

# Comparative Philosophy of Time

## Executive summary

The history of reflection on time does not yield one single theory. It yields several recurrent families of thought. Plato treats time as a cosmological image of eternity, tied to the ordered motions of the heavens. Aristotle makes time dependent on motion and counting, defining it as “number of motion in respect of before and after.” Plotinus deepens Plato by distinguishing eternity from temporal succession, treating time as a moving image of eternity in the life of soul. Augustine turns the problem inward: the past and future do not exist as things outside us, but as memory and expectation in the soul. Newton then re-externalizes time, but not as ordinary clock-time; he sharply distinguishes “absolute, true, and mathematical time” from any sensible measure such as hours, days, or years. Einstein and Minkowski transform the framework again: time is no longer a universal background but is bound to frames, simultaneity conventions, proper time, and spacetime structure. Thermodynamic and cosmological writers then add asymmetry, asking why time seems to have a direction at all. Phenomenology, especially Husserl and Bergson, insists that lived time is not exhausted by mathematical time. <sup>1</sup>

Across these traditions, the deepest fault lines are not simply “ancient versus modern” or “science versus religion.” They are these: whether time is independent or relational; whether it belongs primarily to the world, to consciousness, or to both; whether change presupposes time or time presupposes change; whether eternity is outside time or somehow present within it; and whether temporal direction is fundamental or emergent. These fault lines generate the most durable categories in the philosophy of time: absolute, relational, phenomenological, processual, thermodynamic, spacetime, timeless, and recursive or feedback-like. <sup>2</sup>

If the question is who best captured the full complexity of time, there is no neutral winner. Aristotle remains foundational for physical and relational accounts. Augustine remains foundational for the phenomenology of presentness, memory, and expectation. Newton remains indispensable for understanding the mathematical idealization behind classical mechanics. Einstein and Minkowski remain decisive for physical theory. Husserl and Bergson remain unmatched for the structure of lived temporality. A reasonable synthetic judgment is that no single thinker “solves” time; rather, the strongest overall map comes from placing Newton, Einstein, Husserl, Bergson, Augustine, Aristotle, and Minkowski into one comparative framework instead of forcing them into a single ranking. <sup>3</sup>

Your own “recursive feedback” model of time fits best not with Newtonian absolute time, but with phenomenological, process, and cybernetic-style approaches. It resembles Augustine’s inward distention of the soul, Husserl’s retention-protection structure, Bergson’s interpenetrating duration, and Dōgen’s being-time far more than it resembles a simple external clock. It also has a distant resonance with state-dependent views in contemporary physics, such as Rovelli’s thermal time, where temporal structure is linked to state and information rather than treated as a totally external container. That does not make the model true, but it places it in a recognizably serious lineage. <sup>4</sup>

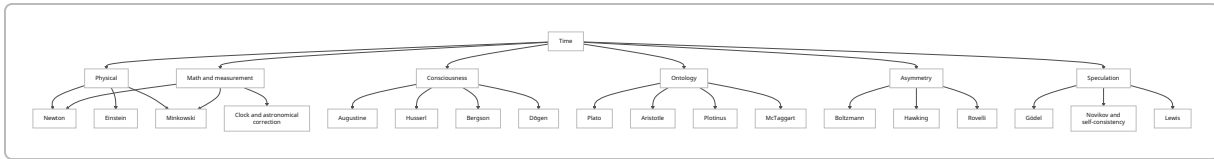
## How this report compares time

I will use fifteen layers of time, because many classic disputes arise from collapsing one layer into another. The layers are not mutually exclusive. Many thinkers operate across several at once.

