

Searching for Time

Auditing Time Models

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Preface

I set out to write thirty pages.

The question looked small. When we say that time is real, what exactly are we saying is real? Not whether clocks work — they plainly do. Not whether things change — they plainly do. The question was narrower than either, and I thought it was tractable. Set out everything we can point to and describe. Is there something left over that deserves the name?

Thirty pages became sixteen chapters, and the reason is worth stating at the outset, because it is also the reason this book takes the shape it does.

Every time I tried to state the answer, I found I had already assumed it. Say that time is what clocks measure, and you have named a calibrated counting practice and quietly added that it measures something. Say that time is the order of events, and you have named a relation and quietly added that the relation belongs to a medium. Say that time is what passes, and you have named an experience and quietly promoted it to a fact about the universe. Each answer was true of something. None of them was true of the same thing. And in every case the interesting word was not the noun but the small addition that came after it — the *therefore*, the *which means that*, the step from a structure we can describe to a further item we cannot.

That step is the subject of this book.

What the book does

Rather than assert that the further item is not there, which is easy and proves nothing, I decided to build a test that any candidate would have to pass, and then to run every account of time through it — including my own.

The test is a sequence of eight questions. What exactly is being proposed: a substance, a structure, a relation, a coordinate, a metric, a primitive, an experience? What admitted phenomenon is the proposal protecting? What extra commitment turns that phenomenon into the proposed ontology? What work does the addition do, and against which alternative? What kind of dependence is being claimed, in which direction? What licenses the move from a scientific model to an ontology, from a procedure to a structure, from an experience to a world? If the candidate is removed while everything else is held fixed, what capacity disappears — and what happens when the critic's own preferred posit is removed instead? And finally: under shared standards, which complete package preserves the most and earns its commitments?

Every gate carries a clause naming what my own view owes at that gate. This is not modesty. It is the condition under which the exercise means anything at all. An audit that only its author can pass is advocacy with a table of contents.

The book audits the strongest formulations I could reconstruct. Eternalism and the block universe, in three distinct forms rather than the caricature. Presentism, in four families with their repairs kept separate from their commitments. The growing block and the moving spotlight, including the recent versions that do not need a travelling property of presentness. Timelessness, in a form that distinguishes what disappears from what merely goes unmentioned. Emergent time, across the relational, semiclassical, algebraic and thermodynamic programmes now under active development in physics. And the view I favour, which is called Changism, and which enters as a contestant rather than as the judge.

The reader should know from the first page that the author of the audit is also one of the audited.

What the book found

Some of it is negative, and I will come to that. But the results I would most want a reader to take away are positive, and they hold whatever one concludes about the ontology.

The word *time* is doing at least a dozen jobs, and they come apart under pressure.

Clock reading, proper count, coordinate label, synchronization result, invariant interval, causal order, productive order, historical order, entropy gradient, biological rhythm, lived duration, calendrical position. These converge in ordinary cases, which is why the ambiguity is so easy to miss, and they separate the moment anything is at stake. A great deal of argument about time is argument that has entered by one of these doors and left by another.

Production and position come apart in both directions. A boulder that falls into a stream and diverts it is productively prior to the new channel, and no clock is required to make that so. Two flashes at distant stations can receive an order from a coordinate system while neither could possibly have influenced the other. The word *before* names at least five different relations, and no one of them is entitled to the authority of the others.

Containment is not enough, and the reason is specific. A complete four-dimensional structure may include every signal, detector, storage medium and inference. What it does not thereby do is discharge three separate obligations: how a physical state came to be a record of a source, under what conditions its content is correct, and what licenses anyone to rely on it. These require different bridges with different premises. Saying that everything is in the block does not say which relation does which job.

What happened, what remains, what can be known, and what a system can use are four questions. A detector reading can be a real and durable record, integrated into working practice, guiding decisions for years — and false about the source it purports to measure. An archived document can be a forgery that everyone acts on. Ordinary language runs these together, and a surprising amount of philosophy runs them together too. Separating them is the most useful thing in this book.

A completed occurrence can make a claim about it true without leaving anything behind. This is the argument I am least willing to give up. Erasing a record changes what

can be consulted, what can be coordinated, and what anyone is entitled to believe. It does not change what happened. Historical truth does not require a stored past, a present surrogate, or a surviving trace — and the account of how that works does not need a privileged present or a growing block to hold it up.

And there is a register, at the end, of inferences that a large and respectable literature makes routinely and that do not go through: from a simultaneity result to the actuality of distant events, from a clock reading to a temporal substance, from a formal conditioning label to a physical measurement, from what constitutes something to how it was produced, from record survival to historical truth, from operational success to fidelity, from a compact representation to a direction of dependence. Each is a step that requires a premise nobody supplies. That register is, I think, the most defensible thing the book produces, and it stands whether or not my own ontology survives.

What the book did not find

I did not find Time.

