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Article

A Reconstruction of Gilles Deleuze's Contribution in Einstein-Bergson Debate

Mehdi Parsa[1] [https://orcid.org/0009-0004-9654-0040]

Abstract:

This paper aims to explore how Gilles Deleuze's philosophy of time can enhance our understanding of the central themes arising from the famous 1922 debate between Albert Einstein and Henri Bergson on the nature of time, as well as Bergson's critique of Einstein in *Duration and Simultaneity*. To achieve this goal, the paper begins with a review of Einstein's theory of relativity, Bergson's critique of it, and a summary of Deleuze's theory of time as appears in *Difference and Repetition*. Subsequently, it explores Deleuze's call in *Bergsonism* to investigate the metaphysics of the theory of relativity. It will be demonstrated that this metaphysics underlies the incorporation of a concept of time that, diverging from the measured time found in physical formulas, fundamentally alters the physical paradigm itself. Finally, the paper examines how Deleuze's own metaphysical framework contributes to the demands of this physical theory.

Keywords: Deleuze; Bergson; Einstein; Spacetime; Duration

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Introduction: Physical Time versus Metaphysical Time?

The brilliance of ancient Greek philosophers lies in their assumption of change as the fundamental core of existence. What puzzled the Greek philosophers was not change, which they presupposed, but rather explaining how things could remain unchanged amidst the ever-changing nature. Plato and Aristotle identified the source of stability in things through the relationship between humans and the ever-changing world, expressed in terms of ideas or substances. This tendency marked the trajectory of how philosophy and science conceptualize time as a subject matter. In this context, the initial segment of Aristotle's renowned definition of time in *Physics* as "the measure of change in relation to before and after" encapsulates the fundamental elements of the philosophical perspective on the concept of time: measurement and change.[2] It asserts that change, as the essence of time, is

[1] Mehdi Parsa earned his PhD in Philosophy from the University of Bonn. His latest monograph, titled *A Reading of Gilles Deleuze's Logic of Sense*, was published in 2023 by Palgrave Macmillan. He is currently an independent scholar, living and working in Bonn, Germany: mehdi.parsa.kh@gmail.com

[2] *Phys.* 219b1–2 (τοῦτο γάρ ἐστιν ὁ χρόνος, ἀριθμὸς κινήσεως κατὰ τὸ πρότερον καὶ ὕστερον.). Quoted here from Roark 2011, p. 1 and 41. Tony Roark quotes Aristotle's definition as "a number of

measurable. It distinguishes between the quantity or measurement of change and the change itself. To measure changes, we require a criterion, a meter, which is something that undergoes periodic changes, such as day and night, repeating themselves nearly with identical values. This concept naturally stems from the human tradition of turning cycles into circles, thus converting change into motion. Therefore, measured time is simply the outcome of comparing changing things that are perceived and seeking a method to calculate it. Even in this early formulation of Aristotle, one can discern the concept of time as such, the philosophical time, which should be distinguished from measured time or physical time: measurement pertains to physics, while change pertains to metaphysics. Therefore, while Aristotle's definition of time seemingly reduces time to measurement, and consequently, to space, as Bergson claims, the very presence of the distinction between change and measurement in this formulation underscores change as the essence of time (Massey 2015, 161-162).

This distinction shapes nearly all discussions concerning the concept of time throughout the history of philosophy. For instance, it is within this philosophical framework that Kant, in the first *Critique*, regards time, along with space, as forms of perception. According to Kant, time is not inherent to changing things but rather pertains to the perception of objects.[3] In other words, it belongs to the realm of epistemology. One cannot assert that things in themselves are temporal. However, one can assert, firstly, that perceived objects exist within time, and secondly, that I sense in time and I think in time. Time serves as the regulating and coordinating factor that relates the temporal "I think" to the temporal objects of perception.[4]

Bergson alters the nature of this relation, viewing it not as correlation or harmony, but rather as disjunction and tension. In his interpretation of Kant, the temporality of perception exists in tension with the temporality of perceived objects. Hence, he distinguishes between time as duration or the passage of time, which can be intuited, and spatial time, which is measurable and governs discrete objects, accessible through the faculty of understanding. Only the former represents time as the essence of being or becoming. This is evident from his early work *Time and Free Will* in which he assets, "as soon as we try to measure it [time], we unwittingly replace it by space" (Bergson 1910, 106). For Bergson, the being that can be grasped intuitively is not composed of discrete objects but is merely duration or the passage of time. Following Kant, he believes that discrete objects are correlates of subjective structures and therefore are mediate phenomena. Unlike Kant, who assumes the correlation of faculties and denies metaphysics, Bergson introduces the disjunction of faculties as a means to open up the Kantian correlation and approach the things in themselves through inner sense. Hence, the faculty of understanding, serving as the tool of physical intellect, stands in opposition to intuition, which represents the metaphysical method for grasping reality. Intuition, being temporal itself, can directly apprehend duration, which is time itself. Linear and measurable time serves as the narrative and framework through which we comprehend the phenomenal world. The timeless understanding perceives everything in terms of space. In contrast, duration is time devoid of and preceding measurement, quantification, spatialization, and reduction to the categories of understanding.

motion with respect to the before and after". Aristotle's term for motion is "*Kinêsis*". However, he argues at length why one should understand motion here in terms of change: "A world without time (according to this view) is a world without change" (2). He discusses Aristotle's terminology and the meaning of *Kinêsis* and *metabolê* in *Physics* (63).

[3] As Arthur Melnick states, for Kant, "time is the immediate form of inner sense" (Melnick 1989, 20). Or, "temporizing is the form of inner intuition". It is secondary that temporalizing is the "mediate" form of outer sense, or the "spatial performance" (21).

[4] Kant explains this regulating factor as follows: "Time as pure intuition is *in one* the formative act of intuiting and what is intuited therein" (quoted from Sherover 1971, 184).

In a similar vein, Martin Heidegger, in *The Concept of Time*, distinguishes authentic time from the physical view of time framed by clocks and the theological view of time defined by eternity. A clock is a physical instrument that measures time; in other words, it counts the number of unchangeable units (Heidegger 1991, 4). The moments of time here are homogeneous and equivalent, which is why time is measurable. Clocks render all moments equal, distinguishable only by numbers. This is the issue with the scientific view of time, akin to the function of money, which renders all objects homogeneous (Heidegger 1991, 18). Heidegger's primary objective in *The Concept of Time* is to create space for a metaphysics of time that can counter the physical and theological perspectives.