Layer	What it means	Typical question
Physical	Time in physical law and dynamics	Does physics treat time as fundamental?
Mathematical	Time as parameter, coordinate, or variable	Is time an independent parameter?
Measured	Clock time, calendars, astronomical correction	What do clocks actually measure?
Biological	Rhythms of living systems	How do organisms keep time?
Psychological	Felt speed, boredom, anticipation	Why does time feel fast or slow?
Phenomenological	Structure of consciousness of succession	How is a melody or flowing present possible?
Metaphysical	Being, change, persistence, eternity	Is time real, relational, or unreal?
Theological	Time in relation to God or absolute reality	Is God in time, outside time, or both?
Mystical	Timelessness, eternal present, nonduality	Can time dissolve in contemplative experience?
Historical	Time as epoch, memory, transmission	How do cultures inhabit temporal order?
Existential	Mortality, finitude, becoming	What does time mean for a life?
Mythic and sacred	Cycles, creation, ritual time	Is sacred time different from ordinary time?
Social	Shared schedules, institutions, coordination	How is time socially organized?
Informational	Ordering, records, entropy, computation	Does time track information and memory?
Speculative	Time travel, quantum gravity, hypertime	Can causality or temporal order bend?

This layered scheme helps explain why thinkers often seem to disagree when they are actually answering different questions. Aristotle is strongest on physical and metaphysical time. Augustine on phenomenological and theological time. Newton on mathematical and metaphysical time. Einstein and Minkowski on physical and mathematical time. Husserl and Bergson on phenomenological time.

Thermodynamic writers on informational and physical asymmetry. Dōgen on existential, mystical, and ontological time. 5



The taxonomy above is not a claim that each thinker belongs to only one box. It is a way of preventing a common mistake: taking a theory designed for one layer and treating it as if it settled all the others. Newton’s mathematical time is not the same thing as Bergson’s *durée*. Husserl’s inner time-consciousness is not a competing physical theory. Einstein’s relativity is not an account of the felt present. Augustine’s analysis of memory does not replace physics. Once that is clear, the field becomes more intelligible. 6

## Foundational conceptions from antiquity to late antiquity

Plato’s classic formula in the *Timaeus* is that time is a “moving image of eternity,” created together with the heavens and “moving according to number.” Time, on this view, is neither the primary reality nor a mere human fiction. It is a cosmological imitation of a higher, more stable order. Days, months, and years come into being with the ordered heavens; eternity itself “rests in unity,” whereas time belongs to becoming. Plato is therefore best classified as cosmological, metaphysical, and quasi-mythic: time is objectively real, but derivative. Its weakness is that it ties temporal intelligibility closely to cosmic order and celestial regularity, which later thought would challenge. 7

Aristotle’s *Physics* offers the classical relational definition: time is “number of motion in respect of the before and after.” He argues that time is neither motion nor independent of motion, though it belongs to motion in a special way. We apprehend time when we mark before and after in change. This makes Aristotle profoundly influential for every later relational theory of time, including some modern process accounts. His strength is conceptual economy: time is not a mysterious extra substance; it tracks ordered change as countable succession. His weakness is that the view struggles with cases that seem to require duration without change, and it leaves unresolved the exact status of the counting soul in relation to objective time. 8

Plotinus, in *Ennead III.7*, radicalizes the Platonic contrast between eternity and time. Eternity belongs to intelligible life in its fulfilled self-presence; time is its moving image in the domain of soul. In a key formulation, Plotinus says that true eternity belongs to the intelligible and that time furnishes “a moving image” related to the soul. This is not merely cosmology. It is a metaphysics of ontological levels: eternity is fullness; time is distension into succession. Plotinus is therefore a pivotal bridge between Plato and later Christian thought. His strength is that he shows why time might feel like derivative unfolding from a higher mode of being. His weakness is that the derivation can appear too hierarchical and remote from empirical temporality. 9

Augustine’s *Confessions XI* turns the problem inward. He asks, “What, then, is time?” and answers with his famous confession: if nobody asks, he knows; if asked to explain, he does not know. He then argues that past and future do not exist in the straightforward way common speech suggests. What actually exist are “a present of things past, a present of things present, and a present of things future,” namely memory,

attention, and expectation in the soul. Augustine’s great strength is that he sees temporal consciousness as structured by retention and anticipation, not by isolated instants. His main weakness is that the ontological status of worldly time can seem underdeveloped relative to the phenomenological analysis. But for lived time, Augustine is one of history’s great masters. <sup>10</sup>

Aquinas, working in the medieval Latin tradition, preserves the difference between time and eternity. In *Summa Theologiae* I, question 10, he asks whether eternity differs from time and treats eternity as belonging to the divine mode of being rather than to successive change. This inherits and systematizes the Platonic-Augustinian line. Its strength is precision: eternity is not “very long time” but a different mode of being. Its weakness, for some modern readers, is that the picture depends on a strong metaphysics of God and being that is no longer widely shared. <sup>11</sup>

