Yuewen Hu
Nankai University in Tianjin, China
https://orcid.org/0009-0005-3449-7566
hu_yuewen@163.com

EXTENSIONALIST ONTOLOGY AND EVENT INDIVIDUATION: BASED ON QUINE'S LOGICAL RECONSTRUCTION OF HERACLITUS'S THEORY OF RIVER*

Abstract: Taking Quine's logical reconstruction of Heraclitus's *Theory of River* "No one can step into the same river twice" as its starting point, this paper critically explores the potential explanatory power of Quine's extensionalist ontology for the problem of event individuation. While Quine himself never explicitly endorsed the ontological status of event, his two criterion of ontological commitment and his criterion of spatiotemporal continuity for an entity provide a unique analytical tool for grounding event individuation. By analyzing Quine's distinction between *river* (as four-dimensional spatiotemporal continuum) and *river stage* (as instantaneous component), this paper argues that reducing event individuation to the demarcation of spatiotemporal regions offers a way to bypass longstanding controversies in traditional event metaphysics.

The diachronic identity of an event does not depend on changes in attribute (such as the replacement of water molecules or differences in flow states), but is solely determined by the continuity of the spatiotemporal region (the integrity of the four-dimensional trajectory).[1] This criterion not only addresses identity disputes arising from the confusion of entity and attribute but also provides a unified logical framework for the individuation of event. The study further points out that Quine's theory resolves traditional metaphysical dilemmas through the semantic ascent strategy, transforming the issue of event identity into the delineation of spatiotemporal regions at the level of linguistic logic, thereby offering a methodological paradigm for naturalistic metaphysics.

The conclusion highlights that although Quine's theory does not directly address event ontology, his extensionalist framework, by rigorously rejecting intensional standards,

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1 Mark Heller, *The Ontology of Physical Objects: Four-Dimensional Hunks of Matter* (Cambridge: Cambridge University Press, 1990), 4–6.

provides a logically parsimonious and metaphysically lightweight alternative for event individuation. This reconstruction not only deepens the analytic philosophical interpretation of the river theory but also furnishes methodological insights for contemporary debates in event theory regarding the role of spacetime and criteria of identity.

Keywords: *extensionalism, four-dimensional, event, individuation, theory of River*

1. INTRODUCTION

Few philosophical aphorisms have been as enduring or as contentious as Heraclitus's famous dictum: "No one steps into the same river twice."[2] This evocative image, handed down via Plato's *Cratylus*, has captivated thinkers from antiquity to modernity because it crystallizes a central metaphysical tension: How can something persist over time while undergoing change? The river is taken to both remain the same and not be the same, inviting a paradoxical understanding of identity through time. This tension between permanence and flux, between entity and attribute, between continuity and transformation, underpins the problem of diachronic identity, one of the foundational concerns in metaphysics.

The river metaphor, when interpreted literally, points toward a broader ontological dilemma: What makes an entity numerically the same across temporal intervals despite the ongoing alteration of its properties or constituents? In modern metaphysical parlance, this leads to the problem of event individuation — namely, under what conditions can an event or process be said to be one and the same across its temporal unfolding?

The Heraclitean intuition pushes us to embrace flux as ontologically basic. Every moment, the water that composes the river has shifted. Hence, if identity depends on material constitution or qualitative properties, the river at t1 is not the same as at t2. The unity of opposites allows something to be both itself and other than itself.

Yet, such a view faces stern resistance from the tradition of formal logic. As Aristotle famously objected, denying the possibility of stepping into the same river twice amounts to violating the principle of identity (A is A) and non-contradiction ($\neg(A \wedge \neg A)$).[3] If something cannot remain identical with itself under change, then the very notion of reference, classification, or reasoning becomes unstable. From this perspective, the Heraclitean dictum appears not as a deep insight but as a confusion

[2] Kathleen Freeman, *Ancilla to Pre-Socratic Philosophers.* A Complete Translation of the Fragments in Diels (Cambridge, MA: Harvard University Press, 1948), 402a.

[3] Aristotle, *Metaphysics*, in *The Basic Works of Aristotle*, ed. Richard McKeon (New York: Random House, 1941), 681–926.

of entity and attribute — a failure to distinguish between the enduring substratum and its accidental properties.

In analytic metaphysics, this ancient puzzle manifests in contemporary debates over the ontology of events. Are events like processes or like substances? Do they persist through time, or are they mere sequences of momentary occurrences? Consider a musical performance, a football game, or a thunderstorm, how do we determine when one event ends and another begins? What distinguishes one instance of a recurring event from another?

These questions depend on how we can tell one event from another as time passes. Traditional answers usually rely on ideas like the event's cause, inner structure, or key features. These ideas are often unclear and lead to endless debate. This paper argues that Quine's extensionalist view, even though he never directly discussed event theory, offers a strong alternative. It shifts the focus to clear logical boundaries and specific points in space and time, which helps solve many of these problems.