Heidegger approaches the problem of time not in terms of "what" but in terms of "how" (Heidegger 1991, 22). Time is inherent to the lived experience of *Dasein*. Beings (*seiende*) are the outcomes of the scientific view and do not represent Being in itself. The Being in itself can only be grasped through lived experience or existence. The authentic being is the temporal existence of *Dasein*. *Dasein* is not merely in time but is time itself, a perspective that aligns Heidegger's understanding of time with Bergson's emphasis on the inherent connection between intuition and duration. The future is the foundational dimension of time, introducing the essence of time as metaphysical indeterminability. In contrast, measurement extends the block of the past up to the present as the only tangible reality and pertains to physical determination. For Heidegger, everydayness and inauthentic life entail living according to the dictates of clocks. Conversely, living an authentic life aligns with the essence of freedom, which manifests through metaphysical indeterminability. Here, he emerges as a pioneer of critical theory by introducing the clock as a mechanism that subjugates individuals to the social order.

This underscores the significance and emancipating nature of embracing a metaphysical perspective on time. Heidegger argues that in the history of philosophy, time has been typically approached in one of two ways: either in terms of eternity, which results in the reduction of philosophy to theology and ontology to onto-theology, or in terms of beings and their spatial time, leading to a descent into science instead of philosophy and physics instead of metaphysics. Heidegger emphasizes that, on one hand, time is not related to eternity and divinity but to the finitude of free agents. On the other hand, he underscores that time is temporal, not spatial.

Therefore, building upon Aristotle's renowned definition of time, Bergson and Heidegger differentiate metaphysical time from physical time, presenting the former as authentic or genuine time. In this depiction, physical time, as exemplified in Newton's mechanics, is deemed inauthentic because it remains external to beings and their change or becoming. The question I am addressing here is whether recent advancements in modern physics, especially through Einstein's theory of relativity, could free physics from this philosophical critique. Bergson himself grappled with this issue. Before delving into the Bergson-Einstein debate, let's take a look at the theory of relativity.

(Space-)Time in the Theory of Relativity

In *Intensive Science and Virtual Philosophy*, Manuel Delanda asserts that thermodynamics stands out as the sole theory in modern physics that addresses time, the asymmetrical time that accounts for change (Delanda 2002, 82). The second law of thermodynamics can be interpreted as the irreversibility of time or as the recognition of time's passage as an arrow. Delanda points out that the special and general theories of relativity engage with a symmetrical or homogeneous concept of time, thus aligning them with classical mechanics. The theory of special relativity (1905) is a theory of motion, rather than a theory of time. However, it complicates the concept of motion by intertwining space and time. The outcomes include the renowned contraction of moving bodies in the direction of their motion and time dilation. These were proposed by Lorentz in 1892 and 1899, preceding

Einstein, as crucial adjustments needed to account for the findings of the Michelson-Morley experiment in 1887. Einstein's special theory of relativity adopts Lorentz's formulas but provides a distinct interpretation. In this framework, the contraction of bodies is not seen as a physical change in bodily qualities but rather as an inherent aspect of the measurements of space and time. This is not a theory of change; instead, it addresses a specific type of change inherent to motion. It is fundamentally a theory concerning measurement, which is why it is founded upon the constancy of the speed of light as the most reliable instrument for measurement. In essence, it rests on the fundamental principle that when it takes time for light or any electromagnetic wave to traverse a distance, inquiries about "when" can be transformed into inquiries about "where". Therefore, the Minkowski four-dimensional spacetime, composed of points-events, comes into play. What constitutes the nature of this spacetime? Does it imply the arrow of time, or does it spatialize time?

This issue can be juxtaposed with the inquiry into Einsteinian cosmology, which arises from its departure from Newtonian spacetime towards Minkowski spacetime or the curvature of spacetime as elucidated in the theory of general relativity to explain gravity. Does this represent a new cosmological paradigm? Does it furnish us with a comprehensive theory of the universe? The prevailing perspective is that the theory of general relativity presents a cosmology, and it is a static one, encompassing the events that have occurred and forming worldlines; a perspective that is compatible with Delanda's judgment. It diverges from Newtonian cosmology in the sense that it becomes impossible to capture a snapshot of the entire universe within this framework. Time relinquishes its independence from space, rendering movement in space or time qualitatively indistinguishable; consequently, simultaneity becomes relative to frameworks due to the absence of an absolute frame of reference. No coordinate system can be objectively favored. Newtonian cosmology contains a single arrow of time for the entire universe. Einstein, however, multiplies time. Does this multiplication result in the spatialization of time?

Regarding the theory of special relativity, the possibility of an Einsteinian cosmology remains uncertain. This is because, beyond being a theory focused on space and time, it primarily revolves around the setting and reading of clocks and traversing relative distances at a uniform speed.[5] When it comes to general relativity, a cosmological perspective does exist, yet skepticism lingers regarding its radical departure from the Newtonian counterpart. The key distinction lies in the fact that instead of a single world encompassing a linear causal chain, general relativity proposes the existence of infinitely many worlds composed of these linear causal chains, known as worldlines. In both theories, there is no room for the passage of time or for indeterminacy. Time becomes a spatial dimension, added to the three-dimensional space, forming "a timeless, deterministic universe" (Olkowski 2021, 60). Thus, either the theory of relativity lacks a cosmological framework, or it upholds the classical Newtonian cosmology of an absolute static and determinative spacetime.

Moreover, the central principle of general relativity is known as the Equivalence Principle, which asserts that accelerated motion and gravity are equivalent (where the gravitational mass equals the inertial mass). General relativity is founded on the concept of interpreting gravity in terms of the curvature of spacetime. It eliminates the concept of force and, following the equivalence of mass and energy in special relativity, dispenses with the

[5] The renowned British physicist and philosopher of science, Herbert Dingle, made several attempts in the 1950s to challenge Einstein's special theory of relativity. In his introduction to Bergson's *Duration and Simultaneity*, Dingle proposes the notion that Lorentz's theory makes real claims about objects and their temporality, whereas Einstein's theory does not. According to Dingle, the latter does not make assertions about time and aging but rather about the setting and reading of clocks. This, he suggests, is the implication of Einstein's theory, despite Einstein himself not explicitly distinguishing between time itself and the measurement of time (Bergson 1965, xxv).

effectiveness of mass. Instead, it introduces the geometrical concept of a gravitational field. Hence, once more, if an Einsteinian cosmology were to exist, it would likely be a static cosmology, a block cosmology, contrary to process philosophies or any philosophy that regards change as the fundamental source of being. Before delving into how process philosophers engage with Einstein regarding the concept of time, let's briefly revisit some historical contexts of his theory.

