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DOCTORAL DISSERTATION

Henri Bergson and the Theory of Relativity: Philosophical Critique of the Concept of Time in 20th-Century Physics

Work written under the supervision of

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and

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Abbreviations

TFW Bergson, H., *Time and Free Will. An Essay on the Immediate Data of Consciousness*, trans. F.L. Pogson (Mineola, New York: Dover Publications, 2001).

MM Bergson, H., *Matter and memory: Essay on the Relation between Body and Mind*, trans. N.M. Paul, W.S. Palmer (New York: Zone Books, 1991).

CE Bergson, H., *Creative Evolution*, trans. A. Mitchell (New York: Random House, 1944).

DS Bergson, H., *Duration and Simultaneity: with reference to Einstein's Theory*, trans. L. Jacobson (New York: The Bobbs-Merrill Company, 1965).

CM Bergson, H., *The Creative Mind*, trans. M.L. Andison (New York: Philosophical Library, 1946).

Introduction

This thesis examines the development of the concept of time in Henri Bergson's philosophy, both throughout his works and in relation to the emergence of the theory of relativity in the early 20th century. Once complementary, science and philosophy underwent profound transformations during this period. The physical notion of absolute time was replaced by the concept of multiple relative times, while mechanical approaches in philosophy gave way to non-deterministic frameworks. Ultimately, the two disciplines diverged, exemplified by the contrast between Bergson's concept of duration and Einstein's theory of relativity. This study traces the origins of this divergence, exploring the possibility—grounded in Bergson's thought—of reconciling philosophy and physics on the subject of time.

This study assesses whether Bergson's argument, particularly his critique of Einstein's concept of time, remains valid or should instead be regarded as outdated from a contemporary perspective, including in light of the current formulation of the theory of relativity. I contend that Bergson's principal critique of the concept of time in relativity theory—as articulated both in his debate with Einstein and in *Duration and Simultaneity*—retains its relevance. I argue that Bergson was justified in challenging Einstein's worldview, particularly regarding the role and nature of time within it, and in asserting that philosophy should contribute to shaping our understanding of time.

Although not without its flaws, Bergson's critique of the physical conception of time in the early 20th century remains compelling, particularly as some scholars view the Bergson-Einstein debate as a pivotal moment in the historical divergence between philosophy and science (cf. Sinclair 2022; Canales 2015, pp. 29, 32, 352). Revisiting Bergson's critique offers an opportunity to trace the roots of this divide and to reconsider how the relationship between physics and philosophy might be restored—a relationship that, in the early 20th century, was so integrated that philosophers often collaborated closely with physicists, many of whom embraced the dual identity of philosopher-scientists.

This thesis contributes to the studies of Bergson's philosophy of time by emphasising the role of simultaneity and, consequently, the question of coexistence. Furthermore, this study argues that while duration represents a philosophical phenomenon of elapsing time—encompassing concepts such as change and memory—the notion of real time refers to physical time, which is both measurable and experienced. Unlike most studies on Bergson's philosophy, which primarily focus on time as *duration* as it develops throughout his works—from *Time and Free Will* to *Creative Evolution*, and occasionally including *Two Sources of Morality and Religion*—this thesis focuses on the concept of real time in relation to duration, as developed in *Duration and Simultaneity*. It further argues that duration and real time together form a single, universal time—a hypothesis Bergson introduced in his earlier works but fully developed only in *Duration and Simultaneity*.

Accordingly, this thesis emphasises the significance of *Duration and Simultaneity*, a work often overlooked in discussions of Bergson's philosophy[1]. Contrary to the prevailing scholarly view, which regards the book as a failed attempt to criticise Einstein's theory, I argue that in addition to contributing to Bergson's philosophy of physics, *Duration and Simultaneity* represents a further development of his philosophy of time[2]. Additionally, this study seeks to dispel and clarify the misunderstandings and misinterpretations surrounding *Duration and Simultaneity* since its initial publication. These misconceptions are evident, for instance, in the fact that Wahl, Gouhier, Guitton, and Jankélévitch felt compelled to justify their decision to republish the book[3].

This thesis introduces a novel approach to examining Bergson's critique of relativity theory by framing it as an integral aspect of his philosophy of science. I argue that Bergson's philosophy of science can be characterised as "engaged"[4] due to three key features. First, it reflects Bergson's commitment to engaging with the sciences by contributing to their development and addressing specific scientific questions, such as those concerning evolution, memory, or physical time. In this respect, Bergson transcended the later dominant conception of the philosophy of science as a detached and generalised methodology[5]. The second feature of Bergson's engaged philosophy of science lies in the stance he believed philosophy should adopt in relation to the sciences: a balance of confrontation and cooperation, whereby philosophy actively engages with scientific inquiry. Finally, describing Bergson's philosophy of science as "engaged" highlights its emphasis on engaging with the content of concrete scientific theories rather than approaching science through the lens of formal logic or linguistic precision, akin to analytic philosophy of science[6]. In this sense,

[1] For example, see Guerlack (2006), Gunn (2002), Kebede (2019), Lapoujade (2018), Massey (2015), Pearson (2018), Sinclair (2020), Vrahimis (2022).

[2] Although Frédéric Worms acknowledged the significance of *Duration and Simultaneity* for the evolution of Bergson's conception of time, he did not elaborate further (see Worms 2009, p. 13).

[3] See Wahl, Gouhier, Guitton, Jankélévitch (1999). During even argues that every new edition of *Duration and Simultaneity* is accompanied by some warnings or notes to readers (During 2009, p. 219).

[4] I use this term in a sense distinct from its usage in the literature, which denotes solely socially engaged philosophers of science (see Plaisance & Elliott 2021).

[5] For a more detailed discussion on the subject, see Kitcher (2023, pp. 57–107).

[6] The tradition of analytic philosophy of science can be traced back to the Vienna Circle (Zammito 2004, p. 3).

Bergson's engaged approach could serve as a valuable reference for scholars seeking alternatives to the analytical methods that currently shape the philosophy of science[7].

Bergson's philosophy of science offers valuable insights into the concept of time and can make a significant contribution to contemporary philosophy. One of the most notable aspects of Bergson's thought, articulated primarily in *Duration and Simultaneity*, is his attempt to develop a philosophical conception of time grounded in scientific knowledge, particularly in physics[8]. Although Bergson has not traditionally been recognised as a philosopher of science, this thesis argues he should be. In particular, his effort to confront the emerging theory of relativity represents an original and exceptional model for practising the philosophy of science. Implementing his approach could undoubtedly be regarded as a (re)turn in the philosophy of science. However, this thesis only outlines this return, which otherwise merits further in-depth study.

Additionally, this study provides a historical context for Bergson's critique of the theory of relativity by focusing on the circumstances surrounding the publication and subsequent republication of *Duration and Simultaneity*, and the events leading up to and following the Einstein-Bergson encounter. This approach seeks to facilitate a more nuanced understanding of Bergson's argument, the precise target of his criticism, and his overarching purpose. Furthermore, by addressing this topic in this way, the study enables a reassessment of Bergson's critique, as—in my view—only through careful consideration of historical data can his criticism be reliably reconstructed and accurately interpreted[9].

While analysing existing studies on Bergsonian philosophy, I concluded that the critique of relativity theory and Bergson's philosophy of physics, in general, remains underdeveloped compared to analyses of his broader philosophical ideas. This may be because much of his physics reflection is contained in *Duration and Simultaneity*[10]. However, that is not to say that no literature exists on the subject; scholars such as Milič Čapek, the late Pete A.Y. Gunter, and, more recently, Élie During have contributed significantly to this area, and this thesis builds upon their work.

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[7] An example of this approach can be found in Anjum & Rocca (2024). While the authors adopt a broader perspective on the relationship between science and philosophy, they share Bergson's interest in "critical reflections about the philosophical foundations of science" (Anjum & Rocca, p. vii).

[8] Notable, Bergson did not address quantum physics. However, he could not have done it, as quantum physics had not formed a coherent theory until the 1930s–40s. Nevertheless, some scholars argue that Bergson's philosophy aligns with quantum theory, particularly its indeterministic nature (cf. de Broglie 1969, Lahav 1991, Murphy 1999, Dolbeault 2012).

[9] The historical approach is particularly vital, as Bergson's critics frequently overlook this context, leading to unwarranted conclusions (see, for example, Heller 2006).

[10] Incidentally, when I applied for a grant from a Polish national institution, an anonymous reviewer noted that Bergson's confrontation with the theory of relativity remains a relatively little-known aspect of his philosophy. This is particularly true in Poland, where *Duration and Simultaneity* has yet to be translated.

Nonetheless, Bergson's philosophy of physics remains less well-known than, for example, his concept of memory, his ideas on evolution, or his arguments concerning free will and freedom. This thesis seeks to contribute to the still underexplored field of Bergson's philosophy of physics.

The recent surge in global interest in Bergson's philosophy has also influenced the development of this work. In 2019, a conference in L'Aquila brought together philosophers and physicists to revisit the issues raised nearly a century earlier by Bergson and Einstein. That same year, the Global Bergsonism Research Project was initiated, organising conferences and workshops dedicated to Bergson's philosophy. This work has benefited from collaboration with the project's organisers; during one of its meetings, I presented research findings related primarily to topics explored in the first chapter of this study. This study draws upon events I organised or participated in during the preparation of this thesis, most notably the conference *Time. The Bergson-Einstein debate 100 years later*, held on 4–5 April 2022 to commemorate the centenary of Bergson's encounter with Einstein[11]. There were also national events related to Bergson, albeit on a smaller scale[12].

This dissertation is divided into four parts and ten chapters, each of which is further subdivided into detailed sections. The first part examines Bergson's critical stance towards pre-relativistic science during a period when physical theories—most notably Newton's—profoundly influenced both scientific discourse and common worldviews. It argues that Bergson's contributions to the philosophy of physics extend beyond *Duration and Simultaneity*, encompassing insights found in his earlier works as well.

Accordingly, the first chapter juxtaposes Bergson's concept of real duration with the conception of time found in pre-relativistic physics. In doing so, it explores the foundations of Bergson's philosophy of time and traces the origins of his philosophy of science through his critique of pre-relativistic physics. The second chapter addresses the transformation of the scientific worldview at the beginning of the 20th century, marked by Einstein's introduction of the theory of relativity. It outlines the foundations of this new physical theory and highlights the ways in which it departs from the Newtonian framework and worldview.

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[11] The conference featured prominent scholars such as Jimena Canales, Élie During, Mark Sinclair, and Keith Robinson. More information is available at https://einsteinbergson.umk.pl/pages/main_page/.

[12] In 2023, during the Twelfth Polish Congress of Philosophy, I organised a colloquium on Bergson's philosophy titled *Henri Bergson: A Forgotten Philosopher. The Revival of Bergsonism in the 21st Century*. The event explored a wide range of topics within Bergson's philosophy, catering to diverse interests and encouraging broader engagement. The colloquium programme is available at https://www.zjazdfilozoficzny.uni.lodz.pl/en/.

The second part situates Bergson's critique of relativity theory within the broader context of his interactions with Einstein—including the circumstances surrounding the publication of his book on relativity—and the reception of the theory at the time, offering a historically informed interpretation of Bergson's thought.

Within this part, the third chapter focuses on the context in which *Duration and Simultaneity* was written and published, investigating the extent to which Bergson can be regarded as a philosopher of science. Through this inquiry, the chapter examines Bergson's role not only as a philosopher of science in general but also as a philosopher of physics in particular, thereby challenging dominant trends in the philosophy of science that have prevailed since the latter half of the 20th century. The fourth chapter subsequently turns to the exchange between Bergson and Einstein shortly before the book's publication. The analysis of the circumstances surrounding this debate, as well as the composition of *Duration and Simultaneity*, underscores the interdisciplinary nature of this study, which combines philosophical reflection with a historically grounded perspective on physics. As such, this work spans the domains of the history of philosophy and science as well as the history and philosophy of ideas. Just as Bergson's thought, in its ongoing development, resists straightforward categorisation within a single intellectual framework, so too does this study seek to interpret his ideas by navigating and integrating multiple modes of inquiry.

The third part addresses the core of Bergson's confrontation with the theory of relativity, presenting his reflections on the physics and mathematics underpinning the theory. It may be described as the most explicitly "physical" part of the thesis, containing its most detailed scientific descriptions and analyses[13]. Moreover, this examination lays the groundwork for the philosophical investigations into the concept of physical time that follow in the next part.

Accordingly, the fifth chapter examines the inadequacy of early 20th-century physical descriptions of reality—such as the concept of ether or the Fitzgerald-Lorentz contraction theory—through the lens of Bergson's notion of "half-relativity". This examination facilitates a deeper engagement with the principle of reciprocity, a defining feature of relativity theory, which Bergson critically examined in his study of the subject. The sixth chapter then turns to Einstein's revolutionary propositions, focusing on relativistic effects concerning time and the emergence of the concept of space-time, alongside a brief presentation of light figures. The chapter aims to evaluate Bergson's interpretation of these propositions and their broader philosophical implications. Finally, the seventh chapter examines the issue of acceleration and the famous twin paradox, as discussed by

[13] The physical input was made possible through collaboration with one of the thesis supervisors, a physicist.

Bergson in *Duration and Simultaneity*, raising the question of whether these issues properly belong to the special or general theory of relativity. It traces the origins of the paradox and critically engages with Bergson's analysis, drawing attention to his significant error in interpreting time dilation.

The fourth part, building on the discussions of the preceding sections, delves into the nature of philosophical and physical time, drawing upon the physical data analysed in the previous part. It offers a novel perspective on Bergson's philosophy of time by re-examining his confrontation with the theory of relativity. This part not only provides an in-depth exploration of the notion of real time as articulated in *Duration and Simultaneity*, but also investigates Bergson's hypothesis of universal time—first introduced in his earlier works—in relation to the space-time geometry of relativity theory, with particular emphasis on the problems of simultaneity and coexistence.

Within this part, the eighth chapter considers the new metaphysical framework that Bergson sought to bring to the theory of relativity. It begins by examining what Bergson perceived as the limitations of Einstein's worldview and the absence of an adequate metaphysical foundation for his theory. It then presents Bergson's reflections aimed at philosophically enriching the conceptual basis of relativity. Subsequently, the ninth chapter explores the significance of the concept of duration in contrast to the notion of time as conceived in physics. It offers the first comprehensive analysis of Bergson's formulation of real time as outlined in *Duration and Simultaneity*[14]. This chapter also traces the development of the concept of duration as it evolves throughout Bergson's engagement with relativity theory. Finally, the tenth chapter addresses the fundamental problem of coexistence through an analysis of simultaneity—an essential component of Bergson's philosophy of time that only assumed central importance in the context of his critique of the theory of relativity.

Beyond being a philosopher of science, Bergson is primarily a philosopher of time. Accordingly, this thesis provides an in-depth study of Bergson's philosophy of time, with a particular focus on the interplay between duration and physical time. These two lines of interpretation are interwoven throughout the thesis: Bergson's critique of the theory of relativity revolves around the question of time, while his exploration of time incorporates considerations related to physical theory. The two are inseparable: Bergson's philosophy of physics cannot be

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[14] While the existing literature recognises the distinctiveness of *real time* compared to Bergson's earlier concept of duration, none offers a comprehensive study of the concept of real time itself.

understood apart from his philosophy of time. Consequently, this study examines the temporal dimension of Bergson's analyses across all ten chapters.

The initial analyses provide an overview of Bergson's philosophy of time as duration, examining its relationship with notions such as space, motion, memory, and intuition. This discussion lays the groundwork for the final comprehensive analysis of duration in relation to his critique of relativity theory. The thesis thus begins by exploring Bergson's philosophy of time, gradually introducing his evolving philosophy of science, and culminating in *Duration and Simultaneity*, which serves as the foundation for discussions in subsequent chapters. The final part revisits Bergson's philosophy of time, synthesising insights from earlier discussions and demonstrating that the philosophy of time functions as both the starting point and ultimate aim of his thought. While Bergson's philosophical method involves a critical engagement with science, his primary objective is to construct a coherent philosophy of time. At the same time, this method grounds his concept of time as one intrinsically connected to the physical world and informed by a scientific understanding of reality.

In the extensive literature on Bergson's philosophy, only a few authors have directly addressed the issues raised in this thesis. Among them, Czech-American philosopher Milič Čapek stands out for his exploration of Bergson's philosophy of physics, particularly in his book *Bergson and Modern Physics* (Čapek 1971). Čapek examines Bergson's theory of knowledge, the concept of duration, and his relationship to contemporary physics, including both relativity and quantum theory. However, given the book's broad scope—ranging from what might be now called Bergson's philosophy of biology (cf. Posteraro 2022, p. 3) to Russell's critique and Bergson's relationship with such figures as Boutroux, Bohm, de Broglie, and Whitehead—Čapek's treatment consists of rather general overview. While the title suggests a focus on physics, the book addresses an array of subjects beyond this area, including, for example, biology. Even in its discussion of physics, Čapek covers so many themes that the analysis lacks depth in places, particularly regarding Bergson's critique of time in relativity theory, which forms the core focus of this thesis.

Building on Čapek's analysis, this study incorporates recent developments in both philosophy and the history of science. For instance, it examines the distinctions between the pre-relativistic worldview and its physics, particularly regarding the three absolutes: time, space, and motion. While the pre-relativistic perspective included concepts of absolute space and motion, these were not rooted in Newtonian physics, contrary to what Čapek indicates. Accordingly, this thesis argues that Einstein's work revolutionised only the concept of time, leaving the ideas of space and motion largely unaffected. Additionally, with recent literature reassessing Bergson's ideas, this thesis incorporates more recent publications, such as the critical edition of *Duration and Simultaneity*, offering an updated perspective on his philosophy of physics, building on and expanding upon Čapek's approach.

Pete A.Y. Gunter is another key figure in the study of Bergson's philosophy of physics. He published *Bergson and the Evolution of Physics* (Gunter 1969), a collection of articles by various authors on Bergson's philosophy of physics. This work notably addresses the 1922 Einstein-Bergson debate and includes a translation of Bergson's dialogue with André Metz on the critique of relativity theory. Unlike Gunter's book, this thesis' subject matter is focused exclusively on Bergson's critique of relativity, excluding some topics covered in *Bergson and the Evolution of Physics*, such as Bergson's connections to quantum physics. However, Gunter's inclusion of English translations of pivotal excerpts related to Bergson's philosophy of physics made his book a valuable resource for this dissertation.

In 1987, Gunter edited *Bergson and Modern Thought. Towards a Unified Science* (Papanicolaou & Gunter 2016), which primarily explores psychology and epistemology while addressing physics largely through the lens of quantum theory. More recently, his 2023 work, *Getting Bergson Straight: The Contributions of Intuition to the Sciences*, provides a comprehensive account of Bergson's contributions across disciplines, from physics to neuroscience. One chapter focuses on Bergson's engagement with the theory of relativity, analysing the relationship between Bergson's and Einstein's ideas and offering insights into the twin paradox. While Gunter's studies include significant aspects of Bergson's critique of relativity, their broader scope prevents exhaustive analysis. This thesis complements Gunter's work by concentrating specifically on Bergson's critique of relativity theory and addressing unresolved issues, such as an inadequate framing of absolute space and motion in Newtonian physics.

Élie During's works are indispensable for understanding Bergson's critique of relativity theory, particularly his critical edition of *Duration and Simultaneity* (During 2009), which has been a starting point for this thesis. During offers a novel reading of Bergson's critique, providing meticulous analyses of the text by explaining certain parts while criticising others. However, this thesis diverges from During's work by extending beyond the text of *Duration and Simultaneity* to provide a broader study of Bergson's critique of the theory of relativity.

