as fragile beginnings but as vessels of ancient wisdom. Cultures cast the child as paradoxical—innocent yet old, vulnerable yet bearing hidden wisdom. Myths of Hermes, Siddhartha, or the Christ child all express this tension between newness and timelessness.

Why do myths so often place wisdom in the child? Part of the answer lies in how cultures wrestle with time. The child is both beginning and continuation, standing between past and future. Myths heighten this role, portraying children as bridges across past, present, and future—linking ancestors, destiny, and the order of the cosmos. In these stories, the child becomes a mirror for society’s deepest anxieties and hopes about memory, fate, and becoming.

Tales of precocious children dramatize how we come to inhabit time. They transform the ordinary puzzles of learning memory, anticipation, and identity into cosmic dramas.[47] They project the fragile beginnings of temporal understanding onto a stage where gods and mortals, past and future, mingle in mythic continuity.

In this way, the ancient child is not merely a character of folklore but a symbol of the very questions explored in this chapter. What does it mean to grow into time? How do we reconcile the fleeting present with the

47 Damasio, A. (1999). The feeling of what happens: Body and emotion in the making of consciousness. Harcourt Brace.

weight of the past and the openness of the future? Myths of the wise or miraculous child suggest that humanity has long intuited the strangeness of these questions. Before psychology charted developmental milestones, before philosophy debated presentism and eternalism, stories of ancient children gave voice to the wonder that even the youngest among us seem already woven into the fabric of time.[48]

Entering the Stream of Time

Time is among the first realities we meet and the last we fully understand. From the very beginning of life, every human being is carried into a flow of moments, yet the sense of how those moments connect—how the past lingers, how the future beckons—must be patiently learned. An infant does not arrive in the world already fluent in time; rather, the child grows into it, step by step, like learning a language whose grammar is hidden in experience.[49]

This chapter follows that journey: from the raw brightness of the present to a world stretched backward into memory and forward into expectation. This progression is more than a curiosity of developmental psychology. It opens a window onto the deepest questions of existence: How do we come to recognize that what is gone is still real? How do we treat what has not yet come as both open and weighty, shaping our choices today? And how does this fragile sense of temporal continuity give rise to the story of a self?

A useful image is a growing tree. At first, there is only a single green shoot—the immediate present, fragile and self-contained. As the child grows, rings begin to form: memories laid down like layers of wood, and new buds reaching forward into imagined tomorrows. With each season, the trunk thickens, branches spread, and the living whole holds both what has been and what is yet to come. By tracing this growth, we can see not only how a child becomes a temporal being but how our own sense of time took root and matured through the slow expansion of lived experience.

48 Piaget, J. (1954). The construction of reality in the child. Basic Books.
49 Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.

The chapter also asks us to reflect on the fragility of this construction. Illness, trauma, or loss can fray the fabric, tugging us back into a narrowed present or trapping us in loops of remembered pain. At the same time, the fact that our sense of time is learned rather than given is a source of strength: if it was built, it can be rebuilt, reshaped, even deepened. The awareness that time is not simply "there" but must be grown into calls forth humility and freedom.

To grow into time, then, is to grow into reality itself. The stages of childhood reveal how memory and imagination expand the borders of what counts as real, how play blurs and then clarifies the line between "as if" and "is," and how language itself becomes a vessel for the temporal world. By following this story of development, we see not only how children come to know time but also how each of us continually negotiates it—balancing presence, remembrance, and anticipation as we live our lives.

The preparation is complete. Let us now walk the path of the child's development: charting the conflicts, breakthroughs, and silent revolutions that initiate a young mind into the endless passage of time.

Challenges and Contradictions in Understanding Time

To say that we "grow into time" sounds simple, but the story is not straightforward. Along this path lie puzzles that resist easy answers, difficulties that complicate neat developmental arcs, and disagreements among thinkers about what children actually learn—or whether they learn it at all. The child's grasp of time is less like a staircase and more like a winding trail—sometimes clear, sometimes tangled, sometimes fading into uncertainty.[50]

One central difficulty lies in pinpointing what the child grasps—cognitively and behaviorally—at each stage. When a toddler exclaims "Daddy is gone!" does this mean they believe Daddy has ceased to exist, or only that he is no longer visible? Developmental psychologists have

50 Trepp, T. C. (2025). Growing Into Time: Developmental Stages on the Child's Timeline. (Preprint) https://philpapers.org/archive/TREGIT.pdf DOI: 10.5281/zenodo.17035840

spent decades debating such questions.[51] Even with carefully designed experiments—hiding toys under blankets, measuring eye movements, recording laughter at peekaboo—it is never entirely clear whether a child is revealing an inner grasp of continuity or merely responding to a clever pattern of appearances and disappearances. We often treat small gestures as clues, like deciphering faint handwriting—and easy to misread.

Another difficulty arises in drawing the line between reality and imagination. Children are notorious blenders of the two: a stuffed rabbit may be treated as if it were alive, an invisible friend may have a reserved seat at the dinner table. Adults may smile at this as "just pretend," yet for the child, play is both real and not real. Here lies a philosophical problem: when does "as if" become "is," and how do children come to police that boundary? Scholars disagree sharply—some see pretend play as a rehearsal for adult rationality, others as a parallel track of experience with its own rules. The tension between these views reflects the broader difficulty of defining reality itself.

There are also disagreements about how language shapes temporal understanding. One perspective insists that children grasp time only once they acquire tense markers— markers of past and future tense—'was,' 'will.' Another view argues the opposite: that the lived sense of "yesterday" and "tomorrow" precedes words and forces language to adapt. This chicken-and-egg debate is more than academic; it touches on how we think about the roots of consciousness.[52] Is time first a bodily rhythm, like heartbeat and breath, later clothed in words? Or is it primarily a narrative structure made possible by grammar and storytelling?

Philosophers also disagree: some defend presentism; others, broader realism about past and future. Some argue that only the present exists, while others hold that past and future also belong to reality. These debates affect how we view children's growth: if only the present is real, then speaking of yesterday or tomorrow would seem like an illusion. But if reality includes both what has already happened and what may yet come, then the child is uncovering more than an idea—they are discovering the wider scope of reality itself. In this way, their first steps into time mirror the very debates that divide philosophy.

The image of a fabric may help us hold these tensions together. Weaving is not always smooth: threads snag, knots form, patterns are interrupted.

51 Piaget, J. (1954). The construction of reality in the child. Basic Books.
52 Husserl, E. (1991). On the phenomenology of the consciousness of internal time (1893–1917). Springer.

Likewise, a child's weaving of time may be uneven, with gaps or reversals. Some children with memory impairments, or those who suffer trauma, find themselves pulled back into narrower bands of time. Others move swiftly, seeming to leap ahead in their grasp of possibility and history. The diversity of these patterns reminds us that growing into time is not a single story but a field of contested interpretations.

These problems, difficulties, and disagreements do not weaken the inquiry—they sharpen it. Each unresolved question opens a deeper vista: How do we truly know what it means to "know" time? What role do imagination, language, and culture play in drawing the lines of reality? And can the very disagreements among researchers mirror the ambiguities within time itself—sometimes clear, sometimes elusive, always unfolding?

With these uncertainties and disputes established, we now pivot to the practical unfolding of the child's temporal journey. We will examine how these complex puzzles manifest in the concrete steps of development.

The Child's Expanding Timeline

In the beginning, an infant's world is astonishingly simple: the present moment feels primary. Imagine a baby, lying on the floor with wide eyes—if a toy is hidden behind a pillow, in that very first stage of life it doesn't just disappear from sight; it seems to vanish. Babies truly live in the "here and now." They have not yet learned that things can continue to exist when they are out of sight. In these first months, for a baby the world is exactly what can be directly perceived at that instant.

As the baby grows, its tiny brain begins to stitch moments together. A turning point comes with object permanence: the child slowly learns that a hidden toy is still "there" even when they can't see it.[53] A simple game of peekaboo suddenly becomes magical. When the parent's face reappears, the baby laughs – not just because the face is there, but because it *remembered* the face from a moment ago. The mind begins to hold the just-past and expect the next, stretching experience beyond the instant.

By toddlerhood, roughly ages two to five, the timeline of reality stretches further. A three-year-old might proudly insist that their cookie is still

53 Baillargeon, R. (1987). Object permanence in 3½- and 4½-month-old infants. Developmental Psychology, 23(5), 655–664.

on the kitchen counter even though it's out of sight, or say that Daddy is "real" even when he's at work. These are the first hints that a child's real world now includes more than just the present second. Memory and imagination begin to seep in: the child remembers that something happened a moment ago, and they look forward to something coming up.

Piaget's cognitive stages, particularly the development of object permanence, reveal how the mind learns to construct the Reality layer. The infant progresses from only acknowledging present Existence to retaining a permanent record of objects that have passed into the past. Fig.22.

Yet this young child still thinks about time in a very personal way. They often mix up "yesterday" and "tomorrow" as if all the days were part of the same batch. For them, their experience is still mostly what they see plus what they just remember or expect.

In these early years of pretend play, children start to test the boundaries of what's real. They might pour imaginary tea for a stuffed rabbit, fully 'playing along.' Far from confusion, it marks growth. By playing "as if," children are learning a crucial lesson: the mind can hold onto something that isn't physically there and still take it seriously.

It shows they intuitively know: *I can pretend, but I also know it's not real tea.* Pretend tea isn't actually in the cup, but the experience of pretending is very real to the child. It's often at this stage that a child will start to ask questions that reveal the gap between now and then.

You might hear a preschooler ask, "I Why doesn't yesterday come back?" These questions show the child senses a world beyond this moment but isn't yet sure how it all fits. They have begun to realize there is a "past" and a "future," even though the past is gone and the future hasn't arrived yet. The child is wrestling with the idea that reality could extend beyond the here-and-now, without fully understanding it yet.

By middle childhood (around 7 to 11 years old), the child's sense of time has broadened dramatically. School-age children begin to think logically

about sequences and causes. They understand clearly that "yesterday did happen" and "tomorrow will come." If their pet died last year, they know that Fluffy isn't coming back—but they also know Fluffy was real and continues living in memories. These children see cause and effect stretching over days and weeks: if they watered the plant yesterday, it will grow today; if they studied for a test last week, they did well on it now.

Even fairy tales and make-believe take on a new character. A nine-year-old might enjoy a story about dragons, but they know the dragon is not a real creature—just a fun idea. They begin to separate what could happen in a story from what actually happened. In everyday life, they assume: "I might have won the race if I hadn't tripped, but that only happened in my imagination." This growing awareness of possible versus actual means their inner world now has layers. They intuitively grasp that one actual event occurred here, while many other imagined events stayed imaginary. The changing understanding of time is often written right into their language. A kindergartener might exclaim "All gone!" when an apple disappears from sight—marking a moment when something true has changed from present to absent. By about age four, children start using words like "was," "will," "yesterday," and "tomorrow" more accurately. When a child says "It was raining" instead of "It is raining," they're not just speaking clearly—they're mapping time. Each new tense or phrase they master is like adding another thread to the fabric of their understanding of time.
As children become teenagers, the timeline of their imagination and understanding expands even more. Adolescents can think abstractly about time itself. They can wonder, "What if I had made a different choice back then?" and consider countless possible futures. Adolescents entertain counterfactuals—what if their grandparents never met?—and multiple futures. In their mind, multiple futures lie open, though they know only one path will unfold.

They've learned that even though lots of things could have happened, only one really did. This richer view of time matches our adult sense: the here-and-now exists plainly, but all the yesterdays and tomorrows remain real in their own ways.
What does this long journey from crawling to contemplating actually tell us about who we are? Every person's sense of self is woven from memories of the past and dreams of the future. As children build a longer timeline in their minds, they are quietly assembling the very idea of their identity. The baby who cried when Mom disappeared grows into someone who knows: "I had a childhood, and I will have a future." Each memory marks the path; each hope points the way.

This perspective also reminds us of our own human fragility and strength. Sometimes illness or stress can pull us backward along this timeline: consider a person with severe memory loss who seems to live only in the eternal now, or someone with trauma who relives the past as if it's happening in this moment. Knowing the path by which children learn time can help us find our way back. As adults, we are in many ways the stories we tell ourselves about our past and our future. We can choose to set aside the past, to plan ahead, or simply to breathe in the present. Realizing that our sense of reality was built step by step gives us humility and power: humility that our "obvious" world was learned, and power that we can reshape it if we need to.

Growing into time is less about dates than about building a world. By adulthood, the timeline of the mind has many layers. We all stand in the present, yet carry the weight of yesterday and the hope of tomorrow. Reality may be best understood as the story we weave from memories and hopes. By learning to live between what has been and what is yet to come, a child grows into time—moving from the fragile present of infancy into the fullness of a life.

Applications in Understanding Children

Our reflections on how human beings "grow into time" do not remain abstract. They offer a lens through which parents, educators, and caregivers can better understand children at different stages of life, and they also provide compassion and insight when development follows unusual or difficult paths. In early childhood, the grasp of time is fragile and easily disrupted. A toddler who cries when a parent leaves the room is not simply being stubborn—they are revealing the raw edge of their temporal awareness. The absence of the parent may feel like disappearance into nonexistence. Knowing this, caregivers can respond with patience rather than frustration. Games like peekaboo, routines of daily life, and the repetition of songs or stories all become tools for strengthening the child's bridge between "now" and "not yet." Recognizing that the young child is still weaving the first threads of continuity helps us meet them with gentleness rather than haste.

By middle and late childhood, children are stretching their temporal imagination in new ways. School routines, friendships, and responsibilities anchor their sense of continuity: homework due tomorrow, birthdays remembered from last year, the cause-and-effect of planting a seed and watching it grow. At this stage, adults can foster resilience by showing how past effort leads to future reward and by helping children distinguish clearly between imagination and reality. A nine-year-old's love of fantasy worlds is not escapism but rehearsal—a way to experiment with possible futures while learning which ones belong only to stories. Understanding this can prevent us from dismissing play as trivial; it is practice for inhabiting time.

Some children travel different paths into time. Some neurodivergent children experience continuity differently. A child on the autism spectrum might hold tightly to routine as a safeguard against the unpredictability of the future. A child with ADHD may struggle to connect present actions with later consequences, finding it hard to project themselves into tomorrow. For children with severe memory loss, yesterday may not linger as securely, leaving them anchored in a narrower present.

These challenges should not be seen only as deficits. They reveal how deeply human identity is tied to the weaving of temporal threads. Supporting such children means helping them find alternative ways of stitching continuity—through visual cues, storytelling, stable rituals, or gentle reminders that what has passed still matters and what is coming can be prepared for.[54] In this sense, Disability invites us to widen our sense of how humans inhabit time.

Whether in the laughter of a preschooler at peekaboo, the planning of a teenager charting their future, or the struggles of a child whose path is different, the central insight remains: to grow into time is to grow into being human. Each child reminds us that temporal awareness is not automatic—it is learned, frail, and precious. By recognizing the stages and variations of this journey, we gain not only better ways to nurture children but also deeper humility about our own tenuous grasp of time.

54 Edelman, G. M. (1992). Bright air, brilliant fire: On the matter of the mind. Basic Books.

The Human Weaving of Time

We began with a puzzle: how a being born into the immediacy of the present gradually learns to stretch reality backward into what has passed and forward into what has yet to come. Along the way, we traced the tentative steps of infancy, where the hidden toy vanishes into nonexistence, through the curiosity of childhood, where questions like "Why doesn't yesterday come back?" open onto the vastness of history and future possibility. We watched adolescents widen this horizon still further, recognizing not only what did happen but also the many things that might have happened yet did not.

Seen in this light, the child's education in time is not simply a developmental milestone; it is the quiet construction of a world. Memory threads the fabric of yesterday into the present, while imagination embroiders tomorrow's patterns upon it. With each step, the mind learns to walk with one foot planted firmly in today and the other poised toward tomorrow. To grow into time is to grow into being human—capable of remembrance, anticipation, and the bittersweet sense that life unfolds only once.

The takeaway is as practical as it is profound. If our grasp of time was built slowly, then it can also be cared for, repaired, and deepened. In moments of forgetfulness or despair, when the fabric seems to unravel, we may remind ourselves that the ability to live between yesterday and tomorrow was never given—it was learned, and it can be relearned. Our capacity to plan, to forgive, to hope, even to endure, rests on this fragile but resilient construction.

Think of a bridge: from the island of the present we lay planks toward memory and possibility. Some planks are sturdy, others wobble, some break and must be replaced. Yet without this bridge we would be stranded in an eternal now. To walk across it—backward into the past, forward into the future—is to live as a storyteller of our own life, carrying both inheritance and expectation in every step.

So we arrive at a pause, looking back on the long arc from infancy to adulthood, and forward toward the broader questions it raises. If a child's small experiments with peekaboo and pretend play conceal within them the seeds of history, imagination, and identity, then what do our mature

responsibilities toward past and future demand of us? If this chapter has shown how we learn to stand within time's unfolding, the next will ask how the mind itself navigates that unfolding—how memory, attention, and anticipation work together when we act in the present and our choices ripple into futures not yet seen.

Weaving Time, Mind and Reality

"What is this 'I'? You are looking at it, and it looks back at you.
The world itself is the I."

— Schrödinger, E. (1967).
What is life? and Mind and matter. Cambridge University Press.

There are moments when time seems to trip over itself. You walk into a room you have never seen before, and yet something about it feels uncannily familiar—the tilt of a chair, the way sunlight strikes the floor, even the rhythm of voices drifting in. For an instant you are convinced you have lived this moment already. Then it dissolves, leaving a trace of wonder—or unease. This is déjà vu, one of the strangest tricks of the mind: the sensation of remembering the present as if it were part of the past.

What makes déjà vu unsettling is how it hints at a glitch in our normally seamless editing of time. Usually, memory and anticipation are stitched together so smoothly that we never notice the joins—yet in déjà vu, the splice shows, and for an instant the machinery behind the illusion is revealed.

Neuroscience has begun to uncover how this eerie overlap of past and present arises.[55] Brain imaging studies suggest that déjà vu occurs when

55 Trepp, T. C. (2025). Time as Constructed and Real: Integrating Cognitive Science with Existential Realism. (Preprint) https://philpapers.org/archive/TRETAC-6.pdf DOI: 10.5281/zenodo.17035309

our memory circuits—particularly those in the hippocampus and temporal lobe—misfire. A current perception may accidentally activate the same neural pathways as a memory trace, making the present feel as though it has already been recorded. Another possibility is that a slight lag between parallel brain processes causes the present moment to be registered twice, once as immediate perception and once as a "memory" of just a heartbeat earlier. In both cases, the duplication needn't be mystical: a hiccup in internal timekeeping can make experience momentarily double back on itself.

Seen this way, déjà vu is not just a curiosity of consciousness but a window into the constructive nature of time. It reveals that what we call "the present" is never a raw, untouched reality; it is always the brain's edited product, assembled from fragments of perception and expectation. When the editing slips, the curtain lifts, and we feel the uncanny truth: even the now is a story told to us by the mind.

Opening the Loom

Time is at once familiar and elusive. We live in it as fish in water—rarely noticing it until the current shifts. Most of us experience time as a steady flow: days pass, clocks tick, seasons turn. But if we look closer, the picture begins to shimmer. What exactly is it that "flows"? Where is the past that shaped us? Where is the future toward which we lean? And how is it that the fragile present feels so vivid, yet so fleeting?

This chapter approaches those questions by weaving together two threads: the outer reality of time as it unfolds in the world, and the inner experience of time as it is constructed by the mind. On the one hand, reality stretches far beyond our momentary view—planets spin, tectonic plates drift, stars ignite and fade, regardless of whether we watch. On the other hand, we never encounter that vast expanse directly. What we meet instead is a narrow window: a present that our brain stitches together, holding fragments of what has been and sketches of what might be. The tension between these two views—the world's unfolding and our mind's weaving—is the central stage of inquiry.

Think of life as a novel we read even as we write it. Each page we hold is the present: tangible, vivid, undeniably existent. The chapters already read do not vanish; their ink remains pressed into the paper, shaping

Lessons from Memory and Anticipation

This chapter began with a puzzle: how can we live in a present that alone exists, while still being bound to a past that shapes us and a future that beckons? We saw how both extremes—treating only the now as real, or treating all of time as equally fixed—fail to honor the depth of our lived experience. What emerged instead is a more supple view: that the present is the place of existence, yet the past and future retain their reality in ways that matter, carried forward in memory and anticipated in imagination.

The mind proves itself to be the great mediator in this drama. Through memory, it reactivates echoes of what once was, allowing traces of vanished moments to remain part of today. Through anticipation, it sketches outlines of what might come, enabling us to orient ourselves toward futures that have not yet arrived. These acts do not transport us out of the present; they deepen it, weaving unseen threads of continuity into the fabric of now. In this light, consciousness is not a prisoner of an isolated instant, but a bridge—one that carries the weight of history in one direction and the pull of possibility in the other.

The key lesson is practical as well as philosophical. To recognize that the past is real is to honor the lessons it leaves us, to take responsibility for deeds that endure in memory, and to cherish histories that ground identity. To recognize that the future is real is to treat our choices as consequential, to plan with care, and to realize that today's actions already ripple outward into tomorrow's world. Living with this awareness means standing with one foot planted firmly in the present and the other reaching across time's expanse, balancing the immediacy of existence with the continuity of reality.