Not, that is, the capitalized item the search was for: an independent container, a substance, a current, a universal master sequence, a global present, a moving spotlight, or a governor that makes change happen. Every phenomenon that made the search seem necessary turned out to be real, and none of them turned out to require it. Change is real. Order is real. Metric structure and proper time are objective and path-dependent. Clocks, calendars and records are physically implemented achievements. Memory and anticipation are genuine organizations of a living body. What is missing is a second reality standing behind all of that and driving it.

This is a comparative result, not a proof of impossibility, and the book says so wherever it says anything.

There is a second thing I did not find, and it matters more.

On the book's central comparison — between the view I favour and the strongest rival I could construct against it — the verdict is **open**. The two accounts preserve the same phenomena, carry crossed and incomplete burdens, and I was not able to build a test that separates them without helping myself to the answer. Several of my own distinctions turn out to be portable: a rival can adopt them and keep his ontology. In at least one place, a competing view holds a local advantage over mine, and I have said where.

I want to make the case, briefly, that this is the correct output and not a failure of nerve.

The eight gates were written before I knew what they would return. They apply symmetrically, and where they returned a result against me I have recorded it rather than adjusting the gate. Throughout the book, I state explicitly what would show the view I favour to be wrong — what a rival would have to do, what a physical result would have to look like, what would make my primitive redundant. I have come to think that having such a list is the whole point. A method that always vindicates its author has not been applied; it has been designed. The places where this book does deliver a verdict are worth something only because the places where it declines to are honest.

So: openness is an evidential result, not an embarrassment. What follows is an audit that reports what it has and has not earned.

How to read this book

It is longer than I intended, and it does not have to be read in order.

Part I sets out the method and the positive account: the question and the eight gates (Chapter 1), the many jobs the word *time* does (Chapter 2), the ontology of productive activity and the discipline for typing dependence claims (Chapter 3), and the distinctions between production, order, metric structure and measurement on which everything later rests (Chapter 4).

Part II tests the rival ontologies: eternalism and the block (5), presentism (6), the growing block and moving spotlight (7), timelessness (8), and emergent time (9).

Part III turns to what any account must preserve: relativity and clocks (10), spacetime geometry (11), quantum theory (12), thermodynamics and the physical capacity for records (13), historical truth (14), and lived duration (15).

Part IV returns everything to a common balance sheet (16).

A reader who wants the argument and not the survey can follow the main argumentative spine through Chapters 1, 3, 4, 5, 14 and 16. A physicist may prefer to start at Chapter 10 and work outward. A reader who has come only for the account of historical truth without a stored past should read Chapter 14 and then §A.7. Appendix A is a reference surface, not a narrative; it is there so that the book's claims can be checked, and it can be skipped entirely on a first pass. The Glossary is for the vocabulary, which is more disciplined than ordinary usage and deliberately so.

One convention needs explaining in advance. Claims in this book carry labels: **[CONSENSUS]** for established science or an accepted formal result, with its regime stated; **[INTERPRETATION]** for a philosophical reading that preserves the relevant empirical content; **[HYPOTHESIS]** for a discriminable proposal that could fail; **[SPECULATION]** for an optional extension; **[APPLICATION]** for the use of these tools in a further domain. These are editorial status markers used within this book, not appeals to a separate authority. The labels exist because established physics and my own conjectures should not be allowed to wear the same clothes. Where a chapter relies on relativity or statistical mechanics, that material is marked as belonging to physics and not to me, and rejecting my ontology leaves every calculation in it intact.

The book that follows is longer than the one I meant to write, and its central verdict is more modest than the one I hoped to reach. I have come to think that both of those facts are in its favour.

The question it began with is still worth asking, and I have tried to ask it in a way that makes the answer checkable. What would count as finding time itself? Here is what I looked for, where I looked, what I found, what I did not, and what would change my mind.

Sergio Montes

Chapter 1 — What Would Count as Finding Time Itself?

Time as a Real Ledger of Ordered Change—or Something More?

1.1 The Question before the Answer

What would count as finding time itself? A wall clock will not settle the question; neither will an ageing body, decaying particle, remembered childhood, coordinate in an equation, invariant interval, entropy gradient or felt stretch of waiting. Each is real and may justify temporal language; none, without further argument, identifies one thing they all reveal.

Imagine a recording studio before a take. A pianist prepares; a quartz timer starts; microphones register changing air pressure; a recorder stores a signal; the performer retains the opening phrase and anticipates its continuation. Asked where time is in the room, one could point to the display, performance, interval, record or felt span. Each is real. The question is whether any reveals a further common bearer.

Consider two accounts preserving the same clock readings, interval relations, records, causal constraints and experiences. One adds an independently flowing medium; the other does not. Agreement on phenomena makes the medium neither real nor impossible. The issue is its identity, work and what is lost without it. The test applies equally to structural additions, declared primitives, appeals to experience, and claims that a specified target emerges from a declared base through a stated bridge: no category is prejudged.