In addition to his critical edition, During has published numerous influential articles on Bergson's philosophy of physics, addressing topics such as the twin paradox (2020a, 2014), simultaneity and coexistence (2023, 2018), space-time (2012, 2020b), the Bergson-Einstein debate (2022b, 2009), and even Bergson's concept of the cinematograph (2015, 2012b). His comparative studies include Bergson's philosophy alongside that of Whitehead (2008a, 2007b) and Bachelard (2008b).

Notably, During has also extended Bergson's philosophy in innovative directions. In collaboration with Paul-Antoine Miquel, he emphasised a Bergson-inspired approach to philosophy, identifying as a "Bergsonian" (During & Miquel 2020). While During often interprets Bergson's critique through the lens of a philosophy of time (c.f., During 2023), this thesis argues that Bergson's critique can also be seen as a groundbreaking contribution to the philosophy of science. Moreover, this study provides historical context and an interdisciplinary approach, as previously described.

Historians, as well as philosophers, have shown interest in the Bergson-Einstein debate. In 2015, Jimena Canales published *The Physicist and The Philosopher: Einstein, Bergson, and the Debate that Changed Our Understanding of Time*, a detailed account of Bergson's 1922 encounter with Einstein. Canales examines the historical context surrounding the emergence of relativity and the public reception of Bergson's ideas. However, her work does not delve deeply into Bergson's philosophical critique of Einstein's theory as presented in *Duration and Simultaneity*. This thesis addresses that gap by offering a detailed analysis of Bergson's arguments and evaluating their contemporary relevance, an area beyond Canales' primarily historical focus.

Another relevant publication is *Einstein vs. Bergson*, edited by Alessandra Campo and Simone Gozzano (Campo & Gozzano 2022). This collection of essays, written by philosophers and physicists, provides diverse perspectives on the concept of time and the Bergson-Einstein debate. While informative, the volume lacks the coherence of a unified study, which this thesis seeks to offer. Although this study also addresses the Bergson-Einstein debate, it foregrounds Bergson's voice by focusing specifically on his critique of relativity as presented in *Duration and Simultaneity*.

Several monographs discuss Bergson's critique of relativity within broader analyses of his philosophy, such as Keith Ansell Pearson's *Philosophy and the Adventure of the Virtual. Bergson and the time of life* (Pearson 2002), Laurens Landeweerd's *Time, Life and Memory. Bergson and Contemporary Science* (Landeweerd 2021), and Adam Lovasz's *Updating Bergson. A Philosophy of the Enduring Present* (Lovasz 2021).

Pearson examines Bergson's critique of relativity in the second chapter, analysing it through the concepts of virtuality and the cinematographic model of reality framed by Deleuze's interpretation. Unlike *Philosophy and the Adventure of the Virtual*, this thesis does not limit its analysis to the concept of virtuality, nor focuses exclusively on the Deleuzean reading of Bergson's critique of relativity. Instead, this study addresses a variety of issues related to the concept of time in Bergson's philosophy, such as simultaneity and coexistence, and engages with other interpretations of his critique of Einstein's theory.

Landeweerd's work, which focuses on Bergson's philosophy in the context of contemporary science, examines Bergson's philosophy of physics in the third chapter, "Time and Life. Bergson and Physics". He discusses pre-relativistic concepts of time, causality, and time symmetry, drawing on Canales' work to present the Bergson-Einstein debate. He also addresses the evolution of the concept of time at the beginning of the 20th century and its depiction in quantum physics. However, the chapter does not evaluate Bergson's critique expressed in *Duration and Simultaneity*, the central focus of this thesis.

Similarly, Lovasz, in the second chapter of his book, "Completing Relativity", emphasises defending Bergson rather than systematically presenting his critique of relativity. Lovasz focuses on Bergson's discussions with Einstein and Metz, referencing Langevin's twin paradox and Einstein's arguments, but does not reassess the validity of Bergson's concept of time in physics. While these works provide valuable insights, they do not treat Bergson's critique of relativity as a standalone subject. This thesis fills that gap by directly addressing Bergson's arguments contained in *Duration and Simultaneity*.

Another book that dedicates an entire chapter to Bergson's "connections" to science is Alan Sokal and Jean Bricmont's *Impostures Intellectuelles* (Sokal & Bricmont 1997). Interestingly, the chapter on Bergson and his "successors", titled *Un regard sur l'histoire des rapports entre science et philosophie : Bergson et ses successeurs*, appears only in the original French version and not in its translations. Sokal and Bricmont present the basic principles and implications of the theory of relativity in an accessible way, covering topics such as Galileo's principle of relativity, the Lorentz transformation formulae, the postulate of the constant speed of light, the breakdown of simultaneity, the twin paradox, and the lack of reciprocity in accelerated systems.

However, their discussion of Bergson's position is inadequate. For instance, they misinterpret Bergson's notion of intuition, attributing to him a view that contradicts his actual explanation of the term[15]. While this thesis does not provide a detailed rebuttal of Sokal and Bricmont's criticism, it addresses key aspects of Bergson's critique of relativity that they misrepresent. These include the essence of Bergson's supposed error, his affirmation of Einstein's

[15] In their book, Sokal and Bricmont argue that intuition is linked to accumulated life experience and theoretical reflection (Sokal & Bricmont 1997, p. 253). This view contradicts Bergson's concept of intuition, a point explored in the first chapter of this thesis (cf. pp. 23–25).

fundamental assumptions of the nonexistence of the ether and the constant speed of light, and the historical context of his critique.

Some Bergson scholars, such as Lacey (1999) and Kreps (2015), briefly touch on his critique of the theory of relativity, dedicating only a few pages to the topic. However, they do not treat this critique as a distinct subject deserving of in-depth examination, nor as a significant component of Bergson's philosophy of physics. In contrast, this thesis argues that Bergson's critique of relativity is a crucial aspect of his philosophy and aims to establish it as an indispensable part of his philosophy of time.

Several articles by various authors explore different aspects of Bergson's critique of relativity theory. Notable contributions include Jean Gayon's work on Bergson's attitude towards science and the philosophy of science (Gayon 2005, Gayon 2007) and Susan Guerlac's analysis of Bergson's hypothesis of universal time (Guerlac 2020). Some articles specifically evaluate the soundness of Bergson's arguments in his debate with Einstein, such as those by Kügler (2021), Savitt (2021), and Robinson's (2022) response to both. Other significant contributions include works by Lévy-Leblond (2007), Durie (1999), Unnikrishnan (2020), Scott (2006), Murphy (1999), Latour (2011), Holsinger Sherman (2020), De Saint-Ours (2003), Lane Craig (2016), and Fradet (2012). Additionally, several articles examine the broader relationship between Bergson's philosophy and science, including those by Worms (2005), Stapp (2016), and Riggio (2016).

Polish sources on Bergson's critique of relativity are particularly scarce. During the 20th century, several scholars specialised in Bergson's philosophy, both during his lifetime[16] and following a revival of interest in his ideas in the late 20th century[17]. However, in recent years, only a handful of Polish scholars have actively engaged with the French philosopher's thought[18]. Notably, none of these studies have focused on Bergson's philosophical confrontation with Einstein. Apart from Michał Heller's brief article (Heller 2006), which adopts a critical stance similar to that of Sokal and Bricmont, only a few references to this aspect of Bergson's philosophy appear in

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16 Among those who have discussed Bergson's thought are Bornstein (1913), Dawid (1913), Mysłakowski (1923), Romanowski (1929), and Zawirski (1936). Other noteworthy publications include Roman Ingarden's PhD thesis, published in 1918 and translated into Polish in 1963 (Ingarden 1963), and the memoirs of Bergson's lectures by Helena Konczewska (1912–1914), published in 2008 (Konczewska 2008).

17 The most influential publications on Bergson's philosophy from that period included Borzym (1984), Bańka (1985), Kołakowski (2008, first published in 1985), Kotowicz (1991), Kulczycki (1996), Weksler-Waszkinel (1986), Wojnar (1985), and Skarga (2014, first published in 1982). For a detailed description of the Polish reception of Bergson's philosophy, see Borzym (1984).

18 The most notable works include Kostyło (2010), Kremplewska (2017), Leszczyński (2014), Maj (2008), Orbik (2017), Pezdek (2010), Ples-Bęben (2013), Strzelecki (2013), and Walerich (2022). For a summary of Bergson's reception in Poland, see Kuszmiruk (2025).

works by Skarga (2014), Zawirski (1936), and Orbik (2017). This limited interest may reflect the broader reception of Bergson's philosophy in Poland, as discussed in Stanisław Borzym's monograph (1984). In contrast, this study reexamines Bergson's philosophy of physics within the philosophy of science, offering a novel perspective on his critique of relativity beyond the prevailing interpretations to date. Therefore, it continues the Polish tradition of interest in Bergson's philosophy, expanding it to include themes related to his philosophy of physics.

Part I

Bergson and Pre-Relativistic Science

Bergson developed his theory of time as duration within the framework of pre-relativistic science, maintaining a consistent engagement with scientific developments throughout his philosophical career. Scientific ideas played a significant role in shaping his thought, and his major works emerged from sustained reflection on specific scientific questions. While he drew on insights from contemporary science, Bergson remained critical of certain prevailing theories—particularly Newtonian physics—which, he argued, misconstrued time by reducing it to spatial terms. In contrast, his philosophy insisted on conceiving time as qualitatively distinct from space, while remaining grounded in empirical reality.

Bergson's critique of the scientific worldview that preceded relativity contributed to a broader re-evaluation of time and motion in early 20th-century physics. By emphasising the heterogeneity and irreducibility of lived time, he directly challenged the notion of absolute time that had dominated classical mechanics. Although he was critical of pre-relativistic science, Bergson acknowledged certain foundational elements of Einstein's framework, such as the rejection of the ether and the constancy of the speed of light—both core principles of modern physics.

This part of the thesis begins by outlining Bergson's conception of duration and his critique of the mechanistic notion of time within Newtonian physics. It then turns to the revolutionary shift brought about by the theory of relativity, setting the stage for a detailed analysis of Bergson's engagement with Einstein's theory in *Duration and Simultaneity*. To fully grasp the philosophical and scientific stakes of this engagement, the discussion also revisits the intellectual context of Bergson's earlier works (*Time and Free Will*, *Matter and Memory*, and *Creative Evolution*), which laid the conceptual foundations for his later reflections on real time.

By tracing the development of Bergson's philosophy of time alongside major transformations in physics—from Newtonian mechanics to Einsteinian relativity—this part provides the essential groundwork for the critique of relativity theory undertaken in the chapters that follow. It clarifies the philosophical implications of the shift from absolute to relative time and prepares the way for evaluating Bergson's alternative conception of universal time within the context of modern scientific thought.

Chapter 1. Bergson's Real Duration and Physical Time

Time—arguably the most fundamental concept in Bergson's philosophy—forms the foundation for many of his key ideas, beginning with *Time and Free Will*. Throughout his works, Bergson argued that our perception of time conditions other essential aspects of reality, including movement, change, and even the concept of the body. He maintained that many enduring philosophical problems stem from a failure to grasp time's heterogeneous, qualitative nature (cf. Bergson 2019, p. 55). Above all, Bergson sought to correct what he saw as a long-standing neglect and misrepresentation of time by both philosophers and physicists throughout the history of thought.

At the outset of his academic career, Bergson entered a climate steeped in determinism[19]. Despite the efforts of French spiritualists such as Émile Boutroux, mechanistic conceptions of the universe—rooted in Newtonian physics and Cartesian philosophy—remained dominant. Reality was widely assumed to be quantifiable, fully describable through mathematical equations, with motion defined by spatial displacements and the body conceived as a kind of machine (cf. Guerlac 2006, p. 18). Challenging these assumptions was a formidable challenge, yet Bergson aimed to reframe our understanding of reality *sub specie durationis*—from the perspective of lived time.

From the outset, Bergson considered sustained engagement with science indispensable to philosophy. He insisted that philosophy should not merely draw from "empirical data"[20] but actively engage with scientific advancements to achieve a deeper understanding of reality. His major works emerged through close reflection on developments in fields such as physics, biology, psychiatry, and sociology. As he claimed in Creative Evolution, "no philosophy, not even positivism, has placed [positive science] so high" (CM, p. 78). Before publishing each work, Bergson undertook extensive research—ranging from studies of memory disorders to the philosophical implications of emerging physical theories—allowing him to critique prevailing assumptions in both philosophy and science.

Bergson's scientific orientation is all the more striking given his early enthusiasm for mathematics, which he once regarded as the most reliable source of knowledge. His keen interest in physics and biology shaped his initial commitment to mechanistic philosophies, particularly those of Herbert Spencer. In a letter to William James, he admitted: "I had remained completely steeped in the mechanistic theories to which I had been introduced very early on by the reading of Herbert

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[19] As Susan Guerlac notes, "The universe could confidently be compared to a smoothly functioning machine" (Guerlac 2006, p. 18).

[20] These data were not solely empirical, as Bergson, like James, argued that knowledge extends beyond sense data (Barnard 2011, p. 41).

Spencer" (Bergson 2002, p. 362). Initially aspiring to become a philosopher of science, Bergson grew disillusioned with frameworks that treated time as homogeneous, measurable, and spatialised.

In the same letter, he confessed: "It was the analysis of the notion of time, such as it appears in mechanics or physics, which revolutionised all of my ideas. I realised, to my great amazement, that scientific time has no *duration*, […] and that positive science essentially consists in the elimination of duration" (Bergson 2002, p. 362). This insight marked a turning point in his thought. "This was the starting point of a series of reflections", he wrote, "which led me, step by step, to reject almost all that I had previously accepted, and to completely change my point of view" (Bergson 2002, pp. 362–363). His critique of scientific time thus became central to his philosophical project.

Against this background, the chapter proceeds in two stages. First, it explores the implications of Bergson's conception of time as duration, as it was developed in his early works leading up to *Duration and Simultaneity*. Second, it contrasts this conception with the temporal assumptions of pre-relativistic science, particularly those found in Newtonian mechanics. The analysis highlights the centrality of duration to key concepts in Bergson's philosophy—such as qualitative multiplicity, change, memory, and intuition—and concludes by examining the mental habits of scientific thought that Bergson sought to overcome by his philosophical intervention.

1.1. Foundations of Bergson's Philosophy of Time

Bergson challenged the Newtonian concept of absolute, universal time long before Einstein introduced his theory of relativity. In his works from the late 19th and early 20th centuries, he examined how the exact sciences conceptualise time. According to Bergson, pre-relativistic science depicts time as a linear, static sequence of unfolding events (cf. Landeweerd 2021, p. 33). However, this notion fails to reflect how people actually experience time in daily life. Measured but not lived, such time lacks duration. Bergson argued that this concept is a theoretical construct with little relevance to reality. Indeed, he contended that pre-relativistic science envisioned the universe as existing outside of time. If time is neither linear nor absolute, how, then, should it be characterised?

Bergson developed his unique concept of time, introducing its foundational features as early as his doctoral dissertation, *Time and Free Will*, which he would later refine. He termed this concept "duration" (*durée*) to emphasise its fluidity and continuous nature, explicitly rejecting the measurable, linear time employed in science. Bergson argued that duration cannot be measured, as it is fundamentally indivisible. Instead, he claimed that science measures points in space rather than time itself, asserting that this confusion prevents science from adequately understanding time.

Distinguishing actual time from this flawed conception, Bergson argued that time as we ordinarily is this “spatialised time”. This conception denotes time that is based on counting and measuring, where only durationless instants can be divided—even infinitely, as implied by the logical concept of infinity. Spatialising time involves treating it as though it were analogous to space. According to Bergson, whenever we measure time or depict it as a line, we are, in fact, thinking in terms of space. For instance, the hands of a clock do not embody the passage of time but instead represent movement in space—the movement of the hands across the clock face. Similarly, the sand in an hourglass does not denote absolute time, which flows uniformly for all, but rather illustrates the changing position of its grains.

Bergson argued that even mental calculations require spatial concepts to arrange and relate numbers. While these symbolic representations of time are indispensable in everyday life and science, he contended that they fail to convey the essence of time. Instead, they obscure our understanding by creating an illusion fostered by the spatialising mind. Bergson asserted that these symbols are often mistaken for time itself, leading to misconceptions. One such misconception is the portrayal of succession as a continuous line in which parts are distinct and juxtaposed simultaneously. Conversely, Bergson maintained that succession comprises multiple states that interpenetrate so thoroughly that they cannot be isolated. To address these challenges, he argued for the need to liberate the concept of time from spatial categories. He proposed “real duration” (*durée réelle*) as the solution.

What is “duration”? Ordinarily, the term refers to a period, the continuity of time, rather than to a punctual moment or a “now”. Indeed, Bergson envisioned duration as the unfolding reality of qualitative change. In this view, concrete moments succeed one another, yet they are neither separate nor separable. He described it as a multiplicity of immaterial objects that cannot simply be added together—a multiplicity without divisibility or quantifiability. He termed this “qualitative” multiplicity, in contrast to “discrete” multiplicity, which pertains to material objects that can be measured[21].

What does it mean that moments succeed one another but cannot be separated, divided, or counted? Bergson’s disciple and successor at the Collège de France, Édouard Le Roy, illustrated

[21] Some scholars argue that Bergson’s concept of discrete and qualitative multiplicities is a reworking of Riemann’s division between discrete and continuous multiplicities (cf. Lundy 2018, p. 52; Pearson & Mullarkey 2002, pp. 2–3; Deleuze 1991, p. 40). However, Bergson never explicitly referenced Riemann in this context.

this by describing a "melodious" moment that contains the "resonance" of preceding moments and anticipates those that follow (Le Roy 2008, p. 191). Bergson himself clarified the concept of duration through metaphors, particularly musical ones, which he believed most accurately conveyed the fluidity and mobility of time. In this regard, Bergson's philosophy likens time to a musical composition, where a melody is a whole created by distinct melodic lines from different instruments, yet is not reducible to them; duration, likewise, is a heterogeneous composition of distinct moments.

In *Time and Free Will*, Bergson described duration as a mental synthesis of distinct states mutually penetrating one another. Since these states are neither independent nor have definite boundaries, they cannot be superimposed on one another. Thus, intervals of time cannot be counted or even distinguished as separate entities—except symbolically (cf. TFW, p. 104). According to Bergson, the mind is essentially temporal rather than spatial—unlike the external world. Consequently, mental states, being temporal, are not external to one another, unlike material objects, which exist separately in space.

Bergson's first book focused on the psychological aspects of duration, limiting its application to mental states. It presented pure duration as the endurance of an ego (TFW, p. 100). In this view, time depends on a conscious spectator synthesising mental states into a single succession. However, in his subsequent works, Bergson sought to overcome this restriction. During one of his lectures on the idea of time at the Collège de France (1901–1902), he contended that he wanted to explore where else this duration, which he had found within oneself, might be located (Bergson 2019, p. 55).

In *Matter and Memory*, Bergson rethought the relationship between the mind and the world. Instead of preserving the dualism of form and matter, consciousness and things, and inside and outside, while attempting to resolve the eternal mind-body problem, he focused on their relationship. He believed this was the only way to approach the issue temporally, rather than spatially, by contrasting one with the other. Consequently, he redefined the relationship between the past and the present—not only in relation to human consciousness but also to the world. By the time of *Creative Evolution*, Bergson had concluded that duration is immanent to the universe and, therefore, not confined to psychic life. In this view, the entire world is dynamic and infused with the energy of time (*élan vital*). He illustrated the fundamental temporal becoming of reality with the example of sugar dissolving in a glass of water (CE, p. 12; see also in Bergson 2016, p. 254). Since dissolution takes time, the interval I experience is the essence of lived duration (*la durée vecue*). In another example, Bergson argued that making tea requires waiting for the water to boil ("Il faut attendre"; Bergson 2019, p. 25). This act of waiting—whether for sugar to dissolve or for water to boil—and impatience it evokes, which constitute my own duration, reveal other durations, including physical ones (cf. Deleuze 1991, p. 32; Sinclair 2020, p. 38). However, these other durations differ from mine; they "beat to other rhythms" (Deleuze 1991, p. 32).