Perhaps the most enduring image is that of a riverboat gliding downstream. We sit in the boat of now, steering as best we can, but the water that carried us here still leaves its sediment, and the water ahead is already shaping the current. To live wisely is to sail attentively: not ignoring the eddies behind or the bends ahead, but navigating with both memory as compass and anticipation as sail.

As we close this reflection, one question lingers: how might this awareness of time's two worlds reshape our sense of responsibility, not only to ourselves, but to those who will inherit the futures we help to form? If

this chapter has shown how the mind bridges the gap between what is and what was or will be, the next will turn to the question of how we ought to live within that unfolding—how awareness of time's depth shapes our sense of responsibility, value, and care for what follows from our actions.

Ethics Across Time

"Act so that the effects of your action are compatible with the permanence of genuine human life on Earth."

— *Jonas, H. (1984). The imperative of responsibility: In search of an ethics for the technological age. University of Chicago Press.*

Imagine sitting at a council fire centuries ago, among the Haudenosaunee—the Iroquois Confederacy of North America. The air is thick with woodsmoke, the circle filled with elders, and a question hangs over the gathering: not simply what is best for us today, but what will this decision mean for those who are not yet born? In this Indigenous tradition, leaders are taught to weigh every action against its impact on the seventh generation to come. The farmer who clears a field, the warrior who chooses a battle, the chief who signs a treaty—each must picture the faces of descendants they will never meet. The Seventh Generation Principle is more than poetry—it is a philosophy of presence, reminding us that the absent remain part of every decision we make.

This vision stands in sharp contrast to much of modern life, and it defines the heart of this chapter: ethics across time treats absent persons—past or future—as real claimants upon the present. We live surrounded by clocks and deadlines, but our ethical time horizon often collapses into the next election cycle, the next fiscal quarter, or even the next click of a refresh button. We praise innovation but neglect the inheritance it creates; we memorialize the past in statues or textbooks, yet often

The Seven Generations principle is a deep temporal ethic, requiring that all actions in the present Existence secure the well-being of descendants seven generations into the future, linking moral duty to Reality's continuous growth. Fig.9.

treat it as a museum we can walk away from at will. Compared with the Iroquois ethic, our moral imagination looks thin, fragile, and strangely amnesiac.

And yet, the instinct that drove those council fires is not foreign to us. We speak, almost casually, of "future generations." We build monuments for ancestors and apologize for old wrongs. When a parent plants a tree with a child, when a scientist sounds the alarm about climate change, when a community debates reparations — we are enacting, often in stumbling form, that same principle: to make decisions as if the lives of people across time matter as much as those across space.[64]

The Seventh Generation Principle is a reminder that responsibility has never been confined to the present tense. It asks us to picture life as part of a continuous weave—receiving from the past and shaping what follows. It tells us that the unborn are not phantoms but participants already waiting in the story we are writing. And it challenges us to admit what our conscience already whispers: that the past, too, is not gone but alive in debts and gifts that still press upon us.

This is the terrain where *ethics across time* begins.[65]

64 Meyer, L. H. (2004). Compensating wrongless historical injustices. Journal of Social Philosophy, 35(3), 262–276.
65 Trepp, T. C. (2025). Ethics After the Present: Responsibility and Moral Agency in a Two-Tier Temporal Ontology. (Preprint) https://philpapers.org/archive/TRETAC-6.pdf DOI: 10.5281/zenodo.17035309

Why Time Shapes Our Moral Choices

Every society, whether it knows it or not, carries on a quiet debate with time. We speak of "future generations," honor "the sacrifices of the past," and yet so often behave as though only today is real. This tension is not a minor philosophical quibble; it shapes our politics, our institutions, and even our personal choices. Should a government invest in renewable energy for citizens not yet born, or prioritize immediate prosperity for those alive today? Should a community apologize for an injustice committed centuries ago, or consign it to the shadows of history as "no longer relevant"?

At the heart of these questions lies a deeper issue: how do we understand time itself? If the present moment is the only thing that exists, then our obligations shrink to a vanishing point. Why save a rainforest if the people who will one day walk its trails "don't exist" yet? Why remember a massacre if those who suffered are gone beyond reach? Presentism, the view that only the present exists, can harden into an ethic of neglect: out of sight, out of time, out of mind.

But the opposite view, eternalism, can be equally unsettling. Eternalism pictures time as a finished film reel: every moment of history and every future scene already recorded. In this view, your great-grandchild's whole life — from birth to death — would already be in the reel, waiting to be played. This gives all times equal weight, but risks draining them of vitality. If the ending is already written, does it matter what choices we make now? To act could feel like moving furniture in a play whose script cannot be altered.

Both pictures—the razor-thin 'only-now' and the frozen 'all-at-once'—distort reality. As argued earlier, our lived experience moves between them. We feel the pull of history behind us, the weight of debts unpaid and promises broken. We sense the press of the future ahead, open but fragile, as though leaning toward us for care. We live in the present, yes, but never only in the present.

This is where Existential Realism enters as a middle way. It distinguishes between what *exists* (the vivid, concrete present) and what is *real* (the broader span of past and future). The metaphor is simple: imagine the present as the lit stage on which we act, while behind the curtains lie both the scenes already played and the scripts yet to be performed.

Those hidden scenes are not illusions; they shape the play we see, even if they are not on stage with us. Or think of time as a ledger: today's entries are being written in ink, but yesterday's balances still weigh on us, and tomorrow's obligations already count.

Our duties to future generations are not promises to phantoms but recognitions of reality itself—the lives our actions are already shaping. Similarly, acknowledging past injustices is a recognition of reality's enduring imprint: wounds that continue to mark the world we inhabit. In both directions, time calls us to responsibility. And so the question returns in a sharper light: how do we orient our ethics across time? How do we care for those not present, without slipping into fantasy or fatalism? How do we honor the reality of past and future while acting in the only arena where we have agency.

These are not abstract puzzles for armchairs and chalkboards. They surface in climate policy, in public apologies, in the design of technology, and in the quiet reckoning of personal conscience. They press us to rethink what it means to live responsibly, not just as citizens of a nation or members of a community, but as participants in the vast unfolding of time.

With this context in place, we pivot to the difficulties at hand: the pitfalls of adopting an overly restrictive Presentism or an uncompromising Eternalism, and the subsequent argument for a more nuanced and balanced vision of time.

When Ethics and Time Collide

The moment we ask how ethics unfolds through time, the ground begins to shift beneath us. What seems obvious in everyday life — that we owe something to future generations, or that the crimes of the past still matter — becomes strangely slippery under closer inspection. Philosophers, politicians, and ordinary citizens alike find themselves pulled in opposing directions, and the disagreements cut deep.

One major difficulty lies in the presentist mindset: the view that only what exists *now* really counts. It is tempting because it feels concrete. After all, the people standing in front of us are visible and vocal; they can vote, protest, demand change. By contrast, the future is mute, and the past is gone. But if only the present matters, then almost every long-term effort begins to look irrational. Why save seeds for tomorrow if only today's meal counts as real? Presentism can shrink our moral horizon until it resembles a small circle of light in a vast darkness.

Eternalism, by contrast, holds that past, present, and future are equally real. This view gives dignity to all times, but risks fatalism: if every page is already written, our choices may seem like performances in a play with no room for improvisation. Even beyond these philosophical poles, practical disagreements multiply. Should we prioritize urgent needs today, or protect those not yet born? Climate change debates embody this tension: are we caretakers of a shared future, or only problem-solvers for the present?

The past raises another dilemma: should we bear responsibility for injustices committed long before we were born? Some say yes, since their effects ripple into the present; others say no, that guilt cannot be inherited. The clash between remembrance and forgetting shapes reparations, apologies, and national memory.

Taken together, these difficulties reveal a paradox. Ignoring the future narrows our horizon; treating it as fixed drains our freedom. Neglecting the past denies context; clinging to it risks paralysis. Each view highlights a truth, but each leaves something vital out.

They leave us searching for a framework—such as Existential Realism—that honors the urgency of now while giving full weight to both what has been and what is yet to come. With this groundwork laid, let us turn to how such a framework might help us navigate these problems.

Living Through Time

“The practically cognized present is no knife-edge,
but a saddle-back, with a certain breadth of its own.”

— James, W. (1890/1950). The principles of psychology (Vol. 1).
New York, NY: Dover.

Few spectacles in nature capture the imagination quite like migration. Across land, sea, and sky, countless creatures embark on journeys that seem almost miraculous in their precision and endurance. Consider the monarch butterfly: born in late summer in the northern United States or Canada, it will flutter southward thousands of kilometers, a fragile scrap of orange and black carried on the wind. But here is the astonishment: no single butterfly completes the round trip. The generation that departs will die before the next spring, and yet its descendants somehow know the way back. Each fragile insect carries within its body the inherited memory of a path it has never flown, tracing a route stitched into its very genes. In this living relay across generations, the present is animated by the reality of past journeys and the expectation of future seasons.

Or take the Arctic tern, a small seabird weighing barely four ounces, whose yearly migration is the longest known in the animal kingdom. From its breeding grounds in Greenland or Iceland, it arcs southward, flying all the way to the edges of Antarctica, only to return again — a round trip of more than seventy thousand kilometers. Over its lifetime, a tern may travel the equivalent distance of flying to the moon and back not once, but three times. And yet these journeys are not reckless wanderings. They are guided by ancestral memory encoded in instincts, by subtle cues in the Earth’s magnetic field, by the accumulated wisdom of survival pressed into biology over countless generations.

The multi-generational Monarch migration illustrates that identity and purpose can persist through Reality's informational record, even when no single, existent butterfly (no single present moment) completes the full journey. The destination remains a real potential, guiding the flow of life across generations. Fig.9.

In both cases, what unfolds is more than navigation. These migrations dramatize a profound temporal truth: the animal lives in the present, beating its wings, scanning the horizon — yet its survival is secured only because the past is real enough to leave traces in its body, and the future is real enough to demand preparation. The monarch cannot afford to treat the coming winter as an abstraction; it must fly south as though that season were already pressing upon it. The tern cannot ignore the return of summer; it departs Antarctica long before food vanishes, trusting a future that has not yet come. Their present existence is bound up with absent times: the remembered routes of ancestors and the anticipated conditions of seasons not yet here.

To watch these migrations is to witness life’s choreography with time. A butterfly’s paper-thin wings and a tern’s slender body testify to an ancient partnership between past and future, each movement a thread woven across generations and horizons. In their epic journeys, we see nature’s clearest affirmation that existence unfolds now, but reality stretches far beyond — carrying in fragile bodies the echoes of what has been and the certainty of what is yet to come.

Weave of Life and Time

To be alive is to be stretched across time.[87] No organism — whether a towering oak, a migrating bird, or a human with morning coffee in hand — exists as a bare, timeless point. Life is not merely a succession of instants but a weaving of memory, anticipation, and presence. The past clings to us in scars, habits, and learned patterns; the future beckons in instinct, planning, and hope. We live always on the edge of now, but the edge is embroidered with threads from both directions.

We live as temporal creatures. Yesterday lingers in our cells; tomorrow pulls on our actions. Even a plant opening before dawn and a bacterium readying its enzymes carry the past forward and lean into what's next.

The present is where life happens; the rest gives it contour. Memory is the past pressed into shape now; a plan is the future reaching in. Either way, living stretches wider than a single instant.

Consider the human mind: it does not experience the world as a series of isolated frames, but as a flowing melody in which the last note lingers and the next one is already expected. Neuroscience and philosophy alike remind us that even our most immediate perceptions are stitched from fragments of what has just been and what is about to be. Similarly, our identities are not snapshots but unfolding narratives, chapters that span from infancy to old age, each one linking us to selves that no longer exist and selves that do not yet exist.
Nor is this temporality reserved for humans. Plants anticipate sunrise; microbes recall patterns of nourishment; animals migrate in concert with the seasons. Life across scales is characterized by an ability to encode yesterday and project tomorrow. This capacity is no ornament — it is survival itself. A creature that lived only for the instant, oblivious to lessons of the past and indifferent to hints of the future, would soon perish. Evolution has therefore written time into the very architecture of life.

In this light, living beings become witnesses to a larger truth: existence is confined to the razor's edge of the present, yet reality expands backward and forward, leaving traces and casting shadows that guide us. The story of life is not a simple record of what happens now, but a chronicle of continuities, of rings in a tree trunk and promises made to a future self.

87 Trepp, T. C. (2025). Time-Bound Organism: Temporality in Biological and Cognitive Systems. (Preprint) https://philpapers.org/archive/TRETOT.pdf DOI: 10.5281/zenodo.17035643

Next, we watch memory, perception, and anticipation at work—how bodies and minds braid what was and what may be into what is.

Organisms in Time: Memory, Anticipation, and Survival

Nothing in nature lives only in an isolated moment. Every plant, every animal, every human being is a creature of time – not just in the sense of aging and withering, but in the sense that its very being stretches beyond the instant. We carry echoes of yesterday in our cells and cast our hopes toward tomorrow in our plans. In this chapter, we see life itself as a living chronicle: the present may be the only place where existence happens, but that existence is richly threaded with past events and future possibilities. Drawing on both scientific insight and philosophical reflection, we find that creatures great and small—humans, plants, even single cells—are fundamentally time-bound: their minds and bodies are built to remember and to anticipate. In living time, every heartbeat, every wave of growth, every act of preparation is a dance between the now and the not-now.

The brain stitches time. When we cause something, the gap between act and outcome feels shorter, as if the mind pulls them closer. We don't just sense events; we feel their ties—our timing bends around meaning and agency.

Altogether, the extended now of perception shows us that we humans live with one foot in the past and one in the future even during "a single moment." The content of the present is already imbued with just-past and soon-to-be. As a result, in our very experience we bear witness to ER's two-tier picture: only the neural processes firing right now exist, but our mind-handling of them makes recent minutes and near moments feel tangibly real. Memory lets the absent act on the present. A birthday long gone still changes how you move through today. Learning leaves marks—networks strengthened, circuits primed—so what once happened can keep happening in us.

We carry a vast archive of these changes. Your brain – indeed your whole body – is studded with the residue of your past. The neural connections that were solidified when you first rode a bike, or learned to speak, or fell in love, are present now. These connections are present existents, but they represent a past event that does not exist now. A useful metaphor

is to think of memories as a "trace" or "engraving" left on the world: the world of your body and mind. In ER terms, those past events that we remember are real precisely because they have left such traces. When you recall your childhood, what actually exists is the current firing of neurons forming the recollection. But that recollection is faithful only because the past event *really happened* and shaped your brain's structure. Memory, then, is a kind of present model of the past built from current material. It's like opening a book and reading your own history; the text on the page is present, but it refers to a story written long ago.

Memory is seldom a perfect recording. It is, in fact, a reconstruction. Psychologists note that our memories are often patchworks, woven from fragments of reality and imagination. The hippocampus and related brain regions "simulate" our past experience when we remember it, filling gaps and editing details. Yet even when flawed, these recollections drive our behavior as though the past were still real. The trauma of an accident long ago still shapes how you drive today; a fond memory warms you in the present. The past event is not here, but it is real for us – real enough to leave genetic, cellular, and emotional footprints on the present.

We humans talk about our past as if it still exists in some sense. "That phase of life really made me who I am," we say. In ER terms, each of us is a current *continuation* of many past selves. The toddler you once were was real in their day, and their reality lives on in the adult you. We navigate identity by treating our former selves as real participants in an unfolding story. We draw causal links – "Because I was raised a certain way, I have these values" – making the past live on in the present. If strict Presentism were true (the notion that only now is real), this sense of personal continuity would be mysterious. Why care about an absent child self as if it were genuinely you? But if we allow that the past is real in the form of its influences, the picture makes sense.[88]

Researchers even find physical evidence for this continuity. When we think about our future selves, brain scans show that feeling strongly connected to the future triggers the same self-related areas as thinking about now. People who feel their future self is "really them" act more as trustees for that future person (saving money, making healthy choices). In contrast, those who feel distant from that future image treat "tomorrow me" almost like a stranger. Our emotion and action towards our past

88 Tulving, E. (1985). "Memory and consciousness." Canadian Psychology, 26(1), 1–12.

and future selves testify that something about them *feels* real: we feel guilt about past mistakes and hope for a future success. In everyday terms, our lives are like books or movies with chapters, not just a single photograph.

Together, memory and imagination transform our solitary moment into a narrative thread. One might say we carry our past inside us, the way a tree carries its rings. Each ring in a tree's trunk is evidence of last year's growth – the tree of five years ago is gone, but its reality remains imprinted. Likewise, human minds continuously weave past and future into the texture of now. We are organisms whose cells and psyche keep journals of what was, and whose dreams sketch what may be.

Trees, Circuits, and the Clockwork of Life

What holds for our minds holds for simpler creatures too – albeit often in subtler ways. We sometimes think that animals or plants live only for the moment: a sunflower tracks the sun, a cactus blooms when it rains, a bacterium divides when it can. Yet scientists have discovered that even these humble beings preserve histories and predict futures. Life evolved under a sky that never stopped cycling: day into night, winter into summer, feast into famine. Organisms that ignored these patterns soon failed. Over eons, life embedded clocks and tropisms to navigate time. Even in darkness, plants keep time. Tiny cellular clocks prime them before dawn so they meet the light already ready. It isn't surprise; it's foresight written into living matter.[89]

The magic here is that a plant's internal clock contains *information about a future time*. At 4 AM in the dark, a sunflower's biochemistry "knows" it is two hours before sunrise. This encoded expectation causes it to tweak its petals and leaves in preparation. If sunrise is thwarted by clouds, the plant still performed the motion – proof it wasn't reacting but predicting. In ER terms: the plant's buds and proteins exist now, but they stand for a future morning. The future "sunrise" is not there, but its reality is written into the plant's cells. Likewise, as the days lengthen, many plants sense the increasing hours of light and "decide" it is time to bloom or shed leaves. They use that day-length signal to infer "Winter is coming," then switch on protective genes. Cyanobacteria, the simplest photosynthetic

89 Microbiology. (2024). Microbes don't have brains – but they do have memory. Microbiology, 170(5), 123–130.

A blue-green algae species – Cylindrospermum sp – under magnification at the Adelaide laboratories of CSIRO Land and Water, 1993. Fig.10.

organisms, do this too. Experiments show they can grow tougher after long nights as if they had learned a pattern of seasons.

Apart from circadian clocks, organisms use tropisms – growth toward or away from stimuli – that effectively anticipate changes. A sunflower turns its face to follow the sun across the sky, then reorients at night to greet the sunrise. It's as if each sunflower is synchronized to the sun's dance steps. When the sky is overcast, sunflowers still tend to point east before dawn, as though they expect the sun to appear there. Even simple marine bacteria can behave in a time-sensitive way: when feeding on a food particle, they show a near-optimal strategy of how long to stay before moving on, as if estimating "when will we find another meal." These behaviors are not conscious, but they are tuned to time.

And plants have other "memories." If a plant endures a scorching heat one day, it often survives a worse heat on the next day much better than a plant that was never stressed. This is known as plant thermomemory. At a molecular level, the first heat stress causes certain protective proteins to remain active longer, or tags DNA so that stress-response genes are easier to turn on later. The first trial is written into the plant's biochemistry, so the next time it is prepared. It's like a plant having learned the last drought and being on guard for the next. Remarkably, some of these stress "memories" can even pass to offspring via epigenetic marks (chemical changes on DNA that alter gene activity). A progeny plant may "remember" in its genes that its ancestors suffered a dry summer. If the stress were not real

to the plant, it would ignore it. But since these internal changes persist, we can say: the past summer's reality lives on.

Single-celled microbes also show memory-like phenomena. Yeast cells briefly exposed to sugar will later metabolize it more quickly if it reappears – a kind of cellular "I've been here before." Some bacteria can learn to associate temperature with food: after many generations of seeing heat spikes followed by a certain sugar, they begin to prepare the machinery for digesting that sugar as soon as the heat rises, even before the sugar arrives. They have encoded "heat followed by lactose" as a rule. It's a bacterial inkling of Pavlovian conditioning. Slime molds (giant one-cell amoebae) take the cake: if regularly pricked by air-drying at intervals, the mold will preemptively slow down just as if the discomfort were coming, even when the punctuations stop. It *learns* the rhythm of the inconvenience and behaves as if it actually expects it. No neurons in sight – just the protoplasm acting on an internal sense of time.[90]

All these examples paint a clear picture: life remembers and foresees. The present state of an organism is never a bare snapshot; it is laden with the imprint of what has happened and oriented toward what may happen. In such creatures, the past matters and the future matters. The simplicity of a plant or a bacterium belies a fundamental temporal sophistication. Evolution has built into life the capacity to treat certain futures as if they were partially here, and certain pasts as if still part of the scene. This is not magical; it is simply survival. A seed that lies dormant through drought *expects* rain that might come; a migratory bird long stashing food for winter *knows* winter is real ahead; an immune cell primed by one infection *remembers* the next.