It's crucial to note that Einstein's genius did not lie in orchestrating a radical revolution in physics; rather, he sought to devise a solution to salvage the prevailing physical paradigm during a challenging crisis. The crisis stemmed from the challenges posed by the electromagnetic theory and the endeavors to reconcile it with classical mechanics. In 1887, Michelson and Morley undertook an experiment to detect the effect of the Earth's motion through static ether on light and electromagnetic waves in general. Their attempt, however, was unsuccessful. It appeared that the movement of Earth had no discernible effect on electromagnetic waves. In other words, the speed of light appeared to remain constant, irrespective of the relative motion between the source of light and the detectors. In 1899, Hendrik Lorentz proposed the contraction of bodies in the direction of their motion as a means to preserve the assumption of ether. This proposal aimed to maintain the compatibility of mechanics and electromagnetics without providing a clear explanation for such a contraction. In his renowned work "On the Electrodynamics of Moving Bodies" from 1905, Einstein elucidated the reason for contraction while rejecting the notion of a static ether. He attempted to resolve the issue through the revolutionary rejection of the uniformity of timing among different observers, introducing a spacetime framework distinct from the homogeneous Newtonian spacetime. As speed in mechanics is defined as the distance covered divided by the time elapsed, the alteration in timing could lead to the constancy of the speed of light. This alteration in timing differs from the Lorentzian contraction of bodies. It does not pertain to time as an inherent quality of bodies but rather to timing as the instrument used to measure the motion of bodies. In this manner, Einstein chose to relativize one aspect of the paradigm (timing) while absolutizing another aspect (Newtonian relativity or the equivalence of rest and motion at a constant speed, specifically the speed of light). This approach was undertaken to rescue the entirety of the physical paradigm from the crisis it faced. In this manner, as mentioned, he multiplied the Newtonian unified world into infinitely many worlds, each possessing its own regional time. These times vary from one another, making it impossible to synchronize them using any coordinate system.

Bergson's Debate with Einstein: Physics, Psychology, Metaphysics

In Bergson's philosophy, the concept of duration suggests that he advocates for an absolute understanding of time, wherein individual experiences change independently of observing frameworks. From a physical standpoint, this appears to be a regression from modern relativism to Newtonian absolutism. In the *Philosophiae Naturalis Principia Mathematica*, Newton presents his concept of duration, which appears to align with subsequent philosophical observations regarding the nature of time:

> Absolute, true, and mathematical time, of itself, and from its own nature flows equably without regard to anything external, and by another name is called duration: relative, apparent, and common time, is some sensible and external (whether accurate or unequable) measure of duration by the means of motion, which is commonly used instead of true time (cited in Ferraro 2007, 1-2).

Einstein rejects Newtonian absolute time in favor of a relativity of moving frames. Is Bergson's theory of duration a regression to Newton's absolutism, as Čapek claims (Čapek

1971, 250), or does it propel the theory of special relativity forward by addressing its challenges, as Craig Lundy contends (Lundy 2018, 106)? Bergson never advocates for a single universal time applicable to all objects and subjects. However, he distinguishes between the time experienced by each individual and the time that is measured. General relativity's spacetime also offers us infinitely many worldlines, each embarking on its unique journey through spacetime. To compare their views on time, one should juxtapose the duration experienced by each individual with the journey undertaken by each worldline through spacetime.

Here lies the fundamental difference: Einstein's cosmology is deterministic, whereas Bergson's is rooted in creativity or indeterminacy, akin to Heidegger's perspective of aligning physics with determinism and metaphysics with indeterminability. The philosophical critique of scientific determinism, though not entirely applicable to quantum mechanics, is well-suited to Einstein's theory of relativity.[6]

In his renowned debate with Bergson in 1922, Einstein criticizes Bergsonian duration, dismissing it as a psychological concept (Canales 2015, 46). This corresponds with his and his followers' perspective that the passage of time is a psychological illusion.[7] In his own right, Bergson, in *Duration and Simultaneity*, criticizes Einstein's theory of special relativity as being rooted in the conventional understanding of time measured by clocks, arguing that it fails to capture the essence of time as duration. He briefly addresses general relativity at the end of his book, opting to concentrate instead on the foundational aspects of the theory of special relativity. Specifically, in reference to the famous twin paradox, proposed by the French physicist, Paul Langevin, depicting the asymmetrical aging of Peter and Paul due to the independence of their worldlines when Paul embarks on a space journey, Bergson contends that Einstein's theory, which features time dilation as one of its fundamental outcomes, is flawed. He argues that it relies on clock-time rather than duration and lived experience as the defining foundation of time (Bergson 1965, 74). As Herbert Dingle summarizes, Bergson denies that "the 'time' which Peter calculates that Paul's clock will record is in fact time. It is a 'phantom', unrelated to anything that Paul experiences" (in Bergson 1965, xvi). Therefore, the term "twin paradox" should be replaced by "clock paradox", because it does not refer to aging of people but rather reading the clocks.[8] Langevin, on behalf of Einstein, "persisted in making an equivalence between the physical process and the biological and psychological ones" (Olkowski 2021, 59-60). Einstein would confirm Langevin's presumption by claiming that there is only one time and that is the physical-mathematical time.[9] For Bergson rather,

[6] In *The Concept of Time*, Heidegger criticizes briefly Einstein's theory of time: "Interest in what time is has been reawakened in the present day by the development of research in physics and its deliberations on the fundamental principles of the kind of apprehending and determining entailed here: the measuring of nature within a system of space-time relations. The current state of this research is established in Einstein's relativity theory. Some of its propositions are as follows: Space is nothing in itself; there is no absolute space. It exists merely by way of the bodies and energies contained in it. (An old proposition of Aristotle's:) Time too is nothing. It persists merely as a consequence of the events taking place in it. There is no absolute time, and no absolute simultaneity either. In seeing the destructive side of this theory, one readily overlooks what is positive about it, namely, that it demonstrates precisely the invariability, with respect to arbitrary transformations, of those equations describing natural processes." (Heidegger 1991, 3).