For Bergson, duration is singular yet unfolds through multiple rhythms that vary depending on the being. Even the universe has its own distinct, irreducible rhythm of duration, gradually unfolding over time (CE, pp. 11–23; Bergson 2016, p. 255). However, the unfolding of matter is less dynamic than that of consciousness. Its rhythm of duration closely approximates durationless mathematical instants, which is why Čapek argues that it can largely be disregarded due to the minimal novelty it conveys (Čapek 1971, p. 198, 288; see also Bergson 2016, p. 256).

Bergson's philosophy of time does not adhere to the classical division of time into past, present, and future. Duration is not a linear arrow measuring time; rather, events themselves constitute time. For Bergson, time never simply *is*—it always *becomes*. Duration is never complete but is constantly being created; or more precisely, it is the very *effort* of creation itself (cf. Kebede 2019, p. 71). Consequently, the incompleteness of duration means that time cannot be adequately described in terms of "past", "present", and "future"[22].

Determining what constitutes the present is inherently difficult, yet Bergson was not concerned with defining it. Instead, he sought to problematise the relationship between the traditional division between past, present, and future (cf. Mullarkey 2000, p. 18)[23]. In his view, the present does not merely contain the past and the future as fixed starting and destination points. Rather, according to Bergson, in actual perception, the present is both past and future. When I experience duration, I apprehend my past and present states as a unified whole (TFW, p. 100), while my attention remains directed towards the next moment due to the practical function of consciousness. At the same time, the moment I attempt to grasp the present, it immediately recedes into the past. Likewise, the future is not already present, as some have claimed[24]; otherwise, genuine novelty could ever emerge.

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[22] A compelling alternative to interpreting time in Bergson's philosophy through the framework of tenses was recently proposed by Yasushi Hirai. In a paper presented at the *Atelier Bergson 2023/2024* seminar on 21 March 2024, titled "Bergson and New Theories of Temporality", Hirai argued for understanding time in Bergson's philosophy through the concept of aspect—a notion first introduced in linguistic studies (cf. https://bergson.hypotheses.org/3199; last accessed: 30.08.2024).

[23] Bergson still used the classical categories of past, present, and future because they are part of everyday language, and he valued such practical considerations.

[24] More specifically, as Čapek notes, it was widely believed that the future is already implicit in the present, though it remains hidden from subjective knowledge (Čapek 1971, p. 90).

Bergson famously stated that nothing is less than the present moment if one understands it as the indivisible limit that separates the past from the future. There are no singular points or instants in the present—nothing besides action. The present is dynamic and enduring; it is what is happening, what is being made ("*ce qui se fait*", MM, p. 150). Consequently, Bergson challenged the prevailing view in both science and common sense that time consists of "zero cuts", or, as Henry Stapp describes it, "zero temporal extension separating a past that no longer exists from a future that does not yet exist" (Stapp 2016, p. 309). Such cuts do not represent becoming; they function merely as measurement tools.

Bergson emphasised the non-momentary nature of experience and, by extension, of duration. He did not believe that one lives "in the moment" or within an isolated present instant. There is no discrete "now" that encapsulates reality. The longstanding philosophical problem of identifying the "present" that vanishes between past and future did not concern Bergson, as he did not conceive of time as passing in this conventional sense (cf. Lacey 1999, p. 51; Kebede 2019, p. 51). In this context, Atkinson's portrayal of duration through the metaphor of flow (Atkinson 2021, p. 18) seems problematic. Although "flow" suggests change, it remains a visual metaphor that misrepresents the essence of Bergson's duration. It misleadingly implies a defined shape or form that can only be recognised retrospectively—an idea incompatible with, among other things, the role of memory in Bergson's philosophy of duration.

As noted, the concept of duration remains the most far-reaching idea in Bergson's philosophy. It influenced other aspects of his thought, particularly his concepts of consciousness and memory, both of which played critical roles in his philosophy of time and in understanding the interplay between the past and the present. Rather than attempting to resolve the mind-body problem, Bergson sought to present these concepts in terms of time rather than space, shifting the focus to their relationship. Moreover, he did not approach consciousness or memory from a purely metaphysical perspective; instead, he examined clinical studies of brain lesions to ascertain their actual role in the human body. He presented these concepts dynamically, identifying perception as fundamentally a source of action rather than knowledge—challenging the prevailing view that perception is primarily epistemological.

In this view, the body is the centre of action (MM, p. 20) and a process of becoming (MM, p. 139). The brain, rather than serving as a mere repository of knowledge or memories, coordinates different rhythms and interacts with the world like an action centre[25]. Perception and the brain

[25] Bergson compares the brain to a central telephone exchange: "its office is to allow communication or to delay it" (MM, p. 30).

enable us to act, while consciousness—not confined to human consciousness—facilitates choice in response to stimuli[26]. Through consciousness, memory emerges from the past and partakes in duration. According to Bergson, memory is not a storage mechanism for memories but an act of enduring. It is inherently linked to the notion of change, as, while enduring, nothing passes, yet nothing remains the same—it transforms. Memory is not simply preserved; instead, it continues (cf. Kebede 2019, p. 181). Bergson also described memory as the survival of past images that "complete the present experience by enriching it with acquired experience" (MM, p. 66). In this sense, memory is orientated towards the past (ME, p. 160), yet it also extends into the present as its continuation, combining various moments of duration into a single intuition (cf. Jankélévitch 2015, p. 103; Guerlac 2006, p. 122)[27].

Accordingly, for Bergson, the past coexists with the present rather than simply following it. The entire past—not just the immediate past—actualises itself in the present through motor mechanisms or independent recollections. Although it no longer acts, it is preserved and manifests through action or intellectual effort, as Pearson and Mullarkey accurately note (Pearson & Mullarkey 2002, p. 17). However, the past is not preserved unchanged; it transforms along with the present[28], as the two meld and continuously influence one another.

Bergson's philosophy of time presupposes the irreversibility of time, in contrast to the prevailing view in classical physics (cf. Guerlac, 2006, p. 77). Newtonian physics, and even Einstein's, perceived physical processes as reversible, suggesting that time itself could be reversed since these processes unfold within it. In this framework, time was represented as a linear continuum in which events and processes had distinct beginnings and ends, implying that they could occur in reverse if the forces driving them were simply inverted.

In other words, the mechanistic worldview of classical science assumed time symmetry, a notion closely linked to causality. The law of causality, grounded in the principle of the conservation of energy, as formulated and verified by Robert Mayer and Hermann von Helmholtz, formed the foundation of deterministic classical science. According to this law, one event—the cause—precedes in time and accounts for another—the effect. In this view, every cause is followed

[26] This thesis does not discuss the details of the complex subject of consciousness in Bergson's philosophy, which would require considering the notion of the planes of existence, Pure Perception, or Pure Memory. It suffices to note that without consciousness, there would be no duration—only a mechanistic, deterministic reality akin to a series of slides placed side by side in a movie projector (CM, p. 109).

[27] Bergson introduced two forms of memory to explain how the past survives in the present: motor memory and imagination memory. These forms align with contemporary psychology's distinction between procedural and declarative memory (Sinclair 2020, p. 89). Although significant, the analysis of these two kinds of memory goes beyond the scope of this thesis.

[28] Consequently, one cannot truly relive or return to any specific past experience.

by its effect and vice versa, just as, based on the principle of conservation of energy, energy cannot vanish but is merely transformed into another form.

Bergson regarded the principle of energy conservation as a logical construct—a form of the law of non-contradiction or the principle of identity (TFW, pp. 150, 207)—and acknowledged its significance within the natural sciences. However, he did not consider it indispensable to all scientific inquiry. He was particularly wary of its application to all phenomena, especially mental states. Thus, Bergson argued for limiting the scope of the law of the conservation of energy[29], particularly in relation to duration[30]. He contended that duration itself is a form of energy that resists the principle of conservation, as it continuously entails an effort of creation (cf. TFW, p. 200; Čapek 1971, p. 108; Guerlac 2006, p. 78; Lacey 1999, p. 81).

Similarly, Bergson criticised traditional notions of causality, arguing that the world cannot be fully determined or completed. He contended that the assumption of the logical necessity of effects, already contained within their causes, is not empirically accurate but rather constitutes a metaphysical assertion (for a discussion on this point, see Dolbeault 2020, p. 107). Notably, Bergson did not reject causality outright but instead challenged its traditional, static, Laplacean interpretation. He maintained that causality exists even in the psychic realm, though not in the form of strict necessity.

Bergson advocated for a redefinition of causality, insisting that it should account for a genuine succession of causal links. In real duration, the "future" is unreal—that is, not yet present but coming into being as a genuine, not merely apparent, novelty. In other words, it is being created. Such a redefinition of causality made room for genuine choice, contingency, and freedom—concepts unthinkable within the determinism of pre-relativistic science, albeit already present in philosophical thought as evidenced, for example, in Boutroux's thought[31].

Similarly to his rejection of the universality of the principle of the conservation of energy—a concept considered unassailable within the framework of deterministic classical science—Bergson

[29] The discovery of radiation challenged the law of conservation of energy, as radiation was spontaneously emitted from radioactive materials without any external force. Susan Guerlac explains how Maria Skłodowska-Curie observed this phenomenon in the new elements polonium and radium (Guerlac 2006, p. 34). Over time, scientists increasingly questioned this principle, and Niels Bohr eventually argued for the non-conservation of energy (Guerlac 2006, p. 39).

[30] In this regard, Bergson followed in the footsteps of his predecessor, Émile Boutroux. For further discussion on the subject, see Sinclair 2020, p. 70.

[31] Bergson's ideas on causality prefigured later discussions by philosophers and scientists. Čapek cites thinkers such as Whitehead, Reichenbach, Heisenberg, Bondi, and Whitrow, who supported a "widened concept of causation […] which affirms the reality of a genuinely growing world in which authentic novelties emerge, not from nothing, but from past antecedents" (Čapek 1971, p. 350).

also argued for the impossibility of reversing time. He maintained that the concept of reversible time arises only when one mistakenly equates time with space. Spatialised time can be infinitely divided and theoretically reversed, but it is not real time. The latter—duration—includes memory, which retains the past and thus makes reversal impossible.

Being aware of the second principle of thermodynamics—the law of entropy—Bergson regarded it as the most metaphysical of physical laws (CE, p. 265). He claimed it expressed the irreversibility of time. However, it was only later, in the 20th century, that scientists began interpreting this law in relation to the irreversible arrow of time. In this context, it is unsurprising that Bergson believed his philosophy of time aligned with the direction in which he expected science to evolve (cf. Čapek 1971, p. 401).

Bergson recognised the challenge of thoroughly explaining the concept of duration, particularly since it contradicted—at least to some extent—the scientific notion of time. Newton's time constituted the absolute frame of events, independent of whether anything was happening in it or not. In contrast, Bergson argued that we need to abandon scientific symbols for time and allow it to "abscond" (Bergson 2016, pp. 87–88). Duration is not a medium in which change occurs, as Lacey argues (cf. Lacey 1999, p. 28), but is change itself. In Bergson's view, time is not distinct from its content, meaning that events do not occur in it but rather constitute it[32]. Furthermore, duration is a potentiality that is already real without becoming actual (cf. Kebede 2019, p. 57). However, thinking of duration proves formidable, as duration applies not only to ourselves but also to external objects, which seem to endure in much the same way we do. Consequently, because the rhythm of these objects' duration is so static that it seems to lack any rhythm at all, time appears as a homogeneous medium (cf. Flewelling 1920, p. 120).

Another reason for the difficulty in apprehending duration is our tendency to think in terms of spatialised time rather than lived time. Despite Bergson's portrayal of spatialised time as an artificial construct, the concept itself did not emerge without reason. It is intrinsically tied to both people's natural way of thinking and the demands of science, particularly mathematics. Scientific time, often referred to by Bergson as clock time, involves eliminating real change and, consequently, duration. It is designed to measure intervals of time based on the assumption that the world is susceptible to quantification, prediction, and even control (cf. Mullarkey 2000, p. 10).

[32] The opposite stance—i.e., viewing time as impervious to events within it—invites speculation about the possibility of time travel (Mullarkey 2000, p. 17), which, according to Bergson's philosophy of time, is impossible.

Treating time as a quantity only reinforces its supposed homogeneity. However, according to Bergson, what clocks measure is not time—certainly not duration—but simultaneities[33].

Apart from the fact that clock time is more practical for everyday life, Bergson identified an epistemological reason behind the human tendency to spatialise time. Contrary to the common belief that people often project subjective elements from their psychological reality onto the external world, Bergson argued that the opposite is true: our understanding of our "inner world" is shaped and distorted by our perception of the external world. As a result, we impose the homogeneous reality of material objects onto our inner lives, thereby mistaking duration for spatial clock time. This inclination is further reinforced by our tendency to use symbols in our perception of reality, with language itself playing a critical role. Everyday language favours a spatial, scientific apprehension of reality, presenting itself as an external and detached perspective that claims objectivity (cf. Guerlac 2006, p. 19). This is why Bergson employed musical and kinesthetic metaphors. He believed that although individual metaphors might not perfectly capture reality, their diversity could offer a dynamic image of reality through their collective portrayal. In this sense, Skarga's observation that Bergson's choice of language was both deliberate and conscious (Skarga 2014, p. 72) appears well-founded.

Bergson proposed an alternative approach to understanding time. He advocated for a deliberate effort to seek an accurate description of reality, which requires recognising ingrained intellectual habits—such as perceiving time as linear—and working to free ourselves from these constraints. He referred to this ongoing act of invention and reinterpretation as "intuition"[34]. According to Bergson, intuition is the way we think in duration (cf. CM, p. 38). In other words, duration presents itself to us directly through intuition (CM, p. 198). By an effort of intuition, we can enter duration and experience it in its immediacy (CM, p. 199). However, to grasp duration in its purest form, we must remain constantly aware of our tendency to spatialise it. In this sense, time as duration is an immediate datum of consciousness: stripped of the habitual distortions of the

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[33] Bergson's views on the significance of simultaneity in his concept of time evolved across his works, shifting from its use as a tool for measuring time in *Time and Free Will* to a foundational problem of coexistence in *Duration and Simultaneity*.

[34] Bergson had doubts about how to term the faculty of knowledge that pertains to duration. He was hesitant to call it "intuition". However, he did not find a better term to depict this mode of knowing, eventually settling on "intuition"—although he acknowledged that this might be misleading (cf. CM, pp. 33–34). Indeed, this term met with fierce critique, to which Bergson responded by emphasising that intuition is simply another form of knowledge. If someone prefers, asserted the philosopher, they may call it intelligence (CM, p. 92). According to Bergson, the distinction exists solely to highlight how, in intuition, the mind turns upon itself, as opposed to turning towards matter, as in intelligence.

human mind, which requires our attention and intellectual effort—what Bergson described as the work of intuition.

The philosopher never explicitly defined intuition due to the limitations of language[35]. However, he likened it to the process of composing a literary work: once we have conducted the necessary research, acquired the requisite knowledge, and gathered all relevant documents, only one task remains—"an effort, often painful, immediately to place oneself in the very heart of the subject" (CM, p. 235). According to Bergson, this effort consists of a form of reflection in which the mind turns inward upon itself, enabling us to return to ourselves and duration. Notably, he argued that we are typically unable to access our inner selves because of our inherently practical nature; in other words, we are oriented towards acting in the world rather than fully participating in duration[36].

Bergson described intuition as a mode of thought or a form of knowledge that, alongside intelligence[37], serves as a complementary epistemological tool—each fulfilling a distinct purpose. While intelligence follows ingrained mental habits that appear solid and unbreakable due to centuries of repetition—habits that filter reality through a framework of fixed ideas—intuition challenges these conventional pathways of thought to access the dynamic reality of duration, which intelligence cannot fully grasp. Bergson contended that intuition requires adopting a critical stance that actively questions the certainty of what one believes to know, thereby demanding a fundamentally new approach to thinking. Yet intuition is not passive contemplation; rather, it necessitates an active and often demanding effort to place ourselves within the immanency of someone or something. This may occur either through reflective introspection or empathetic engagement with the subject of our contemplation—what Bergson termed sympathy—both of which amount to the same endeavour: penetrating an object of intuition and perceiving it from within.

Bergson argued that human thought and action are necessarily "mediated" by the practical demands of our lives, as much of our thinking and doing is directed towards achieving personal goals. Accordingly, he maintained that science, with its focus on the fabrication of instruments, is oriented towards practical utility, pushing the work of intelligence to enable us to become "masters

[35] "Let no one ask me for a simple geometrical definition of intuition", said the philosopher in the second introduction to *Creative Mind*. "It is only too easy to show that the word is taken in meanings which cannot be deduced mathematically from one another" (CM, pp. 37–38).

[36] The doctrine of intuition, paradoxically asserts Luce, is only for those who intelligently reject intelligence —those who recognise its limits (Luce 1922, p. 5).

[37] Bergson deliberately uses the term "intelligence" rather than "reason", a more familiar term in philosophy, to emphasise the active nature of this faculty of knowledge, in contrast to the more reflective connotations of "reason".

of matter" (CE, p. 201)[38]. Inversely, intuition transcends these practical ends to explore the essence of being. It engages with the fluid and the living, providing immediate data of consciousness rather than mere representations. Notably, Bergson did not ascribe greater value to intuition over intelligence; he regarded both as equally significant paths to knowledge. The difference, he argued, lay in their methods, not in their intrinsic worth (CM, pp. 49–50)[39].

Although Bergson originally conceived intuition as a philosophical method, particularly for metaphysics—which he sought to redefine as a philosophy capable of grasping mobility, duration, and change[40]—he also recognised its value to science. He argued that intuition, by accessing reality directly, could then translate that understanding into symbols, language, and scientific representations[41]. Bergson believed intuition could enable science to expand its boundaries beyond the limited perspective of middle dimensions and solid bodies within spatialised time, to which it had been adapting for centuries (cf. Čapek 1971, pp. 78–79)[42]. In this context, Gunter is justified in asserting that Bergson's notion of intuition points to a potential future of science rather than its obsolescence (Gunter 1969, p. 35)[43].

While intuition is how we think duration, freedom—according to Bergson—is how we act within it. He located freedom (*la liberté*) in our immediate experience, asserting that it is inherent to our actions when our will operates, constituting an immediate datum of consciousness (cf. Bergson

38 Bergson viewed humans as *homo faber*, emphasising that people primarily act before they reflect. In other words, according to him, humans think in service of making.

39 A more in-depth study of the relationship between intelligence and intuition would exceed the scope of this study. However, it is worth noting that both of these faculties of the mind, or tendencies—as Bergson called them (cf. CE, p. 151)—are connected to instinct. The latter is both the opposite and complementary to intelligence (CE, p. 149), while it is similar to intuition in that both are directed towards life and the organic (CE, p. 182). Notably, Bergson rejected the anthropocentric viewpoint, asserting that human beings and other animals both possess intelligence, the difference being that it predominates in humans (cf. CE, p. 150; Luce 1922, p. 20; Sinclair 2020, p. 173).

40 As John Mullarkey observes, "in Bergson's hands", metaphysics becomes "a remedial technique in perception, not a form of ethereal contemplation" (Mullarkey 2000, p. 157).

41 Bergson wrote in *Creative Mind* that once grasped, intuition "must find a mode of expression and application which conforms to our habits of thought and which furnishes us, in well-defined concepts, the solid basis we so greatly need" (CM, p. 226). Since to communicate it we need language—the domain of intelligence—"intuition will be communicated only by the intelligence" (CM, p. 48).