Although Quine did not explicitly formulate a theory of events, his two fundamental slogans — (1) To be is to be the value of a bound variable,[4] and (2) No entity without identity[5] — offer a methodological basis for addressing the ontological status of temporally extended particulars. This insistence on identity conditions mirrors Davidson's view, where event identity likewise depends on the provision of principled individuation conditions.[6] Quine's perspective is particularly useful for clarifying the river paradox, since he draws a critical distinction between a river as a four-dimensional spatiotemporal object and its temporal parts or river stages. By using this framework, we can understand Heraclitus's idea in a clearer and more consistent way. The river, seen as a space-time path, stays the same over time. What changes is only the water that flows through it at each moment. Identity depends not on the same material but on the continuous region the river occupies.

This paper argues that we can explain how events are defined by using Quine's extensionalist view. We can see events as spatiotemporal regions in space and time, composed of temporal parts rather than enduring wholly at each moment.[7] This approach helps solve many classic debates about where one event ends and another begins, and about how we decide if two events are the same. The question is not just a historical or theoretical puzzle. It is important in many fields, such as cognitive science,

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4 Willard Van Orman Quine, "On What There Is," in *From a Logical Point of View* (Cambridge, MA: Harvard University Press, 1953), 1–19.

5 Willard Van Orman Quine, *Word and Object* (Cambridge, MA: MIT Press, 1960), 61–68.

6 Donald Davidson, "The Individuation of Events," in *Essays on Actions and Events* (Oxford: Clarendon Press, 1980): 163–180.

7 Theodore Sider, *Four-Dimensionalism: An Ontology of Persistence and Time* (Oxford: Oxford University Press, 2001), 60.

law, artificial intelligence, and physics. If we do not know how to define a single event, we cannot study causes, assign legal or moral responsibility, or understand the order of events over time. Quine's approach, which values clear evidence, logical structure, and simple assumptions, offers a useful way to address these challenges.

Because Quine focuses on extensionality, on looking at language itself, and on using space and time to define identity, he builds a natural way to think about events. At a time when many people question traditional metaphysics, his approach connects logic, language, and reality. By paying attention to how we describe things instead of adding unnecessary entities, his method stays clear, simple, and focused. Rebuilding Heraclitus's river idea through Quine's method is not just a commentary on the past. It is a meaningful step forward in how we understand metaphysics today.

2. Ontological Commitment and Identity Criteria

2.1. Ontological Commitment and Criterion

At the heart of Quine's philosophy is the idea that we should look at metaphysical debates through the tools of logic. For him, ontology is not about guessing what might exist. It is about understanding what our best scientific theories commit us to when we express them formally.[8] Quine uses two main principles to decide what exists.[9]

The first is the *recognition criterion*: "To be is to be the value of a bound variable."[10] It links existence to quantification in a formal logical system, only what a theory quantifies over is ontologically committed. This means that existence depends on what a theory counts or measures within a logical system. A theory is committed to the kinds of things it must refer to when it uses variables. For example, if a theory uses a variable 'e' to talk about events, then it accepts events as real. If a theory never needs to count or refer to such things, then they are not part of its picture of reality. This approach makes discussions about existence more precise. We only accept the things that our theories actually refer to, and we avoid adding unnecessary assumptions.

In Quine's view, the recognition criterion is about how we name and identify the things our theories are committed to. In event theory, this means asking what counts as an event and how we tell different events apart. If a theory includes statements like 'something happened', it shows that events are treated as real parts of the world, similar to physical objects or properties. Philosophers often try to distinguish events by their time, place, or participants. But in Quine's system, we do not need to describe

8 Quine, "On What There Is," 1–19.
9 Quine, *Word and Object*, 13, 21.
10 Quine, "On What There Is," 1–19.

events by hidden qualities or deep essences. If the simplest version of our theory needs a variable for 'event', then events are real. This principle guides us in talking about events clearly. It helps us group different descriptions under the same event or treat them as separate events, creating a clear one-to-one match between our language and what we believe exists.

The second principle is the *test criterion*: "No entity without identity."[11] This rule says that there must be determinate identity conditions for any alleged object.[12] Quine's emphasis on using space and time to define identity comes directly from this idea. Without clear criteria, supposed entities, like events, could become vague and unclear, which Quine wanted to avoid. In simple terms, something is real only if we can explain how it stays the same or becomes different.

Once we recognize entities, we need this test criterion to check their identity. For events, this means deciding whether two descriptions talk about the same event, or whether an event remains the same as time passes. Quine believes we can do this using formal logic and real-world evidence. If two event descriptions mean the same thing and can replace each other without changing the truth of a statement (following Leibniz's Law), then they describe the same event.[13] For example, if 'what happened in scene A' and 'what happened in scene B' are indistinguishable in all relevant respects, they are theoretically considered the same event.