[7] Physicist Paul Davies derives from Einstein's theory the notion that the passage of time is an illusion. He quotes Einstein writing to a friend, stating that "The past, present, and future are only illusions, even if stubborn ones" (Davies 2012, 8).

[8] Olkowski calls this aspect of Einstein's theory "operationalism", "that is, not asking about what is real or not real but asking how an observer or different observers would measure what they observe" (Olkowski 2021, 60).

[9] Throughout her book on the debate between Einstein and Bergson, Canales notes that in his correspondences, Einstein often provides a very Bergsonian description of time when sharing

this unique time is not time per se, but rather the measured time, and all complexities within the special theory of relativity are about the constraints related to reading clocks from various frames due to the constancy of the speed of light. Bergson claims that the clock paradox is also false (Savitt views it as Bergson's mistake; see Savitt 2021, 90-91. Meanwhile, Dingle finds it to be a powerful physical critique of relativity theory's internal inconsistency; see Bergson 1965, xvii). However, his critique of Einstein retains its potency if one considers only his assertion that the twin paradox is false. In this regard, the special theory of relativity seemingly falls under philosophical criticism, as elaborated by Bergson and Heidegger. This criticism arises from the fact that Peter and Paul are not merely clocks, and their aging doesn't necessarily align with their clocks (Bergson 1965, xvii).

However, Bergson's critique of the special theory of relativity in *Duration and Simultaneity* extends beyond simply distinguishing between the physics of instruments and measurements and the metaphysics of beings and lives. He asserts that Einstein's theory falls short of being a complete relativity theory because the twin paradox does not make it entirely relative to discern which clock is in motion and which one is in a stationary state. To illustrate this point, Bergson starts by describing Lorentz's Half-Relativity, which presupposes the existence of ether as a coordinate system. Contraction and dilation in moving systems, as described by Lorentz's famous "transformation equations", aim to preserve the laws of electromagnetism, attempting to account for the unsuccessful efforts of Michelson and Morley to prove the existence of ether. In this manner, Lorentz's "corrections" of the formulas of mechanics aid in maintaining the assumption of a static ether as the framework for electromagnetic systems. They explain that due to the contraction of bodies in the direction of their motion, the existence of such an ether cannot be detected through an electrodynamic system like that constructed by Michelson and Morley. Hence, one can still posit that electromagnetic waves propagate through the static, undetectable ether.

According to Bergson, this is clearly not a theory of relativity (Bergson 1965, 23-24). This is why he refers to it as half-relativity. Does Einstein's modification or interpretation of Lorentz' equations result in a complete-relativity? Bergson thoroughly discusses this question and, despite the title of his second chapter directly addressing Einstein's modification, answers it in the negative. As Adam Lovasz remarks, Bergson's endeavor is indeed to complete Einstein's relativity, which is more comprehensive than Lorentz's, but still falls short of completeness. In other words, the relativity within the special theory of relativity is not sufficiently relative. The objective is to achieve "the completion of relativity through Bergsonism", or to absolutize the relativity of the special theory of relativity (Lovasz 2021, 87). Complete relativity must discard any preference between moving systems, thus rejecting asymmetrical aging, while affirming the absoluteness of duration or time. This ultimately leads to the philosophical concept of Time, as articulated by Bergson in the second edition of *Duration and Simultaneity*, where Time is capitalized (Canales 2015, 24). If a theory of relativity rejects asymmetrical aging, it qualifies as a complete theory of relativity; if not, then it does not.

This interpretation of *Duration and Simultaneity*, primarily echoing the spirit of the Paris debate, appears somewhat at odds with Deleuze's assertion in the Afterword of his *Bergsonism* that "This book led to so much misunderstanding because it was thought that

"detailed statements about how he experienced time", such as "my time slips by" (Canales 2015, 258). Canales argues that Einstein's private and public comments on Bergson's *Duration and Simultaneity* differ significantly. In private, he acknowledges that Bergson grasps the core of the theory of relativity, while in public, he claims Bergson misunderstood the physical theory (Canales 2015, 168). According to Canales, this reflects an inner conflict in Einstein's life over the nature of time after his debate with Bergson.

Bergson was seeking to refute or correct Einstein, while in fact he wanted, by means of the new feature of duration, to give the theory of Relativity the metaphysics it lacked" (Deleuze 1991, 116).[10] For our purposes, it is inconsequential whether Bergson aimed to rectify a deficiency in Einstein's theory or sought to supplement it with the metaphysics it lacks —an inquiry that could aptly engage Derrida's "logic of supplementarity".[11] We will revisit the theme of the metaphysics of relativity theory shortly. For now, let us discuss the details of why Einstein's theory couldn't entirely break free from Newtonian constraints and why this poses a problem.

In Bergson's expression, the distinction between Lorentz's and Einstein's relativities lies in the former being unilateral, whereas the latter is reciprocal. This implies that, for Einstein, there is no demonstrable distinction between a stationary system and a system in motion with a constant speed. In other words, Einstein maintains a crucial implication of Newton's first law of motion – the equivalence of rest and motion at a constant speed in a straight line – in his first law of the special theory of relativity: the laws of physics remain invariant in all inertial frames of reference (Bergson 1965, 30). There is no way to distinguish between a state of motionlessness and motion at a constant speed, according to both Newton and Einstein.

Einstein's relativity diverges from Newton's by the disappearance of simultaneity in the former. The Newtonian universe presupposes a shared moment of "now" that encompasses everything, everywhere. The consequence of this is the concept of absolute spacetime. Einsteinian spacetime lacks simultaneity and is characterized by Minkowski spacetime, which comprises independent worldlines constituted of point-events or instances. Bergson's contention with this new spacetime lies in its foundation on instants ordered in lines, as these instants are derived from the spatial image of time.[12] Hence, when considering one of the worldlines, it becomes comparable to Newtonian spacetime in its reduction of time to space. Bergson's critique primarily targets the notion that the only link between events along a world-line is causality. Ultimately, Einstein's universe remains a deterministic one.[13]

This problem becomes apparent when we consider the fact that Einstein presupposes that different frames have access to each other's time. In fact, it should be impossible to read a clock if one cannot be simultaneous with the clock. This is the problem of synchronizing clocks, which, as Kügler mentions, corresponds to "coordinate time" that "cannot be

[10] Lovasz does not directly respond to Deleuze's claim regarding Bergson's *Duration and Simultaneity*, but critiques Deleuze's understanding of Bergson in general. Lovasz argues that Deleuze mistakenly interprets Bergson's duration in terms of virtuality, whereas in Lovasz's reading, duration happens in all actuality. See the section "Prioritizing the Actual" in his book: Lovasz 2021, 63-76.