42 Notably, Paul Atkinson observes that Bergson's comments on the limits of science and knowledge, which consists of understanding an object solely from the outside, precede, or even constitute the critique of Einstein's theory of relativity—despite being written "a few years before the physicist published his first work on the topic" (Atkinson 2013, p. 94).

43 This provides even more reasons for a critical approach to Bergson's intuition: it was meant to be more than a philosophical method for penetrating reality; he deliberately extended it into the fields of science (CM, p. 77).

2017, p. 17)[44]. As he explained in his 1916 address in Madrid[45], the will is "the power to move itself freely" and concerns itself with creation and its own growth (Bergson 2010, p. 307). Notably, Bergson rejected both determinism and libertarianism, arguing that they equally contradict the very existence of free will.

Although his argument for the existence of freedom and the nature of free will lies beyond the scope of this thesis, it is crucial to note that acting in duration—i.e., "recovering possession of ourselves"—is only possible when our actions are free (cf. TFW, p. 232). In this view, freedom exists in degrees: the more we act as our fundamental selves in duration, the freer the act (TFW, p. 167). The free act testifies to our entire being, constituting a reflection of our history and exemplifying our character. In his lectures at the Collège de France, Bergson explained that duration in its purest form, as a succession of our conscious states, is something we discover in ourselves when we observe ourselves, and when we allow ourselves to experience a deeper, conscious inner life (Bergson 2016, p. 80).

In concluding this brief analysis of Bergson's philosophy of time as duration in his earlier works, prior to *Duration and Simultaneity*, it is relevant to situate it in relation to the so-called analytical philosophy of time, particularly McTaggart's well-known distinction between the A-series and B-series[46], as well as the theories such as eternalism or presentism. Although Bergson never wrote about McTaggart or explicitly engaged these theories, scholars generally agree that, in relation to McTaggart's framework, his philosophy of time aligns more closely with an A-theory than a B-theory. For instance, Mark Sinclair highlights this claim in reference to *Time and Free Will,* arguing that Bergson's originality lies in his account of the experience of succession and passage in time as real duration—an aspect lacking in the A-theory (Sinclair 2020, p. 46). Similarly, John Mullarkey contends that certain elements of Bergson's philosophy are incompatible with the idea of continual succession that allows for different levels of time to coexist (Mullarkey 2000, p. 11). Meanwhile, Lacey emphasises "the spirit" of Bergson's philosophy, describing it as a "thoroughgoing A-theorist" in orientation (Lacey 1999, p. 56).

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[44] During a lecture in 1913, Bergson ascertained that "Volition, not thought, is the basis of conscious life; we should start from the fact of will, not, as so many thinkers have done in the past, from the fact of thought" (Bergson 1972, p. 982).

[45] The lecture was delivered at the Ateneo in Madrid on 2 May 1916 and was transcribed stenographically by the weekly *España*. Bergson's lectures in Spain on 2 and 6 May 1916 were part of a French diplomatic mission in the context of the First World War (cf. Fraser 2010, p. 302).

[46] In short, whereas the former theory considers time in terms of past, present, and future—whose content changes as time passes—the latter focuses on the fixed meanings of temporal expressions such as "before", "after", or "seven days later".

While one might speculate where Bergson's philosophy is positioned within the analytic philosophy of time, such an endeavour appears somewhat misplaced. To speak meaningfully about time from a Bergsonian perspective, one must account for change, novelty, and persistence—dimensions that these theories seem to overlook. In particular, theories such as eternalism and presentism appear more preoccupied with the nuances of what it means to exist rather than the nature of time itself[47]. Ultimately, Bergson's philosophy of duration resists classification within the traditional divisions of analytic philosophy, instead emphasising duration as continuous creation.

1.2. Origins of Bergson's Philosophy of Science: The Critique of Pre-Relativistic Physics

The foundations of Bergson's philosophy were shaped not only by metaphysical concerns but also by early and sustained reflection on scientific ideas. In one of his early works on Lucretius, published in 1883, he expressed an interest in atomism (cf. Pullman 1998, p. 250). However, along with his disillusionment with Herbert Spencer's thought[48], Bergson also came to the conclusion that—as he confessed in his previously mentioned letter to William James—scientific time has no duration, which awakened him from his "dogmatic mechanistic slumbers" (cited in Pearson and Mullarkey 2002, p. ix). However, disillusioned with Spencer's thought, Bergson did not turn to his French counterparts, such as Comte, Renan, or Taine—as Barnard interestingly points out—but to thinkers who represented so-called French spiritualism or voluntarism, namely Félix Ravaisson, Maine de Biran, and especially Émile Boutroux (Barnard 2011, p. 41). Their influence on Bergson's philosophy is evident, particularly in their attitudes towards science, characterised by their opposition to positivism and determinism. For example, Boutroux was the first to argue against the universal validity of the principle of conservation of energy, advocating for only the approximate validity of physical determinism (cf. Čapek 1971, p. 286). French spiritualists also inspired several concepts developed in Bergson's philosophy, such as the concept of habit, the idea that mental processes are fundamentally different from physical processes, and the theory of freedom[49].

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[47] Élie During observes that these disagreements are "not really about time" but rather "about the grammar of existence or identity". According to him, "debates between tensers and detensers, presentists and eternalists, endurantists and perdurantists always strike Bergsonians as a rather frivolous affair" (During 2023, p. 180).

[48] Bergson challenged Spencer's ideas by offering his own original, non-mechanistic interpretation of the theory of evolution in *Creative Evolution*. According to Čapek, while Spencer's philosophy influenced Bergson's thought, it did so primarily as an opposing view (cf. Čapek 1971, p. 5).

[49] For a comprehensive analysis of Bergson's influences and the tradition of French spiritualism, see, for example, Sinclair 2020, pp. 3–4, 8–14, 29, 42–43, 64, 143, 202–203, 215.

Inspired by the spiritualists' critique of mechanism and determinism, Bergson recognised as early as *Time and Free Will* (1889) science's tendency to quantify reality and conceive of it in terms of mathematical formalism. In opposition, he endeavoured to establish the reality of novelty and change at the psychological level, as part of his broader goal to restore freedom. Bergson took issue with intellectual figures such as Théodule Ribot, who maintained that the will is a function of the brain—subject to observation and experimentation—and ultimately grounded in matter[50]. For Bergson, by contrast, the act of free will is incalculable and cannot be foreseen by science. It constitutes an immediate datum of consciousness, akin to duration, within which our free will operates. Even at this early stage, Bergson's conclusions extended beyond the boundaries of psychology, laying the groundwork for his broader philosophy of time—one that was not confined to the psychic domain. In his subsequent works, he became increasingly engaged with physical questions and more audacious in his challenge to the deterministic framework of pre-relativistic physics. In *Matter and Memory* (1896) and *Creative Evolution* (1907), he presented concepts of physical reality that were at odds with the Newtonian worldview and contrary to the pre-relativistic physics concept of absolute time. While some commentators of Bergson's philosophy at the time found his views on change and movement as intrinsic to reality less controversial in light of Einstein's discoveries (cf. Gunn 2002, p. 15), Bergson's thought was considerably more progressive than that of his contemporary physicists. The fundamental difference was that, while Bergson maintained that an adequate depiction of reality must account for its inherently dynamic and changing character, Einstein remained committed to a deterministic worldview. This distinction is all the more remarkable considering that the inadequacy of pre-relativistic physics's description of reality did not become undeniable until the 1920s, and perhaps not until the 1930s[51], coinciding with the quantum revolution[52].

Bergson's critique of pre-relativistic physics targeted not only scientists but also a wide tradition of Western thought that promoted mechanistic thinking. Unlike Spencer, Helmholtz, Mach, and even Poincaré, Bergson questioned the adequacy of the Newtonian-Euclidean description of the world and human intellect. He believed that, due to its formalisation and symbolic representation,

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[50] In one of his articles, Ribot contends: "L'origine de la volonté est dans cette propriété qu'a la matière vivante de réagir" (Robot 1882, p. 78).

[51] Čapek identified 1934 as the exact year (Čapek 1971, p. 382).

[52] Some scholars believe that Bergson anticipated the crisis of classical physics' mechanical models as early as *Matter and Memory*, drawing parallels between his view of reality and the emerging perspective of quantum physics. Louis de Broglie explicitly credited Bergson as an inspiration (de Broglie 1969, p. 46).

science provides a distorted view of reality and immobilises dynamic experience[53]. Since Newton's physics was closely tied to the role of God in his worldview as the source of the world's shape—including forces such as gravity and eternal time—its absence led to physical determinism, which in turn fostered psychological determinism, where the future behaviour of specific individuals could not only be predicted but even calculated. This led to a tendency to mathematise all dynamic properties of matter, striving to reduce them to geometric principles and deterministic laws. By the end of the 19th century, there was a prevailing belief, particularly among scientists, that physics would eventually explain all aspects of the universe. Lucien Price recalls Whitehead's assertion that everyone was convinced that all essential subjects in physics were known at the time. "Yes, there were a few obscure spots, strange anomalies having to do with the phenomena of radiation which physicists expected to be cleared up by 1900" (Whitehead & Price 1954, p. 7). Consequently, physics was regarded as the source of reliable and comprehensive knowledge about reality.

Aware of the tendency to explain every aspect of reality in scientific terms, Bergson believed that the world was entrenched in scientism—a belief that the only method of gaining knowledge is by adhering to scientific methods. An example of scientism, which was the object of his criticism, can be found in August Comte's positivism, which posed as rational thought and assumed that the only reliable method—namely, the scientific method—of acquiring knowledge was derived from "pure sciences". Accordingly, other disciplines, such as economics or sociology, aimed to align themselves with the methodology of Newtonian physics to appear "scientific" and thereby legitimise themselves. While science had full authority as the only source of understanding, other forms of thought, including everyday experience and language, were deemed vague at best and unreliable. Concurrently, spiritualism and Bergsonism were promptly labelled as irrationalism. Anything that was not science was considered an unreliable source of knowledge—a belief that persists in contemporary thinking. However, in the 19th century, this "only true" science extended even to the measurement of the intensity of mental states[54]. This was precisely what Bergson first strongly opposed: the tendency to measure every aspect of reality. The first chapter of his doctoral

[53] Another of Bergson's major charges against science was its assumption of a separation between subject and object, implying that an observer is detached from what they observe and does not interfere with the outcome.

[54] Guerlack describes science's efforts as an attempt to "touch the soul" (Guerlack 2006, p. 24).

dissertation was dedicated to dismantling Fechner's proposal to measure mental states[55]. In his subsequent works, Bergson continued to challenge determinist and mechanistic descriptions of reality, particularly aiming to identify certain illusions and assumptions that science took for granted, even though they were often unjustified. One of these illusions was the concept of motionless movement.

A key element in Bergson's critique of pre-relativistic science is its conception of movement, which abstracts from the lived experience of motion and thereby deprives it of genuine mobility—just as its notion of time excludes the reality of duration. In his view, the mind's natural tendency—reinforced by scientific thought—to separate movement from the "thing" that moves is an artificial and limiting assumption akin to the belief that motion can be measured. Bergson contended that one does not measure motion itself but rather the space traversed. In contrast, he asserted that to truly understand motion, one must engage with it from within, using intuition. He maintained that real movement consists of a qualitative change of states rather than a sequence of discrete positions—a dynamism lost in the scientific representation of movement[56].

Tracing the history of science in pursuit of mental habits and how they influenced scientific thought contributed to Bergson's early philosophy of science. As a result, he maintained that the source of the illusions that continue to affect modern thought can be traced back to the Eleatic paradoxes. Rather than viewing them as mere paradoxes, Bergson presented them as evidence of the spatialising and immobilising tendencies of the mind. Leszek Kołakowski even asserts that the Eleatic paradoxes were foundational to Bergson's philosophy (Kołakowski 2008, p. 25)[57]. Although this statement may seem exaggerated, Bergson's treatment of Zeno's paradoxes did appear to influence his views on movement, change, and time, particularly since he engaged with these paradoxes early in his career while teaching at a secondary school. In these paradoxes, Bergson

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[55] As Susan Guerlac correctly points out, Bergson did not challenge the accuracy or effectiveness of Fechner's research but rather its philosophical implications. Specifically, he disputed the assumption that mental events could be measured or that a human being could be reduced to a Cartesian machine-like body (cf. Guerlac 2006, p. 25). These concepts, now central to cognitive science and artificial intelligence studies, were then regarded as part of positive science. At the time, such ideas were seen as extending science to encompass all phenomena, in line with positivist ideals (cf. Guerlac 2006, p. 25).

[56] As Louis de Broglie describes, this scientific view involves "a continuous series of positions attained successively in the course of time" (de Broglie 1969, pp. 51–52).

[57] Some philosophers argue that the Eleatic paradoxes influence our understanding of time and space (cf. Russell 2009, p. 143), while others contend that these paradoxes cannot be used to develop a concept of time, space, or motion (cf. Chappell 1969, p. 274). The latter view suggests that philosophers merely modified the meanings of these concepts rather than creating new ones. However, this argument is unconvincing. If it were correct, it would imply that Bergson's concept of time, for example, was not an attempt to describe reality but merely a matter of terminology—no more legitimate than that of any other thinker. But if this were the case, what would be the purpose of developing an entire philosophical framework?

identified a perfect example of the confusion between time and space, motion and immobility—illusions that would continue to trouble science for centuries to come.

Accordingly, the arguments of Zeno of Elea served to criticise the pre-relativistic conception of motion and its concept of spatialised time. Take, for example, the argument known as "Achilles"[58]. This argument, as Aristotle noted, posits that in a race, the fastest runner can never overtake the slowest. Each time the pursuer reaches the initial point of the pursuit, the slow runner has already advanced further (Aristotle 1991, p. 110). Accordingly, a fast-running Achilles is chasing a tortoise. Based on common experience, Achilles will inevitably overtake the tortoise since he is faster. However, Zenon argued that Achilles must first catch up with the tortoise to take the lead; thus, he must cover the distance between his own position (point A) and the tortoise's position (point B). Nevertheless, before Achilles has covered the distance AB, the tortoise will already have moved to a different position, having travelled some distance (to point C). Achilles will then have to cover the distance BC, but by the time he does so, the tortoise will have moved another distance, and so on to infinity. As a result, Achilles will never catch up with the tortoise. This conclusion, however, contradicts common experience, leading to the paradox. Bergson, on the other hand, asserted that this is merely an appearance of a paradox.

According to Bergson, the mistaken impression that Zeno's examples present a paradox stems from the confusion between two distinct concepts of time and space. More specifically, time has been conflated with space and consequently endowed with spatial characteristics. The same can be said of motion and the distance traversed by a body[59]. This confusion arises from the erroneous assumption that time and motion can be infinitely divided like geometrical points or durationless instants. If one became aware of this confusion, there would be no paradoxes, only a misunderstanding of the categories. For Zeno, however, motion is simply a path traversed by a body and, therefore, identical to space, rendering it subject to arbitrary division and combination.

The Eleatics, in Bergson's view, effectively substituted the tortoise's steps for his own. Consequently, they effectively compared two tortoises. Meanwhile, only space can be arbitrarily folded and unfolded; motion cannot. According to Bergson, each step taken by both Achilles and the tortoise is indivisible as a movement. Even if one were to consider these steps as space, they

[58] In addition to "Achilles", other Eleatic paradoxes, such as "Arrow", "Dichotomy", and "The Moving Rows" (also known as the "Stadium"), address the relativity of motion. These will be referenced later in this thesis in relation to *Duration and Simultaneity*. A detailed analysis of each paradox, however, is beyond the scope of this study.

[59] Bergson explicitly states: "It is to this confusion between motion and the space traversed that the paradoxes of the Eleatics are due" (TFW, p. 112).

would still represent distinct quantities. Therefore, when added together, they would demonstrate that Achilles overtook the tortoise since the distance traversed by Achilles was longer than the sum of the distance traversed by the tortoise plus the distance by which the tortoise was initially ahead of Achilles (cf. TFW, pp. 113–114). To illustrate this point, Bergson proposed asking Achilles himself[60]. Bergson's Achilles responded that he runs differently than Zeno suggests. Namely, each of his steps is an indivisible act; after a series of these acts, he surpasses the tortoise. Bergson pointed out that regardless of the number of steps Achilles takes, his movement cannot be decomposed into any arbitrary space-like pattern (cf. CM, p. 171). Yet, that is precisely what people usually do when they consider motion as if it consisted of immobility, as posited by Bergson. According to him, if one assumes in advance that immobility can be a reality, "movement will slip through our fingers when we think we have it" (CM, p. 172).

Therefore, for Bergson, movement is real; or rather, it should be stated that reality is mobility[61], while immobility is merely an abstract idea. Bergson pointed out that immobility is analogous to the state of affairs of passengers in two trains travelling on parallel tracks in the same direction and at the same speed. For the passengers in one of these trains, the other appears stationary. Thus, "Immobility being the prerequisite for our action, we set it up as a reality, we make of it an absolute, and we see in movement something which is superimposed" (CM, pp. 169–170). Although this is understandable in practice, when it comes to speculation, one should not overlook the simplifications or confusions accompanying it. Otherwise, as Bergson warned, one only creates unsolvable problems and paradoxes that do not exist.

As noted, the Eleatic paradoxes represented Bergson's initial attempt to resolve contradictions arising from the confusion of time and space, or movement and the distance traversed. Throughout his works, Bergson consistently addressed typical philosophical and scientific problems by shifting the perspective from which they were considered, thus attempting to solve these issues. His approach may be characterised as replacing a static conception of the world with a perception of reality *sub specie durationis* (from the perspective of duration).

By extending his analysis of the Eleatic paradoxes, Bergson suggested that the illusions they embodied continued to inform prevailing conceptions of reality. As a result, both physicists and philosophers, he argued, remained trapped in the habitual tendency to reify the fluid continuity of

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60 "Since Achilles finally catches up to the tortoise and even passes it, he must know better than anyone else how he goes about it" (CM, p. 170).

61 Barnard makes an insightful observation, noting that Bergson carefully articulated his idea that "reality is mobility itself" to avoid implying that reality is a static entity to which movement is added. "Instead, for Bergson, reality is, in-and-of-itself, motion" (Barnard 2011, p. 73).

experience into static, discontinuous images. They confined movement to immobile parts dispersed throughout empty space, perceiving it as simple and mechanical while struggling to conceptualise change and fluidity. Rather than embracing a changeable reality, they sought something fixed to capture change, akin to a Platonic idea. The habits of spatialising and solidifying reality align with the demands of pre-relativistic science, which is driven by the practical application of time and movement that can be described in language. Additionally, according to Bergson, to navigate society and use language efficiently, it remains necessary to employ a mechanistic and deterministic model of reality, consisting of immobilities arranged consecutively. However, this approach creates the illusion of continuity, conceptualising time as a line with unfolding events and space as an extension waiting to be filled.

In line with his broader critique of the spatialising tendencies of thought, Bergson criticised science for supporting and reinforcing the illusions of the spatialising mind. As Barbara Skarga insightfully points out, his historical analysis of the ontological and epistemological foundations of science revealed that it had not always been exclusively concerned with quantitative relations; rather, even within the exact sciences, there existed a potential orientation towards qualitative dimensions (Skarga 2014, p. 78)[62]. However, contemporary science tends to favour phenomena that can be reproduced and analysed in a laboratory setting rather than engaging with the unique qualitative experience of duration and change. Bergson emphasised the repetitive aspect of science, asserting that "anything that is irreducible and irreversible in the successive moments of a history eludes science" (CE, pp. 34, 35). Although science has succeeded in becoming the most respected and reliable source of knowledge, it achieved this status not because it truly discovers universal laws—which it does not—but because of its usefulness and functionality. Accordingly, the success of science does not necessarily imply its truthfulness or even its correctness, and scientific knowledge does not have to represent reality (for further discussion, see Bińczyk 2012, p. 81). A pertinent example of the scientific standards that define what qualifies as scientific knowledge is the numerous attempts to uphold Newtonian physics at the end of the 19th and the beginning of the 20th century, particularly concerning the history of the concept of ether.