Empirically, we may also assess identity through spatiotemporal continuity: If two events occur in precisely the same time and place, then according to strict extensionalist principles, they must be identical.[14] Quine argues that every judgment about identity must be open to logical testing and empirical checking. The test criterion is therefore a tool for confirming identity based on clear reasoning and observable facts.

These principles, taken together, define both the entry point and admissibility conditions for entities in a rigorously extensional ontology. Although Quine never explicitly endorsed the ontological status of events, these two criteria, especially when paired with Quine's emphasis on spatiotemporal continuity, can serve as powerful analytical tools for reconstructing the problem of event individuation, thereby avoiding the vagueness and intensionality that plague traditional treatments.

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11 Quine, *Word and Object*, 61–68.

12 Willard Van Orman Quine, "Ontological Relativity," in *Ontological Relativity and Other Essays* (New York: Columbia University Press, 1969), 26–68.

13 Gottfried Wilhelm Leibniz, *Philosophical Essays* (Indianapolis: Hackett, 1989), 36–37.

14 Quine, *Word and Object*, 171.

2.2. Spatiotemporal Continuity

With the recognition and test criteria as our guide, we now have a basic framework for defining and identifying events. To satisfy the test criterion, Quine argues that identity must depend on spatiotemporal continuity. This idea is clearest in his discussion of physical objects, but it can also apply to other kinds of entities. A physical object continues to exist over time not because its material or function stays the same, but because it keeps occupying one continuous region in space and time. What remains constant is not what it is, but where and when it is.[15]

This way of thinking is especially useful when we analyze events. Events, like objects, happen over time and often change their participants or features. If we think of an event as a fixed area in space and time, we can still identify it even if many things inside it change. The event's identity over time no longer depends on its inner structure or content. Instead, it depends on the shape and position of the region it fills.

In Quine's view, a river stays the same over time not because it keeps the same water or the same qualities, but because it follows one continuous path through space and time. In the same way, an event — like a race, a conversation, or a chemical reaction — can be identified as a single unit if we see it as a defined region in space and time, without needing to refer to vague internal features. This approach gives a clear answer to the question of identity. Two events are the same if and only if they share the same spatiotemporal region. It also meets the recognition criterion, because these regions can be described and measured in formal terms, without relying on subjective ideas or speculative metaphysics.

Here is a clear logical sequence: First, identify the theoretical quantification requirements (i.e., 'what entities do we need to discuss to establish the theory') → then confirm ontological commitments through quantifiable variables → finally verify entity identity using criteria like spatiotemporal continuity. For example, physics requires 'electrons' to explain phenomena. Therefore, we quantify electrons (committing their existence) and then use 'spatiotemporal trajectories' to verify 'whether we're talking about the same electron'.

2.3. Semantic Ascent as a Methodological Supplement

One of Quine's most persistent philosophical aims was the elimination of intensional entities from ontology. He saw such entities — meanings, propositions, essences — as epistemologically opaque and logically unstable. In event theory, intensionality appears in the form of ambiguous individuation criteria: is 'John's opening the door'

[15] Willard Van Orman Quine, "Identity, ostension, and hypostasis," *Journal of Philosophy* 47, no. 22 (1950): 621–633.

the same as 'John's alerting the guard'? Do two causally connected actions constitute one event or two?

Quine's framework offers a way out. By tying individuation to spatiotemporal demarcation, we sidestep debates about content, causality, or essential properties. The question 'Are these the same event?' is replaced by 'Do they occupy the same region of spacetime?' This move also aligns with Quine's broader methodological strategy of semantic ascent, whereby metaphysical questions are reframed in logical or linguistic terms. [16]

This reductionist maneuver, far from being a metaphysical retreat, represents a shift toward epistemic clarity and ontological parsimony. It enables us to retain the explanatory utility of event talk while stripping it of metaphysical excess. Quine's theory resolves traditional metaphysical dilemmas through the semantic ascent strategy, transforming the issue of event identity into the delineation of spatiotemporal regions at the level of linguistic logic.[17]

We can now add semantic ascent as a useful method alongside Quine's ontological criteria. Semantic ascent is a strategy Quine uses to move the discussion from talking directly about things to talking about how we describe them.[18] Instead of debating what events are at the object level, we look at the language we use to talk about them.

In practice, this means rewriting our statements about events in a clearer and more formal way. We replace vague everyday phrases with precise logical expressions so that we can see more clearly what they refer to. In the context of defining events, the main point of semantic ascent is this: Any disagreement about whether two descriptions refer to 'the same event' is really a disagreement about how language is being used. By organizing our language first, we can restate the question of event identity in a clearer form: Within a given semantic system, which statements refer to the same region in space and time? This approach moves the discussion away from unclear metaphysical debates and toward careful, logical analysis.