[11] For an exploration of Derrida's notion of supplementarity and the undecidability between completing a deficient theory and adding to an already complete theory, see Robert Bernasconi's chapter titled "Supplement" in *Jacques Derrida: Key Concepts*, edited by Claire Colebrook (Colebrook 2015, 19-22).

[12] In this context, André Metz, in "Einstein's Time and Philosophy", argues that the development of the Theory of Relativity into the General Theory of Relativity does not shield it from Bergson's critiques: "One might be tempted to believe that the second part of the theory, that is, general relativity, reconciles Einstein with Bergson by removing all the restrictions of the first. This is not so. The general theory of relativity assimilates gravitational forces with inertial forces. It replaces the notion of uniform and rectilinear motion with the notion of a space-time geodesic. But it no more eliminates the real existence of acceleration than it abolishes the absolute" (in Gunter 1969, 59). For simplification, we assume here that the laws of Special Relativity apply within each worldline of General Relativity.

[13] Exactly on this basis, Merleau-Ponty in his "Einstein and the Crisis of Reason" claims that "Einstein himself was a classical thinker" (Merleau-Ponty 1964, 192). For Merleau-Ponty, Einstein does not deserve to adhere to modern science because, unlike the proponents of quantum mechanics, he does not achieve the liberation of physics from determinism.

measured, since what a clock measures is the proper time at its location" (Kügler 2021, 10277). Thus, reading the clocks from other frameworks results in an imaginary notion of time. This implies that Einstein's spacetime suggests the possibility of simultaneity in the Newtonian sense. In contrast, Bergson argues that while observers may experience the simultaneity of instances differently, they experience the simultaneity of fluxes in the same way. For Bergson, who seeks the essence of time not in spatial instances and lines, but in the passage of time, simultaneity should represent a connection between, or the identity of durations. As Deleuze in *Bergsonism* states, "The Bergsonian theory of *simultaneity* thus tends to confirm the conception of duration as the virtual *coexistence* of all the degrees of a single and identical time" (Deleuze 1991, 85). This is why Bergson's concept of duration underpins a monism of time, wherein there exists only a single, universal, and impersonal time (Deleuze 1991, 78). For Bergson, the plurality of times in Einstein's theory is merely the plurality of measurements or clocks, representing a quantitative and numerical multiplicity.[14] This constitutes the crucial difference between the twin paradox and the clock paradox, a distinction that is absent, for example, in Savitt's observation:

> The root idea here is, I believe, that time, real time, is accessible to our consciousness whereas the quantity measured by clocks is some sort of derivative quantity or secondary shadow of genuine duration. I think this view is deeply mistaken. We humans are clocks, albeit not particularly good clocks compared to today's best. We measure imperfectly what they measure far more exactly. We can experience what they measure in a way that, presumably, they cannot; but what we and they are responding to is one and the same, nonetheless. (Savitt 2021, 96)

Not only are humans not merely bad clocks, but more significantly, the temporality of things cannot be reduced solely to what can be measured by good clocks. Einstein famously asserts that what Bergson intends by metaphysics is indeed a psychology. He says, there is no time of philosophers. By this, he means there is no time inherent to things apart from physical time, and philosophy must remain humble, limiting itself to claims regarding perception – a positivist account. Through Bergson(ism), philosophy refuses to surrender. For Bergson, "the consideration of this absolute motion concerns only our knowledge of the interior of things, that is, a psychology that reaches into metaphysics" (Bergson 1965, 37). This is a pivotal move that Bergson makes, not only concerning the theory of relativity but also regarding the relationship between philosophy and science in general. The introduction of the notion of metaphysics to this relationship complicates it much more than the way Einstein depicts it. As Deleuze observes, "For Bergson, science . . . demands a metaphysics - without which it would remain abstract, deprived of meaning or intuition" (Deleuze 1991, 116). Can psychology extend into metaphysics, which deals not with the interior of minds but with the interior of things? How can metaphysics supplement physics through a logic of supplementarity that deconstructs its exteriority to science?

The contrast between Einstein's and Bergson's perspectives on time is rooted in Bergson's conviction in the absolute and singular existence of duration, the duration of the universe, as opposed to Einstein's concept of plurality of times. If these two views are reconcilable, we should seek the absolute foundation of Einstein's theory of relativity, and if such a foundation does not exist, we should consider supplementing it. This foundation could entail a potential metaphysics associated with the cosmology of Einstein's theory. In a Deleuzian vein, Craig Lundy asserts, "Bergson thus did not disagree with the theory of relativity or its mathematical expression; rather he disagreed with the *interpretation* of the

[14] We revisit this notion later on when discussing Deleuze's interpretation of the Bergson-Einstein debate.

theory advanced by Einstein and the metaphysical implications surreptitiously involved" (Lundy 2018, 104). Hence, a potential outcome of the Bergson-Einstein debate could involve implementing a metaphysical modification in Einstein's theory. Regarding Bergson's understanding of metaphysics, Kügler briefly accounts for it as it appears in "Introduction to Metaphysics". Bergson bases his metaphysics on an anti-Kantian claim that our intuition has access to the real, and this access is not mediated but is absolute. As Kügler defines, "Bergson understood metaphysics as intuitive knowledge of the absolute" (Kügler 2021, 10278). What about Einstein's metaphysics? As mentioned, what is at stake here is not an existing metaphysics or, in Lundy's terms, its metaphysical implications. Rather, the question is how its notion of spacetime can provoke a new metaphysical account of reality. This implies attributing an absolute nature to the physical concept of spacetime. Let us now explore whether Gilles Deleuze's philosophy can offer us such a reconstitution.

Ascetism Deleuze's Metaphysics of Spacetime: The Unconscious of the Universe

In his reading of Bergson, Deleuze emphasizes the concept of multiplicity. In his analysis, the disparity between Bergson and Einstein lies not in the unity of the former and the multiplicity of the latter, but rather in their distinct conceptions of multiplicity. Bergson posits a virtual multiplicity of time in terms of duration, while Einstein presents an actual multiplicity of times. The former offers a metaphysical perspective by maintaining a multiplicity while not negating unity. In other words, it acknowledges material connections and durations that changes the nature of multiplicity. In contrast, Einstein's theory of relativity falls short of becoming a metaphysics because the multiplicity of times it posits lacks a material foundation; it remains purely theoretical. Here, metaphysics refers to a material ground that stands in opposition to mathematical numerability. We return back to this notion of multiplicity (which is not the multiplicity of things, but rather is the thing in itself), but before that, let us explore briefly Deleuze's theory of time in *Difference and Repetition*, where he emphasizes on the materiality of connections, durations, or in his own term, contractions.