Since science is oriented towards practice, it is not surprising—following Bergson's philosophy—that it employs static and measurable concepts framed precisely in language. However, this approach fails to present reality in its fullness because it cannot capture its inherent dynamism. Instead, science treats dynamic phenomena as if they were static, thereby creating

[62] Skarga traces Bergson's belief back to his doctoral dissertation supplement on Aristotle, titled *Quid Aristoteles de loco senserit*.

further illusions, as was in the case of the Eleatic paradoxes. According to Bergson, science utilises what he termed—drawing from the technical innovations in the visual experiences of his time—the cinematographical method. This method represents reality not in terms of duration and change but as a series of instantaneous "snapshots", as Gary Gutting describes it, extracted from dynamic phenomena (Gutting 2010, p. 64). Consequently, science operates under the illusion that the constantly changing becoming can be conceived as a consecutive series of "cuts" or instantaneous states of the universe[63]. Čapek insightfully notes that Bergson believed the illusion of the cinematographical method is powerful due to people's medium-sized body perspective and the thickness of physical duration, which renders it negligible; otherwise, they would perceive the universe in its true form: as physical duration unfolding in concrete drops of novelty (Čapek 1971, p. 284). Essentially, the cinematographical method confuses movement with immobility, akin to a sequence of still images rapidly unfolding before one's eyes, and duration with instantaneous, timeless "cuts". This is not only characteristic of science; in daily life, people also discern change and mobility since "the mechanism of our ordinary knowledge is of a cinematographical kind" (CE, p. 332).

By eliminating change and novelty, people are also subjected to the illusion of a necessary connection in time. In criticising this mental habit, Bergson challenged the presumption inherent in science that each new development is contained within the preceding ones. This becomes evident when considering the example of mathematical equations and logical reasoning presented by Čapek (Čapek 1971, p. 106). Specifically, when one writes down the left side of the implication and contemplates the right side, one tends to envision a solution that is merely waiting to be discovered, a solution that already exists. Consequently, like this solution, the future appears fixed and preordained, waiting to be uncovered. In other words, people often perceive the future as embedded in the present and resulting from the past, converting duration into spatialised time. This habit of spatialisation is reinforced by another: the habit of visualisation.

As the history of philosophy and daily experience shows, people's imagination is predominantly shaped by the sense of vision. Meanwhile, as Hannah Arendt posited, Bergson was the first modern philosopher to question the supremacy of sight (Arendt 1978, p. 122; also in Jay 1994, p. 186). Bergson contended that omnipresent visualisation is merely a more concrete form of spatialisation, which is challenging to transcend due to its universal application. Instead, he called for greater attention to be directed towards another sense: hearing. In his works, Bergson employed

[63] Notably, Bergson's view was later validated by the implications of Einstein's theory, particularly regarding the nonexistence of absolute simultaneity.

auditory metaphors, particularly those related to melody. It is impossible to discuss instantaneous moments and instants devoid of duration regarding melody since it requires time to develop and be heard. Only a sound can be punctual, and the sound cannot encapsulate the entirety of a melody. Moreover, auditory examples are better suited to illustrate the idea that change or novelty does not necessitate an object. In Bergson's view, there is no spatial container that would be composed of things that change. Therefore, using auditory metaphors instead of optically-oriented terminology would allow for a discussion of change without the need to imply a "thing" that changes.

Another aspect of science subjected to Bergson's scrutiny was the metaphysics underlying scientific theories. Ideas such as abstract time or absolute space did not arise from experiments; rather, they were assumptions on which scientists operated. Observing the scientific method, one might notice that science presumes events to be repetitive rather than unique. This is, without question, a metaphysical claim—it precedes scientific findings rather than following from them. In *Creative Mind*, Bergson asserted that his only demand of science was for it to remain scientific, i.e., "not to take on an unconscious metaphysics which then presents itself to the ignorant of the half-educated under the mask of science" (CM, p. 78). Science is not obliged to present reality in its duration; it simply needs to refrain from presenting metaphysical assumptions as if they were scientific assertions. To achieve this, Bergson argued that scientists should openly engage with and question the metaphysical foundations of their theories. Although Bergson himself took on the challenge of examining the metaphysical assumptions in physical theories, including Einstein's, he maintained that it was also the responsibility of scientists to uphold the accuracy and metaphysical integrity of their own claims.

Chapter 2. Fundamental Changes in Physics: From the Newtonian to the Einsteinian Universe

Bergson's philosophy of science, as outlined thus far, challenged the deterministic framework of pre-relativistic physics, which conceived reality in terms of fixed absolutes and a static, durationless universe. To borrow Pearson's vivid metaphor, Bergson argued that "Modern science has no more to do with a becoming than bridges thrown across a stream have to do with following the water that flows under their arches" (Pearson 2002, p. 63). Within this framework, time as lived duration cannot be grasped through Newton's concept of absolute time. However, with the advent of new physical theories in the early 20th century, Bergson's interest in the scientific treatment of time deepened—especially as Einstein's special relativity began to gain traction in France. He could not remain indifferent to a theory that promised to redefine physical time and, with it, the broader scientific worldview.

To fully grasp Bergson's critique of relativity, we must complement the analysis of his philosophy of time and science with an understanding of the fundamental shifts that occurred in physics during this period—namely, the transition from Newtonian to Einsteinian universe. This confrontation with relativity took place amid dramatic changes both in Bergson's intellectual reception and in the foundations of physics itself. Relativity theory displaced the seemingly stable principles of classical mechanics with new assumptions and hypotheses. The absoluteness of time, once taken for granted, was not only questioned but decisively abandoned, prompting a re-evaluation of related concepts such as space and motion.

In light of these developments, aspects of Bergson's earlier critique of pre-relativistic science appeared newly vindicated. As noted, the absolute time of Newtonian mechanics could no longer be upheld. But did this mean that the new physics aligned with Bergson's theory of duration? This question became central to his inquiry, offering a potential opportunity to reconcile his metaphysical conception of time with the emerging scientific framework.

Bergson's engagement with the theory of relativity centred on its treatment of time and its implications for his own theory of duration—precisely the central concern of this thesis. To assess this relationship, however, it is essential first to understand the broader transformation in physics at the beginning of the 20th century: what concepts were discarded, what new questions emerged, and how the scientific worldview itself was reshaped. Only by appreciating the depth of this transformation can we fully understand the originality and ambition of Bergson's response, who accepted the premises of relativity theory long before many respected physicists of his time.

Accordingly, this chapter addresses the key developments that redefined physics in the early 20th century. It begins by examining Einstein's major theoretical innovations, with a focus on the special theory of relativity and the classical assumptions it rejected. It then turns to the broader shift from a pre-relativistic to a relativistic worldview, distinguishing between ideas grounded in Newtonian mechanics and those more speculative in nature. Special attention is given to the changing conceptions of time, space, and motion—the core themes at stake in Bergson's philosophical response.

2.1. The Controversial New Theory

Merely two years before Bergson published his *opus magnum*, *Creative Evolution*, in 1905, a young physicist working in the patent office in Zurich, Albert Einstein, introduced his theory of special relativity, marking the beginning of revolutionary changes in physics, particularly in the physical understanding of time. At that time, however, Einstein's paper failed to immediately capture the interest of the scientific community[64]. It only gained recognition after the theory of relativity had proved successful and achieved broader acclaim. Another reason for the delayed acceptance of Einstein's proposal was its radical departure from the established framework of physics. Adopting the theory of relativity required rejecting certain foundational assumptions of pre-relativistic physics, most notably the absoluteness of time. Einstein initially struggled to advance his theory due to the prevailing inclination among scientists to preserve Newtonian physics, which they regarded as a comprehensive model of the universe that, with minor exceptions, accurately depicted reality. Prominent scientists like Ernst Mach, Hermann von Helmholtz, Henri Poincaré, Albert Michelson, and Hendrik Lorentz remained committed to Newtonian principles even after Einstein proposed his theory. To fully appreciate their stance and the challenges Einstein faced in introducing relativity theory, it is essential to consider the scientific context at the turn of the 20th century.

At that time, the dominant theory—and the one that still prevails to a significant extent—was Newton's, introduced in the 17th century and further developed in the 18th century, built on contributions from Copernicus, Kepler, and Galileo, and completed by the work of Leibnitz, Euler, Lagrange, Hamilton, and Jacobi[65]. This pre-relativistic physics, enhanced by deterministic philosophies like those of Spinoza or Descartes, established laws that aimed to precisely define

[64] Interestingly, Einstein's 1905 article caused a sensation among artists immediately after its publication (Demoures 2007, p. 153).

[65] For further discussion, see, for example, Cohen-Tannoudji 2009, p. 118; Guerlac 2006, p. 19.

relationships between different magnitudes and sought predictability by calculating the future movements of objects based on their initial positions and velocities. Science was, therefore, supposed to explain everything. Although Newtonian physics faced certain challenges and limitations, no event or observation contradicted its principles for two centuries, leading physicists to believe they had discovered the true laws governing the universe. They also hoped that any inconsistencies would eventually be resolved[66].

After establishing the unity of physics through Newton's equations for particle motion and Maxwell's theory of electricity and magnetism, scientists faced the challenge of identifying a medium through which light propagates, analogous to air for sound waves. To address this, they proposed the existence of ether[67], a pervasive substance filling "empty" space and transmitting electric and magnetic forces in the form of light[68]. Helmholtz, Poincaré, Fitzgerald, and others supported the concept of ether despite a lack of empirical evidence. In 1887, Albert Michelson, in collaboration with Edward Morley, attempted to measure the speed of light relative to Earth's reference frame[69]. Surprisingly, they observed a single, constant speed, as if the Earth were at rest relative to the ether[70]. Rather than conceive a new theory to explain this null result, scientists sought to preserve the unity of physics by introducing concepts like the Lorentz-Fitzgerald contraction theory[71], which aimed to account for the experiment's outcome.

Einstein's theory initially encountered resistance, primarily because the effects it predicts manifest only at velocities approaching the speed of light and are practically imperceptible in

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[66] The challenges faced by pre-relativistic physics included the thermal properties of matter, which existing theories could not explain; Mercury's orbit, which defied predictions; and electrodynamics, which could not be reconciled with Newtonian mechanics. Further difficulties arose with the photoelectric effect, which contradicted Maxwell's theory of electromagnetism, and black body radiation, which could not be accounted for by either electromagnetism or thermodynamics. Experimental discoveries, such as radioactivity observed by Henri Becquerel and his students, the Curies, in 1896 and 1898, also posed new challenges for physics at the time (cf. Friedman & Donley 1989, pp. 39–40; Cohen-Tannoudji 2009, pp. 120–121; Guerlac 2006, pp. 33–34).

[67] Contrary to common belief, the concept of ether did not emerge until the 19th century.

[68] According to Maxwell's calculations, light waves travel through the ether at a constant speed of 299,792,458 metres per second.

[69] Measuring the speed of something as fast as light posed a significant challenge. Scientists had to develop a specialised instrument capable of such precise measurements—an interferometer. The device itself could not have been created earlier, as its construction required technological advancements, particularly in metallurgy and the German optical industry (cf. Whitehead 1997, p. 117; Čapek 1971, p. 47; Carr 1924).

[70] The experiment was repeated from 1887 through the 1930s, consistently yielding the same result. In this context, Ian Hacking makes an intriguing observation: given these repetitions, one might say that establishing the result took a day and a half, a year, or even half a century (Hacking 2010, p. 174).

[71] According to the theory of contraction, since the Earth moves through the ether, all of its measuring instruments must contract just enough to compensate for the effect of this motion, thereby producing the outcome observed in the Michelson-Morley experiment. Bergson assessed the Lorentz-Fitzgerald theory in *Duration and Simultaneity*.

everyday experience. Meanwhile, Newton's laws serve as an excellent approximation and appear to hold perfectly at smaller scales. Precisely because such high speeds are required for relativistic effects to become noticeable, Einstein's predictions faced the obstacle of limited experimental confirmation. Although he referenced the Michelson-Morley experiment to support his assertions, it could be argued that the experiment might just as easily have indicated unknown properties of the ether rather than discrediting its existence or corroborating Einstein's broader claims. Albert Michelson himself did not believe that his experiment contradicted the validity of Newton's theory. It was not until 1919, with the Eddington expedition, that empirical evidence validated Einstein's predictions, revealing Newtonian mechanics to be imprecise.

Einstein developed his theory by synthesising elements of physics he considered robust, such as Maxwell's equations, Lorentz-Poincaré formulae, and Galilean relativity, while rejecting other concepts[72], most notably the existence of ether[73]. He also replaced Newton's concept of material particles with the notion of a field[74]. The two fundamental postulates of his (special) theory of relativity were presented in his 1905 paper. The first extended Galilean relativity to all physical laws, and the second stated that the speed of light is constant across all inertial frames of reference, thus eliminating the need for ether. While these postulates seem simple, they led to remarkable predictions and extraordinary claims. For instance, imagine a spaceship travelling nearly at the speed of light (approximately 299,000 kilometres per second) alongside a beam of light, which itself moves close to 300,000 kilometres per second. According to the second postulate, the speed of light observed from the spaceship would still be nearly 300,000 kilometres per second, not reduced by the difference of 1,000 kilometres per second (cf. Friedman & Donley 1989, p. 52; Durie 1999,

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[72] It should be emphasised that I am not asserting that the theory of relativity is the work of a single extraordinary individual who, against all odds, "discovered" the fundamental truths governing the universe. Einstein was not a solitary genius who developed his theories in isolation, as he is sometimes portrayed. Rather, the contributions of many scientists, notably Lorentz and Poincaré, were essential to the development of relativity. Without their groundwork, the theory might never have emerged. In particular, Poincaré's contributions have been highlighted by numerous scholars, some of whom credit him with having nearly formulated the theory of relativity (see, for example, Costa de Beauregard 1969b, pp. 244–245; Čapek 1971, p. 21). Moreover, the theory of relativity would not have gained acceptance as a physical theory without the endorsement of the scientific community, which Einstein actively sought. Finally, the theory does not "discover" the rules governing reality; rather, it offers the most precise and conceptually elegant explanation —particularly for phenomena occurring at speeds close to that of light—of observable events in the universe.

[73] As early as 1903, Einstein argued that the concept of ether should be discarded entirely (for further discussion, see Friedman & Donley 1989, p. 50). He had no interest in preserving the unity of Newtonian mechanics and Maxwell's wave physics, the primary justification for the ether concept.

[74] More precisely, Einstein introduced the dual nature of light, asserting that it exhibits both wave-like and particle-like behaviour. Highlighting its wave-like nature was closely linked to explaining the results of the Michelson-Morley experiment. However, in 1905—the same year he published his paper on the special theory of relativity—Einstein also proposed his explanation of the photoelectric effect, which assumed the particle-like nature of light. It was for this work that he was awarded the Nobel Prize in 1922.

p. 204). This result is even more counterintuitive than the postulate itself and may reflect the limitations of language, which is optimised for describing medium-scale phenomena where Newtonian and Einsteinian physics overlap effectively.

While the special theory of relativity, once validated, was relatively straightforward to understand and was moderately well-accepted by the physics community[75], Einstein's general theory of relativity, introduced in 1915, was neither. In this theory, Einstein extended his postulates to all frames of reference (not just inertial ones) to include acceleration and proposed that the universe's structure is a four-dimensional space-time, with time as a fourth dimension[76]. In space-time geometry, movements are represented as paths called world lines. Interestingly, the shortest path between two points is not necessarily a straight line; if the metrics change from point to point, a straight line transforms into a "geodesic" line. According to Einstein's perspective, light can follow a curved trajectory through space. Furthermore, general relativity was challenging because Einstein used non-Euclidean geometry to describe the universe's structure, accounting for accelerated and rotational movements. These groundbreaking ideas drew scepticism, with notable figures like Max Planck expressing doubts[77]. This reluctance to accept relativity likely stemmed from the fact that, in addition to its groundbreaking physical postulates, it also fundamentally transformed how scientists conceptualise the world.

2.2. World Without Absolute Time

Einstein's approach to reality differed vastly from Newton's. Instead of an absolute universe, governed by unchanging laws, he introduced a unified reality constructed from space-time—a universe that Carr describes as "finite and yet unbounded" (Carr 1924). Rather than solid particles, Einstein proposed intangible fields. Whereas prevailing philosophy regarded time and space merely as ways in which one experiences reality, Einstein redefined them as the very fabric of the universe—integral components of reality itself. Most notably, physical time ceased to be

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75 Some physicists remained sceptical of Einstein's claims, favouring pre-relativistic physics instead. As described by Unnikrishnan, the French physicist Georges Sagnac exemplified this attitude, conducting several experiments aimed at proving the existence of the ether and thus challenging the postulates of special relativity (cf. Unnikrishnan 2020, pp. 35–40).

76 The concept of space-time was first proposed by Hermann Minkowski in 1908, and it fundamentally differed from the understanding of space-time in pre-relativistic physics (see, for example, Čapek 1969, pp. 306–307).

77 Coccia recounts how Planck, "having listened to Einstein's state of the art of his efforts while working on his new theory, paternally advised him to let it go: he would not be successful and in any case, no one would take him seriously" (Coccia 2022, p. 199). Fortunately, not only for physics, Einstein did not follow this advice.

absolute. The notion of universal time became obsolete, along with the still-prevalent image of empty space and absolute motion. The static framework of a privileged system of reference was now eliminated—not only from scientific theories (which had already begun shifting in Newtonian physics) but also from the minds of scientists.

It is crucial to distinguish between concepts that arise directly from pre-relativistic principles and those that are mere assumptions without a concrete basis in Newtonian laws, as this issue continues to provoke misconceptions, even among Bergson scholars[78]. Moreover, although these assumptions were not directly derived from physical laws, they were widely held—including by physicists—and helped shape prevailing worldviews. Accordingly, while absolute time was intrinsic to Newtonian physics[79], absolute space and absolute motion did not follow directly from its laws. Nevertheless, Newton and other scientists employed these concepts to describe the world, not as arbitrary metaphysical ideas, but because they were intertwined with concrete physical structures and thus deeply embedded in the scientific worldview of that time. For instance, when Poincaré wrote *La science et l'hypothèse* in 1902—as analysed by Robert DiSalle—he assumed that Newtonian physics necessitated the existence of absolute space (DiSalle 2014, p. 178).

The notion of absolute time underwent the most significant transformation, as it was deeply embedded in pre-relativistic physics. Newton viewed time as universal, implying uniformity across all reference systems. This universal time was thought to flow equably, unaffected by external factors. Pre-relativistic physics further conceived of time as a receptacle for events, providing a homogeneous and continuous framework. The standards for measuring time, originally derived from Galileo, were expanded by Newton in his renowned *Philosophiæ Naturalis Principia Mathematica* (commonly referred to as *The Principia*). The concept of absolute time was also intertwined with Newton's deterministic worldview through the notion of a necessary temporal connection. This understanding of time was considered so self-evident that when Lorentz and Fitzgerald attempted to explain the results of the Michelson-Morley experiment, they saw no reason to abandon it[80].

Einstein, however, conceived of time in an entirely different manner. In relativity theory, time is not absolute but instead depends on the frame of reference. He introduced the concept of the

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[78] See, for example, Gunter 2023, p. 121.

[79] Strictly speaking, Newton's laws of motion presuppose the existence of absolute time (DiSalle 2016, pp. 36, 41).