For example, in the case of the river, semantic ascent guides us to clarify the meaning of terms such as *river* and *river stage*: Do we treat the river as a holistic four-dimensional entity, or as a sequence of temporally segmented stages? Only after clarifying these linguistic distinctions can we apply the recognition and test criteria to determine whether different descriptions refer to the same spatiotemporal object.

Semantic ascent is a hallmark of Quine's pragmatic and naturalistic approach to philosophy. For Quine, many persistent philosophical problems arise not from genuine metaphysical obscurity, but from ambiguities and unclarities in our language.

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16 Quine, *Word and Object*, 19–23.
17 Quine, "Ontological Relativity," 26–68.
18 Ibid.

When we ascend semantically, we move from a discussion of 'what there is' to a discussion of 'what we say there is', or more precisely, how we structure our language to talk about what there is. This shift allows us to clarify our ontological commitments by examining the bound variables of our accepted theories, rather than by positing mysterious, unobservable entities.

Quine famously argued that "to be is to be the value of a bound variable". This dictum is the logical manifestation of semantic ascent. It dictates that our ontological commitments are not revealed by our casual or intuitive talk about existence, but by what our best scientific theories quantify over. If a theory consistently employs variables that range over certain types of entities (e. g., electrons, sets, or spacetime regions), then that theory is ontologically committed to the existence of those entities.[19] Conversely, if a purported entity cannot be consistently captured as the value of a bound variable within a coherent theoretical framework, its ontological status remains dubious.

The power of semantic ascent lies in its ability to defuse intractable metaphysical disputes. Instead of trying to resolve whether abstract universals 'exist' in some Platonic realm, we ask whether our scientific theories require quantification over universal-like entities.[20] Instead of debating the ultimate nature of time or space, we analyze how our physical theories represent and quantify over temporal and spatial magnitudes. This methodological shift replaces speculative metaphysics with a more rigorous, empirically constrained, and logically transparent inquiry into the structure of our best theories. It is a move from the messy ambiguities of 'being' to the clearer terrain of 'talking about being'.

3. Heraclitus and the River: A Metaphysical Dilemma

3.1. The Heraclitean Challenge: Identity in Flux

The aphorism traditionally attributed to Heraclitus "No one steps into the same river twice" presents a vivid and provocative challenge to the notion of persistence. The river, taken literally or metaphorically, is in a constant state of flux. Water flows in and out; the physical constitution of the river changes from one moment to the next. This observation appears to undermine the principle of diachronic identity: How can an object that is always changing be the same object over time?

Heraclitus's insight, however poetic, cuts to the heart of one of metaphysics' deepest questions: What makes an entity the same through change? If identity requires sameness of constituents, properties, or internal structures, then the river

[19] Quine, "On What There Is," 1–19.
[20] Quine, *Word and Object*, 64–70.

seems never to be 'the same'. But if identity can tolerate, or even be compatible with systematic change, we must ask: What standard preserves identity despite alteration?

For Heraclitus, change is ontologically basic. Reality is fundamentally dynamic, and all apparent stabilities are temporary configurations within a deeper process of becoming. While this perspective resonates with many philosophical traditions, it sits uneasily within the logical tradition stemming from Aristotle, where identity and non-contradiction are the bedrock principles of reasoning. In classical logic, an entity that is and is not the same at once defies coherence. The dilemma, then, is this: If we affirm Heraclitus's premise, we risk undermining identity; if we affirm identity, we risk denying change.

3.2. The Quinean Reframing: River as a Four-Dimensional Object

Quine's solution to the river dilemma involves a decisive shift in ontological perspective: From viewing the river as a three-dimensional object persisting in time, to viewing it as a four-dimensional spatiotemporal whole — a space-time worm in the terminology of modern perdurantism.[21] Instead of thinking of the river as something that endures moment to moment, we treat it as a region of spacetime, extended across both space and time, composed of temporal parts or stages.[22] A key virtue of Quine's approach lies in its capacity for semantic regimentation. The Heraclitean dilemma arises, in part, from the ambiguity of natural language. When we say 'the same river', we may mean the same location, the same water, the same shape, or the same hydrological function. Without clarifying which criterion of identity is at play, disputes over sameness become muddled.

Quine's method of semantic ascent addresses this problem by urging us to replace metaphysical intuition with linguistic precision. Rather than ask, 'Is this the same river?' we ask, 'Are these references coextensive with respect to their spatiotemporal coordinates?' The latter question is one that can be answered within a formalized framework.

By identifying the river with a continuous spatiotemporal region, Quinean ontology removes the ambiguity. Two river stages may differ in qualitative content (e.g., water volume, sediment load), yet still belong to the same river if they are part of a single spatiotemporal trajectory. This allows for a consistent use of identity without denying change.

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21 Sider, *Four-Dimensionalism: An Ontology of Persistence and Time*, 1–5.