In a way, these organisms are little time travelers. The tree in the forest today is also the seedling of ten years ago – it exists now because of that history. Every ring in its trunk, every healed scar, every deep root is reality from the past written into the present. At the same time, each bud it holds for spring is a blueprint for a leaf that does not yet exist. Those buds are present, even while their real purpose lies in the spring sun. If frost comes and kills them, one possibility is annulled and another (bare branches) remains. The buds were like wishes for spring with real, physical power in the here-and-now tree.

90 Saigusa, T., Tero, A., Nakagaki, T., & Kuramoto, Y. (2008). "Amoebae anticipate periodic events." Physical Review Letters, 100(1), 018101.

Thus, in ER terms, organisms exist only in the present, yet their reality reaches backward through traces and forward through anticipations. A plant or a person becomes the living link between what has been and what may come. Only the current leg of the journey is tangible, but each leg comes from the one before and goes to the one after. Life is a continuous migration of "what is" into "what was" and "what will be," all anchored to the edge of the present.

Existence on the Razor's Edge of Now

We began with the philosophical puzzle: If only the present truly exists, how can anything past or future matter? Biology answers: because they did, and they will. The very structure and behavior of living beings testify that "unreal" past and "unreal" future wield real influence. It is as though nature has a two-layered timetable: existence beats in the now, but reality straddles time.

Imagine a creature utterly bound to the now: one who felt no loss for yesterday and no concern for tomorrow. Such a being would never learn from mistakes, never prepare for winter, never keep a promise. It would be alien to our very sense of self and survival. No wonder evolution delights in organisms that knit time into their fabric. For humans, our ethical life – keeping our word, bearing the weight of history, planning for progeny – all rides on treating past and future as real. For a plant, germinating only when the rains are expected, our laws of physics are in play (pressure, sunlight), but its responses are anchored in temporal pattern: it grows as if spring will come, because spring *is* part of its reality.

Life doesn't just have a past; it puts the past to work. Stones keep records; organisms keep appointments. A flower, an ant, a child—each carries memory forward and reaches toward what's next.

Existential Realism provides a precise way to articulate this intuition. If we insist only the present is real, we would have to say the tree's rings are meaningless patterns and the bird's migration instinct is nonsensical. But if we allow that past and future realities are woven into what is here and now, everything falls into place. The "becoming" of life – growth, learning, planning – becomes intelligible. The organism's identity and goals, accumulated knowledge and learned skills, are all made sense of.

In this view, life shines a spotlight on time's nature. It vindicates a present-bound existence that still acknowledges a "real" past and future. Life is living proof that our strict definition of "existence" as the now need not deny the vitality of history or the pull of destiny.

Chronobiology and Human Health

One of the clearest lessons from biology is that life is written in rhythms. Plants open their leaves before dawn, microbes adjust their metabolism in anticipation of nutrients, and migratory birds fly vast distances guided by seasonal cues. Humans, too, are temporal beings whose bodies carry clocks. At every level — from the firing of neurons to the release of hormones — our physiology depends on aligning present actions with inherited rhythms shaped by the past and tuned to future cycles.

Modern chronobiology shows that ignoring these natural rhythms can have profound health costs. Shift workers who regularly disturb their sleep-wake cycle face higher risks of cardiovascular disease, obesity, and depression. Jet lag is more than an inconvenience; it is a temporary misalignment between the body's internal clock and the external day-night cycle. Even meal timing matters: eating late at night when the body is "expecting" rest can impair glucose regulation and stress metabolic pathways.

This is biology's practical reminder that the past and future matter for survival. Our cells anticipate dawn before the sun rises; our hormones prepare us for sleep before night falls. To live in tune with these inherited rhythms is to honor the traces of past evolution and the forecast of tomorrow's cycles. Practical measures such as maintaining regular sleep schedules, adjusting light exposure to reinforce circadian timing, and aligning meals with daylight are not trivial lifestyle tips. They are ways of weaving our daily existence back into the biological fabric that binds past, present, and future.

In this sense, personal health itself becomes an exercise in temporal awareness. Just as monarch butterflies inherit routes they have never flown, we inherit biological clocks we cannot see yet must obey. By respecting those temporal patterns, we act as participants in a continuity far larger than ourselves — one that testifies, in every heartbeat, to life's deep entanglement with time.

Loom of Now: A Closing Reflection

The perspective unfolded here reframes the problem. Life does not live in a sterile instant, cut off from other times. Instead, existence is the sharp edge where past and future converge, a meeting point where the traces of yesterday and the sketches of tomorrow are woven into the texture of now. In this light, organisms are not prisoners of a fleeting present but participants in a living continuum, bearing the scars of history and the seeds of what is yet to be.

The lesson is both practical and moral. To acknowledge the reality of time in this way is to recognize responsibility — to our former selves, who handed us the fruits and debts of their decisions, and to our future selves, who depend on us to act wisely. It is to see that regret, gratitude, and hope are not illusions but modes of caring across time. To live well, then, is to learn to balance on that temporal tightrope: steady enough to honor what has been, supple enough to prepare for what will come, and attentive enough to inhabit the instant that is ours.
Picture a shoreline. Waves lay down new water while the sea behind still moves it. The present is that moving edge—shaped by swells from the past, drawn by the pull ahead. What we lay down becomes both inheritance and promise. And so, as we close this chapter, we might ask ourselves: when we act, to whom are we speaking — only to the person we are now, or also to the selves we have been and the ones we are becoming?

If this chapter has shown that living is always living through time, the next will ask how our awareness of this temporal condition shapes the choices we make, especially when the future remains uncertain yet demands our fidelity.

Temporal Vastness

“The eternal silence of these infinite spaces frightens me.”

— Pascal, B. (1670/1958). Pensées (W. F. Trotter, Trans.). New York, NY: E. P. Dutton.

Time has been compared to many things, but perhaps the most vivid images come not from equations or philosophy, but from metaphors that capture its strange, elusive character. Imagine time as a vast archive, already complete from first word to final sentence. In this vision, your birth, this moment, and the last star’s dying light are all preserved together. The story is fixed—grand, but unsettling in its denial of true beginnings and endings.

Or picture time as a stage lit by a single spotlight. Only what stands in the beam exists; everything else—past actors gone, future ones waiting—remains unseen. The present here appears fragile and fleeting, the sole slice of reality before all else fades from view. Here time is fragile, fleeting, like a stage performance where the drama lives only in the instant of its enactment.

A third vision is more extravagant: with every decision or chance event, reality splits into multiple outcomes. In this scenario, every possible path is taken by some version of you. Nothing is ever truly lost — but nothing remains unique either. Time here is possibility run wild — every outcome realized, every potential world inhabited.

And then there is a more modest dwelling, closer to home: a two-story house. On the ground floor is the present — solid, immediate, where life is lived and existence is real. Above, in the attic, are stored the shadows of the past and the outlines of what is to come. They are not fully here, not as tangible as the present furniture and voices around you, but they are part of the house all the same: photographs, traces, blueprints, echoes. This view preserves the vitality of the now without denying the depth of history or the reach of tomorrow.

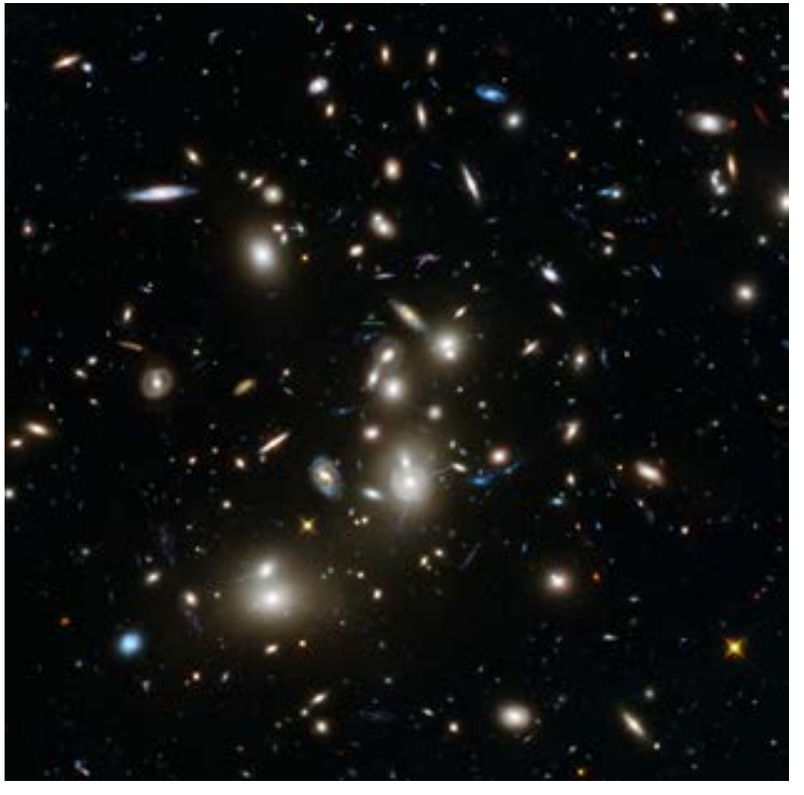
Each of these images — the library, the spotlight, and the house — embodies a different way of understanding temporal reality. They are not just idle pictures; they are architectures of existence. Depending on which you accept, freedom, responsibility, memory, and even identity take on radically different meanings. Do we live in an archive already written, a fleeting spotlight, a branching forest, or a layered home? The answer may shape not only how we think about the universe but how we live in it.

Time has always been both a companion and a riddle. We live it daily, measuring it in clocks and calendars, yet whenever we pause to think about what time *really is*, the ground beneath us begins to shift. Philosophers and physicists alike have long tried to chart it, but their maps diverge dramatically. Some portray time as a vast territory, already laid out from beginning to end, waiting for us to traverse it. Others insist that only the present moment exists, slender and fragile, vanishing as soon as it arrives. Still others imagine not one timeline but countless overlapping realities, multiplying at every possible juncture. And finally, there are those who search for a middle path, trying to hold onto the vividness of the now without losing the depth of history or the promise of the future.[91]

This chapter explores four such visions of temporal reality: the Block Universe, Many-Worlds, Presentism, and Existential Realism. Each offers not only a metaphysical model but an architecture of existence, a structure in which our lives are housed. They differ in scope. Some stretch across billions of years and multiple universes; others collapse reality to the razor's edge of the present. One builds a layered dwelling where the now is central, yet echoes of past and future still resonate.

To make sense of these competing views, it helps to picture time as a kind of built environment. The Block Universe is a monumental library or archive, where every page of history and every chapter yet to come sits permanently on the shelf. The Many-Worlds vision is a dizzying forest of paths, where each step forks into innumerable trails, all equally real. Presentism, by contrast, resembles a narrow stage lit by a single spotlight, where only what stands in the beam exists and everything else fades into nothingness. And Existential Realism imagines time as a

91 Trepp, T. C. (2025). Temporal Vastness and Architecture: A Comparative Analysis of Four Views of Time. (Preprint) https://philpapers.org/archive/TRETVA-2.pdf DOI: 10.5281/zenodo.17035746



The Depth of Reality: The Hubble eXtreme Deep Field image reveals galaxies billions of light-years away, serving as a direct visualization of temporal vastness. The immense scale of cosmic time and space shown here represents the boundless reservoir of Reality (Potential), against which the single, observed moment of Existence (the Actual) is but a flicker. Fig.11.

two-story dwelling: the ground floor is the present, where existence is immediate and tangible, while the upper loft holds the shadows of what has been and the outlines of what is to come.

What makes these models more than abstract puzzles is how deeply they touch human concerns. If the future already exists, are our choices mere illusions of freedom? If only the present is real, what becomes of history, memory, or responsibility? If every quantum possibility is realized, what meaning does identity or truth retain? These are not idle speculations but questions that color how we understand ourselves, our moral lives, and our place in the cosmos.

In what follows, we will walk carefully through these four temporal architectures, examining both their grandeur and their pitfalls. Each promises a different kind of vastness or economy, a different sense of what it means to inhabit time. By comparing them, we not only sharpen our philosophical understanding but also test the resonance of each model against our lived experience.

With the cosmic stage now dimly lit, we draw back the curtain on our inaugural marvel: the Block Universe, that monumental vision where the river of time runs still, and all of history, past, present, and future, is etched as a single, immutable, eternal edifice.

Eternalism — The Infinite Atlas

Let's begin with the Block Universe, a view that often goes hand in hand with relativity physics. Imagine that time is just another dimension like space, and the entire history of the universe – from the Big Bang to the distant future – lies laid out in one big four-dimensional "block." In this picture, all moments of time *are* just like points in space on a map. From a hypothetical vantage point outside time, you could see everything: our birth, this very sentence, the day humans walk on Mars, and even dinosaurs roaming the Jurassic – all are real and fixed, each occupying its own slot in the cosmic block. Time's flow, its "now" moving forward, would be an illusion, a trick of perspective. Albert Einstein himself famously hinted at this idea, suggesting that to someone who understands physics the difference between past, present, and future seems "only a stubbornly persistent illusion." [92]

Conceive of the Block Universe as a vast library of time. Every frame on the reel – every second of cosmic history – really exists, even if we only experience them one at a time. The birth of the universe is one frame, our conversation here is another, and the heat-death trillions of years from now is yet another. In this library, no page of history is ever erased; nothing truly comes into being or passes away. You and I, Napoléon at Austerlitz, T. rex on the plains of Montana, and our grandchildren's grandchildren in the year 3000 are all like books sitting on the shelf of

92 Einstein, A. (1955). Letter to the family of Michele Besso (March 1955). (Einstein consoles his late friend's family by noting that for those who believe in physics, the distinction between past, present and future "only has the meaning of an illusion, though a persistent one".)

this four-dimensional library. None of these "books" is more real than the others; they're all equally there.[93] In the words of the mathematician Hermann Weyl, *"The objective world simply is; it does not happen."* This captures the block's frozen quality: reality doesn't unfold or change, it just is all at once.

The immensity of this view is staggering. In the Block Universe, every nanosecond of the past and every moment of the future is treated as equally present. Picture a train of events running billions of years long, each car holding a full snapshot of the universe. It is a maximal picture: reality is said to include not just what is here and now, but also everything that has ever been and everything that will be. It's like gathering all your memories, dreams, and even future plans into one colossal album—complete with photographs still waiting to be taken. In other words, the Block Universe is a cosmic archive where no moment is lost or unrecorded – a timescape of potentially infinite extent and detail.

Seeing time this way has some deep appeals. It neatly solves certain puzzles, like who or what makes true statements about the past or future. In this picture, when we say "dinosaurs roamed the Earth" or "the Sun will rise tomorrow," we have ready reference: there literally is a slice of the block (or an object in that slice) that corresponds to the dinosaurs or tomorrow's sunrise. The physics of relativity also fits nicely: Einstein's equations treat time much like another spatial dimension, and in relativity there is no single privileged present. Every observer has their own slice of "now," and that meshes with the idea that all of spacetime is equally real. In fact, the math of spacetime can feel so elegant here that it's tempting to simply accept: maybe this whole block *must* be real.

On the other hand, the block's grandeur comes at a cost. It populates reality with a vast array of entities that seem ghostly or bizarre. Think of all the things that aren't present now: Socrates giving lectures, paperbacks on your nightstand in 2050, the New York City of 2120, or that message you'll write in a diary next week – all of these must exist "somewhere" in the block. Our intuition balks at this. It feels strange to say that the Empire State Building or our future grandchildren are sitting there, frozen in spacetime, even though we can't see them. It is as if the world never discards anything, keeping every moment as though in permanent

93 Weyl, H. (1949). Philosophy of Mathematics and Natural Science. Princeton University Press. (Weyl famously wrote that "The objective world simply is, it does not happen.")

And then there is Existential Realism — less spectacular, but more human. It neither freezes time nor fragments it, but lets reality breathe. It admits only the present as existent, yet grants reality to what was and what may come. Between overflow and emptiness, ER feels like a view that fits the scale of experience.

What emerges from this exploration is not a verdict but a shift in attitude. Time is no longer a neutral backdrop but an active architecture shaping how we think, choose, and belong. Whether we imagine ourselves trapped in a crystal block, split among infinite versions, or perched in the thin light of the present, each picture alters how we live.

For ordinary life, the implications are anything but ordinary. Treat time as an archive, and every act feels permanent. Treat it as a blink, and responsibility thins. Treat it as a branching maze, and meaning dissolves in excess. But to see time as an ongoing creation — a continuous becoming that never repeats — is to regain proportion.

A more fitting image might be that of a canvas in progress. Each stroke is present, yet it carries the texture of what came before and hints at what might follow. To live well is to paint carefully, knowing the work is never done and every mark will join the layers that endure.

We leave this chapter with a reminder: time is not only what clocks measure or equations describe; it is the medium of our existence — the living surface upon which every choice leaves color. The question now shifts: how shall we act within this unfolding, aware of time's vastness yet anchored in the fragile now where life truly occurs?

Beginning and End of Time

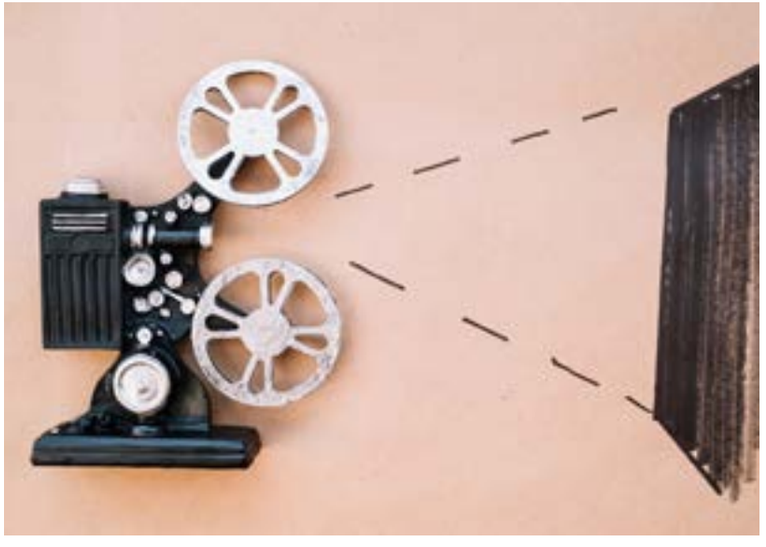
"The universe is under no obligation to make sense to you."

— Tyson, N. D. (2017). Astrophysics for people in a hurry. Norton & Company.

Few images have shaped our imagination as deeply—or misled it as much—as the Enlightenment's cosmic clock. In the seventeenth and eighteenth centuries, precision timepieces inspired a powerful idea: the universe as a perfect mechanism, wound once by a divine watchmaker and left to tick on its own. The vision promised order and clarity, yet it also carried a hidden cost—if the cosmos is only a clock, where is the space for novelty, freedom, or genuine creation? If the universe is merely a clock, what room remains for novelty, freedom, or transformation? A machine may start and stop, but it cannot truly create. The watchmaker's gift was order, but also inevitability.

Over the centuries, alternative metaphors have competed for our imagination. The universe has been pictured as a living organism, breathing, growing, and decaying according to some hidden life cycle. It has been staged as a theater, with stars and planets as actors moving across a cosmic set. These metaphors opened up new ways to think about beginnings and endings—not only as mechanical resets but as births, deaths, or finales. Yet each carried its own limitations: the organism metaphor risks reducing the cosmos to biology, the theater metaphor tempts us to believe in a pre-written script.

Today, in the wake of relativity, quantum physics, and cosmology's expanding horizons, new images are needed to correct the narrowness of these older frames. The projector metaphor highlights the flickering reality of the present moment, each frame illuminated only as long as the light shines upon it. The loom conveys how reality is woven out of potential, one stitch at a time, without a fabric already waiting. The engine reminds us that time is not a container but a process, a conversion of



The Projector in the cosmological context represents the universe's complete history. The machine's entire run, from first activation (The Big Bang) to the final frame (The End of Time), encompasses the totality of Reality. However, only the single illuminated frame passing through the gate at any instant is considered Existence. Fig.12.

potential into actuality. Each of these metaphors emphasizes becoming rather than static design, transition rather than fixed architecture.

The "Clockmaker's Dilemma" is thus more than a historical curiosity. It exposes the danger of letting our most advanced technologies dictate our vision of the cosmos. Each of our chosen metaphors—whether clock, loom, projector, or engine—illuminates one side of time while casting another into shadow. They shape how we imagine beginnings and endings, how we speak of creation and closure, and even how we think of our own lives within time. By re-examining these metaphors, we are invited to see that the question of whether time began or will end cannot be answered by mechanism alone. It demands a broader lens—one that honors not only the structure of the universe but the lived immediacy of existence.

Opening the Question

The question of whether time has a beginning or an end has haunted human imagination for as long as we have reflected on our place in the cosmos. Ancient myths spoke of cycles of creation and destruction, while early philosophers debated whether time stretched infinitely backward or emerged with the world itself. In modern science, cosmology has inherited these same questions, translating them into the language of singularities, entropy, and cosmic horizons. Yet the underlying puzzle remains essentially the same: is time a river that always has flowed, or a stage that was one day lit for the very first time? And will it continue forever, or does the play have a final curtain?