That caution is not a denial of time. The formulation used in this book is exact: **Time, in disciplined Changist usage, is the derivative ledger of ordered change: the comparative and operational structure through which changing processes are counted, measured, coordinated, and represented, and through which objective metric relations among them are accessed, expressed, and compared. It is real as comparative organization, but it is not an independent container, substance, flow, universal master sequence, global present, or cause of change.** This locates the referent of Changism's technical term *time* in the ledger; it does not locate all temporal reality there. *Derivative* means dependent, not fictitious, merely verbal or dispensable. The explanatory direction is productive change, immanent order and then ledger—not ledger, order and then change. This use does not make productive change, immanent order, objective metric structure, proper time, duration, memory or lived continuity unreal. It denies that those realities require an additional item called Time.

The opening question is therefore whether the admitted phenomena require something more: perhaps an independent container, substance or flow; a universal master sequence; a globally privileged present; a primitive temporal fact; or another candidate whose identity and work can be specified. The phrase *time itself* will serve only as shorthand for the candidate under audit, never as its description. Capitalized *Time* will mark the stronger ontological upgrade—an independent container, universal flow, master ordering medium, moving spotlight or metaphysical governor. Lowercase *time* remains available for ordinary, scientific and derivative uses. Typography fixes the target; it decides nothing about the verdict.

A phenomenon is what an account must preserve before disagreement begins: change, succession, measurable duration, clock behaviour, metric relations, causal constraints, record formation, historical determination or lived continuity. A posit is what a theory adds to explain, constitute, organize, unify or otherwise make sense of that phenomenon. The addition may be warranted. It may also prove redundant. Calling it an *upgrade* names the inferential move, not the verdict.

This distinction protects both sides. A critic may not make a rival lose by declaring its target unreal. A defender may not borrow the evident reality of a clock, experience or formalism and transfer it silently to a stronger ontology. First admit the phenomenon. Then specify the candidate. Only then ask what would count as finding it.

1.2 Why “Does Time Exist?” Is One Question Too Late

“Does Time exist?” sounds elementary because grammar supplies a subject before inquiry supplies a candidate. In ordinary speech, time may concern an appointment, age, delay, season, duration or remembered period; in scientific use, it may concern a coordinate, external parameter, clock indication, invariant interval, causal structure or thermodynamic asymmetry. Historical and phenomenological uses add chronology, inheritance, retention, anticipation and lived continuity. A single yes or no can therefore change meaning while appearing to answer one question.

Candidate-first language comes first. At family level, ordinary, scientific, historical and phenomenological temporal expressions remain legitimate. At technical audit level, the speaker must name the phenomenon and the further candidate allegedly required by it. This policy neither forbids time nor grants each use an ontology; translation fixes the claim rather than making the phenomenon disappear.

Further questions fix claim level. Is the speaker reporting a use, describing objective structure, proposing an explanatory role or asserting a fundamental constituent of reality? Over what domain and at which locus does the claim range? What would acceptance license that the weaker statement would not? What evidence would distinguish the stronger claim from a rival preserving the same phenomenon? Without answers, verbal agreement may conceal content disagreement.

Table 1.1 — Temporal expressions and more precise referents

Temporal expression	More precise referent	What the translation does not establish
Clock time	Calibrated count or reading within a comparison practice	A temporal substance measured by the mechanism
Proper time	Invariant interval structure along a timelike path	A display value, coordinate label or universal sequence
Historical time	Order among occurrences and methods of reconstruction	That surviving records constitute every past fact
Time’s arrow	A specified causal, thermodynamic, record-forming or experiential asymmetry	One homogeneous flow that explains every asymmetry
Lived time	Experienced duration, retention, anticipation and short-span organization in a specified subject or system	A moving cosmic present disclosed by consciousness

These translations clarify the claim; they do not decide it. Replacing *time* with *metric structure* cannot prove that metric structure is unreal, while replacing *flow* with *experienced continuity* cannot show that objective passage is impossible. Nor does a more precise referent become Changist merely because Changism asks for it. The existence question becomes

tractable only after category, scope, claim level and proposed work are fixed. Until then, ‘time exists’ may be true in one register, false in another and indeterminate as metaphysics.

1.3 Seven Kinds of Candidate

A candidate must be individuated tightly enough for its presence and absence to have different implications. An account should state what kind of item it proposes; its bearer, relata or instances; its domain and scope; its identity conditions; and whether the claim is ontological, formal, operational, representational, phenomenological or mixed. The following families are starting points, not definitions.