22 David Lewis, "Events," in *Philosophical Papers, Volume II* (Oxford: Oxford University Press, 1986), 241–269.

This reframing accomplishes several things at once:

3.2.1. It allows the changing contents of the river (e.g., different molecules of water at different times) to be part of its temporal differentiation, rather than threatening its identity.

3.2.2. It grounds the persistence of the river not in sameness of material or function, but in the continuity of its spatiotemporal trajectory.

3.2.3. It enables a logical reconstruction of the Heraclitean puzzle: While no one steps into the same stage of the river twice, they may step into the same river — understood as a unified four-dimensional entity.

Thus, change is accommodated as variation within the entity, not as a threat to the entity. Each river stage corresponds to a temporal slice, a momentary cross-section of the river's existence. The river itself is the sum of these stages — a temporally structured extensional object.

The great strength of this reconstruction is that it allows us to affirm both the reality of change and the coherence of identity. The river changes because its stages differ; it remains the same because it constitutes a single spatiotemporal whole. This dual affirmation is possible only because we have disentangled the notion of identity from material or functional sameness, grounding it instead in structural continuity.

This move solves the Heraclitean dilemma by showing that the criteria for identity need not conflict with the facts of change. Once identity is redefined in terms of spatiotemporal continuity, variation in content no longer undermines persistence. The diachronic identity of an event does not depend on changes in attribute (such as the replacement of water molecules or differences in flow states), but is solely determined by the continuity of the spatiotemporal region (the integrity of the four-dimensional trajectory).[23]

Importantly, the river is not merely a poetic metaphor but a model for a wide class of metaphysical entities. Events, like rivers, unfold in time, involve change, and are difficult to individuate without intensional criteria. An event is no longer defined by its causal outcome, participant intention, or narrative role, but by its place in spacetime. Just as river stages are parts of the river, so too event phases are parts of a larger process individuated by its temporal and spatial extension. Quine's approach suggests that we treat events as we do rivers: As temporally extended objects, composed of stages, unified by spatiotemporal continuity.

This model does more than resolve philosophical puzzles. It also has practical uses. In fields like cognitive science, physics, and law, defining and distinguishing events is a key task. By providing a clear and evidence-based standard based on the

[23] Quine, "Identity, ostension, and hypostasis," 621–633.

shared region of space and time, Quine's approach can bring different areas of study together under a single, consistent framework.

3.3. From River to Event: The Transfer of a Metaphysical Model

The analysis of Heraclitus's river paradox in this chapter is not an isolated exercise in philosophical exegesis, nor merely a retrospective commentary on ancient metaphysical imagery. Rather, it serves as a model case, a metaphysical template for understanding a broader class of ontological entities: Namely, temporally extended particulars. The conceptual tools developed in the discussion of rivers, especially the distinction between river stages and the river as a four-dimensional spatiotemporal whole, provide the groundwork for addressing more contemporary problems, most notably the individuation and identity of events.

The main insight is the parallel between river stages and event phases. A river, when seen as something that continues through time, is made up of different stages that are linked together. In the same way, an event — like a concert, a battle, or a chemical reaction — can be understood as a series of temporal parts. In both examples, change within the thing does not destroy its ongoing identity. The unity of the whole depends on its continuous path in space and time (spatiotemporal continuity), not on unchanging material or qualities.[24] This is the crucial point: A river does not stop being the same river when its water changes, and an event does not stop being the same event when its content or participants change.

More importantly, the criterion used to resolve the river paradox — spatiotemporal continuity — is not parochial to that case but can be generalized to the ontology of events. Both rivers and events exemplify what Quine would describe as extensional objects that unfold in time and occupy determinate regions of spacetime. Their metaphysical puzzles arise from similar pressures: How to reconcile persistence with change, and how to draw principled boundaries around extended, dynamic phenomena. Quine's reconstruction in the river case does succeed. By replacing ambiguous appeals to identity with precise spatiotemporal demarcation, it suggests a natural extension of the same strategy to events.

This transfer is not merely analogical but methodologically foundational. The semantic ascent performed in the river analysis, like clarifying the referential structure of terms like 'the same river', directly informs how we might regiment our talk about events. This approach enables us to bypass longstanding debates about essential properties, causal roles, or intentional descriptions in event theory. By modeling events on rivers as continuous, extensional spatiotemporal units, we

[24] Quine, *Word and Object*, 23.

gain a powerful and parsimonious framework for resolving questions of event identity and individuation.

Thus, the Heraclitean river, far from being a poetic metaphor or historical footnote, emerges as a functional prototype for a naturalized metaphysics of temporally extended entities. The philosophical insights gleaned from its analysis are carried forward into the next chapter, where they will be systematically applied to the problem of event individuation.