To explore this theme, we will move between the most intimate and the most cosmic scales. On one side, our ordinary intuitions: the way we experience the arrow of time in memory, anticipation, and decay. On the other, the grand theories of cosmology: the Big Bang as a first spark, heat death as a final fade-out, multiverse bubbles as parallel stages, horizons as limits to what can ever exist for us.[98] Along the way, we will draw on metaphors that anchor these vast abstractions in familiar images—movies projected frame by frame, a candle's flame igniting in darkness, a weaver's first stitch and last knot. Such metaphors remind us that these seemingly remote questions touch the core of how we understand change, finitude, and presence.

At the heart of the discussion lies a simple but radical claim: time is not an object that *is*, but an act of becoming. When we ask about its beginning, we are not asking when a line started, but when the act of becoming itself commenced. When we ask about its end, we are not asking when a line is cut, but whether the act of becoming might one day cease. These questions unsettle our categories, for they force us to imagine the absence of time itself—a condition where words like "before" and "after" lose their grip. And yet, it is precisely by holding onto the distinction between reality and existence that Existential Realism offers clarity: the beginning and end are not gaps in time, but the thresholds of time.

Thus, in what follows, we will examine how beginnings and endings can be reinterpreted not as walls but as transformations, how cosmological

98 Tegmark, M. (2003). Parallel universes. Scientific American, 288(5), 40–51. https://doi.org/10.1038/scientificamerican0503-40

models can be understood within this frame, and how the most speculative theories—about bouncing universes, cosmic inflation, or mirrored arrows of time—can be tamed by the same logic. What might otherwise seem paradoxical or mystical is brought into view as a continuous story of manifestation and demanifestation, of existence arising and subsiding.

Let us now examine the problems that arise from this scenario: how time might have begun, how it could end, and what lies in between those two luminous thresholds.

Conflicts of Thought: Infinity, Finitude, and the Limits of Language

Whenever we ask whether time had a beginning or might one day come to an end, we find ourselves stepping directly into one of philosophy and science's oldest battlegrounds. What seems at first a simple curiosity—"Did it all start somewhere? Will it all eventually stop?"—quickly unravels into a web of paradoxes, rival theories, and deep disagreements. These are not only technical debates for physicists, but also enduring puzzles that shape how we imagine our own place in the cosmos.

One difficulty lies in the very idea of a 'first moment.' To say time began is to speak of a river without a source. The paradox matters because it forces us to imagine creation without a before—a spring emerging from nowhere. Some thinkers embrace that enigma, others seek continuity through cycles or quantum prehistories, but all wrestle with the same limit of language.

On the other end of the spectrum, the idea of an end to time raises its own set of disputes. Will the universe fade into a uniform, silent heat death—an eternal winter where nothing new occurs? Or will it collapse violently in a crunch, or shatter apart in a catastrophic rip? Some scientists argue that time itself would halt in such scenarios, while others maintain that time could go on indefinitely even if nothing interesting happened within it.[99] The very question "Does time stop?" fractures into disagreement about what "stopping" could possibly mean. Is a motionless, empty stage still time, or has the play itself concluded?

99 Frolov, V. P., & Novikov, I. D. (1989). Black hole physics: Basic concepts and new developments. Springer Science & Business Media.

Another tangle lies in the concept of infinity. If time has no beginning, then we face the problem of the infinite regress: how could an actual infinity of past moments already have elapsed? If time has no end, then the future stretches out forever—yet our minds struggle to imagine endless existence without closure. Conversely, if time is finite, we run into the paradox of origins and endings: what can it mean to stand at the threshold where time itself switches on or off? These competing intuitions—toward infinity on one side and finitude on the other—have divided philosophers since antiquity and still animate cosmology today.

Even within physics, disagreements proliferate. General relativity seems to point toward singularities—places where the equations break down, suggesting boundaries to time. Quantum theories, however, often gesture toward continuity, bounces, or branching scenarios.[100] Theories of cosmic inflation raise further tensions: if new universes constantly bubble into being, each with its own clock, does it make sense to speak of one universal beginning or end at all? Disputes here are not just about numbers and equations, but about the very metaphors we allow ourselves: is time a line, a cycle, a branching tree, or a stage with lights going on and off? Each image illuminates one aspect while obscuring another.

And then there is the difficulty of perspective. From the imagined vantage of an "outside observer," the universe might appear as a complete story, with a clear first and last page. But from within, for beings like us who only ever live in the present, such total views can seem unreal. Do beginnings and endings exist independently of observers, or are they narrative conveniences imposed on an ongoing process? Here, the disagreements are not only scientific but existential, concerning whether the cosmos is ultimately a finished book or a script being written as it goes.

These problems, difficulties, and disagreements are not obstacles to be cleared away, but signposts showing us where the deepest issues lie. They remind us that when we speak of the "beginning" or "end" of time, we are stretching the limits of language and imagination. Each theory, metaphor, or intuition solves one puzzle but leaves another in its wake.

Guided by the pull of these intellectual tensions, our gaze now settles on the horizon of ultimate beginnings and ends: the mystery of the inaugural tick; the shadow of the last cease; and the total revolution of perspective required to trace the boundaries of time itself.

100 Steinhardt, P. J., & Turok, N. (2002). Cosmic evolution in a cyclic universe. Physical Review D, 65(12), 126003. https://doi.org/10.1103/PhysRevD.65.126003

Reframing the Cosmic Question

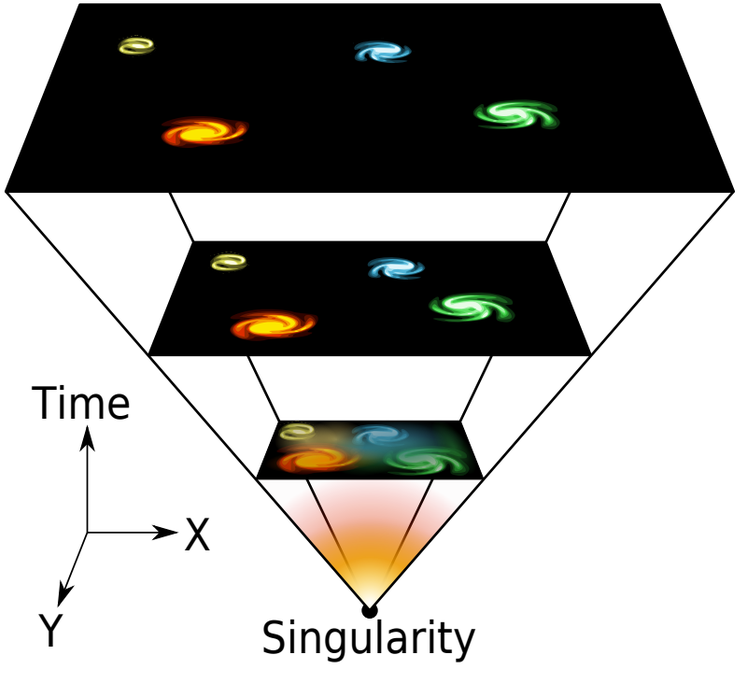
Let's explore what this means for the grand questions of cosmology. First: Was there a first moment, a moment when time itself "switched on"? And conversely: Could time stop one day, with an absolute last moment? Then: What about the exotic ideas like multiple universes or bouncing cosmologies – do they have their own clocks and presents? And finally: What role do cosmic horizons play – does an unobservable galaxy truly exist for us?[101]

Cosmology tells us that about 13.8 billion years ago, everything began with the Big Bang. As we trace time backward, density and temperature rise until we reach a limit—t = 0—where our equations fail. At that point, physics breaks down and metaphysics begins: the threshold where existence itself first flickered into being. General relativity tells us physics as we know it breaks down there. In plain terms, we say *time started* at the Big Bang. But what does that really mean?

It helps to use a metaphor. Imagine you walk into a dark room with a light switch. Before flipping the switch, there is darkness – you could think of this "darkness" as the absence of our world's events. When you flip the switch, suddenly the room is illuminated. In Existential Realism terms, before the Big Bang there was no "room" to speak of – no stage, no projectors – simply nothing in time. When the Big Bang happened, it's as if the light turned on for the first time. The first frame of the movie of our universe appeared. We cannot meaningfully ask *what happened before* that because "before" has no meaning without time; it's like asking what came before the light switch was invented.

This is different from saying the Big Bang was simply an event preceded by others. Instead, it marks a threshold: the moment when existence itself first flickered into being. There was no earlier time when that event was real or existing. In everyday terms, think of it like this: normally when you light a candle, for a brief moment the idea of that flame was just a possibility in the future. Then you struck a match and *now* the flame exists, and a moment later it becomes a memory (the soot). For the Big Bang, there was no prior moment where its "possibility" was waiting in

101 Trepp, T. C. (2025). Beginning and End: Inflation, Horizons, and the Limits of Time. (Preprint) https://philpapers.org/archive/TRECIT-4.pdf DOI: 10.5281/zenodo.17035778



Formation of the Universe in the Big Bang. This illustration shows simplified "slices" of space at different moments in time. Only two of the three spatial dimensions are shown so the time axis can be depicted more clearly. Fig.13.

the wings – it was as if that first flame burst forth from pure potential with no clock ticking before it. Whatever laws or conditions caused that ignition are beyond time, so we can only say: the Big Bang was the first present moment of everything.

Another analogy: consider weaving a fabric. Typically, you weave stitch by stitch. But what about the very first stitch? Before it, the textile *didn't exist*. The moment you make that first stitch, weaving begins. That stitch isn't a part of some pre-existing fabric; it creates the fabric from scratch. In a similar way, the Big Bang is the very first stitch in the fabric of reality. There is no "outer edge" of time that we stand beyond and look back at; the beginning is the moment time and reality emerge from what was essentially no-time.

If there were some kind of abstract "pre-universe," Existential Realism would call it reality without existence. Maybe it's like having a pattern laid out before weaving – a set of potential blueprints or laws. These blueprints were not themselves events in time; they were more like timeless instructions. When conditions aligned, the first present moment happened, and our universe began knitting itself into being. We can say: before the first moment, only non-temporal reality (or nothing at all) existed, and with the Big Bang, existence was switched on.

The Final Flicker: When Time Might End

Picture the universe as a film nearing its final frame, the projector's lamp fading. Could time itself share that fate—a last moment after which no new frame appears? Physicists have proposed several dramatic possibilities for the ultimate fate of the cosmos. Let's consider a few, and see how Existential Realism interprets each:

- **Endless Expansion and Heat Death**: Picture the universe like a balloon still inflating. As it expands, stars burn out, galaxies drift apart, and eventually everything cools off. In this scenario, time never literally stops ticking, but eventually nothing much happens. It is like watching a film that has reached its final scene: the projector still runs, but the screen shows only emptiness. Entropy (a measure of disorder) soars to a maximum, and the universe approaches a uniform, cold uniformity. Existential Realism would describe this as a time that goes on *in principle*, but practically the movie has already finished. The present moment continues in name, but it's endlessly similar to itself (like an infinitely long static shot). The projector never actually turns off, but after some cosmic epoch, each frame is basically blank. Existence lingers on, but with no new "acts" to present – it's an eternal but meaningless present.
- **Big Crunch or Big Rip**: Now imagine a film that ends with a dramatic final frame. In the Big Crunch scenario, the universe stops expanding and collapses back, crunching down into a singularity. Time, as we know it, reaches a last tick. In the Big Rip, dark energy tears everything apart in finite time—galaxies, stars, planets, even atoms are shredded, ending the movie abruptly. In both cases, physics predicts a definite last moment where our normal description breaks down. Under Existential Realism, a genuine last moment is like the final scene: after it, there are no new scenes. The projector lamp goes out.

What happens at that moment? In these terminal scenarios, as the last moment arrives, there are no future possibilities left – the future horizon collapses to zero. It's as if all remaining blank film has been used up. At that point, the present dissolves into record: existence ceases, leaving only reality as history. Everything that happened up to that point remains recorded in the universe's history, but no new events are ever presented. We might think of the universe as leaving behind an everlasting archive – a final frame or a locked snapshot containing the whole history, but with the projector off and no next frame. In the Big Crunch, that final state might even be a singular point of infinite density; in the Big Rip, it might be a cold, empty void. Either way, after the last tick, no next tick follows.

A subtle question arises: if the final moment arrives and then nothing happens, does *anything* even remain? In the heat death view, leftover particles and photons persist, approaching infinite dilution; in a crunch or rip, even that might get shredded. Existential Realism would say that the facts of the past (whatever survived) remain part of reality. If there truly are no particles left (in some far limit), perhaps reality shrinks to nothing as well. But more likely, we imagine that the story that was written can still be "read" even if no more events take place.
An important insight is that the end of time in this framework is mirrored with the beginning. Just as time began with a first present, it could end with a last present. After the beginning, the projector started. After the end, the projector stops. Both are not edges in a container, but transitions: the beginning is like a switch-on, the end is a switch-off. There is no temporal "place" beyond those points – the before-the-start and after-the-end are outside the scope of time.

For us walking around now, the approach to an end would feel strange. Imagine living in the moment a Big Rip is about to happen: atomic bonds tearing, objects dissolving, clocks stopping. In those final instants, each object would be ripped out of the chain of cause and effect. From our perspective, existence would literally flicker out – each thing that

it, the future as scenes not yet shown but already waiting. Machines so designed would neither ignore what has been nor presume what will be; they would learn to navigate the world in the same way we do, by treating each moment as the fragile hinge where history meets possibility.

For us, the takeaway is both practical and moral. Practical, because a car that slows for a possible danger, a doctor's system that remembers a scar, or a climate model that reserves a seat for future generations all act more wisely than systems that flatten everything into a single ledger entry. Moral, because such designs remind us that our own decisions are always pages in a larger story. What we choose today will echo backward as explanation and forward as consequence.

Perhaps the clearest image is of a bridge we build while crossing it—each step a new present laid down between the memory behind us and the possibility ahead. This is how we live, whether we notice it or not. And it is how we might invite our machines to live alongside us: attentive to the present, respectful of the past, cautious yet hopeful about the future.

Who, then, are we ultimately designing for—ourselves alone, or also the generations who will inherit these companions we build? The question remains open, but it is one we cannot avoid.

If this chapter has taught us to respect the fragile weave of time in our machines, the next invites us to look outward again—to the universe, where that weave strains and tears, and where the meaning of responsibility must confront the mighty cracks of spacetime.

Cracks in the Projection

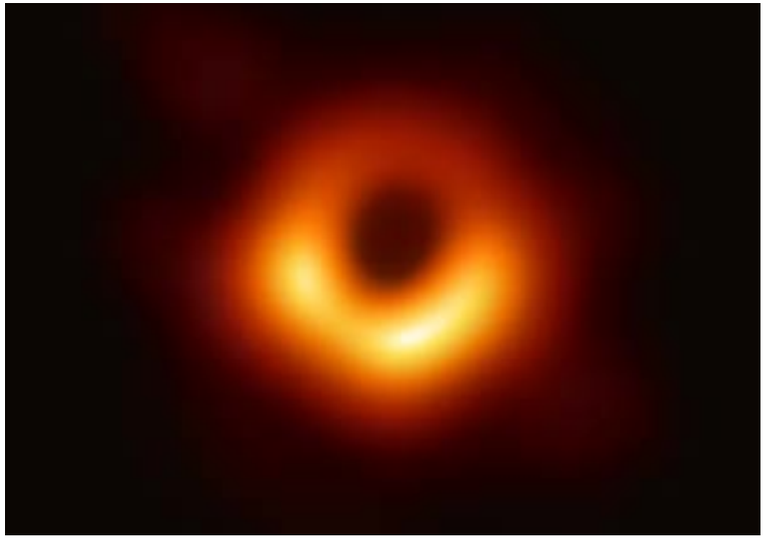
"It from bit. Every physical thing—every it—derives its meaning from bits, from yes–no choices, from acts of distinction. What we call reality arises from the posing of questions and the registering of answers; in this sense, the universe is built not from matter or energy, but from information."

— Wheeler, J. A. (1990). Information, physics, quantum: The search for links. Addison-Wesley.

In 1609, Galileo lifted a crude telescope to the sky and saw something that should not have existed. The Moon, once thought to be a perfect celestial sphere, was scarred with mountains and shadows. Jupiter, that wandering star, had tiny companions orbiting around it—moons of its own. The heavens, long believed to be flawless and eternal, turned out to be as fractured and dynamic as the Earth below.

For the first time, humanity glimpsed that its cosmic order was not absolute but contingent. A crack had opened in the great projection of perfection—a fracture through which another world shone. What had seemed smooth and divine now appeared textured, material, alive with imperfection. In that instant, the ancient symmetry between heaven and earth collapsed, and a deeper reality came into view: one that was not built for our eyes, not centered on our minds, not governed by our hierarchies.

That moment was more than a scientific revelation; it was an existential one. It exposed the limits of our seeing, showing that every image of the world is also a veil. Since then, each new instrument—from the microscope to the particle collider—has widened that same fissure, revealing that beneath the stable picture lies an architecture of constant flux. The deeper we look, the more the image unravels, as if the universe were inviting us not to mastery but to humility.



The Event Horizon Telescope, a worldwide network of synchronized radio telescopes, captured this first image of the supermassive black hole M87* in 2017. The dark central region is its shadow, about 40 microarcseconds across. Massive global data collection and processing at specialized correlators produced this averaged image from multiple reconstruction methods. Fig.14.

We often picture reality as projection: frames flickering across a screen, one moment lighting the next. The image captures flow, but it is cold and distant from lived texture.

Every age inherits its enigmas, and ours is no exception. For centuries, thinkers have gazed at the night sky and asked not only what the universe is made of but also how it holds together — and whether its appearance is the full story. In our own time, physics has uncovered unsettling clues suggesting that the cosmos may not be what it seems. The very fabric of space, once thought to be a stage stretching endlessly, now reveals cracks that hint at a hidden scaffolding beneath. Black holes, those mysterious absences in the cosmic stream, have become focal points where the familiar story of reality begins to fray. Around them gather the deepest paradoxes of information, time, and existence.

To speak of projection is already to use a metaphor. A projection is not the thing itself but an image cast from something more fundamental. In cinema, the glowing figures depend on a hidden reel. If modern physics is on the right track, our universe may be similar. Space and time form the

screen of experience, while a deeper informational structure supplies the reel. The cracks revealed by black holes and quantum puzzles suggest that the screen is not seamless—brief openings where the underlying machinery comes into view.

These questions do not belong to science alone. They also touch philosophy at its core, because they demand we rethink what it means for something to be real or to exist. Are the things we see and touch the ultimate constituents of reality, or are they like flickering images derived from an invisible code? Is the present moment truly unique, or is it just one frame among countless others, all equally inscribed in an unchanging block of spacetime? And if the universe is a ledger of information, what gives our fleeting “now” its peculiar vividness? Such questions are not technical curiosities but profound challenges to our sense of being in the world.

This chapter takes these challenges seriously, not as puzzles to be dismissed but as invitations to deepen our vision. Black holes will be our starting point — those cosmic abysses where light itself falters, and where physics strains against its limits. Around their horizons swirl paradoxes: does information vanish, or is it preserved in some hidden form? Is time there halted, stretched, or rewritten entirely? These mysteries will guide us toward a broader framework — Existential Realism — which proposes a way to reconcile the paradoxes by distinguishing between *existence* (what is present now) and *reality* (the wider ledger that holds past, present, and future in a continuous record).

In what follows, we will move between physics and philosophy, weaving together insights from both. The aim is not to settle every riddle but to offer a perspective from which they become intelligible. The cracks in the projection are not mere failures of comprehension; they are opportunities to see the universe afresh, as though a hidden light were suddenly illuminating the seams of the screen.

With the theoretical mechanisms now visible, we turn to the engines of cosmic strangeness: the destructive singularities of the black holes, the intractable paradoxes of time, and the vulnerable quantum seam separating what merely is from what must be real.

Deep Fractures of Time and Information

When we peer into the idea that the universe might be a kind of projection, a host of thorny problems immediately confronts us. These are not minor technicalities, but deep fractures in our understanding, the kinds of cracks that force us to question the foundations of science and philosophy alike.

The first difficulty is the clash between relativity and quantum mechanics. Relativity says that once something crosses a black hole's horizon, it leaves the outside world causally behind. Quantum theory insists that information cannot be destroyed. To lose it would be to rip a page from the cosmic ledger. The tension is not cosmetic; it threatens the promise of one coherent physics, as if nature were written in two incompatible scripts.

A second problem is conceptual. If the universe is indeed holographic — if the three-dimensional world we see is a projection from a deeper informational surface — then we must ask: which is more real, the picture on the screen or the hidden reel of code behind it? Our daily lives are steeped in the solidity of things: we trust the weight of a chair, the warmth of sunlight, the nearness of a friend. Yet the holographic picture whispers that these vivid experiences might be derivative, like shadows cast on a wall.[109] Some philosophers balk at this suggestion, fearing it drains reality of its immediacy. Others embrace it, arguing that appearances have always been underpinned by unseen structures. The difficulty is not in choosing a side, but in acknowledging that both perspectives carry part of the truth — and part of the burden.