Table 1.2 — Seven candidate families and non-equivalence controls

Family	Minimum specification	Work the candidate might do	Non-equivalence control
Substance	An independent medium, bearer, container or entity, with persistence and identity conditions	Bear change, contain events or ground duration	Not automatically a coordinate, relation, metric or reading
Structure	An instantiated pattern of order, interval, invariance or constraint, with scope and modal status	Constitute organization, constrain possibilities or unify models	Representation alone does not establish instantiation
Relation	Relata and a relation such as earlier than, simultaneous with, successive to or equally distant	Organize events without a container and support comparisons	Order is not automatically metric, total or fundamental
Coordinate	A label or parameter with a construction rule, transformation behaviour, gauge status and domain	Organize calculation, description and synchronization	Not a clock mechanism, proper time or ontological arena
Metric	Interval structure with a domain, invariance conditions, dynamics and operational access	Fix objective comparisons, constrain paths and support predictions	Proper-time structure is not proper count, clock reading or coordinate time ¹
Primitive	An irreducible fact of succession, passage, presentness or becoming, with a stopping rationale	Ground tense, becoming or modal distinctions	Declared primitiveness does not evade comparison, cost or failure conditions
Experience	Lived duration, flow, retention, anticipation or short-span organization in a specified subject or system	Explain phenomenology, cognition, agency or temporal discourse	Experience neither proves cosmic passage nor becomes illusion by stipulation

Table 1.2 is heterogeneous. A structure may be real without being a substance; a coordinate may be indispensable without being an entity; an experience may be irreducible at one explanatory level without governing the cosmos. No family is exhaustive and none is disqualified by its category. The table also remains candidate-neutral. The *integration horizon* introduced in §§15.7–15.8 is the book’s later Changist interpretive and application proposal for embodied short-span organization; it is not smuggled into this initial translation as though every account already accepted it.

Specification blocks opposite shortcuts. A primitive is not a mysterious substance merely because it resists reduction, but an announced stopping point whose content and comparative value remain assessable. A structure is not less real merely because it is non-substantial; its instantiation, modal reach and relation to representation remain questions. Objectivity also does not imply universality: invariant proper-time structure can be path-indexed and causal order can be partial. Category discipline prevents rewarding substances and punishing

relations before evidence, a formal parameter acquiring causal power through grammar, or local experience becoming a field-wide fact without a bridge.

Relativity-facing claims require a further restraint: **Ongoingness is locus-indexed. A process is ongoing at its own locus. Changism does not posit an invariant field-wide relation of co-ongoingness between spacelike-separated processes, nor a global present slice, preferred foliation, or master clock.** This is a mandatory prohibition, not a completed usable locus semantics or a demonstration of relativistic safety. Locus individuation, overlapping loci, the composition of partial classifications and the danger of reintroducing field-wide co-ongoingness remain open.

Chapter 4 gives the corresponding role-tense vocabulary. *Past-role* concerns records and inherited consequences through which prior occurrences bear on later activity; *ongoing-role* concerns active local process at a specified locus; *future-role* concerns instantiated dispositions, constraints and admissible continuations. These are roles within organized actuality, not three ontological regions. Naming them here does not prejudge whether their full semantics can be supplied.

Hybrids are permitted but must allocate roles: a theory combining spacetime structure with primitive passage must say which component supplies interval, actuality or becoming. An emergence claim must identify target, operative base, recovery bridge and claimed kind of emergence. Changism must keep productive act, immanent order, objective metric structure and ledger distinct. With these boundaries, the audit can proceed without chasing a moving target.

1.4 The Eight-Gate Audit

The audit is sequential but revisable. A later answer may expose ambiguity that returns a view to an earlier gate. Passing a gate means producing its required output, not agreeing with Changism. Every gate asks the same kind of question of Changism and its rivals, although the evidence appropriate to different candidates may vary.

Four rules recur. No gate may smuggle in a later answer. Practical indispensability is evidence for a role, not automatic licence for the strongest ontology. Failure of one formulation need not defeat its family. Comparison must address the best available version while recording uncertainty wherever a bridge, mechanism or formalization remains incomplete. The audit tests claims, not labels, reputations or schools.

Claim status is part of the method, not decoration. Five classifications identify different burdens: [CONSENSUS] marks established science, formal result or broadly accepted method; [INTERPRETATION] marks a philosophical or conceptual reading that preserves the relevant empirical content; [HYPOTHESIS] marks a discriminable proposal with possible support and failure; [SPECULATION] marks an optional unestablished extension; and [APPLICATION] marks the use of Changist controls in a further domain. No claim may borrow the authority of a stronger classification.

Methodological qualifications answer a different question. The five claim-status labels above state evidential standing. When a distinction is methodological or provisional, the text says so directly; unresolved matters are stated as open questions. In this chapter the candidate-family map, Eight-Gate Audit, contribution taxonomy and placement scheme are [INTERPRETATION]. The six-profile classification and Bridge Rule are methodological proposals offered under [INTERPRETATION], not established science or a completed ontology.