4. Event Individuation and Extensionalist Ontology

The river, as a metaphor, stands in for all temporally extended but qualitatively unstable entities. This includes not only rivers themselves but also persons, processes, institutions, and, centrally for this paper, events. What makes such entities puzzling is that they appear to persist while continuously undergoing internal change. The river today is not composed of the same water as it was yesterday, nor does it necessarily have the same speed, depth, or ecological conditions. Yet we speak of it as the same river.

This is precisely the kind of case that threatens to dissolve under traditional metaphysical assumptions. If identity is taken as sameness of constituents, the river cannot persist through time. But if identity is stretched to accommodate any change, it risks becoming trivial or vacuous. What is needed is a framework that can respect both the phenomenological continuity and the physical variability of the object in question. This is what Quine's extensionalist ontology provides: A way to reconstruct identity across change without recourse to metaphysical essences or modal intuitions.[25]

4.1. Transforming Event Identity into Linguistic Demarcation

As explored earlier, the question 'Are these two events the same?' becomes highly problematic when identity hinges on vague intensional criteria such as causal roles, internal properties, or subjective interpretations. Semantic ascent provides a way out of this impasse by transforming the question from one about the intrinsic nature of events to one about the logical structure of our language for individuating them.

When Quine proposes that an event's diachronic identity is determined by the continuity of its spatiotemporal region, he is, in essence, making a semantic ascent. He is not claiming that events 'are nothing but' spacetime regions in a reductive sense, but rather that our talk about events can and should be regimented in terms of

[25] Ibid., 171.

spatiotemporal coordinates. The question of 'event identity' is thus translated into a question of 'how we delineate spatiotemporal regions in our theories'.

Taken together, Quine's recognition and test criteria, along with the criterion of spatiotemporal continuity, provide a minimal yet powerful toolkit for reconstructing the ontology of events. While Quine himself remained agnostic or skeptical about the existence of events as a distinct ontological category, his framework offers all the necessary components for such a reconstruction. Events, thus redefined, become spatiotemporal particulars: Temporally extended but logically individuated, extensional but ontologically grounded. They do not float in an intensional realm, nor do they depend on teleological or causal narratives. They are simply regions within the fabric of spacetime, to be described, measured, and quantified without metaphysical inflation.

The use of Quine's extensionalist ontology not only reinterprets the Heraclitean river theory but also offers a logically parsimonious, metaphysically lightweight account of event individuation. It transforms a perennial metaphysical puzzle into a question of logical geography. Extensionality, spatiotemporal continuity, and semantic regimentation collectively form a toolkit for reconstructing problematic metaphysical categories, such as events, without appeal to vague or intensional notions.

A cornerstone of Quine's philosophical project was the elimination of intensional entities from acceptable ontology. In the context of event theory, intensionality manifests in the form of ambiguous individuation criteria. As previously mentioned, questions like "Is 'John is opening the door' the same event as 'John is alerting the guard'?" become problematic when their identity hinges on subtle differences in meaning, causal implications, or intentions.

Quine's framework offers a powerful way to sidestep these intensional ambiguities entirely. By tying event individuation to spatiotemporal demarcation, we are no longer entangled in debates about an event's content, causality, or essential properties. The question 'Are these the same event?' is systematically replaced by the far more precise and empirically verifiable question: 'Do they occupy the same region of spacetime?'. This transforms a seemingly intractable metaphysical problem into a question of logical and empirical observation.

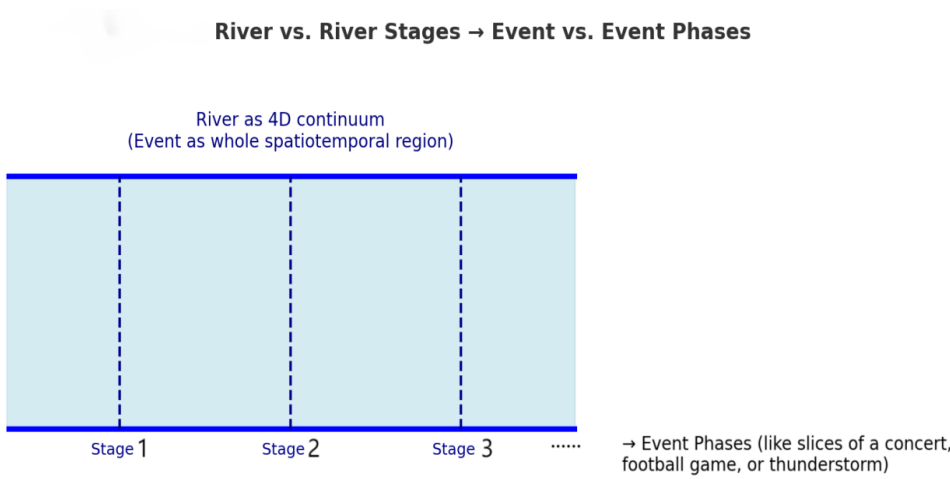
This move aligns perfectly with Quine's broader methodological strategy of semantic ascent. Instead of directly addressing metaphysical questions about the nature of events, we ascend to the level of language and logic, focusing on how we structure our discourse about them. The goal is to regiment our scientific and everyday language about events in a way that is clear, consistent, and amenable to formal analysis. As the abstract rightly points out, Quine's theory "resolves traditional metaphysical dilemmas through the semantic ascent strategy, transforming the issue of event identity into the delineation of spatiotemporal regions at the level of

linguistic logic", thereby allowing us to utilize event talk effectively while purging it of its metaphysical excesses. The result is an ontology of events that is not only robust but also rigorously transparent.