Even when we turn to information as the bedrock of reality, difficulties abound. John Wheeler's phrase '*it from bit*' shifts focus from matter and energy to information. But what does that really imply? Is the universe best thought of as a vast information process? If so, what ensures that this information is meaningful, and that our lived experience of time and change is not reduced to a mere by-product of raw calculation? Here lies another fault line: some celebrate the elegance of informational realism,

109 't Hooft, G. (1993). Dimensional reduction in quantum gravity. arXiv:gr-qc/9310026.
Susskind, L. (1995). The world as a hologram. Journal of Mathematical Physics, 36(11), 6377–6396. https://doi.org/10.1063/1.531249

while others protest that it explains away, rather than explains, the richness of lived existence.[110]

Finally, there are the problems of perspective. What one observer sees at the edge of a black hole may not match what another perceives falling in. Whose account should we trust? The universe seems to tolerate these contradictions, but our minds do not. To us, a crack in the projection feels like a violation — as if the screen has torn and the play can no longer be performed consistently. Yet perhaps these contradictions are less failures and more signals: reminders that our categories of real and existent, visible and hidden, may need refinement.

These problems, difficulties, and disagreements form the terrain upon which the rest of this chapter must tread. They are the cracks that invite deeper attention, not to be smoothed over too quickly but to be examined as signs of where new understanding might emerge.

Black Holes and the Hidden Order of Time

Imagine if the world around you – cities, forests, stars – were really a glowing image on some cosmic screen. What would that mean for the reality you take for granted? Strangely enough, modern physics is nudging us toward exactly this idea. Clues from black holes – those mysterious gravitational maelstroms – and from the mathematics of information hint that our three-dimensional universe might be a kind of holographic projection. It's as if all the data of space is written on a far-off boundary, and what we see is just the projection.

In fact, back in the 1970s Jacob Bekenstein and Stephen Hawking found something truly wild: a black hole's capacity for information (its entropy) is proportional to the *area* of its event horizon, not its volume.[111] In plain language, a giant black hole holds the same amount of information per unit *surface* area as a much smaller one. It was as if the details of anything falling into a black hole were being recorded on its "skin," not lost inside. This insight sent ripples through physics. Gerard 't Hooft and Leonard Susskind embraced it, coining what we now call the holographic

110 Wheeler, J. A. (1990). Information, physics, quantum: The search for links. In W. Zurek (Ed.), Complexity, Entropy, and the Physics of Information (pp. 3–28). Addison-Wesley.
111 Bekenstein, J. D. (1973). Black holes and entropy. Physical Review D, 7(8), 2333–2346. https://doi.org/10.1103/PhysRevD.7.2333

record, even if it has temporarily left the stage of existence. This provides a metaphysical reason why many physicists are so sure that hidden processes (like holography or subtle correlations) will save the day and keep information intact. In ER's terms, reality as we conceive it doesn't blink things out of being; it quietly tucks them away and continues on.

Entropy and entanglement also suggest that disorder is not the whole story. Beneath appearances, a deeper coherence may still persist in the universe's overall state. Consider two entangled particles. To any one observer looking at them separately, the outcomes might seem random. But only by considering them together (or by comparing notes) do you see the perfect anti-correlation in their states. Likewise, as entropy grows in our universe, the overall quantum state may become highly entangled and information may be wildly dispersed. From any local perspective, things look random. But the *total* state of the universe could still harbor intricate patterns. In other words, reality might have an hidden pattern or correlation that preserves those patterns even if each present moment shows only a tiny excerpt. This perspective could even help explain why the early universe started in such a low-entropy (highly ordered) state: ER suggests that fundamental order is never lost, only hidden and spread across a larger web.

Causality remains robust in this view. Because past entities stay real, they can serve as concrete causes of present effects. For example, if something fell into a black hole long ago, that very object (or its information) is still the cause of the hole's mass or of a subtle pattern in its later radiation. There's no need to invent new present entities to explain why anything happens; the chain of reality remains unbroken. This continuity is like a conservation law for existence: the cause survives even if it's not present in the current moment. ER thus straightforwardly solves the classic philosophical problem of past truth-makers. When we say "the moon created those tides," ER assures us the moon *really is* part of reality's web, so it legitimately makes that statement true. The world's history is like a record that we keep adding to, rather than a story that erases its chapters.

Let's summarize how ER stands among its peers. A strict block universe would say all information is simply *already there* in spacetime, so no paradox ever arises – but then why do we see time as moving or do experiments at all? Pure informational realism might insist information is always conserved by definition, but it doesn't highlight why *now* matters

In Existential Realism, Reality is the full, growing film reel of time (past and future). Existence is only the single frame illuminated by the present. Fig.15.

or how the future differs from the past. Finally, let us indulge in a bit of speculation by combining ER with the holographic idea. If the universe really is holographically encoded, then the ultimate "boundary" that contains the cosmic data might be something like the Big Bang's horizon or the quantum gravitational degrees of freedom of space itself. ER suggests that this boundary's record would grow over time – like an ever-lengthening film reel capturing the universe's story. In that picture, black holes are like sub-horizons or special segments in the record: they temporarily hold onto information and release it later, but they are still part of the overall record. From a "god's-eye" view on the entire boundary, maybe even those segmented portions eventually reintegrate (for example, when the black holes evaporate or when we include their interiors in the global accounting). One could say that the hidden order of time might even be written explicitly on that boundary: perhaps it shows a pattern that isn't obvious to us inside spacetime, encoding every nuance of how the story unfolds.

In ER, we can speak of two complementary views of the universe: an interior view, where we experience the fleeting present with partial information, and a broader view, where information accumulates over time into an ever-growing record. Unlike the block view, this record is not fixed once and for all but continues to expand. We may never see the complete record, but we can reason as if a consistent reality exists beyond our view, while still recognizing the unique vividness of the present we inhabit.

In the end, what does all this mean for us? These ideas are admittedly bold and still very much in the realm of speculation, blending the cutting edge of physics with metaphysical imagination. A full theory that ties Existential Realism to a concrete holographic model of the cosmos is still far beyond our reach. Yet the narrative they create is thought-provoking. If reality is indeed a kind of projection, then understanding the projector – the hidden mechanisms that generate our universe of experience – becomes a profound task. Existential Realism offers one conceptual toolkit for that task. It reminds us that reality might far exceed what we see in the here and now: much of what is real may lie outside our immediate experience, yet it is no less important. As theoretical physics and metaphysical inquiry advance, frameworks like ER can help translate between the language of quantum information and our human experience of time and presence. They allow us to ask meaningful questions like "Where (and when) are we in the grand scheme of things?" We don't have definitive answers yet, but these questions guide our journey toward a deeper understanding.

The cracks in the projection – those edge-cases like black holes and quantum mysteries – are not flaws to be lamented, but windows into the universe's workings. By studying them through the twin lenses of physics and philosophy, we inch closer to glimpsing the hidden order that underlies time and reality.

What the Cracks Reveal

We began with a fracture — a recognition that black holes expose not just the limits of physics but the boundaries of our seeing. The universe, some suggest, may be a projection: a luminous surface animated by hidden informational structures below. From there, we entered the deep conflicts of modern thought — relativity and quantum theory, the block universe and presentism, informational realism and its discontents. Each framework offered a glimpse of coherence but left behind its own fissures, like shards of a larger picture scattered in time.

The key lesson is not confined to physics. It speaks to how we live. Our present actions, however fleeting, are entered into reality's ledger; they will shape the story that unfolds beyond us. To live, then, is to contribute lines to an ongoing script, knowing they will echo in ways we may never witness. We are both audience and author, inhabiting the frame while leaving indelible traces in the reel.

Perhaps the most resonant image is that of sedimentation: each moment settles like a new layer of earth, pressing softly upon what came before. Over ages, these layers harden into the strata of a shared world — durable, contoured, and deep. We stand upon this living geology of time, adding our own thin layer, aware that what we deposit now will shape the ground beneath those who follow.

And so we close this chapter not with finality but with a pause. The cracks in the projection, far from signaling collapse, invite us to look more carefully at the weave, to notice how absence and presence, seen and hidden, are joined in a deeper order. If this chapter has shown how the universe itself preserves what seems lost, the next will ask what it means for us — finite beings in the flow of time — to act, to remember, and to imagine futures not yet written.

Part III has widened our view, exploring time's role in architecture, collective imagination, and recording. This has shown time to be more than just a lived or conceived experience; it is embedded in how we relate progress to change, duration, and becoming.

Yet, to test these conceptual frameworks, we must turn to the ultimate measure of change: the precision of physics and the natural order it describes. For centuries, science has wrestled with time more directly than any other discipline—first as a universal backdrop in classical mechanics, then as a relative coordinate in Einstein's theories, and finally as a puzzle at the quantum edge.

Part IV turns to this physical domain, focusing on the Natural Order. Here, we examine how relativity, cosmology, and quantum theory intersect with the framework of Existential Realism. The move is not away from philosophy, but deeper into its dialogue with science: testing whether the distinction between existence and reality can withstand the most demanding accounts of the physical world.

Part IV – Physics and Natural Order

"The world is not a collection of things, it is a collection of events."
— Rovelli, C. (2018). The order of time. Riverhead Books.

Spacetime

A young patent clerk in Bern walks to work, his laboratory an imagination stocked with thought experiments. One begins with the ordinary: a rushing train, a platform, and two lightning strikes at opposite ends. To the observer on the platform, light from both bolts arrives together, so she judges them simultaneous. Inside the moving train, another observer is carried toward one strike and away from the other. Because light has a finite speed, the nearer flash reaches her first. For her, the events are not simultaneous. One comes before the other.
Here is the seed of Einstein's revolution: simultaneity is not absolute. "At the same time" depends on relative motion. The Newtonian metronome—the same time for everyone—fails. In its place comes a new order where space and time form a single geometric stage and even "now" bends with perspective. The lesson was won with imagination, not machines. Ask the childlike question—"what if I ride the train?"—and follow it to its conclusion; the structure of physics shifts.

The result is not a curiosity but a shock: the shared "now" is parochial, valid only within one frame. What is present for one can be already past—or not yet—for another. The universal present dissolves into a web of perspectives, each with its own slice of simultaneity. That is why the

clock-and-train vignette endures. With no equations, it lets anyone feel the vertigo of a world where the present is relative and our sense of flow must be rethought.
Time feels obvious yet resists capture. We live in its current—past receding, future approaching, the present vividly where things happen. Since Einstein, physics unsettles this picture: no single universal 'now'; simultaneity depends on motion and perspective. What is present for one can be past or future for another. If the present is not universal, what does it mean to exist now? [115]

In this chapter, we will explore how Existential Realism can be reconciled with the relativity of simultaneity, the bending of spacetime in general relativity, and the philosophical disputes between eternalism and presentism. We will see how ER resolves paradoxes such as the Andromeda thought experiment, how it interprets cosmic time and curved spacetime, and how it restores the flow of becoming in a universe that otherwise seems frozen in a block. The central theme is clear: relativity need not force us to abandon the reality of time's passage. By carefully distinguishing between existence and reality, we can retain a universe that is both scientifically rigorous and experientially faithful.

Spacetime, Relativity, and the Persistence of Becoming

This chapter will explore how ER weaves through the challenges that relativity and modern cosmology pose. We will see how relativity's denial of an absolute present does *not* force us to abandon becoming or to embrace a frozen block universe. Through examples like the celebrated Andromeda paradox, we will see how ER reconciles the frame-dependence of "now" with an objective unfolding of events. We will examine the implications of Einstein's dynamic spacetime on a present-centered view: whether cosmic time could give us a preferred present, or whether we embrace a fully relational present. And we will compare ER to the traditional alternatives – eternalism (the block universe) [116] and presentism (only now exists) – to show how ER avoids their pitfalls and captures the

115 Trepp, T. C. (2025). Spacetime, relativity, and the persistence of becoming. (Preprint) https://philpapers.org/archive/TRESRA-2.pdf DOI: 10.5281/zenodo.17035485
116 Einstein, A. (1954). Relativity: The special and general theory. London: Methuen.

best of both. In the end, ER restores room for genuine becoming and flow of time in a relativistic world, explaining why our experience of the passage of time is not illusion after all.

In Newton's view, time was like a universal clock, ticking at the same rate for everyone, everywhere. In that Newtonian picture, all clocks agree on the moment "now." If two people stand at different places, they can, in principle, synchronize their clocks and point to the same slice of time. Under such conditions, a presentist worldview (where *only* the present exists) feels natural. All of us share the same page of history, so to speak.

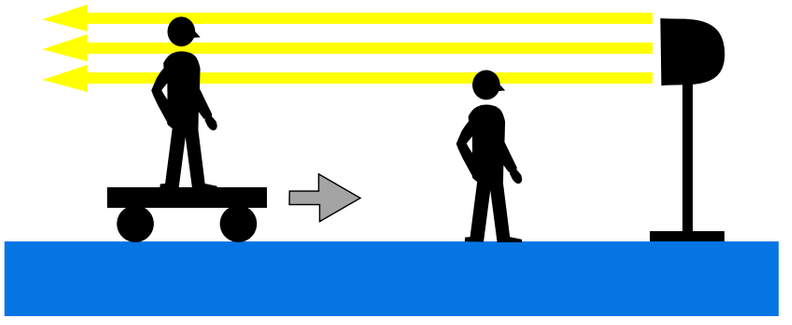
In 1905, Special Relativity shattered the comfortable picture. Time is not a universal backdrop; together with space it forms a single physical geometry. Moving observers cut that geometry into "space" and "time" differently, so simultaneity is relative. Two lightning strikes at a train's ends can be "together" for the platform observer yet ordered for the passenger. Both perspectives are valid; there is no single definitive now.

Einstein himself noted this consequence: for those who pay attention to physics, the distinction between past, present, and future is just an "illusion" – a stubborn but misleading perception. His mentor Hermann Minkowski even declared that space and time are inseparable,[117] and the flow of time is a subjective effect of our consciousness moving along the spacetime "block." In this block-universe picture, all moments – past, present, future – are laid out once and for all in a four-dimensional reality. Time doesn't really flow; it just *is*. We crawl through it, giving the appearance of movement, but the universe is sometimes described as a static structure where all events are fixed, but this picture risks erasing the reality of becoming.

This view (called eternalism) fits nicely with relativity's mathematical structure, but at a cost. It suggests that your childhood, your current coffee break, and a distant future on Mars are all equally real "out there" in the block. Critics find this counterintuitive: it makes our experience of time's passage, of things "becoming," feel like a grand illusion. If everything in time just exists in the static patchwork of spacetime, it would seem nothing genuinely new ever happens.

At the same time, believing only the present is real (presentism) also runs into trouble. Without an absolute simultaneity, which slice of spacetime

117 Minkowski, H. (1952). Space and time. In The principle of relativity (pp. 73–91). New York: Dover.



The principle that the speed of light is constant for all observers demonstrates that simultaneity is relative. This fact destabilizes the notion of a single, universal 'existent now' and necessitates a distinction between the relative perspective of Existence and the objective record of Reality. Fig.16.

is *the* present? Suppose I insist that a certain set of events is the one true now – that seems to contradict Einstein's relativity. If instead I say each observer has their own present, then which one is the "real" present? The naive answer of insisting on one universal now flies against everything relativity has taught us.[118]

In fact, if we try to make sense of presentism in relativity, an odd argument emerges (often called the Rietdijk–Putnam argument or embodied in the so-called Andromeda paradox).[119] It goes like this: take two observers moving relative to each other. Each will have a different set of events they call "simultaneous with now." If both sets of events are said to truly exist (as presentism would normally insist), then the union of those sets looks suspiciously like *all* events in spacetime – exactly the eternalist's block. This is the classic worry: relativity seems to force presentism to become eternalism, unless we change something fundamental.

Yet this inference isn't an ironclad logical mandate. Some philosophers point out that relativity itself doesn't *force* a single interpretation. One could imagine, for example, secretly restoring an absolute time by adding an unseen "preferred frame" (like an undetectable cosmic clock) – though this violates the spirit of relativity – or one could accept each observer's present as valid and give up the idea of a single shared reality slice. Neither option is entirely satisfying.

118 Markosian, N. (2004). A defense of presentism. In D. Zimmerman (Ed.), Oxford Studies in Metaphysics (Vol. 1, pp. 47–82). Oxford: Oxford University Press.

119 Rietdijk, C. W. (1966). A rigorous proof of determinism derived from the special theory of relativity. Philosophy of Science, 33(4), 341–344. And Putnam, H. (1967). Time and physical geometry. Journal of Philosophy, 64(8), 240–247.

Existential Realism offers a third way. It acknowledges relativity's lesson: there is no single, God-given now. But it also refuses to throw away the idea that the present moment *means* something. ER does this by making present actuality itself a relative concept. In ER, what "exists" is always relative to a particular place or observer, while what is "real" remains the whole story of events. This clever move sidesteps the block-vs-flow dilemma in relativity. We no longer have to force all observers to share a lone present, nor do we have to accept a frozen block where nothing ever changes in an ontologically deep sense. Instead, each observer has their own slice of "now" that exists for them, and past and future events belong to reality but don't *exist* (yet or anymore) in the concrete sense.

The Tale of Two Pasts: The Andromeda Paradox

Consider the Andromeda paradox, Roger Penrose's playful illustration of relativity's reach. Two people, Alice and Bob, stroll past one another on Earth, moving in opposite directions at walking speed. Both look toward the Andromeda Galaxy, 2.5 million light-years away. Because of their tiny difference in motion, their "now"-slices of spacetime tilt slightly—so slightly that over cosmic distance the offset equals days. Each carries a different present, defined not by imagination but by velocity.

Imagine that on a planet in Andromeda, an alien council is deliberating whether to launch an invasion fleet toward Earth. From Alice's moving frame, her slice of "now" through spacetime might include the moment those aliens vote Yes; it is, so to speak, happening right now in her present. But Bob's slice, tilted the opposite way, might place that same decision two days in the future – it hasn't happened yet in his present. Neither Alice nor Bob can know about this Andromeda event yet – it's far outside their light cones – so nothing they do on Earth can affect it at this moment. Yet relativity tells us their "now" slices disagree about *when* the decision takes place.

What exists "now"? Did the aliens already vote, or will they in two days? Presentism demands one answer and so collapses into paradox. Eternalism shrugs—both moments simply exist in the block. Existential Realism replies differently: each observer's present exists for that observer; no single absolute "now" binds them. The alien decision is real—it will occur and leave effects—but it does not yet exist for either Earth-bound observer until it enters their causal reach. Reality is continuous; existence is local.

Think of it this way: you have not seen or heard anything about those Andromeda aliens yet; in your current life experience, they're outside your world. ER would treat such distant events as part of the broader reality of the universe, like pages in the script, but not part of your current page. Only events that lie within your "here-and-now" – things in your immediate vicinity or within your past light cone – truly exist for you at this moment. The alien decision is on a page of the script that hasn't been revealed in your frame. When you eventually get a news transmission (or the aliens arrive), that event will enter your present and then exist for you. Until then, ER says, the question of "did they decide yet or not?" has no bearing on your present reality.

This view neatly resolves the paradox. Both Alice and Bob are correct about the relativity of simultaneity – they just slice spacetime differently. But neither is committed to the aliens' decision *existing* in their present in an absolute way. Both can acknowledge: "There is a decision in Andromeda that will eventually be made, that is real as an outcome of their deliberation. But it isn't yet part of our present world." In practical terms, there is no contradiction in experience: neither observer sees or is affected by the aliens until after the light (or spaceship) arrives.

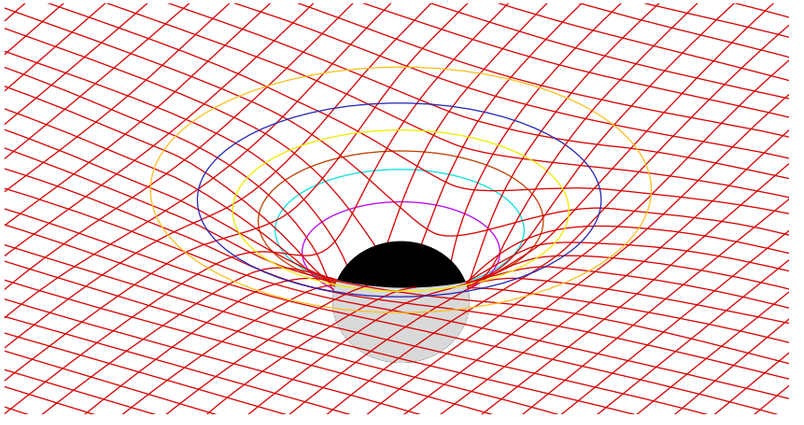
In short, ER says: Yes, "now" is relative, but that doesn't force the universe into a frozen block of co-existing events. It only means each observer has their own local "now." Only what lies in your causal here-and-now exists for you; everything else can be very real yet still non-existent from your vantage. This preserves the common-sense idea that the present is special and dynamic, while fully acknowledging Einstein's insight that there is no single cosmic now.