A compressed comparison is useful here:

Thinker	Core text	Core definition	Best category	Strongest insight	Main weakness
Plato	<i>Timaeus</i>	Time as moving image of eternity	Cosmological-metaphysical	Connects time to order, number, creation	Risks over-cosmicizing time <sup>7</sup>
Aristotle	<i>Physics</i> IV	Number of motion regarding before/after	Relational-physical	Makes time inseparable from ordered change	Hard on duration without change <sup>8</sup>
Plotinus	<i>Enneads</i> III. 7	Time as mobile image of eternity in soul-life	Metaphysical-process	Distinguishes eternity from succession	Empirically indirect <sup>9</sup>
Augustine	<i>Confessions</i> XI	Threefold present: memory, attention, expectation	Phenomenological-theological	Explains lived temporality from within	World-time less fully theorized <sup>10</sup>
Aquinas	<i>Summa</i> I q. 10	Eternity as distinct from temporal succession	Theological-metaphysical	Clarifies eternity is not endless time	Depends on theological framework <sup>11</sup>

## Modernity, consciousness, and the fracture of common time

Newton is often caricatured as the philosopher of a giant cosmic clock. His own text is more careful. In the *Scholium* to the Definitions of the *Principia*, he writes that “absolute, true, and mathematical time, in and of itself and of its own nature, without reference to anything external, flows uniformly,” while relative or

common time is merely “any sensible and external measure of duration by means of motion,” such as an hour, day, month, or year. He explicitly says that natural days are unequal, that astronomers correct common time to arrive at truer measures, and even that there may be no perfectly uniform motion by which time can be exactly measured. Newton’s time is therefore not ordinary clock-time. It is an ideal, mathematical, and metaphysical duration presupposed by mechanics and imperfectly tracked by clocks and astronomy. <sup>12</sup>

This matters because Newton’s view is frequently simplified in exactly the wrong direction. He did not identify time with what clocks directly show; he distinguished duration from its sensible measures. He did not say absolute time is observable; he says the sensible substitutes are all we usually have. He also pairs time with space, arguing that all things are placed in time according to order of succession and in space according to order of position. His strength is extraordinary clarity about the difference between ideal parameter, empirical measure, and metaphysical posit. His weakness is that the “flow” of absolute time is asserted more than operationally grounded, and this is precisely what later relational and relativistic theories attack. <sup>12</sup>

Bergson rebels against the spatialization of time. In *Time and Free Will*, he argues that “pure duration is wholly qualitative” and cannot be measured except by symbolic representation in space. He describes pure duration as a succession of qualitative changes that “melt into and permeate one another,” not as juxtaposed units laid out like points on a line. Bergson’s target is not only physics but the habit of converting lived succession into spatialized countability. His strength is that he identifies a real distortion in ordinary and scientific talk about time: much of what we call “time” is already a spatial diagram. His weakness is that the relation between *durée* and physical theory remains difficult, and critics have long argued that he overstates the opposition between lived time and measured time. <sup>13</sup>

Husserl, in his analyses of inner time-consciousness, supplies one of the most exact accounts of the flowing present. The now, he argues, is never a bare instantaneous point. Each primal impression carries a retention of the just-elapsed and a protention of what is about to occur. The concrete temporal structure of experience is therefore primal impression, retention, and protention. This lets Husserl explain how a melody can be heard as one temporally extended object rather than as isolated acoustic atoms. His strength is analytical precision. His weakness is that phenomenological constitution does not automatically settle metaphysical questions about whether objective time is fundamental or derived. But as an account of lived temporal synthesis, it remains unsurpassed. <sup>14</sup>

Dōgen’s *Uji* or “Being-Time,” as represented in the available translation tradition, pushes an even more radical claim: time itself is being and beings are time. The point is not that things happen “in” a neutral time-container, but that existence itself is temporal enactment. This is one of the strongest premodern challenges to the container model of time. Because the present sourcing here is thinner and partly mediated through an encyclopedic summary rather than a critical edition, I treat this section more cautiously than the Newton, Augustine, or Aristotle sections. Still, the conceptual point is clear enough: Dōgen belongs with those who refuse to separate being from temporality. <sup>15</sup>