Gate 1 — Candidate. *Question:* What exactly is proposed: substance, structure, relation, coordinate, metric, primitive, experience, or an explicit hybrid? *Required output:* category,

content, bearer or relata, domain, identity conditions, and claim level. *Common failure*: candidate drift, such as moving from clocks to proper time, from coordinates to geometry, or from experienced flow to cosmic passage without notice. *Symmetry*: rivals must individuate their temporal posit; Changism must distinguish productive act from change, field-in-act, immanent order, record, and ledger rather than letting a slogan substitute for a candidate.

Gate 2 — Phenomenon. *Question*: What admitted datum or practice is the theory protecting: change, succession, duration comparison, clock behaviour, invariant interval, record capacity, history, or lived continuity? *Required output*: a neutral statement of the phenomenon and the observations, formal relations, practices, or experiences every acceptable account must preserve. *Common failure*: denying the datum to win, or treating the phenomenon's reality as proof of the candidate. *Symmetry*: a rival may preserve temporal phenomena without Changism; Changism may question an upgrade only after retaining the rival's strongest empirical, formal, semantic, historical, and experiential achievements.

Gate 3 — Upgrade. *Question*: What additional commitment turns the protected phenomenon into the proposed ontology? *Required output*: a contrast between phenomenon alone and phenomenon plus candidate, naming the added primitive, existential commitment, or constitutive claim. *Common failure*: assuming that grammar, scientific vocabulary, mathematics, or ordinary practice already contains the upgrade, or assigning a rival an upgrade it rejects. *Symmetry*: temporal ontologies must own their extra commitments, while Changism must own productive act as a primitive wager rather than presenting it as a cost-free paraphrase of admitted change.

Gate 4 — Difference. *Question*: What causal, constitutive, modal, semantic, explanatory, predictive, experiential, operational, or unifying work does the candidate perform, and against which alternative? *Required output*: a named contribution, contrast class, result, and type-appropriate evidence or argument. *Common failure*: making physical intervention or direct detection mandatory for every candidate, counting relabelling as explanation, or asserting indispensability without comparison. *Symmetry*: a rival may earn its place through non-causal work; Changism must identify what productive act and ledger reconstruction contribute beyond verbal austerity or a lower primitive count.

Gate 5 — Dependence. *Question*: What dependence relation is asserted, in which direction and at what claim level? *Required output*: source and target, scope and a typed profile—productive (P), constitutive-organizational (CO), modal-constraint (MC), semantic-satisfaction (SS), epistemic-warrant (EW), formal-logical (FL), compound or OPEND (open dependence kind) where the current profiles would distort the claim. *Common failure*: the Big-G slide, in which causation, constitution, explanation, representation, evidence, and derivation become one undifferentiated 'grounding' claim.² *Symmetry*: rivals must type their dependencies; Changism must do likewise and treat its taxonomy as an interpretive discipline, not a flat ontology established by definition.

Gate 6 — Bridge. *Question*: What licenses a move between scientific model and ontology, procedure and metric structure, experience and world, trace and truth, or one dependence register and another? Under the Bridge Rule (§3.5 and Appendix §A.4), the *required output* is the source dependence kind or specifically assessed source material, target dependence kind, exact transferred claim, additional premise, scope, standards and tolerances, and defeaters or invalidating conditions. *Common failure*: a silent promotion from representation to reality, science to metaphysics, experience to cosmos, or evidence to ontology. *Symmetry*: every rival exposes its bridging premises; Changism must expose the bridges from productive act to order, records, historical determination, and temporal reconstruction.

Gate 7 — Revocation. *Question*: If the candidate is removed while the protected phenomenon and other earned resources remain fixed, what capacity disappears, and what

happens under reverse removal? *Required output*: a controlled ablation, stated losses, preserved background, and a reverse test withdrawing the critic's preferred primitive. *Common failure*: removing the phenomenon together with the candidate, posing a rhetorical 'what changes?', or demanding causal alteration from a structural or constitutive posit. *Symmetry*: a temporal candidate survives when its loss is genuinely costly; Changism loses if productive act can be withdrawn without material explanatory loss.

Gate 8 — Cost and comparison. *Question*: Under shared standards, which complete package best preserves the phenomena and earns its commitments? *Required output*: a balance sheet covering achievements, primitives, translations, empirical adequacy, bridge risks, unresolved questions, and explicit failure conditions, followed by a defeasible placement. At book level, the matched-package protocol declares the assessment unit, rival, criteria, tolerances, noncompensable losses and stopping rule before performance is known. It records costs as a non-aggregated qualitative burden vector rather than a scalar score; crossed vectors may yield trade-off, parity or underdetermination (§16.1). *Common failure*: treating primitive count as the only cost, preloading the verdict, penalizing a rival for commitments Changism also makes, or mistaking reinterpretation for refutation. *Symmetry*: eternalism, temporal primitivism, spacetime realism, emergent time, or another view may outperform Changism.