[80] Zawirski points out that Lorentz's interpretation demonstrates, among other things, that he did not abandon the concepts of absolute time and ether. Instead, he introduced the notion of local time, realising that only such time could be physically indicated and described (Zawirski 1936, p. 106).

multiple "proper times", each individual and unique in measurement. Consequently, time measured within one reference system will appear to pass more slowly when observed from another. He formulated this "slowing down" of time as time dilation, wherein the greater a system's speed, the slower its time flows. As the system's speed approaches the speed of light, its time slows down to what Friedman and Donley describe as an "infinitesimal crawl" (Friedman & Donley 1989, p. 55). The concept of time dilation also forms the basis of the well-known twin paradox[81].

Another fundamental difference between Einstein's and Newton's universe is the concept of simultaneity, which is directly related to time. In pre-relativistic physics, determining simultaneity was straightforward: if two events were deemed simultaneous, they shared the same absolute time, as indicated by a clock[82]. There was an absolute "now" that encompassed everything, meaning events occurred at precisely the same time. In special relativity, however, simultaneity is frame-dependent. Two events separated by even the smallest spatial distance will have distinct space and time values for different observers, making simultaneity dependent on the observer's frame of reference. Consequently, what is simultaneous for one observer may not be so for another. While the breakdown of absolute simultaneity is less apparent in medium-scale physics, it becomes highly significant in astronomical contexts[83]. However, it is important to note that relativity theory still implies the existence of causally linked events, which remain sequential in every frame of reference[84].

Einstein's theory made it impossible to sustain the pre-relativistic conception of space as an empty container, which Newton himself described as an unchangeable entity, unaffected by any external influences (Newton 1962, p. 6). This shift is all the more significant given that the notion of absolute space served as the foundation upon which the entire framework rested, providing an absolute reference point for all physical events. Considered the backdrop for all occurrences, empty space was deemed essential for the very existence of anything; without it, any temporal event or motion would be impossible to conceive. The "true" motions of bodies were determined by their relation to absolute space, as everything was thought to have a fixed, absolute location within it. However, the concept of absolute space was not fully supported within Newtonian physics itself. As DiSalle explains, absolute space presupposes a distinction between absolute rest and absolute

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[81] The twin paradox is discussed in greater detail in later chapters of this thesis.

[82] For a more detailed description, see Durie 1999, pp. 203–206.

[83] Friedman and Donley clearly and vividly describe the absence of simultaneity on a galactic scale (cf. Friedman & Donley 1989, pp. 57–59).

[84] For further information on this subject, see, for example, Čapek 1971, p. 232; Friedman & Donley 1989, p. 56; Coccia 2022, p. 191.

motion that is neither well-defined nor realisable (DiSalle 2016, pp. 42, 43), suggesting that its origin must lie outside Newtonian mechanics.

Notably, the emergence of infinite, empty, homogeneous space was, for Bergson, an astounding development. According to him, such a view contradicted lived experience. Yet, this concept was gradually constructed alongside the development of human intellect to the point that it became the dominant perspective in the pre-relativistic world until the 20th century. In particular, science, as de Broglie notes, represents extensity through "homogeneous geometrical space" (de Broglie 1969, p. 49)[85]. Bergson remained critical of this depiction of space, arguing that it was overly schematic and inappropriately reduced to mere juxtaposition. Rather than viewing space as a geometric container for all events and bodies, he saw it as a schema that facilitates human action[86]. In *Matter and Memory*, Bergson expressed a favourable view of the work of Faraday and Maxwell, field physics theorists who challenged the pre-relativistic concept of empty space. Ultimately, the theory of relativity entirely dispensed with the notion of absolute space, instead linking it to time and emphasising its relative nature[87].

Einstein's theory also transformed the concept of motion, departing from Newton's framework. Newton defined physical movement according to his doctrine of inertia, which states that a body at rest or moving at a constant velocity will remain in that state unless acted upon by an external force. In pre-relativistic physics, motion was therefore understood as a result of forces between bodies and was defined as a displacement or change in position—essentially, the distance traversed by a moving body, as Bergson accurately described[88]. Newton's laws of motion were based on Galileo's principle of relativity[89], which states that all measurements are relative to their reference frames[90]. Since motion in all inertial frames (i.e., frames moving at a constant velocity) follows uniform laws, it is impossible to determine whether a system is in motion or at absolute

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[85] De Broglie referred to classical physics, including the theory of relativity, with its "unsatisfactory geometrisation of space" (de Broglie 1969, p. 50).

[86] Bergson's view of space evolved throughout his works. In *Time and Free Will*, he described space (*l'espace*) as homogeneous, extensive, and qualitative. However, in his later writings, he attributed qualities such as change and qualitative difference to space, referring to it as "the extensive" (*l'extension*) (for more on this subject, see, for example, Mullarkey 2000, p. 13; Lacey 1999, p. 23; Čapek 1971, p. 212).

[87] This effect can be observed in longitudinal contraction. As Cohen-Tannoudji describes, "Two identical rulers in relative motion do not measure the same length" (Cohen-Tannoudji 2009, p. 124).

[88] Bergson argued—in agreement with Newtonian physics—that bodies move only in relation to one another, given the non-existence of an absolute frame of reference.

[89] Friedman and Donley point out that Kepler's laws of planetary motion enabled Newton to test his laws of universal gravitation beyond Earth, ultimately facilitating predictions such as the discovery of Neptune, a previously unseen planet (Friedman & Donley 1989, p. 29).

[90] Notably, the laws of Newtonian physics, unlike measurements, were not relative but consistent across all reference frames (cf. Friedman & Donley 1989, p. 47).

rest. Thus, from a physical standpoint, motion at a constant speed is indistinguishable from a state of rest[91].

However, Galilean relativity did not extend to all physical phenomena. As Zawirski notes, there were doubts about its applicability to optical and electromagnetic phenomena, leading to the belief that absolute motion might be detectable in optical systems relative to the cosmic ether (cf. Zawirski 1936, p. 99; Costa de Beauregard 2016, p. 330)[92]. The idea of absolute motion, still present in scientific worldviews, was defined relative to absolute space, which was thought to consist of fixed parts known as absolute places. Absolute motion, therefore, was understood as a transition from one otherwise immobile absolute place to another (cf. DiSalle 2016, p. 42). In contrast, Newton defined relative motion in relation to other bodies. This dichotomy was conceivable due to concrete metaphysical views[93], though, like absolute space, it lacked necessary support within Newtonian physics[94]. Ultimately, the concept of absolute motion was discredited as attempts to demonstrate its existence failed. In Einstein's universe, there was room only for relative motion, as he extended Galileo's principle of relativity to encompass all physical phenomena.

In conclusion, Einstein's theory transformed pre-relativistic physics and its underlying metaphysical assumptions. The previously dominant concept of absolutes, which had formed the foundation of reality, was abandoned. Most notably, absolute time ceased to function as the temporal framework of the universe. Rather than all events occurring together within a universal moment, they no longer co-occurred in absolute time; instead, their timing varied depending on the observer's frame of reference. The only remaining absolute in the universe was now the constant speed of light. These groundbreaking changes in the physical understanding of reality prompted responses from the philosophical community. As one of the most fundamental shifts concerned the nature of time, Bergson was prepared to take on the challenge.

Despite these profound changes in physics and its associated worldview, people have remained accustomed to the perspective of pre-relativistic physics, often without recognising it. The perception of time, space, and motion as absolute and determinate has persisted as a matter of common sense—or at least appears to—well beyond the late 19th and early 20th centuries, despite the emergence of Einstein's theory, which, incidentally, remains quite challenging for the average

[91] For further information on the subject, see, for example, Zawirski 1936, p. 99; Coccia 2022, p. 188.

[92] Zawirski also notes that this idea motivated attempts to detect the motion of Earth with respect to the ether through optical phenomena, most notably in Michelson's 1881 experiment (Zawirski 1936, p. 100).

[93] According to DiSalle, the idea of absolute motion was "implicit in seventeenth-century thinking about physical causes and physical explanations" (DiSalle 2016, p. 52).

[94] This was except for absolute rotation, which had a basis in Newton's laws (DiSalle 2016, p. 48).

person to grasp[95]. Notably, these concepts continue to shape popular thought. Laypersons, philosophers, and physicists alike still conceive of time as analogous to the movement of a clock's hands, space as a geometrical surface filled with bodies and objects, and motion as merely the absence of rest.

In *A Brief History of Time*, Stephen Hawking argues that Newton's theory is often employed "for all practical purposes because the difference between its predictions and those of general relativity is very small in situations that we normally deal with. (Newton's theory also has the great advantage that it is much simpler to work with than Einstein's!)" (Hawking 2011, p. 16). Therefore, revisiting the specific ideas and concepts that shaped contemporary physics is relevant. Moreover, in this context, a critique such as Bergson's appears all the more valuable—not only historically but also in the present day—for it demonstrates that his philosophy still has much to offer both physics and philosophy, particularly in encouraging a dynamic way of thinking about the world. His insights have the potential to deepen our understanding of time, space, and motion, moving beyond the conventional frameworks shaped by spatialising habits.

[95] According to Richard Feynman, in advanced physics, "no one really understands" the results produced by mathematics (cf. Feynman 1965, p. 6).

Summary of the first part:

Bergson conceived his concept of time as duration well before Einstein introduced the theory of relativity. From his earliest writings, he aimed to understand reality through a more adequate notion of time. Over the years, he refined this concept, culminating in *Duration and Simultaneity*, his book on Einstein's theory. The first chapter, however, focused on the evolution of Bergson's thought during the "pre-Einsteinian" or "pre-relativistic" period, examining both his views on time and his broader attitude toward science. Accordingly, it presented Bergson's philosophy primarily as a philosophy of time, and simultaneously as a philosophy of science.

Bergson's theory of duration differs markedly from both scientific and everyday understandings of time due to its emphasis on heterogeneity. Influenced by French spiritualism, he portrayed reality as a dynamic process of becoming, analysing not only duration but also change, memory, and intuition. Bergson remained critical of contemporary science, particularly Newtonian physics and its notion of absolute time, arguing that science tends to represent dynamic phenomena in static terms. This, he claimed, led to conceptual distortions—most notably, the spatialisation of time. Bergson identified certain mental habits that reinforced these distortions, and he sought to overcome them by rethinking reality in terms of time's continuous becoming rather than static absolutes.

Remarkably, during Bergson's lifetime, physics underwent a profound transformation. As outlined in the second chapter, Newton's conception of a uniform, absolute time gave way to Einstein's space-time framework, characterised by multiple relative times and the rejection of absolute simultaneity, space, and motion. Although the theory of relativity was initially met with scepticism, it ultimately became the dominant model for describing macro-scale phenomena. Newtonian physics, while displaced as a universal framework, remained valid for mid-scale systems, offering a simpler yet sufficiently accurate approximation. Despite their differences, both Newtonian and Einsteinian models remain deterministic—an aspect that lies at the core of Bergson's philosophical critique.

Part II

Bergson and Einstein: Two Monologues and the Damned Book

Having laid the groundwork by examining Bergson's conception of real duration in contrast to the absolute time of pre-relativistic physics, and by tracing the shift from Newtonian mechanics to Einstein's theory of relativity, this thesis now turns to the pivotal moment at which these two visions of time directly confront one another. This section focuses on Bergson's response to the new physics, culminating in his public debate with Einstein and the publication of his critique in *Duration and Simultaneity*, marking a critical juncture in the philosophical discourse on time and its engagement with modern science.

Historians typically identify the Eddington expedition of 1919 as the moment that brought Einstein's theory of relativity both scientific legitimacy and widespread public attention[96]. Virtually overnight, Einstein became a global figure, soon embarking on a series of international lectures to promote his theory. By the time Bergson published his critique of relativity in 1922, Einstein remained at the centre of intellectual discourse.

In contrast, Bergson was already an established authority—a philosopher of international stature whose fame had peaked with the 1907 publication of *Creative Evolution*, and who remained prominent during and after the First World War, including through his diplomatic work for France and efforts toward world peace. Engaging in a public debate with Einstein was not a strategic career move; rather, Bergson risked his intellectual standing by challenging a dominant scientific framework as someone outside the community of physicists.

Nevertheless, the concept of time that emerged from relativity was too significant for Bergson to ignore. He not only sought to examine its relationship to his own philosophy but also recognised in Einstein's "relative" time a potential improvement over the Newtonian notion of time in physics. With the publication of *Duration and Simultaneity*, Bergson put his intellectual authority and the viability of his philosophy of time at stake by testing its relevance within this new scientific framework. This thesis argues that Bergson's critique stemmed from his broader view of the relationship between science and philosophy—one that required active, critical engagement with contemporary scientific developments, including Einsteinian physics.

[96] For example, Friedman and Donley argue that relativity remained largely unknown for years, during the First World War. "This situation changed dramatically, however, when the results of the British eclipse expedition […] were announced in November 1919" (Friedman & Donley 1989, p. 10).

As the title of this part suggests, the following discussion focuses on Bergson's engagement with Einstein, the architect of the theory of relativity. Their encounter took place both in person—during Einstein's visit to Paris in April 1922—and intellectually, as Bergson grappled with the implications of relativity while writing *Duration and Simultaneity*. However, this part moves beyond the moment of their meeting. While the previous part explored the foundational principles of relativity within the broader evolution of physics, this part turns to its reception, with particular attention to the French context. Since Bergson's critique was shaped in dialogue with French intellectual responses to Einstein, this cultural and philosophical milieu must be carefully reconstructed.

Chapter 3. *Duration and Simultaneity*

The fundamental changes in physics outlined in the previous chapter gave rise to numerous academic responses, both scientific and philosophical. By 1922, the groundbreaking character of Einstein's propositions was widely acknowledged. People were beginning to adjust to a world without absolute time—a vision Bergson had already advanced before the formulation of the theory of relativity. Yet the philosopher was not content with merely diagnosing the limitations of pre-relativistic physics. He felt compelled to engage with the emerging physical theory and the worldview it introduced, particularly regarding its treatment of time.

Duration and Simultaneity is, at its core, a philosophical work with strong scientific engagement. Arguably the least known of Bergson's writings, it is also the most controversial. This controversy centres on a persistent question: Was Bergson correct in his critique of relativity—or more fundamentally, was he justified in undertaking such a critique, given his lack of formal training in physics? While this latter question resonates more strongly from today's perspective than it did at the time, it remains legitimate. A closer examination suggests that Bergson's own view of the relationship between philosophy and science left him no choice but to enter into dialogue with physicists. This stance, however, did not spare him from harsh criticism within both scientific and philosophical circles. Ultimately, Bergson discouraged further discussion by refusing to republish *Duration and Simultaneity*. While some of his other works were placed on the Index of Forbidden Books by the Catholic Church, only this book was unequivocally "damned"—disavowed by its own author.

Within this framework, the chapter offers an analysis of *Duration and Simultaneity*, beginning with its central hypothesis and positioning it as a key articulation of Bergson's philosophy of science. It considers the extent to which the book can be regarded as a contribution to the philosophy of science, focusing on Bergson's view of the relationship between science and philosophy and their respective roles in shaping scientific knowledge and the account of reality. The chapter then addresses the book's contentious reception and the reasons it came to be described as "the damned book". Rather than analysing the core argument of *Duration and Simultaneity*—the focus of subsequent chapters—this discussion explores the origins of the book, its reception, and philosophical character, including Bergson's attitude toward Einstein as reflected in the text. This contextual foundation prepares the ground for a closer examination of Bergson's direct engagement with Einstein.

3.1. DS as an Exemplification of Bergson's Philosophy of Science

The analysis of the first part revealed that, from the outset of his philosophical activity, Bergson engaged with and commented on science and its achievements, sometimes critically, sometimes approvingly[97]. Notably, his reflections were not confined to physical theories. As Jean Gayon, a philosopher of science, observes, apart from *Laughter*, all of Bergson's books involved a confrontation with a particular field of scientific knowledge: from psychology and the study of memory disorders (in *Time and Free Will* and *Matter and Memory*), through biology and the theory of evolution (in *Creative Evolution*), to social studies, including sociology and ethnology (in *The Two Sources of Morality and Religion*) (cf. Gayon 2007, p. 183). Each of these works was preceded by years of research into specific scientific disciplines and reflection on their implications for Bergson's philosophy (cf. Gunter 1969, pp. 29–30). The philosopher also engaged with physics in his 1922 *Duration and Simultaneity*, the subject of this thesis.

This thesis argues that Bergson's critique of the theory of relativity contained in *Duration and Simultaneity* exemplifies his philosophy of science—contrary to the claims of some scholars (cf., for example, Gayon 2007, p. 188; Lovasz 2021, p. 135; Gayon 2005, p. 43[98]). Traditionally, the study of Bergson's philosophy has been regarded as a historical-philosophical endeavour and, in some cases, framed within the history of ideas (cf. Skarga 2014, p. 77). More recently, however, there has been a growing tendency to interpret specific aspects of his philosophy in relation to particular disciplines of knowledge—a notable example being his philosophy of biology (cf. Posteraro 2022). This study aligns with this trend but extends it further by addressing Bergson's philosophy of physics and highlighting his general stance on the relationship between philosophy and science while treating it as his philosophy of science.

This thesis further argues that, although Bergson's thought does not align with contemporary definitions of "philosophy of science", this misalignment does not preclude it from being considered as such. On the contrary, it highlights the need to reconsider and expand the boundaries of what philosophy of science can encompass—an endeavour that is by no means futile.

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[97] While his stance on pre-relativistic physics was largely critical, Bergson's overall attitude towards scientific research remained predominantly optimistic, as seen in his engagement with memory and biology studies. Even his approach to relativity was, in many respects, positive.

[98] In the article, Gayon asserts that we can only speak of Bergson's implicit philosophy of science (Gayon 2005, pp. 47, 53). Although Gunter uses the expression "philosophy of science" in relation to Bergson's thought, he does not clarify its precise meaning, ultimately gravitating toward the term "Bergson's philosophy of physics" (Gunter 1969, p. 24).

Accordingly, this examination situates Bergson's engaged philosophy of science[99] in relation to both the dominant philosophical approaches to science of his time and contemporary debates in the philosophy of science.

Despite his profound interest in science and basing his philosophy on scientific knowledge, Bergson has never been considered a philosopher of science, even in France. Jean Gayon, an already cited philosopher of science, describes his academic training in France as grounded in "a mixture of neopositivist authors and three French philosophers […]: Bachelard, Canguilhem, and Foucault" (Gayon 2005, p. 43). Absent from this curriculum, Bergson indeed displayed different views from the ones indicated by Gayon on the relationship between science and philosophy. Namely, instead of methodological evaluation and systematic interpretation of the scientific structure of a theory (cf. Gayon 2005, p. 50), Bergson opted for the confrontation with scientific theory—not only with its methods or its significance for the understanding of science but more fundamentally, with its content[100]. Otherwise—he argued—philosophy precludes itself from examining the foundational facts upon which science is based, facts that are not purely objective but imbued with assumptions and interpretations.

Ironically, Bergson would not describe himself as a philosopher of science either. Early in his academic career, after graduating from the École normale supérieure, his reading of Spencer's works led him to take an interest in what was then called "the philosophy of sciences", which dealt with the study of concepts related to science (Bergson 2002, p. 362). However, when analysing the concept of time, Bergson realised that scientific time, as presented in the philosophy of sciences, does not endure and adds nothing new to the perception of reality. This realisation prompted what might be described, in Kantian terms, as Bergson's awakening from dogmatic slumber. In other words, recognising the redundancy of time in the philosophy of science marked a turning point for him[101]. Consequently, Bergson was not interested in analyses of the philosophy of science understood as reflections on the methodology of scientific knowledge, as he believed such an approach ignored the fluidity of reality. As Gayon observes, Bergson rejected "the philosophy of

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[99] The reasons for characterising Bergson's thought as an "engaged philosophy of science" are outlined in the Introduction to this thesis.