A second comparison table helps:

Thinker	Time is primarily	Category	Stance on past/ present/future	Relevance now
Newton	Absolute duration plus relative measures	Absolute, mathematical, metaphysical	All events ordered in one uniform temporal flow	Classical mechanics; foundations of measurement <sup>12</sup>
Bergson	Lived qualitative duration	Phenomenological- process	Interpenetrating flow, not discrete instants	Critique of spatialized time; consciousness studies <sup>13</sup>
Husserl	Structured field of consciousness	Phenomenological	Present includes retention and protention	Cognitive science, temporal experience <sup>16</sup>
Dōgen	Being-time	Ontological-mystical	Temporal enactment rather than container	Process ontology, contemplative philosophy <sup>15</sup>

## Physics, asymmetry, and time travel

Einstein's special relativity breaks the Newtonian assumption that time statements have absolute significance independent of frame. In his popular exposition, he argues that simultaneity requires an operational definition and concludes that events simultaneous with respect to the embankment are not simultaneous with respect to the moving train. He states baldly that every reference-body has "its own particular time." That is the conceptual hinge: time is no longer one universal flowing background for all observers. Einstein's strength is operational and physical rigor. His weakness, if one wants a complete theory of lived temporality, is that relativity is not trying to answer phenomenological questions in the first place. <sup>17</sup>

Minkowski then makes the geometric turn explicit. In "Space and Time," he declares that "space for itself, and time for itself shall completely reduce to a mere shadow," and only their union preserves independence. This is not merely rhetorical flourish. It marks the shift from independent space and time to spacetime structure. Minkowski's strength is conceptual compression: once the geometry is seen correctly, many relativistic effects become structural rather than paradoxical. His weakness is that geometry can tempt one to think every temporal problem has become a geometrical one, which it has not. <sup>18</sup>

Thermodynamic time adds another layer. The Stanford Encyclopedia entry on thermodynamic asymmetry stresses that heat flows from hot to cold, smells disperse, engines degrade useful energy into less useful forms, and reversed macroscopic processes do not occur spontaneously. The second law, in coarse terms, gives time a direction through entropy increase. Yet modern discussions emphasize that this directionality is not simply read off the microscopic equations; it also depends on boundary conditions, especially the astonishingly low-entropy past. Boltzmann's enduring contribution lies here: he makes temporal asymmetry statistical rather than purely dynamical, though that opens the door to Loschmidt-style worries about reversibility. <sup>19</sup>

Gödel and Hawking mark opposite poles in speculative physics. Gödel's rotating-universe solutions to general relativity show that spacetime physics can permit structures in which ordinary global temporal ordering breaks down; later discussions note that some GR solutions contain closed timelike curves and challenge determinism. Hawking's chronology protection program, by contrast, argues that physics appears to defend itself against the macroscopic formation of time machines, with quantum backreaction and related effects acting as a kind of "defense in depth." The broad moral is not that time travel is simply "ruled out" once and for all, but that general relativity opens the door conceptually while semiclassical reasoning may shut it again physically. <sup>20</sup>

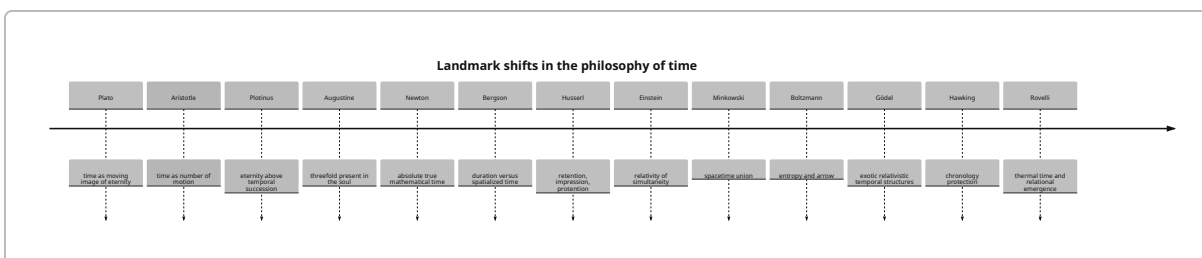
Contemporary relational and emergent views go further. Rovelli's thermal-time program treats time as state-dependent: in a certain sense, temperature can be understood as the rate of thermal time relative to proper time. That does not mean ordinary time is unreal, but it does suggest that in some domains, what counts as temporal flow may emerge from statistical state and informational structure rather than being built in as a primitive. This is especially relevant for quantum gravity, where a single external time parameter becomes difficult to sustain. <sup>21</sup>