Order matters. Candidate drift returns inquiry to Gate 1; Gate 2 prevents eliminating or appropriating the phenomenon; Gate 5 types a dependence that Gate 6 must still license across registers. Gate 7 is controlled ablation, not a demand for a new causal signal. Only Gate 8 assigns placement, always defeasible under better evidence, a clearer bridge or a stronger formulation of either side. Discipline remains reciprocal.

1.5 Difference-Making without Causal Prejudice

To ask what difference a candidate makes is not to demand that every real thing push matter, trigger a detector or appear as an extra variable. Different candidates propose different contributions and their evidence must match their category. A metric may constrain invariant comparisons without becoming another cause; a coordinate may organize calculation without becoming an entity; an experience may require explanation without revealing a universal present.

Nine forms of work are admissible. **Causal work** produces, transmits, constrains or disposes physical outcomes. **Constitutive work** helps make a phenomenon the kind of thing it is. **Modal work** fixes or limits possibilities, necessities, counterfactuals or nomic profiles. **Semantic work** helps determine content, reference, standards or truth conditions. **Explanatory work** makes a fact intelligible through a relevant causal or non-causal dependence. **Predictive work** generates discriminating expectations. **Experiential work** accounts for lived duration, presence, retention or anticipation. **Operational work** enables measurement, calibration, synchronization, ordering or coordinated practice. **Unifying work** connects domains, compresses principles or discloses common structure.³ These forms may overlap; none automatically settles ontology.

These are Gate 4 contribution-types, not Gate 5 dependence profiles. A candidate may perform predictive, operational or unifying work through several dependence kinds, while causal, constitutive, modal and semantic contributions often—but not automatically—correspond to P, CO, MC and SS claims. Explanatory work is a generic role, not a seventh profile: its particular dependence must be restated as P, CO, MC, SS, EW, FL, a compound claim or OPEND. Keeping the taxonomies distinct prevents useful contribution from acquiring an unearned ontological type.

Each claim owes corresponding support. Causal proposals require suitable mechanisms, interventions, dynamics or robust counterfactuals; constitutive proposals need identity, realization or part-whole grounds; modal proposals must state their base and comparison class; semantic proposals require a theory of content or standards. Explanatory and unifying proposals need a contrastive explanandum and demonstrated gain. Predictive proposals need a model, assumptions, calibration, error structure and testable output. Experiential proposals require phenomenological or cognitive evidence and an explicit world bridge if claimed. Operational proposals require procedures, tolerances, domains and failure conditions.

This pluralism does not make reality whatever anyone finds useful. The candidate must perform, not merely accompany, the work, and support must discriminate it from live alternatives. Correlation alone cannot establish constitutive dependence; semantic success cannot substitute for physical formation; predictive accuracy can coexist with ontological underdetermination. The broader standard is stricter than causalism because each contribution must declare its burden.

Direct detectability is neither necessary nor sufficient. A detectable effect may reveal a field rather than ‘time’; an undetectable relation may still be constitutive or modal. Conversely, usefulness, elegance or indispensability in one representation does not automatically confer the ontology claimed for it. Gate 4 identifies the work. Gates 5–8 determine whether that work belongs to the candidate, crosses its bridges legitimately, survives revocation and outweighs its costs.

1.6 Burden Symmetry: Changism Enters the Audit

An audit only its author can pass is advocacy disguised as method. Changism therefore enters as one contestant among others. It may propose candidate-neutral standards, but it may not define *explanation*, *reality* or *difference* so that productive language wins automatically. Eternalism may unify event relations; spacetime realism may identify indispensable instantiated structure; temporal primitivism may ground passage or tense;⁴ emergent time may reconstruct dynamics from correlations. Productive eternalism may retain irreducible, source-sensitive production while holding every event equally actual. Whitehead’s process ontology may explain inheritance, novelty and determinate achievement through occasions, prehension and concrescence.⁵ Those achievements count before comparison.

Changism’s own primitive is productive act: the primitive concrete being-underway of reality—the ontological character of concrete actuality insofar as reality is genuinely operative, not a substance, force, medium or bearer standing behind what occurs. It is a primitive wager, not a deduction from neutral premises and not a synonym offered free of cost. The view must distinguish it from change as a description, the field-in-act, immanent order, records and the derivative ledger. It must type its dependence claims and expose each bridge from productive activity to constraint, metric comparison, historical determination and lived organization.

It must also state non-redundant work. Productive act is meant to account for concrete occurrence, formation, inheritance and source-sensitive difference-making; the ledger is meant to organize comparisons without becoming their cause. If structural relations exhaust these tasks, or if the primitive merely adds the word *actual* to a complete account, Changism loses that comparison. Its costs include primitiveness, translation burdens, incomplete formalization, bridge risk and any failure to recover physical, historical or experiential phenomena.