4.2. Events as Four-Dimensional Entities: Analogies to the River

The Heraclitean river, as explicated in Chapter 3, serves as a crucial metaphysical paradigm for understanding temporally extended but qualitatively unstable entities. Quine's genius lies in his reinterpretation of this ancient dilemma, transforming the river from a paradox into a model for a robust metaphysics of persistence and change. By conceiving of the river not as a three-dimensional object enduring through time, but as a four-dimensional spatiotemporal whole — a "space-time worm"[26] — Quine provides a powerful analogy for events.

Just as the river, understood as a space-time worm, remains identical across time despite the constant flux of its water molecules, so too can an event be understood. An event, whether it be a musical performance, a football game, a chemical reaction, or a thunderstorm, is not an instantaneous occurrence but a process that unfolds through time and occupies a continuous region in space. The various 'stages' of the river — its momentary cross-sections — are its temporal parts. Similarly, an event is composed of its own temporal parts or 'phases'. The identity of the event, much like the identity of the river, is preserved not by the sameness of its fleeting constituents or attributes, but by the unbroken continuity of its spatiotemporal trajectory.



[26] Sider, *Four-Dimensionalism: An Ontology of Persistence and Time*, 1–5.

If an event is conceived, much like Heraclitus' river, as a four-dimensional process, then its fundamental identity resides not in the transient qualitative attributes it exemplifies at any given moment, but rather in the enduring continuity of its spatiotemporal location. Quine's rigorous rejection of intensional entities and his overarching philosophical commitment to extensionality fundamentally compel us to individuate events precisely in terms of unambiguously demarcated regions of spacetime. This profound conceptual shift implies that internal changes within an event — such as the replacement of water molecules in a river or the varying traffic on a street — do not, by themselves, alter the event's fundamental identity. Instead, an event, under this Quinean lens, is understood as a bounded yet non-redundant segment of the world's intricate space-time fabric.

This four-dimensional view allows us to affirm both the reality of change and the coherence of identity without contradiction. The event changes because its internal constituents or attributes may vary from one moment to the next, or from one 'stage' to another. Yet, it remains the same event because its overarching spatiotemporal trajectory constitutes a single, unified entity. This framework thus accommodates the dynamic nature of events while providing a stable criterion for their individuation. It resolves the Heraclitean dilemma by demonstrating that the criteria for identity need not conflict with the observed facts of change. The river serves as a tangible, conceptual bridge, allowing us to extend this robust understanding of persistence through change to the complex ontology of events.

4.3. Resolving the Problem of Diachronic Identity in Events

The problem of diachronic identity — how an entity can persist through time despite undergoing change — is a foundational concern in metaphysics. The Heraclitean aphorism, "no one can step into the same river twice", perfectly crystallizes this tension. As discussed in Chapter 3, Quine resolves this tension for the river by distinguishing between instantaneous river stages (temporal parts) and the river as a unified four-dimensional spatiotemporal whole. This elegant solution provides a direct blueprint for resolving the parallel problem of diachronic identity in events.

Traditional accounts of event persistence often struggle with qualitative change. As Kim has shown, tying the identity of an event to its specific properties or material constituents leads to excessive event multiplication and threatens the possibility of event persistence across change.[27] If an event's identity were tied to its specific properties or constituents, then any significant alteration — such as a change in the participants of a meeting, the instruments in a musical performance, or the specific

[27] Jaegwon Kim, *Supervenience and Mind: Selected Philosophical Essays* (New York, NY: Cambridge University Press, 1993), 33–52.

water molecules in a river — would seem to threaten its identity. This leads to paradoxical conclusions or forces philosophers to invoke complex and often vague notions of essence or sufficient similarity to maintain identity through change.

Quine's spatiotemporal framework sidesteps these difficulties entirely. For an event, its diachronic identity does not depend on the continuity or sameness of its attributes. Instead, it is solely determined by the continuity of its spatiotemporal region — the integrity of its four-dimensional trajectory. Just as the river's identity is preserved by its continuous occupation of a specific region of spacetime, regardless of the water flowing through it, an event maintains its identity as long as it occupies a continuous, unbroken segment of spacetime.