Curved Spacetime and the Cosmic Present

The relativity of simultaneity in special relativity already challenges presentism, and general relativity complicates the picture even further. General relativity (GR), Einstein's extension to include gravity, complicates the picture even more. In GR, spacetime is not fixed and flat but can bend, stretch, and ripple under the influence of matter and energy. There may not even be any way to define one universal time coordinate across a wildly curved cosmos. In extreme solutions of GR, the notion of a global "slice" of simultaneous events can break down entirely (for instance, certain rotating or closed-universe models can allow weird paths that loop back in time). Even without such exotic cases, GR's laws simply don't single out any particular slicing of spacetime as *the* present for everyone.

On the largest scales, cosmology offers a practical anchor. Because the universe expands smoothly, physicists define *cosmic time*—the age of the universe measured by an observer at rest with the cosmic microwave background. Each constant-time slice provides a convenient global "now." Some philosophers treat this as a natural absolute present. Existential Realism stays neutral: it can use that slicing if the universe truly provides it, or discard it if relativity admits none. ER's framework flexes either way, tying existence to whatever temporal structure physics justifies.

But ER doesn't insist on a privileged frame. It can equally work if we take GR's spirit at face value – if all frames are on equal footing with no hidden absolute time. In that fully relativistic perspective, we can think of existence as strictly local or frame-relative. Conceptually, one could even say every event has its own infinitesimal "present" around it – basically, the event itself and its immediate neighborhood are what exist at that moment for that event. For us ordinary observers, this means our present actuality is just the tiny piece of spacetime we actually occupy at this instant (plus maybe the immediate space around us that light hasn't quite reached yet, like seeing across the room as "now" even though the light took microseconds). Extending our 'now' across the universe is a practical convention for calculation, not a fundamental feature of reality. General relativity recasts "now" in causal terms. Only events inside or on your past light cone—those that can already influence you—exist for you at this moment. Others, though real in the universe's unfolding, are



A common visualization of spacetime curvature. The massive object in the center (often representing a planet or star) warps the surrounding spacetime fabric, causing other objects (like satellites or planets) to follow curved paths. This curvature is what we perceive as gravity. Fig.17.

outside your present existence until causal contact occurs. ER need not press this view to daily life, but the lesson holds: existence is the sphere of immediate interaction; reality is the wider field in which those interactions are embedded.

This view matches well with relativity. Just as relativity denies an absolute "simultaneous everywhere," ER denies an absolute "exists everywhere now." We can still use cosmic time or any convenient simultaneity slicing when modeling the universe, but ER is clear that this is just a human convention for calculation, not something objective loaded. Distant galaxies, other solar systems, even far-off regions of space-time that are causally disconnected right now – they can be considered real parts of reality (the universe's structure), but ER says they should not be counted as part of *our* present existence unless we have causal access. In that way, ER keeps the door open to an objective flow of time (new events coming into existence) without requiring the physics to reveal a hidden master clock.

General relativity also introduces the idea that spacetime itself can evolve. One way to think about presentism and the flow of time is through the image of an *evolving block universe*: the past and present exist, and the future is gradually added to the block as time goes on. Some cosmologists even speak of spacetime "growing" as the universe evolves. Existential Realism shares the spirit of an evolving picture, but with its twist: the *reality* of events is already in place (they have happened or will happen), but their *present actuality* only happens at the moment they occur. In other words, ER does imagine the block of events is "growing," but it doesn't pretend that the whole past and present are equally present at once. Only the very tip of that block – the "leading edge" of the wave – exists at any given moment, and that edge marches forward in time. This preserves a notion of objective becoming (the future isn't already real in existence) without contradicting GR. In relativity terms, GR doesn't tell us whether time *flows*, it just gives the geometry; ER says the geometry is like a map – the map exists all at once, but the meaning of "moving through the map" is that the present point on the map is continually updated.

In summary, general relativity's lessons – dynamic spacetime, no universal present – do not doom a present-centered framework if we adjust our definition of the present. Existential Realism meets relativity's challenges by making existence *observer- or event-dependent*, while keeping reality as the invariant web of events. No matter how wildly spacetime bends, each observer moves through it, and at each step only the local here-and-now exists. The rest – distant here-and-now's of others – are acknowledged as real parts of the world's structure, but not part of your immediate presence. In this way ER harmonizes the spirit of relativity with the intuition of a flowing present.

Existence vs. Reality: A Two-Tier Universe

At the heart of Existential Realism is that simple two-part separation: existence versus reality. Everything that ever happens in the universe is part of reality. This includes not only the raw events in spacetime (big and small) but also the relationships between them – the causal threads, records, and information that tie past, present, and future together. In that sense, reality is like the whole story of the universe. But at any given moment, only a portion of that story exists in the full sense of "is happening right now." That portion is the present.

This two-tier view neatly solves some puzzles that haunt the other theories. Why can we talk about the past as if it's truth? Because past events left an imprint on reality – evidence and records – so statements about them have truthmakers in reality even though they don't exist now. How can the past cause things today if it doesn't exist? Because causation runs through reality: the past event happened (is real) and set the stage for later events. ER says the cause is real, its effects persist in the present (both as physical effects and as "news" that has arrived in our causal cone).

Why do we sometimes feel there is a "before" and "after"? Because we experience the open nature of future. In ER, the future is not written in stone, but it is not sheer fantasy either: it is the realm of real possibilities that are shaping up under current conditions. We can be uncertain about the future exactly, but we understand there *are* facts (or at least chances) about what may happen. Once a future event occurs, it becomes present and so exists, and the other possibilities fall away. In that way, ER preserves a genuine openness of the future. This avoids the fatalism of eternalism (where the future is as fixed as the past) while also not ignoring the real structure that shapes what might happen.

To keep it simple, you might think of ER as saying: only the present truly "has a being," but much more of time has a reality. Everything "to the left and right" of the present in the timeline has its reality assured by causal connections or laws, even if those events aren't in our existence. Only "on the page right now" is full present actuality. In an analogy: eternalism treats every page in the ledger as flatly printed and open; presentism treats only the current page as real and ignores or blanks out the rest; ER has all the pages printed, but only the current one is open before us, fully alive.

Reclaiming the Passage of Time

We began with a tension: our lived certainty that time flows stands against relativity's claim that there is no universal "now." Einstein's framework dissolves any single global present, showing that simultaneity depends on motion and perspective. Yet this does not mean the present is unreal—only that it is not shared everywhere at once. Eternalism treats all events as coexisting within a timeless block, erasing becoming. Presentism insists that only the now exists, severing the links that bind moments together. Both, in different ways, mistake the map for the landscape.

Existential Realism restores what each view loses by distinguishing existence from reality. Existence belongs only to the present—the lived event of being that is constantly renewed. Reality, by contrast, extends beyond it: the past endures as trace, the future as potential. Time is thus not an illusion but a continuous unveiling, where existence is the crest of the wave and reality the sea that sustains it.

In this light, relativity and flow are not enemies. The spacetime manifold describes relations among events—how reality is structured—but it does not describe the act of becoming itself. That act happens only in local existence, in the ever-moving present through which global reality takes form.

The insight is practical as well as metaphysical. The past grounds us, the future draws us forward, and the present is where both converge into choice and responsibility. To live consciously is to participate in reality's renewal—to add one more pattern to its unfolding form.

If this chapter has shown how the passage of time can coexist with relativity's geometry, the next turns to an even deeper question: why quantum physics, with all its indeterminacy and collapse, seems to grant the present a special status—an arena where potential becomes actual and reality renews itself.

Quantum Physics and the Power of the Present

"The actual world is a process,
and that process is the becoming of actual entities."

— Whitehead, A. N. (1929). Process and reality:
An essay in cosmology. Macmillan.

Imagine the universe not as a finished film but as a chessboard alive with tension. Past moves are fixed; they cannot be undone. The future offers many lines of play, some toward victory, others toward defeat, yet none is settled in advance. The drama resides in the present turn—hand poised above a piece, breath held—where hesitation ends and action begins. In that instant, the game is not determined by what has been or by what might be; it is decided by the move now made.

This image captures something essential about our experience of time. We live with the weight of our past moves: choices made, accidents suffered, consequences endured. We also sense the looming expanse of the possible future: hopes, fears, opportunities, and threats waiting to take shape. But neither the past nor the future holds the decisive energy of the present. The present is where the hand touches the piece, where hesitation ends and action begins, where uncertainty collapses into actuality. Just as no chess game can be played without the continual making of moves, no universe can unfold without the continual becoming of moments.

Classical physics tempted us to see the board as already complete—every move fixed from opening to mate. Relativity seemed to deepen that picture: a world where the present is only a spotlight sliding across a frozen sequence. In such a view, the player is irrelevant and the moves are mere reveals, not decisions.

Entangled Realities

"In any theory that adds hidden parameters to quantum mechanics, the setting of one measuring device must influence the result of another, no matter how distant."

— Bell, J. S. (1964). On the Einstein Podolsky Rosen paradox. Physics, 1(3), 195–200.

When the first telegraph wires spanned continents, they carried more than electric pulses—they carried a shock to perception. For centuries, distance meant delay; news moved only as fast as horses or sails. Suddenly words leapt across oceans in seconds, an invisible thread binding what nature had kept apart. Newspapers marveled that "space itself was annihilated," while others fretted that such speed would unbalance society, compressing time and distance in disturbing new ways.

The telegraph's wonder echoes in quantum entanglement. Here too, distance dissolves: two particles far apart respond as if joined. Einstein dubbed it "spooky action at a distance." Each age meets its own shock—the telegraph collapsed distance across continents; entanglement collapses it at the foundations of physics. What the telegraph changed for trade and society, entanglement changes for our understanding of time and reality.[125]

Quantum entanglement is one of the most unsettling puzzles in modern physics. Two particles, created together, can be separated by vast distances and still respond as if joined by a hidden thread. Einsteins question was simple: how could one particle "know" what the other had done without any signal moving at light speed or less? Experiments repeatedly confirm the effect. The real mystery lies not in whether the coordination happens, but in what it reveals about time and matter.[126]

125 Howard, D. (1985). Einstein on locality and separability. Studies in History and Philosophy of Science Part A, 16(3), 171–201.
126 Putnam, H. (1967). Time and physical geometry. Journal of Philosophy, 64(8), 240–247.

This chapter explores that fragile present through the lens of entanglement—how correlations arise without signals, how reality reaches beyond what exists, and how this dual structure avoids both rigid presentism and frozen eternalism. Bell's theorem will guide the way, revealing not just a puzzle in physics but a clue to time's architecture.[127]

To step into the terrain of quantum entanglement is to step into a landscape littered with puzzles. The experiments themselves are straightforward enough—two photons born together, later found to be mysteriously coordinated—but the interpretations they provoke have split physicists and philosophers alike. What does it mean for two events to be linked across distance without a signal? And what does such a link tell us about time itself?

The first difficulty lies in how entanglement strains our ordinary categories. We like to think of the world as made up of separate pieces, each doing its own work. But in the case of entangled particles, the whole seems to come before the parts. The pair has a joint state, a shared description, even when separated. Yet when outcomes finally appear, they appear only locally: one here, one there. It is as if the orchestra began with a single score, then split into instruments that nonetheless stay in tune without exchanging any notes. How this is possible has been debated for nearly a century.

A second problem is the tension between physics and lived experience. Our everyday sense is that time flows—that there is a before, a now, and an after, each distinct. Yet one influential camp, sometimes called the "block universe" view, suggests that time does not really pass; all moments coexist in a vast four-dimensional tableau. From this angle, entanglement poses no mystery: the outcomes were always written into the block, waiting to be read. But this neatness comes at a cost. It denies the freshness of becoming, the sense that something genuinely new occurs in the present. On the other side stands strict presentism, the idea that only the present exists.[128] But if that is all we allow, then entangled particles seem to coordinate by magic, for nothing from the past could persist to enforce their harmony. We are left between two extremes, neither of which sits comfortably with both physics and experience.

127 McTaggart, J. M. E. (1908). The unreality of time. Mind, 17(68), 457–474.
128 Oaklander, N. (2014). The ontology of time. Prometheus Books.

Entanglement illustrates how Reality maintains immediate, non-local informational connections between particles, regardless of their distance in Existence (space-time). The instantaneous correlation reveals an underlying unity that transcends the spatial separation of the present moment. Fig.18.

Disagreements also flourish about what role measurement plays. Some interpretations insist that nothing definite exists until a measurement is made, leaving the quantum world in a kind of ghostly suspension. Others argue that everything is definite all along, and that measurement merely reveals what was already there. Each position faces difficulties. If everything is indefinite, how can the world feel so concrete? If everything is already fixed, what room is left for choice, chance, or the flow of time? The debates circle around this fault line, with no consensus in sight.
Another difficulty arises with relativity. Special relativity tells us there is no universal "now"—different observers may disagree about which of two distant events came first. Yet entanglement appears to require some deeper unity, as if both measurements were part of a single occasion. How can there be one event spanning two locations without contradicting relativity's limits against faster-than-light influences? Some physicists speak of "nonlocality" in hushed tones, wary of suggesting hidden signals; others insist the correlations can be explained without breaking any laws, but at the price of making reality itself less intuitive. The tension remains unresolved, like a riddle whispered across disciplines.

Finally, there is the philosophical unease. Entanglement seems to hint at a reality more interwoven than our categories allow, yet attempts to capture this insight often slide into paradox. Is the correlation itself something real, existing before it manifests? If so, in what sense? If not, how can the two particles behave in step? These are not minor disagreements but fundamental questions about what it means for something to exist, to be real, to come into being.

Taken together, these problems form a thicket through which any clear account must carefully move. Entanglement forces us to confront the limits of both scientific models and philosophical intuitions. It challenges our comfort with separateness, our assumptions about time, and our definitions of reality itself.

Entangled Realities and the Fragile Present

In a quiet lab, two photons are born together and sent far apart. When Alice and Bob measure, they register perfectly opposed results—no signal needed, no light outrun. Block-universe stories claim the outcomes were fixed all along; anti-realist readings deny depth until measurement. Existential Realism offers a third path: becoming is real and local, yet reality reaches beyond the present. Only what happens here-and-now exists, while past records, future possibilities, and the shared entangled state remain real without yet being present.[129]
The pair's joint state is a real relation even before either lab measures; outcomes, by contrast, come into existence only locally, at their own moments. The correlation is objective yet not a space-time fact until the clicks occur. Alice's result is born here, Bob's there; two births, one prior bond. Entanglement is the thread, existence the stitch that makes it visible.

Picture a single holistic preparation that later resolves into two local outcomes. No message ripples between labs; each click is locally born, yet jointly constrained by the earlier relation. Nothing was pre-written, and nothing relies on a bare, isolated now. The present is not mere illumination but articulation—the moment potentials become facts in step with the prior constraint.

129 Trepp, T. C. (2025). Entangled Realities, Present Existence: Bell Nonlocality in ER. (Preprint) https://philpapers.org/archive/TREERP.pdf DOI: 10.5281/zenodo.17100326

We can refine the metaphor: suppose the world's present is like a delicate strip of film moving through a projector. Each pattern (say the entanglement pattern) is imprinted onto this strip as it passes through "now," then becomes a fixed record once it flickers by into the past. The entangled state prepared earlier is like an image in a projector that is encoded in the machinery but not yet projected. When the measurement occurs, the image is cast – it splits into two patches of light at Alice's and Bob's detectors. The present moment has "pulled" those latent image features into reality, and they become the fossils of outcomes we record. In this way, the present is an active interface: it inherits structure from a deeper reality (the projector's hidden image), and then bequeaths a concrete record to the future (the photographic slide of outcomes).
This picture explains how Alice's and Bob's results can be correlated without any signal or pre-arranged cover-up. In ER, the entanglement itself is real, but nonlocal; it doesn't sit in space until measurement. Only at the instant of measurement do two local events emerge, connected by the fact that they once were aspects of a single quantum whole. We never have to say that either outcome was determined before its time. Instead, each outcome *comes into existence* in its own moment, and the harmony between them is secured by the one pattern that linked them beforehand.[130]

This resolves one classic conundrum: entanglement does *not* enable any faster-than-light message. Alice cannot send information to Bob by choosing how to measure her photon. Each outcome, viewed alone, is random. It is only in retrospect – by comparing notes later via ordinary signals – that the perfect anti-correlation becomes apparent. Think of preparing two coins in boxes so that when opened they always show opposite faces. No coin *tells* the other what to do; the link is baked in at setup. In ER, the two photons were "prepared" in a joined state. When Alice and Bob open their boxes (make their measurements), each sees a result that by itself carries no message. Only when the boxes are unlocked and compared do we see the coordination.

None of this breaks relativity. No energy or signal outruns light; each lab registers a local, random result. What does the heavy lifting is the prior relation—real yet non-propagating—which constrains both outcomes. Observers may disagree on which click was first, but no contradiction

130 Sider, T. (2001). Four-dimensionalism: An ontology of persistence and time. Oxford University Press.

follows: the statistics are frame-invariant, and the correlation requires no superluminal traffic, only a shared constraint already in place.

This has profound consequences for how we think about time and existence. Strict presentism – the idea that only the present is real – cannot by itself account for these correlations. If absolutely nothing exists but the here-now, then the two photons would have no way to "remember" their shared past. One would have to say the matching results are a fluke, or else smuggle in some hidden prescript until both labs do the measurement. But that smuggles a retrofitted realism, which is exactly what ER provides in principle. On the other hand, a frozen eternalism (everything equally real in a block) can accommodate the data by positing that both outcomes were just static facts of the block all along. Yet that picture kills off the flow of time and the freshness of choice, leaving our lived experience out in the cold.
Bell's theorem exposes what both extremes miss. The relation pre-exists as potential, yet outcomes arise only when and where they happen. ER names this layered reality: a link that is real before it is actual. Each detector's click becomes real locally, the pair fulfilling the correlation without prescript or magic. Nothing existed twice, nothing waited unformed in a void—the world simply matured its potential at the moment of encounter.

Bell's result strengthens ER's claim: reality is layered. The real extends beyond what presently exists, while existence keeps its privilege of becoming. The world unfolds in one stream, yet its fabric bears long threads of connection. No hidden signal, no frozen script—only the scaffold of reality spanning distance and the genuine emergence of each event.

Consider the delayed-choice entanglement swap. Two earlier detections exist, but a later choice about their partners fixes whether those past clicks count as parts of one entangled story or as independent records. No past is rewritten; the raw events stand. What is settled in the present is the consistent reading of the joint record. ER captures this cleanly: outcomes occurred, while aspects of their correlation remained open until now.

All this shows that the present moment is *fragile* and permeable. It is not an isolated island untouched by what lies beyond. The instant when Alice and Bob measure is like a thin membrane connecting what came before

the way we process it—linking human societies ever more deeply to the strange architecture of the quantum present.

We began with a riddle: how can particles far apart move in perfect accord? The puzzle struck at our oldest intuitions—presentism's isolation and eternalism's stillness. Entanglement revealed another path: reality reaches beyond the present, yet existence takes shape only within it. Each measurement is a new stitch in a fabric that spans unseen reaches, coherence without loss of freshness.
For us, the moral is quiet but profound. Every choice is a bridge between what was and what may be; each act leaves ripples in the weave. The manuscript of the world is written line by line, each sentence alive with what preceded it. We pause, aware that the present is fleeting yet deep, the moment where the whole resounds. From here, the story turns toward the paradoxes of stillness and flow—our next inquiry into quantum freezing and Zeno's arrow.

Entanglement revealed a universe stitched together across distance. But quantum theory also hints that time itself can be stitched — that observation can slow or even halt change. This is the paradox of Quantum Freezing, or the Zeno Effect: the present's power not only to connect, but to hold.

Quantum Freezing and Zeno Effect

"No phenomenon is a phenomenon until it is an observed phenomenon. The universe does not exist 'out there' independent of observation—it is in the act of observation that the universe comes into being."

— Wheeler, J. A. (1983). Law without law. In J. A. Wheeler & W. H. Zurek (Eds.), Quantum Theory and Measurement (pp. 182–213). Princeton University Press.

A Tibetan sand mandala, built grain by grain and then swept away, teaches that becoming is bound to vanishing. The point is not endurance but rhythm: appearance, disappearance. Quantum paradoxes echo this lesson. Time does not advance under constant glare; it moves in intervals. This chapter brings together three images—Zeno's arrow, the measured quantum system, and the mandala—to make one claim: existence unfolds by pulse and pause. To ask whether time is discrete is not only to consult equations; it is to notice how impermanence scales from quanta to culture. We will track how observation can stall change, how intervals enable becoming, and how these patterns clarify the boundary between what exists now and the wider reality that prepares and receives each moment.
"Watch often enough and nothing changes" is a clean slogan that hides rough edges. First, what counts as a measurement? In quantum theory, measuring is not a glance but a state-selecting interaction—yet where selection happens (device, dynamics, or description) remains contested. Without agreement on "looking," the effect's foundation stays provisional.[131]

131 Misra, B., & Sudarshan, E. C. G. (1977). The Zeno's paradox in quantum theory. Journal of Mathematical Physics, 18(4), 756–763. https://doi.org/10.1063/1.523304

Existence and Impermanence: The ritual destruction of the Tibetan Sand Mandala is a profound metaphor for Existential Realism. The moment of creation establishes a highly ordered state of Existence (the Actual), which, upon dissolution, is returned to the formless, infinite potential of Reality. Fig.19.