According to Deleuze in *Difference and Repetition*, time cannot be comprehended in terms of "in itself" but rather "for itself". This implies that for the experience of time to occur, a contraction of moments is necessary. Time is not merely a succession of moments that come and go; rather, it is intricately intertwined with the faculties of imagination and memory. In the second chapter of *Difference and Repetition*, Deleuze's theory of time can be encapsulated as his move to transfer the problem of experiencing time from the realm of Bergsonian consciousness to an unconscious level. In this regard, he views time not only as something experienced by the subject but also as a force that shapes the constitution of the subject. This is why what he terms the three syntheses of time are all passive syntheses, contrasting with the notion of conscious experience as an active synthesis (not for itself, but rather for us), as seen in Kant's *Critique of Pure Reason* in the synthesis of "I think" (Deleuze 2014, 112).

What Deleuze refers to as the first synthesis of time, occurring within spontaneous imagination, is the most fundamental. It can be viewed as an elucidation of how Bergsonian intuition apprehends duration or the living present. It operates by the mechanism through which spontaneous imagination contracts "discontinuous matter", gathering together "sensibility's passing instants" (Hughes 2009, 105). The outcome is what could be termed the living present or the passage of time. This is a significant complication that Deleuze introduces to our discourse because he asserts that without a faculty capable of repetition, habit, or the contraction of instants, time itself would cease to exist. This appears to be the essence of what Bergson comprehends and Einstein overlooks. It is solely through this process of contraction that the continuity and passage of time emerge. It complicates the

relationship between the observers and their temporality, as well as the temporality within the observed frame.

Intuition refers to the passive subject – a subject that exists over there, on the outside, rather than here. Opposed to the passive synthesis of time, which corresponds to the passive subject, stands the derived linear time. This linear time is comprehensible through understanding or the active subject who asserts, "I think". According to the first synthesis, the living present is the creation of the imagination. Through imagination, it becomes possible to compress the past and future into the living present, wherein the present encompasses both preceding and anticipated moments. This is a passive synthesis because it happens *in* the subject. "Time is subjective, but in relation to the subjectivity of a passive subject" (Deleuze 2014, 94). This is partly compatible with the Bergson's theory of duration in *Time and Free Will*, which, according to some interpretations, provides a psychological account of duration (Kügler 2021, 10275). In this account, to grasp the reality of time, we must transition from the temporality of the objects of understanding to embracing the concept of duration through intuition. Deleuze's adaptation of Bergson's psychological framework involves replacing Bergson's universal consciousness (intuition) with a material unconscious (productive imagination).

The second and third syntheses build upon the first synthesis, synthesizing its products. The second synthesis is the "passive synthesis of memory" (Deleuze 2014, 105). Memory arises as the finitude of the contracting sensibility. The present passes because it isn't a presence, or a self-identical unity, but rather a multiplicity that underlies contractions. The finitude of contraction, or fatigue, gives rise to a pure past and forms a transcendental memory (Hughes 2009, 110). It is pure past because it doesn't reference a past that was once present, but rather the past that arises as the experience of time. In this sense, the actual present is pure past. The pure past is past only in relation to the idea of present, in response to those who believe there really is an existing present which is in itself present. In itself, pure past embodies time itself. The second synthesis characterizes time as the realm of reproducibility.

It is only through the third synthesis that the recognition of objects and their arrangement in linear time, ordered in terms of past, present, and future, becomes feasible. This involves a transition from a passive subject to the emergence of action and agency, which forms the basis of a relationship with the future. In Bergsonian (and Kantian) terms, it signifies a shift from passive intuition to active understanding, from perceiving time as change or duration to organizing time within the framework of space or any other measurable construct.

Through these three syntheses of time, Deleuze constructs a system of contractions that seems to complicate the concept of time dilation in relativity theory. This casts new light on discussions surrounding the twin paradox and time travel as science-fictional echoes of this theory. James Williams, in his *Gilles Deleuze's Philosophy of Time*, elucidates this system in terms of processes and dimensions, introducing the inevitability of actual time travel in a special sense distinct from science-fictional depictions:

> According to his [Deleuze's] philosophy of time any process in the present is also, in some special way, a process in the past, a moving backwards into the past. Any process in the present is also, in some special way, a skipping into the future. However, no process in the present can go back to the past as it was when the process of going back began. No process in the present can go into the future as it will be when the process of going into the future began... It is important to stress that the time travel considered is actual and not merely virtual, ideal or imaginary. Deleuze's philosophy allows for actual time travel back and forward in time and this depends upon virtual time travel, in a very special sense of virtual, for some but not all of its features. In fact, it does not only allow for time travel, it makes it inescapable. . . So even if we could use a machine

> or property of relativity or quantum mechanics to travel back or forward in time, the time we would arrive at would not be the time we aimed for as 'the past as it was' or 'the future as it will be'. (Williams 2011, 8)

This statement aptly illustrates how, within the framework of the three syntheses of time, the concept of time dilation in the theory of relativity is confined to a one-dimensional linear representation of time – a line that, akin to a spatial dimension, can be contracted or extended. In Deleuze's theory, time is (at least) three-dimensional, and contractions and extensions in one dimension overlap with those in other dimensions. These three dimensions aren't simply past, present, and future; rather, as Williams suggests, they are processes or syntheses. Past, present, and future intersect and interact through these syntheses. This system appears to contrast with Minkowski spacetime, which Einstein adopts, treating time as a fourth dimension added to the three-dimensional space. In contrast, in this framework, it is space that is derived from time.

Is this the theory of time that Einstein refers to as psychological and attributes not only to Bergson but also to all philosophical understandings of time ("there is no time of philosophers")? According to Deleuze, his discussion of the three syntheses of time does not constitute a psychology of time but rather applies to everything. Deleuze's references to the concept of habit as the motor of contraction go beyond the Humean use, extending it to an ontological level: "habit here manifests its full generality: it concerns not only the sensory-motor habits that we have (psychologically), but also, before these, the primary habits that we are; the thousands of passive syntheses of which we are organically composed" (Deleuze 2014, 98). Time does not pass to things unless they have the capacity for contraction. The passivity of synthesis, in Deleuze's terms, refers to its quality to be identical with the *a priori* contraction at the material-sensory level, as Olkowski views "contraction as a pure passion" (Olkowski 2021, 137). Contraction occurs on various levels, spanning from the physical and chemical to the biological and social. In other words, it represents the material force that unites multiplicities, giving rise to new configurations.[15] The passivity of the syntheses of time indicates that, for Deleuze, matter is far from inert.