McTaggart's famous modern metaphysical intervention is different again. In the background of contemporary debate stand his A-series and B-series distinction and his argument that time is unreal if becoming is contradictory. Even those who reject his conclusion are still arguing on terrain he helped define. McTaggart's strength is diagnostic power: he forces us to ask whether temporal becoming is coherent or whether ordered earlier/later relations are enough. His weakness is that many philosophers think his argument turns on controversial assumptions about what genuine time must contain. <sup>22</sup>

A compact physics-and-metaphysics table:

Thinker	Core move	Category	Strongest contribution	Main tension
Einstein	Relativity of simultaneity; frame-dependent time assignment	Relativistic-physical	Replaces absolute simultaneity with operational time	Does not address lived temporality <sup>17</sup>
Minkowski	Union of space and time in spacetime	Geometric-spacetime	Makes relativity structurally intelligible	Risks geometric overreach <sup>18</sup>
Boltzmann	Statistical grounding of temporal asymmetry	Thermodynamic-informational	Explains arrow statistically	Reversibility and low-entropy-past problems <sup>19</sup>
McTaggart	A-series/B-series challenge	Metaphysical	Forces clarity about becoming	Conclusion may outstrip premises <sup>22</sup>
Gödel	GR allows exotic temporal structure	Speculative-relativistic	Shows causality can fail in solutions	Physical relevance disputed <sup>23</sup>

Thinker	Core move	Category	Strongest contribution	Main tension
Hawking	Chronology protection	Speculative-physical	Constraints on time-machine scenarios	Not a final theorem of quantum gravity <sup>24</sup>
Rovelli	State-dependent thermal time	Relational-emergent	Reopens time in quantum gravity	Still programmatic and domain-limited <sup>21</sup>



## Comparative synthesis and the recursive feedback model

Your recursive model asks whether time is a kind of feedback between mind and world, perhaps like microphone feedback: a looping relation in which experience, memory, anticipation, and environment recursively generate temporal appearance. Strictly speaking, no major classical thinker states the model in that electronic idiom. But several positions move surprisingly close.

Augustine is close because his analysis makes time inseparable from memory, present attention, and expectation. Temporal structure is not just “out there”; it is partially constituted in the soul’s distention. Husserl is even closer in formal structure: each now includes retentional carry-over and protentional anticipation, so consciousness is intrinsically recursive in a weak but precise sense. Bergson is close in a different way: successive states interpenetrate rather than stand apart, so the present is thick with the past. Dōgen also resonates, because “being-time” dissolves the container picture and makes temporal existence inseparable from enactment. <sup>25</sup>

What your model should not do, if it wants philosophical discipline, is collapse physical, measured, and phenomenological time into one thing too quickly. Newton is useful precisely because he separates duration from clocks. Einstein is useful because he separates operational time-assignment from absolute simultaneity. Husserl is useful because he separates the structure of consciousness from ordinary objects in time. A strong recursive theory would therefore need at least three claims kept distinct: a claim about lived temporality, a claim about informational or cognitive feedback, and a claim about whether physical time itself emerges from such feedback or merely gets represented by it. The first claim has substantial historical allies. The third remains much more speculative. <sup>26</sup>

My own comparative judgment is this. If one asks for the best account of **objective physical time**, the decisive sequence is Newton to Einstein to Minkowski, with Boltzmann and later thermodynamic work correcting the issue of direction. If one asks for the best account of **lived time**, Augustine, Bergson, and Husserl are stronger than most physicists because they directly analyze memory, expectation, and thickness

of the present. If one asks for the best account of **time in relation to eternity**, Plato, Plotinus, Augustine, and Aquinas remain central. If one asks for the best account of **time as recursive process**, the most fertile synthesis is Augustine plus Husserl plus Bergson, with a modern bridge to informational and thermal-time ideas. <sup>27</sup>