Second, the conditions are exacting. Idealized models assume isolation and precision; laboratories face coupling, noise, and drift. Push interventions too fast and you can hasten, not hinder, evolution—the anti-Zeno regime. The phenomenon is therefore not a universal freeze but a balance: parameters of energy, environment, and timing decide whether observation acts as brake or accelerator.

Even when experiments confirm the effect, interpretations split. Some call it a mathematical artifact. Others see in it hints that time may unfold in indivisible steps. Still others claim it tells us more about our models than about the world itself. Like a courtroom with conflicting witnesses, the verdict depends on who is asked and how the case is framed.

The disagreements do not end there. The very metaphor of "freezing" has been challenged. Critics point out that most systems are not so completely halted but only slowed, nudged, or redirected. In this view, the Zeno effect is not the freezing of time but the reshaping of probabilities—less a stopped clock than a clock that ticks to a slightly different rhythm. Even the name "Zeno" is contested: some insist the analogy with the Greek paradox is misleading, suggesting stillness where in fact there is

only statistical hesitation. The result is a phenomenon at once celebrated and disputed, luminous in its suggestiveness yet murky in its foundations.

All of this raises a broader, more human difficulty: how do we make sense of an effect that seems to confirm and deny itself at once? On one hand, it demonstrates vividly that observation alters reality. On the other, its precise workings remain elusive, shifting depending on how finely we peer into the details. The Quantum Zeno Effect thus inhabits a twilight zone between principle and peculiarity: too well-documented to dismiss, too ambiguous to settle.

These difficulties are not flaws to be ironed out but invitations to deeper inquiry. They remind us that the world at its foundations resists neat diagrams and easy metaphors, just as Zeno's paradox resisted resolution for millennia. The disagreements surrounding the Zeno effect do not diminish its importance; they heighten it, showing that we are in the presence of something that unsettles our most basic assumptions about time, change, and observation. Now, with these problems laid bare, we can turn to the heart of the matter: how the phenomenon itself unfolds, and what it might mean for our understanding of becoming.

The Pulse and Pause of Time

There are moments in science where the world seems to hold its breath—a particle, poised on the brink of decay, refuses to fall; a wave, caught by watchful eyes, never completes its journey. These are not mere quirks of laboratory technique, but windows into the nature of time, existence, and our role as observers. If you have followed this book so far, you'll be equipped for our next exploration: a voyage into the paradoxical domain of quantum freezing—famously known as the Zeno effect—and the speculation that time itself may come in discrete, countable packets, not as a seamless flow.[132]

To set our scene, let's borrow the artful clarity of film: imagine a story told not as a seamless movie but as a reel of photographs, each frame projecting a world seemingly still, yet collectively giving rise to motion. Now, what if the way the universe itself unfolds has just such a granular rhythm?

132 Trepp, T. C. (2025). Quantum Freezing and Discrete Becoming: Zeno Effect, Causal Sets, and Quantum Gravity. (Preprint) https://philpapers.org/archive/TREQFA.pdf DOI: 10.5281/zenodo.17121388

Let's step into this narrative, and see what happens when the gentle current of becoming is seized—again and again—by the gaze of observation, and when the stream of time is imagined as a sequence of indivisible drops.[133]

You might recall from earlier chapters the long-standing puzzle posed by Zeno of Elea, the Greek philosopher who loved to trouble our sense of motion. Picture Zeno's paradox of the arrow in flight: at any single instant, observed closely enough, the arrow is motionless; how then can it ever truly move? For centuries, this was resolved by embedding motion in a continuum—a seamless unfolding of moments, each smaller than the last. Yet, beneath the veneer of mathematical elegance, quantum physics hints at a deeper mystery.

It tells us, in no uncertain terms, that observation is not a passive act. Watching does something. Quantum systems, when observed, do not simply reveal their state—they leap, they freeze, they resist becoming. This is not some poetic turn, but the stark prediction and experimental reality of the quantum Zeno effect.

And so we find ourselves in the theater of the very small, as experimenters and thinkers, actors and audience alike, poised between the pulse and the pause.

133 Rideout, D., & Sorkin, R. D. (1999). Classical sequential growth dynamics for causal sets. Physical Review D, 61(2), 024002. https://doi.org/10.1103/PhysRevD.61.024002

Quantum Freezing: When Watching Halts the March of Time

Think of drifting toward sleep. Left alone, you cross the threshold; nudged every few seconds, you never quite do. In quantum terms, those nudges are measurements. Too many, and the transition stalls.

This is not mere analogy. An unstable atom, left to evolve, tends to decay; repeatedly ask "decayed yet?" at the right cadence and it lingers in its initial state. Measurement does not only report; it resets, collapsing maybes into the same outcome again and again, denying the system time to explore its natural path. That staccato of interventions is the Zeno effect: observation can halt change by forcing actuality to reassert itself before possibility has room to grow.[134]

But why does this happen? The quantum world is alive with possibility: in between measurements, a system lives in a shimmering superposition—part here, part there, part in transition, a puzzle of maybes. To measure is to force the system to pick—like the moment the film projector halts on a single frame, freezing the motion. Each measurement discards the gently evolving landscape of possibility, making the system snap back to its starting point.

If measurements come quickly enough—each a decisive, all-or-nothing commitment—the system never has time to wander, to become what it would have become. Change is not just delayed, it is arrested; the stream of time, for that particle, is dammed by the act of observing.

And just as Zeno's arrow stood still in each instant, never truly flying in any one moment, so too the quantum world—probed too persistently—finds itself unable to move.

It's worth pausing here to reflect on the everyday resonance of this phenomenon. Do we, perhaps, trap ourselves in similar cycles? Think of a child under constant scrutiny. If they are interrupted at every attempt to start a new task or entertained at every idle moment, do they ever settle, explore, create, or do they hover, eternally on the brink of something new? Is there a rhythm to attention and inattention—a necessary interval of freedom that lets true change happen?

134 Maudlin, T. (2019). Philosophy of Physics: Quantum Theory. Princeton University Press.

Present as Dimensional Unfolding

"The constructionist hypothesis breaks down when confronted with the twin difficulties of scale and complexity... At each level of complexity entirely new properties appear, and the understanding of the new behaviors requires research which I think is as fundamental in its nature as any other."

— Anderson, P. W. (1972).
More is different. Science, 177(4047), 393–396.

Look inward and emergence is immediate. The body is measurable and material—organs, tissues, firing neurons—yet from this activity arises a distinct order: mind. Neural firings yield meaning; physiology supports psychology without exhausting it. Tracking ions and spikes does not explain a poem's significance or a melody's sorrow. The emergent layer is lawful, not mysterious, but its laws are cognitive—attention, memory, interpretation—rather than chemical. This is our template: higher orders supervene on lower ones while introducing their own necessities.
The mind is bound to the body, yet it is more than body. It creates its own world: the world of ideas, beliefs, intentions, and decisions. In this psychological world, words can wound more deeply than blades, memories can shape an entire life, and abstract symbols can redirect civilizations. Here, new laws reign—the laws of cognition, language, attention, and imagination. A thought can silence another thought; a decision can alter the path of a life; a story can move countless strangers. These are not simply descriptions of physical events, though they depend on them—they are expressions of a higher order, layered on top of the physical ground.

Emergence shows that when matter becomes sufficiently complex, something new arises. The body produces the mind, but the mind is more

than body—it is a new frontier where meaning and information take precedence. Emergence is not only a scientific principle but the lived structure of our existence.
And here lies the deeper analogy that will guide this chapter. Just as the mind emerges from the body, so too does the present emerge from reality. The now is not simply a point within a preexisting timeline, like a coordinate on a graph. It is a new level of being, irreducible to the physics that precedes it. The present is the active frontier where reality unfolds into existence, where potential collapses into actuality, where something new is always born.

To understand time, then, we must treat the present as we do the mind: not an illusion or a byproduct, but a genuine emergence—a level of being with its own order, its own necessity, its own laws.

Emerging Dimensionality

Imagine the present as the glowing tip of a projector's beam. What you see now is like a single illuminated frame, supported by the unseen reel or by the deep ocean beneath a cresting wave. Each image is vivid, yet always sustained by what lies behind it. In much the same way, what if the vibrant three-dimensional now that we inhabit is continuously unfolding from a hidden foundation—a simpler, lower-dimensional layer of information that underlies everything? This idea may sound abstract, but it can be made intuitive. Picture reality itself as a kind of hologram or cosmic record: the present is the part currently lit up and existing, while past and future lie in darkness offstage—*real* as ever, but not currently in the spotlight. Let's explore this vision step by step, as an ongoing intellectual adventure rather than a fixed theory, weaving together metaphors and insights to illuminate how time might truly flow.[139]

ER draws a strict line: existence is only the present—concrete and observable—while reality is the wider causal–informational structure that includes past records and future tendencies. Only the now exists, yet much more is real. This keeps the privilege of the present without erasing how non-present structures shape what can manifest next.

139 Trepp, T. C. (2025). Emerging Dimensionality: The Present as Unfolding from Lower-Dimensional Reality. (Preprint) https://philpapers.org/archive/TREEDT.pdf DOI: 10.5281/zenodo.17086072

Modern physics has tossed around an astonishing idea: what if our three-dimensional universe is essentially a hologram? In physics terms, the holographic principle suggests that everything happening inside a volume of space could be encoded on a lower-dimensional boundary of that space. In plain language, it's like saying our 3D world might be "written" on a 2D surface, somewhat like how a flat holographic plate can encode a three-dimensional image. The physicist Leonard Susskind famously remarked that "the three-dimensional world of ordinary experience… is a hologram, an image of reality coded on a distant two-dimensional surface". It's a mind-bending concept: the *depth* and richness of what we see around us might emerge from information that's spread out on a flatter, hidden canvas of reality.

Now, in our context of Existential Realism, we're going to borrow this hologram idea as a metaphor—a vivid analogy—to picture how the present could emerge from a simpler, underlying reality. We're not claiming that literally a tiny 2D grid in space contains the code for every tree, star, and heartbeat. Rather, we suggest imagining reality (in the ER sense) as a kind of informational blueprint or holographic film, and the present moment as the projection of that information into the vivid 3D scene we experience.

Think of a classic hologram in a lab: a flat photographic plate with seemingly random swirls. Shine a laser on it just right, and suddenly a three-dimensional image pops into view, hovering in space. All the 3D details were somehow encoded in those 2D patterns. In our analogy, Reality (capital R for the ER term) is like that holographic plate or a cosmic *film reel* storing an intricate interference pattern—the complete informational record of the world. The Present is like the 3D image that appears when a portion of that record is illuminated or decoded. At any given moment, only a slice of the information lights up—only a *frame* of the cosmic film is being projected—and that slice is what we see as the concrete world right now. Everything else (the rest of the film, the part of the hologram not currently lit) still exists as information in reality, but it's not currently visible or tangible.

This holographic metaphor makes the two-layer idea more tangible. It is as if the universe holds patterns of past and future in its informational layer—but only the present is ever brought into display. The record is being written as it goes, not revealed all at once. Only the current frame, the now, has been projected into full existence. We might imagine a

cosmic projector light moving along the film reel: as it advances, it continuously brings the next frame into view (the next present moment), while previous frames slip back into darkness (becoming past reality) and future frames lie ahead, still unilluminated (future reality). The result is an unfolding movie of time: the world as a holographic projection playing out moment by moment.

The metaphor risks implying a finished film. ER rejects that: reality is not prewritten but continuously updated. Each event adds structure to the record; what has not yet manifested remains an open set of lawful possibilities, not fixed frames awaiting reveal. The present does not disclose a predetermined script—it contributes new information to reality.

To extend the metaphor: imagine the holographic plate growing over time, or the film reel spooling out new blank frames that get exposed and developed one by one. Reality provides the constraints and possibilities—the interference patterns or outlines that guide what can happen next—but until the projector light passes over a given frame, that part of the story isn't set in stone. The present moment isn't merely revealing something hidden on the tape; it's actively writing the tape as it goes. The universe, in this view, is not a pre-made hologram but a holographic computation in progress—a kind of participatory unfolding. We live on the edge of creation, where each "now" both reads from the informational underlayer and writes to it, adding new information (and hence altering the future reality).

This interpretation preserves a sense of free will and novelty: the future exists as a spectrum of real possibilities, not as a fixed slideshow waiting to play. When the moment arrives and one possibility actualizes (becomes the present event), the other possibilities either evaporate or retreat back into the realm of the unrealized. The now, in effect, is when reality's ambiguities collapse into a definite occurrence—like a fuzzy multitude of potential images snapping into one clear picture. And once that happens, that occurrence is logged into reality's ledger (it becomes part of the holographic record) and the cosmic process moves on. We get an endless cycle of informational feedback: reality yields an existence (projection), existence then updates reality (new info recorded).

Put more poetically, the present is like a *holographic screen* where the universe momentarily flashes its current scene, and behind that screen is a constantly adjusting apparatus making sure the next scene will follow

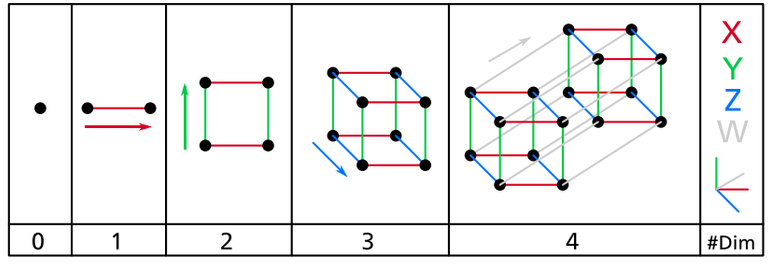
coherently. We are both watching the movie and, in some way, contributing to its script. Reality is the hidden projector and film, the present is the living image, and time's flow is the steady click of the projector advancing frame by frame.

In summary (of the metaphor): We might inhabit a holographically structured cosmos, where what we experience as a rich 3D now is rooted in a lower-dimensional "source code." But unlike a static hologram in a museum, this cosmic hologram is dynamic and interactive—more story than sculpture, being written in real-time.

How Simple Could Reality Be? (One-Dimensional Strings to Zero-Dimensional Seeds)

Dimensionality itself may be emergent. The point of the thought experiments is modest: a simpler informational substrate could lawfully generate a richer present without implying predetermination. Whether one imagines a 2D code, a 1D stream, or an even sparser basis, ER needs only this: a lower-order reality can specify constraints and potentials, while the present manifests one concrete outcome and updates the record.

If one dimension is still too much, imagine boiling reality down to zero dimensions—a single, dimensionless point of pure information potential. This is admittedly a very speculative, almost mystical idea: all of reality as a sort of seed or singularity containing the source of everything in an unextended form. How could a point give rise to a universe of extension and duration? We might say that this point is not empty; it's like a concentrated nexus of possibilities. At each moment (each "tick" of time), this seed bursts forth a little, blooming into the present world with all its spatial dimensions and content. Then it recedes again, perhaps to gather the newly generated information. In each cycle, something latent in that singularity is expressed as actual existence and then folded back into the seed. It's as if the universe is emanating from a single source point continuously, a fountain of being that creates time by an endless series of tiny expansions and contractions—unfolding into now, enfolding back into potential. In this fantastical scenario, even space might be an emergent property: the *where* and *when* only spring into being when that seed "unpacks" itself into a present moment.



A schematic illustration of dimensional emergence, from points to higher-order structures. The arrows mark extrusion into new axes, evoking holographic projection where each level encodes the next. On the left is zero dimensions (a point), while on the right the unfolding reaches four dimensions (a tesseract), suggesting how holography reveals hidden layers of reality through successive dimensional expansion. Fig.20.

Why entertain such extreme scenarios? The point (no pun intended) is to emphasize that the dimensional richness we take for granted might arise from something simpler. Whether reality's hidden layer is 2D, 1D, 0D, or something even more abstract, the common idea is that existence (what we see as a 3D, unfolding world) could be the *frontier* or interface where a simpler, information-rich substrate translates into the complex theater of life. Dimensionality might not be fundamental at all, but an emergent property of how information organizes itself when it becomes actual. These thought experiments stretch our intuition: a line of code spinning out a cosmos, a dimensionless point seeding space and time. While they're speculative and not proposed as literal physics, they serve a philosophical purpose. They remind us that ER's two-tier view doesn't require reality to look just like existence in miniature. Reality could be radically unlike the everyday world—simpler, more compressed, hiding in patterns—yet capable of generating the familiar dimensions and objects when it unfolds into the present.

To make this idea more tangible, we can follow a familiar sequence from physics to mind—watching how new dimensions of order emerge step by step within existence itself. If we step back from the vast holographic view of reality and look inward at how complexity itself unfolds, another pattern becomes visible—a quiet hierarchy of emergence. From the simplest physical events to the highest forms of awareness, each level does not replace the one beneath it but arises from it, translating earlier principles into richer modes of organization. Existence seems to build itself upward, each tier giving rise to new capacities that could not have been foreseen from the previous.

At the base lie the physical elements, the primal dance of particles and fields. They obey their laws with unfailing precision—motion, interaction, and conservation—producing stability where chaos might otherwise reign. Out of these pure interactions, chemical bonds begin to form: atoms finding one another, creating molecules, lattices, and reactions. Here, the world learns to hold a shape. Energy becomes architecture; relations endure long enough to store information.

Within this chemistry, certain configurations cross a decisive threshold: they begin to persist for their own sake. These are the living cells, where matter starts to loop back on itself in metabolism, repair, and replication. A cell is chemistry that has learned to stay. From that fragile autonomy emerge networks of cooperation—specialized organs—where clusters of cells divide labor and sustain one another through shared purpose. Life becomes coordination; structure gains function.

When these organs integrate, the whole organism comes into being: a unified being capable of sensing, moving, and responding. Here existence gains direction—it acts upon reality rather than merely enduring it. The organism anticipates, remembers, and protects its continuity. Yet one more layer forms when these countless processes synchronize into a single field of reference: consciousness. It is not a ghost above the system, but the living summary of its coherence, the caption that allows the organism to read its own story as it unfolds. Through consciousness, existence gains navigation—the ability to evaluate, choose, and project itself forward in time.

From particles to perception, each stage carries the logic of the previous one but refracted through a new mode of relation. Physical law becomes chemistry; chemistry becomes biology; biology becomes awareness. None of these layers vanish—the atom still hums within the neuron, the neuron within the thought. Emergence, in this sense, is not a ladder climbed once, but a continuous translation: reality folding into existence at ever higher resolution.

And the ascent does not stop with the individual. When many conscious beings interact, they form collective systems—societies, languages, and cultures that extend cognition beyond the single mind. Shared symbols allow distributed awareness, turning communication into a new kind of organism. On a still broader scale, ecosystems weave together species

and environments into living fabric of feedback and balance. The principle remains constant: relation gives rise to integration, and integration to consciousness.
Seen through the lens of Existential Realism, this chain of emergence reveals no miracle outside nature, only nature deepening its own coherence. The same universe that began as a field of particles has gradually learned to reflect upon itself through living beings capable of understanding. Consciousness is thus the latest expression of an ancient impulse—the universe's ongoing project to organize, sustain, and finally know its own existence.

At the Edge of Now: How the Present Emerges

So far, we've painted a picture of the present as a kind of projection or decoding from a deeper reality. But how does this projection actually happen? What's the process by which possibilities become actual events, and actual events then become part of the past? Existential Realism describes this in terms of manifestation (when something moves from reality into existence) and demanifestation (when something passes from existence back into reality). The present moment is essentially the zone of manifestation – the razor-thin line where reality is continuously crystallizing into concrete existence, and simultaneously where each existing thing, as its moment passes, slips back into reality as a memory or record.

If this sounds abstract, think of a simple natural process: the life cycle of a tree. Before a tree exists, it's a real possibility contained in a seed and its environment. Given soil, water, sunlight, and time, the seed's information *manifests* as a sprout and then a growing tree – it moves into existence as a living organism. That tree stands in the present, fully existent, for perhaps decades. Eventually, it dies – it demanifests. Does it cease to be entirely? Not in ER's view. The tree leaves behind a stump, decaying wood enriching the soil, perhaps seeds of its own, and memories in anyone who sat under its shade. Those remnants mean the tree is still real as part of the world's story and causal fabric (nutrients for other plants, recorded in someone's photo album, etc.), even though it no longer exists as a present living tree. The tree's mode of being changed: from a real possibility (seed) to a present existent (tree) and back to a real influence

articulation takes form.

The metaphor of emergence therefore completes the holographic image: reality is not a finished pattern waiting to be revealed, but an active grammar still writing its own syntax. Each moment extends the sentence, adding new layers of meaning to what came before. The unfolding does not end; it refines itself—dimension by dimension, relation by relation, into forms ever more capable of knowing that they exist.

Part IV brought us to the hard edge of physics, where time is measured in equations, warped by gravity, and unsettled by quantum indeterminacy. There, we tested whether Existential Realism could hold its ground against the most demanding accounts of nature. The result: physics, far from closing the question, deepens it.