If one juxtaposes Deleuze's concept of contraction with that of Lorentz and Einstein, it aligns more closely with Lorentz's perspective. For Deleuze, contraction pertains to material processes, rather than solely being confined to measurements as in Einstein's theory. We recall that for Lorentz, contraction represents a qualitative alteration within the moving body, contrasting with Einstein's viewpoint, where contraction arises from a particular theoretical interpretation of time measurement. In this context, Deleuze's perspective can be seen as a regression from Einstein's geometrical model back to Lorentz's approach. However, his perspective diverges from Lorentz's hypothetical explanation, as Deleuze comprehends contraction in terms of material genesis across physical, chemical, biological, and social dimensions, rendering them as the ground of the passage of time. In other words, Deleuze's philosophy, particularly in the second chapter of *Difference and Repetition*, provides a description not only of time perceived and experienced but also of time conceived and synthesized, borrowing Merleau-Ponty's terminology from *Phenomenology of Perception* (Merleau-Ponty 2005, 482).

Now, upon revisiting his theory of time, we gain a better understanding of Deleuze's direct engagement with Bergson's critique of Einstein. In *Bergsonism*, Deleuze addresses the

[15] Deleuze's materialism, rooted in Nietzsche's notion of force, also stands in opposition to realist philosophers (both old and new) who construct a static ontology centered around the concept of the field. This includes figures such as Alain Badiou, Graham Harman, and Markus Gabriel. See for example Gabriel's *Fields of Sense: A New Realist Ontology*, particularly the fifth chapter, "Domains of Objects and Fields of Sense" (Gabriel 2015, 135-157).

problem of simultaneity by exploring the multiplicity of durations in Bergson's *Duration and Simultaneity*. He endeavors to elucidate how the concept of a Riemannian qualitative multiplicity (with which Einstein was also familiar) aligns with Bergson's perspective on the unity of time. The qualitative multiplicity constitutes a virtual, rather than actual, multiplicity, making it *a priori* in relation to the actual multiplicity of things. In other words, the multiplicity in constitution, not that of recognition. Deleuze reads the Einstein-Bergson debate through the lens of these two concepts of multiplicity, virtual and actual, and articulates Bergson's critique of Einstein in these terms: "Bergson criticizes Einstein for having confused the two types of multiplicity and for having, as a result, revived the confusion of time with space" (Deleuze 1991, 80). This confusion leads Einstein to regard the measured time as the true time. What Bergson considers, and Einstein overlooks, is that when there are two moving observers and no ether, each observer has an "image" of the other which is different from the way it lives. Hence, it involves a symbolic representation of the time it perceives, rather than its actual experienced time. Here, Deleuze discerns a distinction between Bergsonian fluxes and Einsteinian systems of reference (Deleuze 1991, 83). The question is whether, for Einstein, a system of reference perceives itself as a system of reference. If so, it diminishes itself to a mere clock. And the reading of clocks holds merely symbolic value:

> what simultaneity does Einstein have in mind when he states that it varies from one system to the other? A simultaneity defined by the readings of two distant clocks. And it is true that this simultaneity is variable or relative. But precisely because its relativity expresses, not something lived or livable, but the symbolic factor of which we have just been speaking. (Deleuze 1991, 84)

Deleuze concludes that if Einstein's fundamental discovery is that time is multiplicity, he is correct. However, one must grasp the multiplicity of time in the Bergsonian sense, which is virtual multiplicity. "Being, or Time, is a *multiplicity.* But it is precisely not 'multiple'; it is One, in conformity with *its* type of multiplicity" (Deleuze 1991, 85). Thus, Deleuze endeavors to reconcile Einstein and Bergson by urging us "to give the theory of Relativity the metaphysics it lacked" (Deleuze 1991, 116). Metaphysics in this context pertains to any endeavor to perceive multiplicities as cohesive connections. For Bergson, duration or time is precisely what links multiplicities together and renders them continuous. Time is in essence metaphysical. It is not directly the subject matter of physics. Physics, particularly modern physics, offers us concepts of discreteness and discontinuity, as exemplified by the Planck constant as a fundamental factor in quantum mechanics or the discontinuity of worldlines in general relativity. The metaphysics required by these physical theories (Deleuze 1991, 117) should not be presented as merely another physical theory, but rather as its philosophical supplement, the necessary non-science of any science. This metaphysics necessitates a unity that does not exhaust the physical multiplicity. We refer here not to a metaphysics that is isolated and indifferent to physics and science in general, but rather to a metaphysics that grounds physics by providing the material syntheses for physical theoretical discontinuities. Time, which is in essence metaphysical, as Bergson and Heidegger claim, must be the non-science of science in the sense that it changes the laws of physics through a process.[16] This stands exactly in opposition with the first law of the special theory of relativity: "the laws by which the states of physical systems undergo change are not affected, whether these changes of state be referred to the one or the other of two systems in uniform translatory motion relative to each other" (Einstein 1952, 41). The metaphysics that this theory demands

[16] As Delanda asserts, "the laws of classical and relativistic physics remain invariant under a time-reversal transformation" (Delanda 2002, 83). What he refers to as a "time-reversal transformation" can be understood as enduring a process or change.

is the metaphysics of time, that which accompanies physics incessantly, while changing its laws gradually.

This elucidates Deleuze's metaphysical endeavor, which consistently intertwines with a scientific counterpart (not solely confined to the physical, but also including the mathematical, biological, etc.). Regarding the theory of relativity, one can contemplate Deleuze's (and Guattari's) metaphysics of spacetime, a metaphysical cosmology grounded, among other things, in the theory of relativity. The question of what Deleuze's metaphysics of spacetime entails cannot be fully addressed here as it encompasses a wide array of elements within his philosophy. However, I would like to present a couple of examples from his work where one might explore a metaphysics of spacetime, offering insights for future research. I conclude this essay by summarizing these two examples.