## Open questions and limitations

This report is strongest where I could directly ground the discussion in primary texts or authoritative scholarly sources already retrieved: Plato, Aristotle, Plotinus, Augustine, Aquinas, Newton, Bergson, Husserl, Einstein, Minkowski, thermodynamic asymmetry, Hawking, Gödel, and Rovelli. <sup>28</sup>

It is incomplete with respect to several figures and traditions you explicitly requested, especially Nāgārjuna, Advaita Vedānta source texts, Abhinavagupta, Whitehead, Barbour, and Smolin. I did not retrieve adequate primary or official texts for those before finalization, so I have not reconstructed them in the same depth. That omission is methodological rather than philosophical: I would rather leave the gap explicit than flatten those traditions into uncited generalities. <sup>29</sup>

The deepest unresolved question remains whether these layers can be unified. Can phenomenological time, thermodynamic asymmetry, and relativistic spacetime be shown to arise from a single framework? The historical record suggests caution. The most defensible near-term research program is not a premature grand unification, but a disciplined comparison of how measured time, lived time, and emergent or informational time constrain one another. That is where the next interesting work likely lies. <sup>30</sup>

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<sup>1</sup> <sup>7</sup> <sup>28</sup> The Internet Classics Archive | Timaeus by Plato

<https://classics.mit.edu/Plato/timaeus.html>

<sup>2</sup> <sup>6</sup> <sup>12</sup> <sup>26</sup> <sup>27</sup> The Principia

[https://personal.lse.ac.uk/ROBERT49/teaching/ph103/pdf/Newton1687\\_ScholiumToDefinitions.pdf](https://personal.lse.ac.uk/ROBERT49/teaching/ph103/pdf/Newton1687_ScholiumToDefinitions.pdf)

<sup>3</sup> <sup>5</sup> <sup>8</sup> The Internet Classics Archive | Physics by Aristotle

<https://classics.mit.edu/Aristotle/physics.4.iv.html>

<sup>4</sup> <sup>10</sup> <sup>25</sup> CHURCH FATHERS: Confessions, Book XI (St. Augustine)

<https://www.newadvent.org/fathers/110111.htm>

<sup>9</sup> The Project Gutenberg eBook of Plotinos Complete Works Volume I, by Kenneth Sylvan Guthrie.

<https://www.gutenberg.org/files/42930/42930-h/42930-h.htm>

<sup>11</sup> Summa Theologica

<https://isidore.co/aquinas/english/summa/FP/FP010.html>

<sup>13</sup> The Project Gutenberg eBook of Time and Free Will, by Henri Bergson.

<https://www.gutenberg.org/files/56852/56852-h/56852-h.htm>

<sup>14</sup> <sup>16</sup> Edmund Husserl (Stanford Encyclopedia of Philosophy)

<https://plato.stanford.edu/entries/husserl/>

<sup>15</sup> Uji (Being-Time)

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19 30 Thermodynamic Asymmetry in Time (Stanford Encyclopedia of Philosophy)

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20 23 General Relativity, Time and Determinism

[https://arxiv.org/abs/1610.06547?utm\\_source=chatgpt.com](https://arxiv.org/abs/1610.06547?utm_source=chatgpt.com)

21 Thermal time and the Tolman-Ehrenfest effect: temperature as the "speed of time"

[https://arxiv.org/abs/1005.2985?utm\\_source=chatgpt.com](https://arxiv.org/abs/1005.2985?utm_source=chatgpt.com)

22 John M. E. McTaggart (Stanford Encyclopedia of Philosophy)

<https://plato.stanford.edu/entries/mctaggart/>

24 [hep-th/9202090] From wormhole to time machine: Comments on Hawking's Chronology Protection Conjecture

<https://arxiv.org/abs/hep-th/9202090>

29 Henri Bergson (Stanford Encyclopedia of Philosophy)

<https://plato.stanford.edu/entries/bergsont/>