Reverse ablation keeps these admissions reciprocal. Hold every earned structural relation fixed and remove productive act; then hold every earned productive achievement fixed and remove the rival’s temporal primitive or structure. The imagined subtraction must not erase

the protected phenomenon by definition. Its purpose is to expose genuine dependence, borrowed vocabulary and residual explanatory burden on either side.

Four placements are available, but none belongs to a named theory in advance. A candidate may be **rejected as unearned surplus** when its upgrade adds insufficient work; **reinterpreted but not refuted** when its phenomenon or formal success survives a weaker ontology; retained as a **live rival** when its achievements and costs remain competitive; or left **open** when evidence, individuation, bridging or comparison is incomplete. Placements attach to claims and branches at a declared scope, not automatically to whole traditions. A compound result may therefore reject an idle global privilege, reinterpret a local formal success, retain a sophisticated branch as a live rival and leave its package comparison open without contradiction. Openness is an evidential result, not an embarrassment.

The standing of productive act against productive eternalism is open, with research-programme warrant only. Changism may not claim preference simpliciter, package dominance over an eternalist reconstruction or victory from a rival's incompleteness. A verdict may rise only as far as comparator adequacy and adjudication independence have been verified. This restriction does not suspend the audit; it states what the audit must accomplish before a stronger verdict becomes available.

The test is whether each package preserves more, explains better, bridges more honestly and incurs acceptable cost. Burden symmetry is not courtesy added after the argument. It is a condition of having an argument at all.

Claim status. [INTERPRETATION] The gates, contribution-types and comparative placements are this book's audit method. Core Changist claim. Productive act remains Changism's declared working primitive, not an empirical discovery or a demonstrated fundamental constituent. No distinct [HYPOTHESIS] is advanced in this chapter.

Open questions. Formal specification of productive act, metric scale and grounding direction, usable locus semantics, comparator adequacy and independent adjudication remain unfinished. **Limits of this chapter.** No method-level distinction in this chapter establishes Changist package dominance, a derivation of metric structure or completed relativistic safety. These are questions for later testing, not concessions imposed only on rivals.

1.7 Scope and the Route Ahead

This chapter establishes method, not result. It does not claim that time is unreal, temporal discourse defective or physics proves Changism. It does not identify clocks, ledger, calendarization, change, geometry, entropy, causation or experience as simply time, nor treat their coordination as evidence for one bearer. It does not decide in advance whether a temporal primitive, block universe, privileged present, spacetime ontology, timeless base or emergent construction succeeds; it asks what each candidate is and what would count as success. On the central comparison, the starting limit is explicit: productive act and productive eternalism remain open until a matched, independently adequate comparison earns more.

Responsibility for the audit is divided rather than concentrated here. Section 1.4 supplies the eight gates. Section 16.1 supplies the matched-package protocol, burden vector and stopping rule used for the final comparison. Appendix A supplies the controlled reference schemas for loci, dependence, bridges, clocks, records, modality and emergence. Later chapters may apply and refine these instruments, but they may not quietly redefine success to favour a local conclusion.

The book proceeds in four parts. Part I, *Method and Positive Foundations*, begins with Chapter 2, **The Many Uses of Time**, which maps ordinary, scientific, historical and

phenomenological registers. Chapter 3, **Reality in Act**, declares productive act, separates its dependence claims and compares it with Whitehead and productive eternalism. Chapter 4, **Before and After Without Time**, develops immanent order and the derivative ledger while keeping change, order, objective metric structure, records and coordinate labels distinct. Its locus-indexed past-, ongoing- and future-role vocabulary states a relativity-facing discipline without claiming a completed locus semantics.

Part II, *Temporal Ontologies*, tests the principal alternatives. Chapter 5, **Eternalism, B-Theory, and the Block Universe**, distinguishes bare nonproductive, reductive-structural and productive eternalism. Chapter 6 separates presentist families and examines privilege under relativistic pressure. Chapter 7 audits growing-block addition and moving-spotlight meta-time. Chapter 8 disambiguates timelessness and separates configuration from formation. Chapter 9 distinguishes relationism, timelessness and emergence while testing target-specific reconstruction strategies.⁶

Part III, *Clocks, Physics, Records and Experience*, turns to what every verdict must preserve. Chapter 10 separates clock mechanism, proper count, reading, coordinate time and invariant proper-time structure. Chapter 11 distinguishes formal representation, physical instantiation and spacetime ontology. Chapter 12 separates the roles of time across quantum theories. Chapter 13 asks what thermodynamics and decoherence establish about asymmetry and record capacity. Chapter 14 distinguishes the branching architecture of occurrence, mark, record, operational determination, fact and evidence; truth cuts across those terms rather than completing a ladder. Chapter 15 protects lived duration while testing cognitive and world-directed bridges, including the later Changist application of the embodied integration horizon.