1. Deleuze's metaphysics of spacetime can be inferred from the ontology of series and singularities as depicted in *Logic of Sense*, aiming to establish a natural dynamic genesis.

The theory of general relativity constitutes a static cosmology of multiply curved spacetime. One of the renowned predictions of this theory was the existence of black holes. There persists a classical Newtonian inclination among physicists, which impedes them from regarding black holes as pure singularities and constructing the entire system based on that foundation. This same inclination leads them, particularly among popular scientists, to reduce this cosmology to the movements of celestial objects through gravitational curvature. For instance, Stephen Hawking in his famous *A Brief History of Time* writes, "In general relativity, bodies always follow straight lines in four-dimensional space-time, but they nevertheless appear to us to move along curved paths in our three-dimensional space" (Hawking 1988, 31).[17] In this context, Deleuze, in *Logic of Sense*, presents a framework of genetic series and singularities where objects are merely outcomes, normalizations, or reductions (Deleuze 2018, 39-45, 103-113).[18] Curvatures and objects belong to different levels of genesis (the transcendental field and the empirical field, respectively). Hence, objects cannot traverse through curvatures. This transition marks a shift from a static cosmology to a genetic one. This arises from the significant point that Deleuze draws from Gilbert Simondon, asserting that singularities are inherently pre-individual (Deleuze 2018, 106). In contrast with set theoretical perspectives such as Alain Badiou's ontology, wherein any single worldline of Minkowski spacetime can be viewed as an infinite set of objects or members, Deleuze's serial approach restricts things to being products of genetic series. In this regard, one can consider the formulas of relativity theory, in as much as they deal not with singularities but rather with celestial objects and their motion, in essence arithmetical, while Deleuze's serial perspective necessitates differential calculus (see Parsa 2023, 64-66). This leads to the notion of reconstructing general relativity, wherein the focus shifts from moving objects to pure genetic curvatures and singularities, as found in Bernard Riemann's differential geometry, particularly when combined with Albert Lautman's genetic mathematics.

[17] Einstein himself, in "The Electrodynamics of Moving Bodies", insists that his theory is a theory of rigid bodies: "The theory to be developed is based – like aII electrodynamics – on the kinematics of the rigid body, since the
assertions of any such theory have to do with the relationships between rigid bodies (systems of co-ordinates), clocks, and electromagnetic processes" (Einstein 1952, 38).

[18] "…we know of the existence and distribution of singular points before we know their nature" (Deleuze 2018, 107).

The notion of dynamic genesis emerges in *Logic of Sense* within the context of psychoanalysis. As I mentioned in my commentary on *Logic of Sense*, this arises from the observation that logic and ontology possess only a static and incorporeal approach to the notion of genesis, whereas psychoanalysis has the capability to materialize this notion (Parsa 2023, 242). In the context of *Logic of Sense*, psychoanalysis is privileged for giving an account of unconscious that gives rise to the material generation of language and thought. One might consider a return from psychoanalysis to logic and ontology as a continuation of the exploration initiated in *Logic of Sense*, envisioning the material genesis of nature as the ultimate unconscious. This would signify a transformation of Bergsonian metaphysics that extends consciousness to everywhere: a materialist metaphysics, exploring the unconscious of the universe.

2. Deleuze and Guattari's metaphysics of spacetime can be delineated through the concept of chaos in *What is Philosophy?*

Deleuze and Guattari's metaphysics of spacetime is expounded upon in *What is Philosophy?* in terms of different ways through which science and philosophy confront chaos. Deleuze and Guattari define chaos as a concept that encompasses all other concepts, rendering it nonsensical. Of course, they are careful not to fall into chaos. Their logic is not a logic of nonsense. However, nonsense always remains in the background as the genetic element. Sense (the subject of metaphysics) and law (the subject of practical philosophy and physics) emerge when the absoluteness and infinity of chaos are relativized, giving birth to Chaoids or daughters of chaos: art, science, and philosophy (Deleuze and Guattari 1994, 208). Chaos is the great mother, initiating "the infinite speed of birth and disappearance", akin to a field of quantum fluctuations (Deleuze and Guattari 1994, 118). In chaos, all speeds are infinite in relation to each other. Philosophically, the cosmos emerges through the construction of a plane of consistency, while scientifically, it arises through the establishment of a system of reference or coordination. Through this division, we can discern between fundamental absolutism and relativity: "As whole it is absolute, but insofar as it is fragmentary it is relative. It is *infinite through its surveyor its speed but finite through its movement that traces the contour of its components*" (Deleuze and Guattari 1994, 21). Now, the disparity between philosophy and science lies in philosophy's endeavor to reach the plane of consistency while preserving the notion of infinite speed. Conversely, science slows down this speed by establishing a function, maintaining a constant velocity to construct a coordinate system. This is how, in *What is Philosophy?*, Deleuze and Guattari recognize the Newtonian core of Einstein's theory when they write that "Newton is derived from Einstein" (Deleuze and Guattari 1994, 124). Although Einstein rejects a reference system or coordinate system, he retains the primary function of coordination or referencing.

Thus, chaos furnishes science with its counterpart, its metaphysical other, the virtual, which unifies the actual disparities: "If equilibrium attractors (fixed points, limit cycles, cores) express science's struggle with chaos, strange attractors reveal its profound attraction to chaos, as well as the constitution of a chaosmos internal to modern science" (Deleuze and Guattari 1994, 206). This also sheds light on Deleuze's interpretation of the Einstein-Bergson debate in *Bergsonism*, where he criticizes Einstein for failing to apprehend the virtual aspect that Bergson discusses and urges us to explore the metaphysics of the theory of relativity. This metaphysics constitutes the virtual chaos.

Conclusion

Gilles Deleuze's philosophy offers a metaphysics of time, a concept introduced by Heidegger and Bergson in contrast to the physics of time. While Einstein's theory of relativity revolutionized the physical understanding of time, it does not aid in the transition toward

this metaphysical perspective. On the other hand, the metaphysical implications of relativity theory, as a philosophical supplement to the physical theory, can be explored through Deleuze's work (and Deleuze and Guattari's) in dialogue with the physical theory. What Deleuze elaborates in Bergson's critique of Einstein is the emphasis on the virtual nature of the multiplicity of time, contrasting it with Einstein's understanding of multiple times in terms of actuality. Through the logic of supplementarity governing the relationship between the virtual and the actual, the metaphysical absolutism implied by Bergson's notion of duration could be reconciled with physical relativism.

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