[100] Gayon contends: "As far as I know, Hempel, Popper, Bachelard, or Kuhn did not devote entire books to showing that, for instance, the foundations of psycho-physics were just wrong, that the theory of cerebral localisation and psychophysical parallelism was not proved, that biologists had missed something essential in evolution, and that the current interpretation of Special Relativity in physics was unsound. But this is precisely what Bergson did" (Gayon 2005, p. 50).

[101] As Bergson confided to James, "This was the starting point of a series of reflections which led me, step by step, to reject almost all that I had previously accepted, and to completely change my point of view" (Bergson 2002, pp. 362–363).

sciences" as he understood it—namely, as a metadiscourse on science that had existed since the mid-19th century (Gayon 2007, p. 178; Gayon 2005, p. 45).

Should we speak of "the philosophy of sciences" or "the philosophy of science", particularly in relation to Bergson's philosophy? Notably, the idea of a generalised philosophy of science was entirely foreign to Bergson (Gayon 2007, p. 178). This was not unique to him but characteristic of other scholars of his time, including Auguste Comte, who, despite prolonged efforts, failed to establish the first professorial chair in the field of *histoire des sciences* (Hacking 1996, p. 37). What united these thinkers was their insistence on grounding their reflections not in abstract principles but in what could be achieved in practice (Hacking 1996, p. 38). In other words, they rejected the notion of a collective construct under the generic label of "science", choosing instead to engage directly with specific scientific disciplines[102]. Regardless of whether "philosophy of science" or "philosophy of sciences" is the more legitimate term, this thesis adopts the former for practical reasons: it is more commonly used today, and Bergson himself often described his attitude towards science in general without restricting it to a specific discipline. Thus, one can speak both of his philosophy of physics—primarily in relation to his critique of the theory of relativity—and of his philosophy of science, in defining his views on the role philosophy should play in relation to science.

In one of his lectures[103], Bergson described his philosophy as aspiring to what he termed "positive metaphysics", a mode of thought grounded in factual considerations and open to continuous refinement based on experience (cf. Bergson 2005, pp. 64, 67; Gayon 2007, p. 177). This positive metaphysics was intended to be a philosophy that actively engages in dialogue with science while maintaining empirical relevance. Bergson proposed grounding this thought in scientific knowledge, incorporating the latest advancements in physics and other sciences, such as biology and psychology, all while remaining aligned with empirical reality (cf. Bergson 2005, pp. 67–68). Bergson's positive metaphysics—particularly insofar as it defines the role of philosophy in relation to science—is referred to in this thesis as his philosophy of science.

This study does not adopt the term "positive metaphysics" for several reasons. First, this term is broader than "philosophy of science", as Bergson sought to construct a coherent philosophy of reality that extends beyond reflections on scientific knowledge and the relationship between science

102 The concept of "the philosophy of sciences" in the plural has seen a resurgence, as illustrated by Galison's and Stumps' book, in which Hacking's article appears. This resurgence persists despite the importance some thinkers have placed on the idea of the unity of science (Hacking 1996, pp. 39, 53–54).

103 The lecture is "Psychophysical Parallelism and Positive Metaphysics" (an English version is available in Bergson 2005).

and philosophy—the primary focus of this thesis. Second, the term "philosophy of science" more clearly conveys the scope of this study, whereas "positive metaphysics" would require further clarification. Third, "philosophy of science" is more practical, as it remains rooted in contemporary fields of thought, whereas "metaphysics" is now more commonly associated with the history of philosophy rather than contemporary philosophical discourse, rendering it somewhat outdated. Finally, Bergson's positive metaphysics would require a more comprehensive exploration, which lies beyond the scope of this study. This thesis is limited to delineating a possible framework for interpreting Bergson as a philosopher of science, with a particular focus on analysing his philosophy of physics.

What was Bergson's view on science and its relationship with philosophy? Bergson remained closely attuned to scientific developments and did not hesitate to criticise them when necessary. As he explained, his aim was for science to remain scientific and "not to take on an unconscious metaphysics which then presents itself to the ignorant or the half-educated under the mask of science" (CM, p. 78). Although he remained critical of certain aspects of scientific thoguht, he neither rejected nor belittled scientific knowledge. On the contrary, he regarded it as fundamental to understanding reality. He grounded his philosophy in scientific research and developed his ideas in parallel with scientific advancements. Observing the evolution of science throughout history, from Galileo to the emergence of the life sciences (cf. CM, p. 228), Bergson argued that philosophers, in general, ought to be well-versed in the scientific worldview[104]. Moreover, he maintained that, sooner or later, science would extend its scope beyond fixed objects to incorporate movement and fluidity, much as it had done with the wave-corpuscle duality (CM, p. 85)[105].

Bergson valued science as much as philosophy, believing that both disciplines concern themselves with different aspects of the same reality (CM, p. 93). As he stated in *Creative Mind*, he attributed to both philosophy and science "the power of attaining an absolute" (CM, p. 78)[106]. He recognised that science and philosophy have distinct objectives: the former seeks to analyse fixed,

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[104] He wrote: "The masters of modern philosophy have been men who had assimilated all the material of the science of their time" (CM, p. 236).

[105] Notably, Bergson did not endorse the notion of continuous scientific progress, a characteristic feature of scientism. In one of his lectures, he argued that the belief in the inevitable discovery of missing proofs and facts through the advancement of science can only be sustained if "one is fully imbued with the Leibnizian or Spinozian idea of a universal mechanism" (Bergson 2005, p. 66). However, he acknowledged that scientific progress occurs only piecemeal. According to Bergson, such progress arises through the increasing validation of already accepted principles and an intellectual expansion that renders previously paradoxical concepts intelligible (cf. Bergson 2005, p. 61).

[106] In this context, it is surprising that Bergson was accused of holding an anti-scientific attitude, and even more so that, to this day, he continues to be perceived as an anti-intellectualist.

quantifiable aspects of reality, while the latter engages with the fluid and unmeasurable dimensions of existence. In his view, the guiding principle of science—following Francis Bacon—is to "obey in order to command", whereas "the philosopher neither obeys nor commands" but instead seeks to be immersed in nature (CM, p. 149). In his philosophy of science, he sought both to shield science from the accusation of producing only relative knowledge and to prevent philosophy from descending into abstract speculation (cf. Pearson & Mullarkey 2002, p. 35).

Unlike the dominant attitudes of his era, Bergson envisioned the philosopher's task as deeply engaged with scientific developments. He argued that philosophers should not merely echo scientific findings or replicate science's approach to reality, as this would contribute nothing new that science has not already conveyed. Instead, they should employ the method of intuition to recognise and discard the mental habits—such as the spatialisation of time—that science inadvertently adopts, extending beyond the knowledge available to scientists. In "Philosophical Intuition", Bergson maintained that if philosophers merely reiterate scientific conclusions in their attempts to unify knowledge, they not only remain at a superficial level of generality but also undermine science and diminish the significance of philosophy (CM, p. 144).

In Bergson's view, philosophers should not leave facts solely within the domain of science. Instead, they should engage with the content of scientific theories, participating alongside scientists in the process of establishing facts and constructing knowledge. He drew a parallel between the facts described by science and the laws promulgated by a legislator, arguing that, unlike in the judicial domain, facts and judgement in science are not independent of each other. While in a courtroom, laws and judgments must necessarily remain separate, the facts of science depend on selective "cuts" from reality that shape how they are represented. Therefore, "form is no longer entirely isolable from matter" (CE, pp. 213–214), just as facts cannot be separated from their evaluation and interpretation. Bergson thus urged philosophers not to divide the labour of philosophy and science but to maintain a collaborative relationship. Otherwise, they would deprive scientists of the opportunity to grasp the essence of reality (CE, pp. 212–214) and risk turning philosophy into an inconsistent and speculative metaphysics[107].

The argument for cooperation between philosophy and science gained further justification from the symmetry and complementarity of their methods. According to Bergson, both disciplines are rooted in empirical inquiry, though they engage with experience in distinct ways. While their

[107] "For not having wished to intervene, at the beginning, in questions of fact, he [a philosopher] finds himself reduced, in questions of principle, to formulating purely and simply in more precise terms the unconscious and consequently inconsistent metaphysics and critique which the very attitude of science to reality marks out" (CE, p. 213).

approaches differ, these differences could serve to advance both fields. Bergson maintained that science and philosophy offered complementary perspectives to reality, which is why he believed their collaboration could yield fruitful outcomes. In particular, philosophy could "enable science to progress" (CM, p. 77) by engaging in scientific inquiry, critically examining its foundations, and questioning implicit assumptions. However, for this collaboration to be effective, philosophy must abandon any ambition to control science or to regard itself as superior. Instead, Bergson advocated for genuine cooperation between philosophers and scientists, fostering dialogue across distinct disciplines of thought.

Bergson not only advocated for this approach, but he also actively practised philosophy in this manner. Apart from his confrontation with the theory of relativity, which this thesis analyses, it is also worth considering his philosophical development prior to his encounter with Einstein. Bergson recounted that he began with the issue of psychophysiological relation and freedom, which he examined in *Time and Free Will*, leading him to the problem of mind and body. After analysing issues of aphasia, brain lesions, and attention to life, he concluded that memories are not stored in any particular location but rather preserve themselves. He emphasised that his philosophical approach lay in formulating problems rather than solving them—or, more precisely, that he resolved problems by posing them (cf. CM, pp. 85–90).

However, the most striking example of Bergson's approach to science is *Duration and Simultaneity*, in which he critically engaged with the theory of relativity. In this work, he conducted a focused and systematic analysis representing a scientific and philosophical approach. Although he incorporated aspects of his own philosophy of time—making the text less conventional within the philosophy of science (cf. Gayon 2005, p. 52)—this integration reflects his broader conception of the proper structure of the philosophy of science. From the outset of his career, his philosophical investigations consistently informed his engagement with scientific theories. This methodological stance stemmed from his commitment to grounding his entire philosophical system in scientific knowledge, a principle that also underpinned his critique of Einstein's theory.

The distinctive nature of this book is also evident in its title: it is the only one of Bergson's works to reference not only "duration"—a central concept in his philosophy—but also a specific scientific theory and its author[108]. In *Duration and Simultaneity*, Bergson explicitly stated that he chose to examine special relativity rather than general relativity because the former introduced novel ideas about the concept of time, which remained his main focus. This emphasis on a specific

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[108] The full title of Bergson's book is *Durée et simultanéité: à propos de la théorie d'Einstein*.

scientific theory is not only exceptional within Bergson's writings but—more significantly—illustrates a characteristic approach within the philosophy of science (cf. Gayon 2007, p. 185). The book's engagement with methodological issues, alongside its precise, concrete, and non-metaphorical argumentation, further reinforces its alignment with this tradition.

Therefore, Bergson's analyses—particularly those in *Duration and Simultaneity*—might be considered exemplary contributions to the philosophy of science. Moreover, as Gayon suggests, contemporary philosophers of science may find elements of his thought that align with their own and identify numerous theses that could be regarded as part of the philosophy of science (cf. Gayon 2007, p. 189). Nevertheless, this thesis argues against the imposition of contemporary philosophy of science frameworks onto Bergson's work. This reluctance stems from the observation that, in its present form, the philosophy of science often lacks substantive engagement with the epistemological foundations and conceptual assumptions of scientific theories. Instead, it has largely devolved into a formalistic academic discipline, detached from broader philosophical inquiries about life and reality[109]. This perspective is supported by a historical understanding of how the philosophy of science has evolved.

The most prevalent approach today is arguably analytic philosophy of science, which engages in debates such as whether McTaggart was correct in asserting that time does not exist. While specialists within this tradition are undoubtedly valuable, little space is afforded to those interested in exploring reality as a dynamic flow—except under the vague and often dismissive label of "continental" philosophy, a categorisation imposed by self-identified analytic philosophers. Beyond this narrowly defined philosophy of science, it is essential to acknowledge the field of science and technology studies (STS), an interdisciplinary area more closely aligned with Bergson's philosophy, albeit without fully encompassing the scope of his analysis. Perhaps the most compatible framework is contemporary history and philosophy of science. Nevertheless, even these perspectives fall short of Bergson's direct engagement with science, which remains distinctive in its treatment of reality and its dynamic processes.

Another argument against aligning Bergson's philosophy of science with the prevailing analytical tradition lies in the origins and foundations of the contemporary philosophy of science.

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[109] Bergson's approach, by contrast, was deeply concerned with the lived experience of time and the dynamic nature of scientific concepts. His engagement with science was not merely analytical but also integrative, seeking to bridge the gap between scientific theories and fundamental questions about human perception, intuition, and temporality. Unlike the dominant trends in the contemporary philosophy of science, which often prioritise logical analysis and model-building, Bergson's method emphasises the evolving and qualitative aspects of scientific inquiry. This distinction highlights why his work should not be retroactively assimilated into contemporary frameworks that might overlook its broader philosophical significance.

As the successor to logical positivism, this field has been shaped by Cold War politics and is characterised by its emphasis on an apolitical, abstract, and technical model of knowledge and science. Many scholars examining the development of the philosophy of science—such as George A. Reisch, Rebecca S. Lowen, Mark Solovey, and Naomi Oreskes—contend that the discipline has rendered itself ineffective by disregarding the social dimension of scientific inquiry, among other factors. Some of these scholars advocate for reassessment or even reinvention of the contemporary philosophy of science.

Finally, Bergson himself warned about confining the philosophy of science to the analysis of a scientific theory's structure or its historical significance while neglecting its content. He demanded more from philosophy in its engagement with science than merely criticising it or positioning itself as a metaphysics that claims to transcend science, only to avoid challenging anything within its domain. Such an approach, he argued, would amount to an abdication of philosophy's responsibility to engage meaningfully with scientific knowledge (cf. Gayon 2007, pp. 176–177). Instead, Bergson maintained that philosophers should engage in dialogue with scientists about their theories, focusing on the content of scientific knowledge—this is precisely what he sought to achieve in his engagement with the theory of relativity. Otherwise, the philosophy of science risks rendering itself superfluous and, eventually, obsolete.

By advocating for a philosophy that directly engages with the content of scientific theories rather than merely critiquing their structure or historical significance, Bergson challenged the prevailing boundaries of the philosophy of science. His approach underscores the necessity of philosophical reflection that is both critical and integrative, bridging the gap between scientific thought and broader metaphysical questions. Building on this, this thesis argues that Bergson's considerations, particularly those presented in *Duration and Simultaneity*, can be interpreted as a proposal for an alternative philosophy of science—one that moves away from abstract analyses and towards active engagement with scientific inquiry. This alternative approach would foster genuine dialogue with scientists, much like the one Bergson sought to establish with Einstein on relativity.

3.2. The Turbulent Fate of DS

In 1922, Bergson published *Duration and Simultaneity*, a work he had been developing even before his personal meeting with Einstein on 6 April of that same year. In 1923, a second edition of the book was released, incorporating several important appendices. Between 1926 and 1931, four additional printings were published. In later years, Leon Jacobson translated the book into English under the title *Duration and Simultaneity: With Reference to Einstein's Theory*. In the 1999 edition, edited by Robin Durie, the subtitle was changed to *Bergson and the Einsteinian Universe*. As noted earlier in the introduction to this thesis, the book has never been translated into Polish.

Duration and Simultaneity had been in development for over a decade before its publication. Bergson's interest in Einstein's theory of relativity was first sparked by a speech delivered by the French physicist Paul Langevin at the Philosophical Congress in Bologna in 1911, where the latter discussed what later became known as the twin paradox. Notably, Langevin was one of the most prominent popularisers of Einstein's theory and one of the few academics teaching it at the university. Bergson was captivated by the remarkable example of the twins, which he would later analyse in *Duration and Simultaneity*. However, he could not fully devote himself to the research immediately after the Bologna congress, as he was deeply involved in public affairs. During the Great War, Bergson worked tirelessly to help expedite its end, striving for an Allied victory over Germany. Acting as an envoy of the French government, he undertook peace missions to numerous countries, including Spain.

During his visit to Spain in 1916, in one of his many speeches and dialogues, Bergson revealed to the gathered audience—comprising both students in Madrid and political figures—that his previous philosophical analysis had brought him "face to face with a certain new problem" in science (cited in Cain 1959, p. 405). One can only speculate that he was referring to the twin paradox and the concept of time it implied. He further shared that "this problem made it necessary for me, if I wished to obtain a solution, to undertake studies which were new to me" (Cain 1959, p. 405). He was likely referring to the study of the theory of relativity. As history attests, Bergson did not shy away from the challenges posed by his philosophical investigations, even when they required him to explore the complexities of the latest developments in physical theory.

According to Bergson, a philosopher is fundamentally "a man who is always ready, whatever his age, to become a student again", for philosophy demands "that one never shrinks from the study of a new object or even a new science" (cited in Cain 1959, p. 405). True to this conviction, Bergson dedicated over a decade to examining the theory of relativity. He read "an impressive amount of books", including works by Einstein, Lorentz, Minkowski, Schlick, and Whitehead, discussed the subject with mathematicians such as Édouard Le Roy, and attended conferences that addressed the philosophical implications of the theory of relativity (During 2014, p. 524). Bergson reportedly read "almost everything that had been published at the time on the subject" (During 2020a, p. 36). However, he did not initially intend to turn his analyses into a book. As he explained, "One is never obliged to write a book", and he firmly concluded, "On new problems I shall write noting" (Cain 1959, p. 405). Yet, despite his initial resolve, Bergson's studies of relativity theory ultimately culminated in writing an entire book on the subject.

In one of his many conversations with Jacques Chevalier, Bergson revealed that he had initially intended to present the outcome of his analyses on relativity in the form of a brief note (Bergson 2009, p. 384). Accordingly, in the preface to *Duration and Simultaneity*, Bergson emphasised that he wrote the book primarily for his own purposes. However, what began as a mere note evolved into a full-fledged text (cf. During 2009, p. 223). Thus, in the late summer of 1922, Bergson published his long-prepared book, which served as a confrontation with Einstein's physical theory, particularly its concept of time, as reflected in the title (*Durée et Simultanéité: A propos de la théorie d'Einstein*).

Bergson was especially intrigued by the nature of space in general relativity and its reliance on non-Euclidean geometry. However, he observed that the concept of time in special relativity was ambiguous and challenging to grasp. Consequently, as a philosopher, he resolved to examine the meaning of time within Einstein's theory[110]. This task appeared all the more significant given that, as demonstrated by Langevin's example of travelling twins, relativity presented a conception of time that differed radically from that of pre-relativistic physics. The latter, as noted, was a target of Bergson's critique. Unlike Newton, Einstein did not conceive of time as a linear and abstract sequence of instants. Instead, he proposed a radically different understanding, unbound by the Newtonian worldview. This divergence compelled Bergson to confront his own philosophy of time in light of the new physical theory, adhering to the principles of his philosophy of science.

Another reason for analysing the theory of relativity was that, according to Skarga, Bergson simply could not forgo the challenge of analysing the theory that had revolutionised the field of physics, particularly given his enduring interest in natural philosophy (cf. Skarga 2014, p. 91). Zawirski takes this argument further, asserting that if Bergson wished his philosophical system to remain relevant and to account for the latest advances in knowledge, he had to evaluate the philosophical implications of the new theory. This necessity was all the more pressing given that

[110] Even decades later, the concept of time implied in Einstein's theory continued to intrigue many philosophical and scientific minds. As Kurt Gödel posits, "One of the most interesting aspects of relativity theory for the philosophical-minded consists in the fact that it gave new and surprising insights into the nature of time" (Gödel 1970, p. 557).

Bergson's philosophy centred on the concept of time (Zawirski 1924, p. 103)[111]. Thus, Bergson felt compelled to scrutinise the theory and assess its compatibility with his own concept of time.