But physics alone cannot carry the full weight of the framework. To make time intelligible across disciplines, we also need structures of thought precise enough to capture its distinctions and flexible enough to link them to cognition and culture. This is the task of logic and cross-disciplinary modelling.

Part V turns to that domain. Here, formal logic is developed to encode the two-tier framework of existence and reality. And here too, bridges are built outward: toward information philosophy and toward ways of showing how time's structure is not only measured but represented, reasoned about, and lived through formal systems of thought.

Part V – Formalization and Theory-Building

„The future is open.
It is not predetermined and it cannot be predicted,
except by accident."

— Popper, K. (1982). The open universe:
An argument for indeterminism. Routledge.

Logic of Becoming

Picture the birthday candles: one breath, the flames are gone. The event does not exist, yet smoke, wax, and a wish remain—traces that alter air and mood while a not-yet outcome begins to steer choices. In a single gesture we see the riddle of time: the present collapses; the just-past persists as record; the not-yet bears on action as possibility. What vanishes from existence still endures in reality, and what is unrealized is already real enough to matter.[142] This chapter develops the distinction and its reach—across logic, physics, mind, and ethics—so the logic of becoming emerges as a working framework: preserving the uniqueness of the present while refusing to reduce the non-present to nothing.

Picture a childhood beach day—gone from existence yet still shaping you through memories, photos, even who you became. Picture next year's

142 Trepp, T. C. (2025). Formal Logic for Existential Realism: Modeling Time, Causality, and Observability. (Preprint) https://philpapers.org/archive/TREFLF.pdf DOI: 10.5281/zenodo.17035424

graduation—unrealized yet already prompting bookings and invitations. Daily life treats both the gone and the not-yet as more than nothing, despite our claim that only the present exists. The tension is old: presentists confine existence to the instant, denying past and future any weight; eternalists stretch existence equally across all times, as if every page of the timeline were open at once.

- **Existence**: concrete presence in the here-and-now—detectable, interactive, tied to the index *now*.
- **Reality**: the wider causal-informational web—anything that has mattered, matters, or will matter for the world, whether or not it currently exists.

With these definitions, we can say: the domain of reality includes all present existents (obviously, whatever exists now is real *by definition*), plus those non-present things that nevertheless make a difference. Extinct stars whose light still reaches us are real (though they no longer exist). Historical figures like Socrates or dinosaurs are real by virtue of the causal traces they left – fossils in the ground, ideas in books, consequences that ripple to this day. Future events that are confidently predicted – say, an upcoming solar eclipse, or simply tomorrow's sunrise – have a kind of reality too: they are woven into our current explanations and plans (through astronomy and physics, we know the eclipse *will* happen, so it's treated as real in advance). Even certain theoretical entities in science, like an electron or a black hole we haven't directly seen, count as real if their effects show up in our detectors and equations. In short, reality is existence extended across time and inference: if something, at any time, contributes to the causal or informational structure of the world, we grant it reality, whether or not it exists right now.
A slogan captures it: **Reality = Existence + Δ** — where **E** is what exists now, and **Δ** is all that is real yet non-present: traces, records, potentials, expectations.
Reality therefore equals the present plus the temporal web that connects causes behind us and possibilities ahead.

To reason cleanly we sketch a two-tier logic: define ExistsNow(x) — true only for what occupies the present spotlight—while the universe of discourse already contains all real entities, past, present, or potential. This lets us speak without conflating "is real" with "exists now."
To illustrate, suppose our domain D is the set of all real entities

(everything that has ever, does, or will play a role in the world). Among these, some special ones satisfy ExistsNow(x) – those are exactly the ones currently existing. We can then naturally state the fundamental asymmetry of Existential Realism in this language:

- **If x exists now, then x is real.** (This is just common sense: whatever exists is of course part of reality.)
- **x can be real without existing now.** (This is the crucial part: ExistsNow(x) might be false, yet x can still be in our domain D, meaning x is something we consider real in the broader sense.)

We could even formalize the first part as a tiny axiom: ∀x (ExistsNow(x) → Real(x)). In our setup, "Real(x)" is almost redundant because by being in domain D, x is considered real; but writing it out just highlights the point. The second part would be the statement ∃x (Real(x) ∧ ¬ExistsNow(x)) – there are things that are real but not presently existing. And indeed, under our two-tier view, there are plenty of such things (Socrates, that eclipse in 2045, etc.).

What does this buy us? It means we can now speak clearly where before we had to speak in riddles. We can say in our formal language: "Socrates is real AND NOT exists-now." That captures the idea that Socrates (who died long ago) does not exist at present, but because he has real effects (maybe through his ideas, or simply the chain of history that leads from him to now), he remains a real entity in our framework. In plain English, our framework allows statements like "X is real although X does not exist now" to be not only sensible but logically well-formed and non-contradictory.
To make this system complete, we do need to account for time explicitly, because "now" is a moving target. One way to handle time is to imagine a series of moments or time indices – call them t_0, t_1, t_2, … – each with its own set of existing things. We can think of ExistsNow(x) as secretly having an index: ExistsAt(x, t) meaning *x exists at time t*. But we also want to be able to talk about the world *from within* a given present. So instead of always saying "at time t," we often speak from the perspective of the current moment (like actors on a stage while the play is ongoing). In practice, one can formalize this with semantics that evaluate truth at a particular time, but we don't need to dive deep into that here. The essential picture is: as time progresses, the set of things that exist (now) keeps

$$R = E + \Delta$$

updating. At one moment, some event happens and comes into existence; later, that event is in the past, so it has slipped out of the existence category – but it doesn't vanish without a trace, it moves into the reality-only category. At any given moment, something either exists now or it does not. If it does not, it may have existed in the past, may exist in the future, or may never exist at all. The logic has to keep track of identities across time – for example, we want to be able to say "the tree that exists now is the same tree that was a seedling ten years ago." In our framework, that's possible because "the same tree" is one entity in the domain of reality, which *had* the property of existing at the time of the seedling and *has* the property of existing now. If we fast-forward to a time when the tree has fallen, that entity will no longer exist, but it will still be real (as a dead tree, perhaps, or as wood decaying – still causally and materially present in some form). Our logical framework, by having one encompassing domain of reality, allows us to refer to that tree across different times without confusion. We treat existence as a changing property, not an inherent part of the identity of the tree.

This new framework also respects causality and the flow of time. We build in the idea that the past can influence the present, but the present cannot (under ordinary circumstances) influence the past. In logical terms, we might include something akin to a rule: if an event lies entirely in the future relative to now, it cannot have causal effects on what exists now (because the future isn't set yet, or at least hasn't 'arrived' to do anything). Conversely, if something existed in the past and is real now, it's likely because it has some present influence or leftover evidence. We could even add a principle like: *if x is real but entirely in the past, there should be some present trace of x.* This isn't a strict logical necessity, but it aligns with the spirit of empiricism – we believe in past events because we have records or memories of them now. In practice, this means our framework isn't cluttered with random past events that left no sign; every real thing tends to connect to the present in some way (or we wouldn't even know about it). Likewise, for the future, we often only consider a future event real if we have some present indication of it (a plan, a prediction, a growing trend).

Revisiting Philosophy's Puzzles

Having sketched the framework, we can circle back to some classic philosophical conundrums about time and existence. These are questions that have nagged presentists and eternalists alike. Now we can address them with fresh insight, using our two-tier perspective.

The truth of "Dinosaurs existed" rests on their reality —creatures that once existed and still leave fossils and causal traces—so ER needs no special truth-maker beyond acknowledging their past actuality. In our logical formulation, we could say something like: $\exists x$ (Real(x) $\wedge$ Dinosaur(x) $\wedge$ PastExistence(x)). This asserts that there is at least one real entity which is a dinosaur and which existed at some time in the past. That statement comes out true, because indeed, many such entities existed. The truth-maker is not a mysterious present ghost; it's the actual past dinosaur itself, considered as a real entity that simply isn't in the present anymore. We have, in effect, formalized what common sense wants to say: the world *did* contain dinosaurs, so that proposition is true. We're just careful to note that "contain" here means contain in reality, not in the present domain of reality.

What about future truths? Suppose I say, rather confidently, "There will be a solar eclipse on April 12, 2045." Is this statement true right now? We usually think it is (assuming our astronomy almanac is correct), because we can predict such an eclipse with high certainty. But *what* makes it true? The event hasn't happened yet, so we can't point to a specific eclipse occurrence in reality that exists now. However, we can point to present reality: the current configuration and orbits of the Earth, moon, and sun, together with the laws of celestial mechanics, which guarantee that on that date the alignment will occur. In other words, the truthmaker for this future-tense truth is the present reality of the solar system that makes the future eclipse inevitable. The event is as good as real already, in that it is *determined* by existing conditions. Our framework would describe it like this: the eclipse is real (even now, before it exists) inasmuch as it is determined by current causality. In a sense, the event is already woven into reality's continuum – it's a pattern that is going to emerge, given what is presently the case. Of course, not all future statements are so clear-cut. If I say "It will rain here exactly one year from today," I don't have the same certainty or a tidy truthmaker – that future is not fixed yet, it remains an open possibility. In such cases, one might say

2. **The Cosmic Calendar.** Compress the 13.8 billion years of cosmic history into a single year — the "cosmic calendar." In this scale, galaxies form in January, Earth condenses around early September, life emerges mid-September, multicellular organisms late November, and dinosaurs vanish just after Christmas. Humanity appears only in the last hours of December 31; all recorded history occupies the final seconds before midnight. In this cosmic midnight, our entire existence — every war, cathedral, and thought — flashes like the brief glow of a spark. To some, that perspective feels nihilistic; to others, it is a revelation. Fragility becomes not failure but fact: even the stars themselves have lifespans. In such a universe, meaning cannot depend on endurance. It must arise in the very act of becoming — in each present that burns and passes on.

3. **The Fragile Fabric of the Human World.** Our societies, too, mirror this cosmic impermanence. Empires collapse; technologies obsolete themselves; even memories degrade within a generation. The structures we build — governments, markets, cultures — are not monuments but waves, rising and breaking in succession. Yet in this constant renewal lies vitality. The fragility of human systems reminds us that value is not secured by permanence but by participation: by building, maintaining, and renewing together, moment after moment. Modern civilization, for all its power, is still an experiment balanced on a thin layer of atmosphere and trust. Climate, biosphere, and cooperation — all depend on delicate equilibriums that could easily tip. The lesson is not despair but attentiveness. Fragility, seen clearly, becomes a call to care.

To live in awareness of these scales — the flicker of human time against biological and cosmic spans — is to see how existence is both precious and precarious.
Our moment is brief, yet in its brevity lies intensity. Every act, every life, every creation participates in the same vast rhythm: emergence, transformation, and return. The fragility of existence is not a flaw in the system — it is the very logic of becoming made visible.

Living Within the Sway

We began with a problem: how to live with the knowledge that everything we cherish—objects, memories, even our very selves—is fragile, perpetually at risk of vanishing. Along the way, we saw how the illusion of permanence dissolves under closer scrutiny, how existence is better understood as a succession of fleeting events, and how narrative, memory, and resonance shape the way we navigate impermanence. What initially appeared as a source of despair slowly revealed itself as the ground of value: it is precisely because things pass that they matter, precisely because presence is fragile that attention becomes sacred.

If there is a single insight to carry forward, it is this: transience does not negate meaning; it creates the conditions for it. A flame is precious because it can be extinguished, a sandcastle beautiful because the tide will erase it. To exist is not to stand firm against time but to participate fully in the momentary weave of presence. This recognition shifts our orientation: the task is not to secure permanence, but to cherish the unrepeatable now.

Picture crossing a rope-bridge over a valley: each plank holds only for the moment, the wind sways it, nothing is guaranteed—yet the very instability makes every step more attentive and every view unforgettable. To walk the bridge is to trust fragility enough to move forward. The question lingers: will we cling to illusions of permanence, or let transience sharpen our presence and deepen our care for what is here now?

The book closes, but the frontier remains open. It waits in the next instant, in the next discovery, in the next act of awareness. The question of time is not finished — it has only begun to live through those who continue to ask it.

The Living Frontier

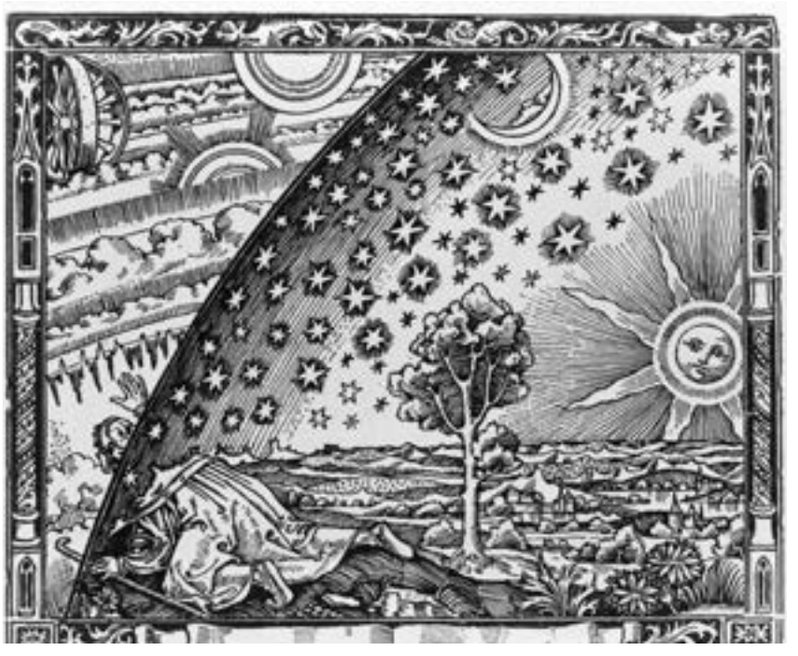
"We are the way for the cosmos to know itself. Some part of our being knows this is where we came from. We are a way of the universe to look at itself and wonder."

— Sagan, C. (1980). Cosmos. Random House.

Every book must close, yet time continues. We have traced its thread from the immediacy of perception to the architecture of the cosmos. What began as a question—what it means for something to exist—has widened into a deeper one: what it means for time itself to live. At the far edge of this inquiry, language begins to dissolve, leaving only the recognition that to understand time is already to live within its unfolding.

We stand within an unfolding that exceeds our knowing. Every present is a frontier—the crossing where possibility turns into fact, where what has been meets what will be. The world does not repeat itself; it remakes itself. We call this process "becoming," though the word is smaller than what it names. Each moment arrives as a first time—irreversible yet continuous with all that came before. Existence, in its fragile pulse, is the passage through which reality learns to exist anew.

Time remains our closest companion and our most alien enigma. The more precisely we map it, the more it slips the map. The past is not gone—its traces persist; the future is not nothing—it already bends our choices. Yet no formula encloses it. Time is not a river we drift upon nor a line we traverse; it is the living act by which existence becomes real.



Breaking Existence: The engraving depicts the philosophical journey of breaking through the structured world of Existence (the finite sphere) to witness the boundless, ultimate potential of Reality that lies behind it. Fig.21.

Even with the clarity of Existential Realism, questions remain that no theory can close:

- Why does time flow at all?
- Why is there a "now"—a pulse of presence that parts what merely is from what becomes?
- Why are nature's laws written to permit novelty, uncertainty, and life?
- If unfolding proceeds by collapse and renewal, does it continue beyond our horizon—new worlds arising where old ones fall inward?

Such questions do not end inquiry; they sustain it. They remind us that mystery is not a defect in understanding but its horizon. Every explanation, no matter how refined, meets a silence where the next question begins. What we call reality may be endless not only in space but in depth — a vast structure that thinking can only approach, never enclose.

For us, the challenge is not to conquer this mystery but to live wisely within it.

If existence is the luminous edge of a deeper reality, then each of us participates in the unfolding of time itself. Our choices are the way reality experiments with its own future. The memory we preserve and the attention we offer become part of the world's ongoing structure. Every gesture, every act of care or neglect, becomes a thread woven into the continuity of what is real. The frontier is not distant; it passes through us, moment by moment.

To live at that frontier is to accept that time is not a corridor we traverse but a relationship we enact. It is to see that the present, brief as it feels, carries the entire weight of reality — the past pressing behind it, the future leaning forward, both converging in the fragile clarity of now. Here, meaning is not given but made. Here, each thought and breath becomes the universe discovering itself anew.

Philosophy must hand over to life.

The aim is not to master time but to meet it. We are finite within a boundless process. Where theory falters, humility begins.

Time continues—with or without us—yet only through us does it become known.

The book closes, but the frontier stays open: the next instant, the next discovery, the next act of awareness. The question of time does not end; it begins again wherever someone asks it.

Time continues — with or without us — yet it is only through us that it becomes known.

The book closes, but the frontier remains open. It waits in the next instant, in the next discovery, in the next act of awareness. The question of time is not concluded—it begins anew in those who continue to ask it.

Epilogue

"Being is. Non-being is not. Time is the moving frontier between them. Existence is the present crest of reality's wave — the frontier where what is possible becomes actual."

— Paraphrase of Parmenides (c. 515–450 BCE) and Heraclitus (c. 540–480 BCE) synthesis

This book has followed a path through the many faces of time. We began with philosophy's most basic question: what it means for something to exist, and why reality must extend beyond existence. We saw that the present alone anchors what is actual, while the past and future remain real through traces, consequences, and possibilities. That distinction — existence versus reality — carried us through every stage of the journey.

We then moved inward, to time as it shapes human life. Memory, anticipation, responsibility, and the fragile urgency of the now revealed that time is not a distant puzzle but the medium of our own becoming. From there, the lens widened to culture, technology, and science — showing how the patterns of time are inscribed into our buildings, machines, and theories of the universe. Physics pressed the framework hardest, yet even in relativity, cosmology, and quantum mechanics, the present proved irreducible. Logic and formal modeling gave the framework its structure, linking it to cognition and information.

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Image references

Fig.1. The Lantern represents the full scope of objective Existence (the physical present moment). freepik.com

Fig.2. Eternalism, Presentism and Existential Realism. Made by Tenzin Trepp

Fig.3. Schema Reality-Existence. Made by Tenzin Trepp

Fig.4. Double slit experiment. https://commons.wikimedia.org/wiki/File:Doubleslit.svg

Fig.5. The briefly burning, bright flame of the match represents Existence. freepik.com

Fig.6. The telescope reveals a universe of time delays: we see stars not as they are, but as they were. https://commons.wikimedia.org/wiki/File:Street_Telescope_Exhibitor.jpg

Fig.7. The Loom illustrates the mechanics of Existence and Reality. https://commons.wikimedia.org/wiki/File:Loom_2.png

Fig.8. William James (1842–1910): Architect of the "Specious Present". https://commons.wikimedia.org/wiki/File:William_James_b1842c.jpg

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Fig.10. A blue-green algae species – Cylindrospermum sp – under magnification at the Adelaide laboratories of CSIRO Land and Water, 1993. https://commons.wikimedia.org/wiki/File:CSIRO_ScienceImage_4203_A_bluegreen_algae_species_Cylindrospermum_sp_under_magnification.jpg

Fig.11. The Hubble eXtreme Deep Field image reveals galaxies billions of light-years away, serving as a direct visualization of temporal vastness. https://en.wikipedia.org/wiki/File:Heic1401a-Abell2744-20140107.jpg

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Fig.13. Formation of the Universe in the Big Bang. https://commons.wikimedia.org/wiki/File:Universe_expansion-en.svg

Fig.14. The Event Horizon Telescope, a worldwide network of synchronized radio telescopes, captured this first image of the supermassive black hole M87* in 2017. https://commons.wikimedia.org/wiki/File:Black_hole_-_Messier_87_crop_max_res.jpg

Fig.15. In Existential Realism, Reality is the full, growing film reel of time (past and future). Existence is only the single frame illuminated by the present. freepik.com

Fig.16. The principle that the speed of light is constant for all observers demonstrates that simultaneity is relative. https://commons.wikimedia.org/wiki/File:KonstdLichtgeschw.svg

Fig.17. A common visualization of spacetime curvature. https://commons.wikimedia.org/wiki/File:Gravitation_space_source.svg

Fig.18. Entanglement illustrates how Reality maintains immediate, non-local informational connections between particles, regardless of their distance in Existence (space-time). gemini.google.com

Fig.19. Tibetan Sand Mandala is a profound metaphor for Existential Realism. https://commons.wikimedia.org/wiki/File:Mandala_zel-tary.jpg

Fig.20. A schematic illustration of dimensional emergence, from points to higher-order structures. https://commons.wikimedia.org/wiki/File:Dimension_levels.svg

Fig.21. The Flammarion engraving is a wood engraving by an unknown artist that first appeared in Camille Flammarion's L'Atmosphère: Météorologie populaire (1888) https://commons.wikimedia.org/wiki/File:Flammarion.jpg

Fig.22. Jean Piaget (1896–1980), the pioneering Swiss psychologist who founded the theory of cognitive development in children. https://commons.wikimedia.org/wiki/File:IMAGEN_DE_JEAN_PIAGET.jpg