Part IV, *Comparative Verdict*, consists of Chapter 16. It returns the candidates to the common balance sheet under predeclared criteria and tolerances, records crossed burdens without turning them into a score, states how Changism could lose and reports what remains open. The Epilogue returns to the recording studio and the opening question without adding a new argument. Appendix A, the Glossary, Notes, Bibliography and Index then provide the book's reference and source apparatus.

The route therefore promises neither a delayed proof of Changism nor a refusal to judge. It promises a layered account of what has been preserved, reinterpreted, rejected, retained and left unresolved. On the central comparison, the completed audit presently reports open or underdetermined rather than preference simpliciter. Before asking which ontology wins, Chapter 2 asks how one word came to carry so many legitimate but non-equivalent realities. That register map is the first evidence the audit must learn to read.

Notes to Chapter 1

1. Albert Einstein, ‘On the Electrodynamics of Moving Bodies’ (1905), sec. 1, in *The Principle of Relativity*, trans. W. Perrett and G. B. Jeffery (New York: Dover, 1952), original German publication <https://doi.org/10.1002/andp.19053221004>, supplies the operational treatment of distant-clock synchronization. Robert M. Wald, *General Relativity* (Chicago: University of Chicago Press, 1984), chaps. 2–4, and Wolfgang Rindler, *Relativity: Special, General, and Cosmological*, 2nd ed. (Oxford: Oxford University Press, 2006), chaps. 2–5, <https://doi.org/10.1093/oso/9780198567318.001.0001>, support Lorentzian interval and proper-time structure. Samuel C. Fletcher, ‘Light Clocks and the Clock Hypothesis’, *Foundations of Physics* 43, no. 11 (2013): 1369–1383, <https://doi.org/10.1007/s10701-013-9751-3>, treats the relation between idealized clocks and metric proper time. These sources do not settle proper time’s metaphysical interpretation.
2. Kit Fine, ‘Guide to Ground’, in *Metaphysical Grounding: Understanding the Structure of Reality*, ed. Fabrice Correia and Benjamin Schnieder (Cambridge: Cambridge University Press, 2012), 37–80, <https://doi.org/10.1017/CBO9781139149136.002>; Gideon Rosen, ‘Metaphysical Dependence: Grounding and Reduction’, in *Modality: Metaphysics, Logic, and Epistemology*, ed. Bob Hale and Aviv Hoffmann (Oxford: Oxford University Press, 2010), 109–136, <https://doi.org/10.1093/acprof:oso/9780199565818.003.0007>. The typed profiles and Big-G diagnosis are this book’s syntheses, not taxonomies attributed to either author; see Chapter 3, §§3.4–3.5, and Appendix §§A.3–A.4 for their status and limits.
3. Jonathan Schaffer, ‘Grounding in the Image of Causation’, *Philosophical Studies* 173 (2016): 49–100, <https://doi.org/10.1007/s11098-014-0438-1>; Karen Bennett, *Making Things Up* (Oxford: Oxford University Press, 2017), <https://doi.org/10.1093/oso/9780199682683.001.0001>. These works support the legitimacy of building and explanatory relations that need not be additional physical causes. The nine-part difference-making taxonomy remains this book’s methodological synthesis.
4. Theodore Sider, *Four-Dimensionalism: An Ontology of Persistence and Time* (Oxford: Oxford University Press, 2001), <https://doi.org/10.1093/019924443X.001.0001>; Tim Maudlin, ‘On the Passing of Time’, in *The Metaphysics Within Physics* (Oxford: Oxford University Press, 2007), chap. 4, 104–142, <https://doi.org/10.1093/acprof:oso/9780199218219.003.0005>. These sources supply strong four-dimensionalist and primitive-passage comparators; neither is treated as representative of every eternalist or temporal primitivist.
5. Alfred North Whitehead, *Process and Reality: An Essay in Cosmology*, corrected ed., ed. David Ray Griffin and Donald W. Sherburne (New York: Free Press, 1978). The comparison protects Whitehead’s accounts of inheritance, novelty, concrescence and stable order; it does not identify Creativity with Changist productive act or treat Whitehead as a disguised Changist.
6. Don N. Page and William K. Wootters, ‘Evolution without Evolution: Dynamics Described by Stationary Observables’, *Physical Review D* 27 (1983): 2885–2892, <https://doi.org/10.1103/PhysRevD.27.2885>; Philipp A. Höhn, Alexander R. H. Smith and Maximilian P. E. Lock, ‘The Trinity of Relational Quantum Dynamics’, *Physical Review D* 104 (2021): 066001, <https://doi.org/10.1103/PhysRevD.104.066001>; Rasmus Jakobsen and Kian Salimkhani, ‘The Many Problems of Spacetime Emergence in Quantum Gravity’, *The British Journal for the Philosophy of Science* 77, no. 3 (2026): 795–821, <https://doi.org/10.1086/727052>. These works support heterogeneous relational and emergence programmes, not one homogeneous doctrine or a completed ontological verdict.