Consider a multi-day scientific experiment. The specific equipment used might change, the researchers involved might rotate, and intermediate results might fluctuate. If the event's identity were tied to these changing attributes, it would be difficult to claim that it's the 'same experiment' throughout its duration. However, from a Quinean perspective, as long as the experiment occupies a continuous spatiotemporal region — i.e., it takes place in the same lab, over a connected period of time, without significant spatial or temporal gaps — it remains a single, individuated event. As Lewis argues, qualitative changes within an event do not undermine its identity, since events are individuated by their spatiotemporal location rather than by their variable qualitative features.[28] The changes are simply variations within the event, not threats to its overall identity. This allows us to acknowledge the reality of flux while maintaining a robust and consistent concept of event identity, effectively dissolving the longstanding controversies that arise from conflating identity with qualitative content.

4.4. A Metaphysically Lightweight Ontology of Events

The Quinean reconstruction of event individuation, grounded in spatiotemporal demarcation, contributes significantly to the project of naturalized metaphysics. Naturalized metaphysics, in the Quinean sense, seeks to integrate philosophical inquiry with the methods and findings of natural science, rejecting armchair speculation in favor of empirically anchored and logically regimented approaches. By treating events as spatiotemporal particulars — temporally extended but logically individuated, extensional but ontologically grounded — this framework aligns perfectly with such a naturalistic vision.

This approach offers a metaphysically lightweight but analytically robust model for event individuation. It consciously sidesteps modal and essentialist ambiguities

[28] David Lewis, *Philosophical Papers, Volume II* (Oxford: Oxford University Press, 1986), 241–269.

that plague many traditional theories of events, instead placing event identity squarely within the observable, public framework of spacetime. This is particularly valuable in contemporary debates over the ontology of processes, where disputes often hinge on unclear or untestable criteria of sameness. By aligning event identity with region-identity, Quinean metaphysics reorients the discussion toward physicalist and naturalistic parameters, providing a common conceptual scheme for diverse domains of inquiry.

Furthermore, this framework demonstrates how problematic metaphysical categories, such as events, can be reconstructed without recourse to vague or intensional notions. It shows that we can retain the explanatory utility of event talk — our ability to analyze causal relations, assign responsibility, or parse sequences in time — without incurring heavy metaphysical commitments. In an era of increasing skepticism toward speculative metaphysics, Quine's naturalized metaphysics, exemplified by this reconstruction of event individuation, offers a compelling disciplinary bridge between logic, language, and ontology. It moves us beyond Heraclitean paradox and into a logically rigorous and empirically sensitive metaphysical framework, contributing a live perspective to the future of metaphysics.

5. Conclusion

We have shown that the diachronic identity of an event, much like that of the river, is not dependent on qualitative changes in its attributes, but is solely determined by the unwavering continuity and integrity of its four-dimensional spatiotemporal trajectory. This criterion not only effectively addresses identity disputes arising from the traditional confusion of an entity with its attributes but also furnishes a unified and logically coherent framework for the individuation of all types of events.

Furthermore, this study has underscored that the power of Quine's theory lies in its ability to resolve traditional metaphysical dilemmas through the strategic deployment of semantic ascent. By transforming the complex issue of event identity from a purely ontological mystery into the more manageable delineation of spatiotemporal regions at the level of linguistic logic, Quine provides a compelling methodological paradigm for naturalistic metaphysics. This approach encourages clarity, logical rigor, and an empirical grounding that eschews speculative and ill-defined metaphysical commitments.

We have argued that, while Quine did not explicitly build a theory of events, his ontological tools, when applied to the Heraclitean challenge, yield a viable framework for individuating temporally extended entities. By grounding identity in spatiotemporal continuity and rejecting intensional surplus, this approach sidesteps classical metaphysical conundrums.

To argue for this thesis, the paper proceeded in several key steps. Chapter 2 meticulously explicated Quine's foundational framework of ontological commitment, detailing how the existence and identity of entities are determined within the rigorous confines of a first-order logical system, guided by his dictum "To be is to be the value of a bound variable" and the test criterion "No entity without identity". Building upon this foundation, Chapter 3 then provided a precise reconstruction of the Heraclitean river paradox through a Quinean lens. This chapter demonstrated how Quine's crucial distinction between the river as a four-dimensional spatiotemporal continuum and its instantaneous river stages effectively resolves the identity-through-change dilemma, offering a blueprint for understanding persistence amidst flux. This conceptual move provides the bedrock for understanding events not as fleeting occurrences defined by their changing attributes, but as enduring entities identified by their continuous occupation of specific regions in spacetime. This reinterpretation, as demonstrated in Chapter 4, is the cornerstone of our argument: Reducing event individuation to the clear and objective demarcation of spatiotemporal regions offers a robust method to bypass the longstanding and often intractable controversies that have plagued traditional event metaphysics.

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