In the preface to his book, Bergson claimed to have found support for his own assertions within Einstein's theory. However, it is important to emphasise that *Duration and Simultaneity* was not solely intended to explore the compatibility of Bergson's concept of duration with Einstein's views on time. Nor was it an attempt to reconcile Bergson's philosophy with the theory of relativity or fit the latter into the framework of the former. Bergson's aim was far more ambitious. He felt obliged, as a philosopher, to clarify certain misconceptions and address issues arising from the popularisation of the theory, which often misrepresented its physical claims. He recognised an opportunity to explore new perspectives on time introduced by the theory of relativity. This was all the more significant given that the conception of time in relativity was unprecedented and had, until then, remained largely unexamined in philosophical terms—a gap that philosophical analysis could help bridge[112].

Although Bergson undertook the task of commenting on physical theory, *Duration and Simultaneity* retains a fundamentally philosophical character. To begin with, the book contains analyses that are crucial to Bergson's philosophy of time, further developing his concept of time as duration[113]. Indeed, Bergson devoted an entire chapter of *Duration and Simultaneity* to reflections on the nature of time. Numerous scholars pay attention to the philosophical issues addressed in the book, though they identify different themes as the primary focus of Bergson's inquiry. Deleuze, for instance, argues that the book centres on Bergson's philosophical exploration of whether there exists a single time or multiple times (Deleuze 1991, p. 78). He also asserts that the question of the multiplicity of durations was far more critical to Bergson than the multiplicity of times in the theory of relativity (Deleuze 1991, p. 80). However, this interpretation appears inaccurate, as Bergson focuses only on the multiplicity of physical times within the context of Einstein's theory, without addressing the multiplicity of duration or that of real time. In contrast to Deleuze's interpretation, Jankélévitch offers a different perspective on the book's main concerns. He suggests that the primary aim of *Duration and Simultaneity* is to demonstrate that the problems of relativity ultimately pertain to the distance between the observer and the observed—an issue that falls within

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111 "The philosopher, in whose system the concept of time occupies a central place, could not remain indifferent to a natural theory which seems to shed new light on this notion, and has started to exert a certain influence on philosophical minds" (Zawirski 1924, p. 103).

112 "[…] this famous »time« of relativity has in a certain way not yet been thought of, and this unthought maintains confusions that a philosophical analysis is capable of dissipating" (During 2009, p. 226).

113 Frédéric Worms points out that it is often overlooked that this work is also significant for a deeper understanding of Bergson's concept of time (Worms 2009, p. 13).

the domain of philosophical inquiry (Jankélévitch 2015, p. 24). While this view may hold some validity, it does not fully capture the essence of Bergson's argument. This thesis contends that *Duration and Simultaneity* primarily aims to propose and examine a concept of physical time that is grounded in reality, while also exploring its relationship with Bergson's notion of duration.

Duration and Simultaneity is a significant work not only for its philosophical depth but also for the many issues it addresses, including the evolving relationship between philosophy and science, particularly in light of the developments in Einstein's theory. Following the Eddington expedition in 1919, there was widespread public fascination with the implications of the new physics for everyday life. As mentioned earlier, misunderstandings and misinterpretations of Einstein's theory were common. Some believed Einstein had discovered a way to manipulate time, opening possibilities like time travel, while others speculated about eternal youth or even the elimination of time itself. Even those who correctly understood the theory often struggled to conceptualise phenomena such as the slowing down of time or the curvature of four-dimensional space[114]. Bergson sought to correct these misinterpretations and refocus attention on the philosophical implications of the linguistic and conceptual habits tied to Einstein's theory of relativity.

Bergson recognised that Einstein's theory lacked a metaphysical foundation, as the notion of absolute Newtonian time could no longer be upheld. Consequently, he sought to construct a metaphysical framework from the ground up. He thus undertook an in-depth exploration of the theory of relativity (cf. During 2009, p. 244; Deleuze 1991, p. 116). As a result, Bergson not only proposed a new conception of scientific time but also identified certain metaphysical assumptions underlying Einstein's work, which he deemed illegitimate and of which Einstein himself seemed unaware. Bergson's empirical approach led him, notably, to scrutinise all the formulae underpinning the theory of relativity to uncover the nature of its conception of time, rather than presupposing a transcendent notion of time a priori (cf. During 2009, p. 232; During 2022b, p. 112).

Contrary to the claims of his later critics, Bergson did not attempt to refute the theory of relativity or to "correct" Einstein. Instead, he sought to clarify aspects of Einstein's conception of time that, in his view, had been obscured by possible philosophical interpretations of relativity. In particular, Bergson aimed to defend Einstein's work from relativist metaphysical readings that distorted its philosophical foundations (During 2007b, p. 80). From the outset of *Duration and Simultaneity*, he made it clear that his analysis was limited to the aspects of relativity that pertain to

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114 Panero discusses the mythology surrounding the dissemination of Einstein's ideas into general circulation, a mythology that Bergson had to contend with; cf. Panero 2016, pp. 156–157.

time[115]. Furthermore, while he primarily focused on special relativity, he engaged with general relativity only insofar as it treated time as one of its coordinates (DS, p. 7).

The claims regarding Bergson's negative attitude towards Einstein are even more untenable when one considers the philosopher's own remarks about the physicist. At the outset of *Duration and Simultaneity*, Bergson explicitly expressed his admiration for Einstein and his scientific contributions. The French philosopher emphasised that Einstein's significance extended beyond introducing a new theory; he also pioneered a novel mode of thinking. Through extensive study, Bergson came to appreciate the profound implications of Einstein's work, recognising its transformative impact on contemporary understandings of time and simultaneity. Far from dismissing Einstein's theory, Bergson acknowledged its value and regarded the physicist as a genius who successfully challenged the prevailing "absolutes" that had long obscured a more nuanced and accurate depiction of reality (Gunter 2023, p. 131). Consequently, any suggestion that Bergson harboured an intrinsically negative stance towards Einstein fails to account for the philosopher's explicit recognition of Einstein's intellectual achievements and the depth of his engagement with relativity.

Despite the considerable effort Bergson devoted to writing *Duration and Simultaneity*, the book faced harsh criticism from physicists and philosophers alike. Among the most vocal critics were physicists Jean Becquerel and André Metz, who accused Bergson of fundamentally misinterpreting the theory of relativity, particularly its concepts of time dilation, simultaneity, and the multiplicity of relative times. Both articulated their objections in writing, challenging Bergson's position as presented in *Duration and Simultaneity*. While Becquerel's critique was conveyed in a private letter to Bergson, Metz's response was far more public. His article, "Bergson and the Evolution of Physics", was published in *Revue de Philosophie* following the release of the book's second edition. Metz even accused Bergson of being "anti-intellectual", claiming he desperately clung to the notion of universal time (Metz 1969, p. 158).

Bergson addressed both criticisms. In 1923, he published a second edition of *Duration and Simultaneity*, which included three appendices to clarify his position and tackle what he identified as fundamental misunderstandings of the book, particularly regarding the twin paradox and the distinction between real time and imaginary times. One of these appendices contained fragments of the letter Becquerel sent to Bergson, along with the latter's response. Ironically, rather than dispelling misunderstandings, the appendices provoked further criticism, including that from Metz.

115 "We have carved out the theory of relativity that which concerns time; we have laid the other problems aside" (DS, p. 7).

Bergson responded to this criticism by writing two articles as part of his "conversation" with Metz in the pages of *Revue de Philosophie* in 1924 (Bergson 2009, pp. 417–430; for English translation, cf. Bergson 1969). However, in his second letter, Bergson expressed disappointment with Metz's reply. He believed the physicist had failed to engage meaningfully with his arguments, neglecting nearly all the key issues he had raised. Bergson concluded that Metz had not fully comprehended the articles or the book, remarking that "there is nothing he can do about it" (Bergson 2009, p. 430).

Even if the criticisms raised by Becquerel and Metz had some merit, their failure to grasp Bergson's conception of time and his critique of the multiplicity of times rendered their objections ineffective in identifying and correcting any potential flaws in his work (Durie 1999, p. xvi). This was equally true of many other objections directed at Bergson. Although vigorous, these critiques were often articulated by individuals who lacked the necessary philosophical background[116] or had not familiarised themselves with the philosophical foundations of his argument. Many critics failed to engage with his philosophical objectives and concepts or to extract aspects of his position that might offer valuable insights from a scientific perspective. It is fair to say that much of the criticism directed at Bergson stemmed more from an association of his philosophy with anti-scientific mysticism than from a substantive engagement with his actual arguments (cf. Landeweerd 2021, p. 42). This widespread misunderstanding of Bergson's critique of relativity theory deeply disillusioned the philosopher (Atkinson 2013, p. 96). Unsurprisingly, he eventually withdrew from the "discussion", choosing to cease speaking publicly on the subject.

Despite the philosophical character of the book, it has received little attention from philosophers. Élie During attributes this to two main factors. On the one hand, the subject of Bergson's analysis—time in the theory of relativity—posed challenges for philosophers lacking a mathematical or physical background (During 2009, p. 222). Bergson himself expressed frustration, remarking to his friend Jacques Chevalier that *Duration and Simultaneity* was understood by very few philosophical readers, even though he believed the mathematical equations he used were accessible to all. He lamented, "But it is extraordinary to see how ignorant of mathematics our philosophers are" (Bergson 2009, pp. 385–386). Nevertheless, the book's extensive use of formulae and calculations arguably did not improve its accessibility (During 2009, p. 223).

On the other hand, During suggests that the book's limited appeal among philosophers also stems from certain sections being dry and repetitive, making it less engaging and more difficult to

[116] "It is possible to be an eminent physicist without being trained to deal with philosophical ideas" (Bergson 1969, p. 175).

follow (cf. During 2009, p. 224). However, Jean Gayon commends *Duration and Simultaneity* for its rigorous dedication to analysing the theory of relativity (Gayon 2007, p. 185). The book's reception in Poland, particularly among philosophers, was similarly diverse: while Zygmunt Zawirski, for instance, expressed a relatively positive attitude[117], the broader Polish philosophical community—strongly influenced by the Catholic Church—rejected Bergson's entire philosophy, including the book on relativity[118].

Eins*tein himself* profoundly influenced the reception of *Duration and Simultaneity*. The events surrounding Bergson's meeting with the physicist on 6 April 1922 played a crucial role in fostering a negative interpretation of Bergson's critique of relativity (cf. During 2020a, p. 34). Einstein's influence on the public perception of the philosopher's arguments—and even on the reception of his entire philosophy—was substantial, particularly in light of their exchange that day[119]. The most frequently cited critique of Bergson—that he failed to understand the theory of relativity, which rendered his arguments irrelevant to science (cf. During 2009, p. 221)—was initially propagated and strongly endorsed by Einstein himself, despite indications in his journal and later correspondence that he was aware of this not being accurate (Canales 2015, p. 26).

Einstein is often reported to have exclaimed, "May God forgive him", in reaction to what he perceived as Bergson's misinterpretation of the theory of relativity. However, during his subsequent journey to Japan, after reading *Duration and Simultaneity*, Einstein appeared to recognise that Bergson had a sound grasp of the theory and was not attempting to oppose it (Canales 2020b, p. 23; Canales 2015, p. 46). Despite this, Einstein disparaged Bergson's approach, suggesting that he had more literary flair than psychological depth—a remark which contradicted the recurrent yet unfounded accusation that Bergson was "psychologising" time (During 2020a, p. 40). Einstein's

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[117] In his review of *Duration and Simultaneity*, Zawirski recommends reading Bergson's book, stating that it is the best work defending universal time that he is aware of (although Zawirski erroneously assumes Bergson supports Newton's concept of absolute time). He also notes that "German literature does not have a similar book" (Zawirski 1924, p. 112), making evident the extent to which Polish philosophy was influenced by German thought.

[118] This argument was presented by Paweł Polak and Jacek Rodzeń during their conference talk titled "The Influence of the Reception of Bergson's Philosophy on the Development of Entropic Concepts in Poland" at the twelfth Polish Philosophical Congress, held from 11–16 September 2023 in Łódź. For an overall reception of Bergsonism in Poland, see Kuszmiruk 2025.

[119] In a recent book on the reception of Bergson's philosophy, commentators observe: "Einstein's rejection of Bergson's ideas on time and memory is in part the reason for the decline in popularity of the latter's work in Spanish America by the 1930s" (Pitts, Westmoreland 2019, p. 160). Similarly, Barnard, following Elizabeth Grosz, argues that "Bergson's professional demise began sometime after 1922 when he was perceived by the educated public, correctly or incorrectly, as having lost the debate with Einstein" (Barnard 2011, p. xxii). Michel Weber goes further, suggesting that the consequences of the Bergson-Einstein debate extend beyond Bergson's decline, stating: "It meant and still means that science's symbolic violence was powerful enough to make (some) people renounce to their own experience and to prefer a construct condemning their life to meaninglessness" (Weber 2022, p. 237).

unfavourable remarks had a chilling effect, even on Bergson's supporters, many of whom felt uneasy about *Duration and Simultaneity* and were reluctant to defend it publicly (cf. During 2009, p. 219). Consequently, despite more recent reassessments, the belief that Bergson failed to understand Einstein's theory became so entrenched that it persists to this day (see, for example, Lane Craig 2016, p. 317; Heller 2006, p. 278).

While some of Bergson's analyses in *Duration and Simultaneity* were indeed flawed, dismissing the entire work or claiming that Bergson fundamentally misunderstood the theory would be an overstatement. A few errors do not render the book worthless, as they do not invalidate the broader philosophical insights and thought-provoking analyses it offers. Moreover, it is crucial to recognise that similar remarks—whether regarded as misinterpretations or errors—were made by distinguished scientists such as Édouard Guillaume, Paul Painlevé, Henri Poincaré, Hendrik Lorentz, and Albert Michelson (cf. Canales 2015, p. 352; Canales 2020b, p. 25). This context suggests that Bergson's engagement with relativity, rather than being a product of misunderstanding, reflects a broader discourse in which even prominent scientists grappled with its conceptual implications. Thus, instead of outright dismissal, a more nuanced assessment of Bergson's work is warranted—one that acknowledges both its limitations and contributions to the philosophical discussion of time and the theory of relativity.

While Bergson may have misinterpreted aspects of relativity, this does not warrant the conclusion that he lacked competence in mathematics and physics. Although he lacked formal training, his engagement with mathematics and physics began in his youth and was marked by significant achievements. As a student at the École Normale Supérieure, he excelled in mathematical and physical competitions, even considering an academic career in mathematics before turning to philosophy (During 2020a, p. 35). Moreover, some scholars suggest that Bergson may have been acquainted with the non-Euclidean geometries of Georg Riemann and Nikolai Lobachevsky prior to his encounter with Einstein (cf. Jones 2008, pp. 135–136). Although he never explicitly referenced Riemann, his distinction between discrete and virtual multiplicity reflects a reworking of Riemann's differentiation between discrete and continuous multiplicity (cf. Lundy 2018, p. 52; Deleuze 1991, p. 40; Pearson & Mullarkey 2002, pp. 2–3). Notably, even scientists with extensive expertise struggled with the conceptual challenges of relativity, often to an even greater degree than Bergson. Therefore, any assertion that he was entirely unqualified or ignorant of the relevant mathematical and physical concepts is unjustified.

In 1931, Bergson published a sixth and final edition of *Duration and Simultaneity* (Sinclair 2020, p. 24). Following this, he chose not to reprint the work or pursue any further translations.

This decision was widely interpreted as a form of capitulation, particularly given the prevailing view that his criticism had failed—the view supported by the fact that the overwhelming majority of scientists and many philosophers rejected it (cf. Gunter 2023, p. 119). However, it would be misleading to interpret this as Bergson's complete disavowal of the book. Despite his decision to cease its reprints, he never entirely repudiated the work[120] (cf. During 2020a, p. 35; Lacey 1999, p. 59; Canales 2005, p. 1184). On the contrary, Bergson continued to reflect on and engage with the issues raised in *Duration and Simultaneity*, as evidenced by a long footnote to *The Creative Mind*, published in 1934 (Sinclair 2020, p. 24). This ongoing engagement suggests that, rather than abandoning his critique, Bergson remained intellectually invested in the topics addressed in the book, even as the scientific community continued to reject his arguments.

Duration and Simultaneity did not reappear until 1968 (Lévy-Leblond 2007, p. 238). It had been notably excluded from the centenary volume, which compiled Bergson's significant works and articles in 1959, and from *Dits et Écrits,* published in 1957 (Gayon 2005, p. 51). This exclusion reflected the ongoing marginalisation of Bergson's critique of relativity. When the book was eventually republished in 1968, the editors included a note explaining their reasons for reprinting it[121]. This note suggests that the editors felt compelled to justify the publication of a book that Bergson had distanced himself from. Their inclusion of the note almost apologetically acknowledged the book's contentious status, providing a rationale for reintroducing a work that had been, at least partly, disavowed by its author.

Consequently, *Duration and Simultaneity* is not widely recognised as a significant part of Bergson's writings. However, it is his only book—indeed, the only text of the philosopher—whose title explicitly incorporates the central notion of his philosophy: *duration*. Moreover, as the title implies, the book embodies and develops Bergson's doctrine of duration, engaging directly with contemporary physical theories (Worms & Soulez 2002, pp. 187–188). Despite this, *Duration and Simultaneity* is often overlooked in discussions of his most influential works. Commentators typically focus on the first three works—*Time and Free Will*, *Matter and Memory*, and *Creative Evolution* (excluding *Laughter*)—and then move directly to his final book, *The Two Sources of Morality and Religion*, occasionally mentioning *Mind-Energy*. The latter, however, is more a compilation of previously published lectures and articles (Čapek 1991, p. 296). This pattern of

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[120] According to Wahl, Gouhier, Guitton and Jankélévitch, Bergson did not forbid the re-publication of *Duration and Simultaneity* but simply chose not to reprint it under the prevailing circumstances (cf. Wahl, Gouhier, Guitton, Jankélévitch 1999, p. 152.

[121] The note was translated into English in the volume edited by Robin Durie; cf. Wahl, Gouhier, Guitton, Jankélévitch 1999, pp. 151–153.

neglect further highlights the paradox of *Duration and Simultaneity*'s central philosophical importance and its marginalisation within Bergson's intellectual legacy.

Bergson's work on relativity transcends merely addressing whether he was right or wrong or whether he "won" or "lost" the debate with Einstein, as often suggested. *Duration and Simultaneity* holds value not only in a historical context but also for its continued relevance to contemporary philosophical reflection. The book provides a creative examination of time, both in relation to physical theory and as an innovative concept developed by Bergson throughout his works. Additionally, it embodies a "non-classical" philosophy of science that engages with issues still pertinent to modern discourse.

Chapter 4. Bergson Meets Einstein

When Bergson met Einstein on 6 April 1922, he had already completed *Duration and Simultaneity*, which is why the previous chapter introduced its context. Notably, the book is often interpreted through the lens of Bergson's interaction with Einstein, especially their public debate during the physicist's visit to Paris. For this reason, it is essential to examine the encounter itself. This examination situates Bergson's ideas within the broader reception of relativity and sheds light on the originality—and limits—of his interpretation of Einstein's theory. Furthermore, this chapter contributes historical context to the thesis's broader inquiry by drawing on Bergson's contributions to the 1922 debate, thereby laying the groundwork for a more focused analysis of his critique of special relativity. It also highlights the philosophical stakes of the confrontation between physics and philosophy, a tension central to Bergson's understanding of science.

This chapter explores the nature of Bergson's dispute with Einstein, centred on their conflicting views of time and the question of who has the authority to define it. It begins by outlining the intellectual backgrounds of the two figures—Bergson as a philosopher, Einstein as a physicist—emphasising the differences that framed their now-famous confrontation. It then turns to the French reception of relativity and Einstein's 1922 visit to Paris, placing the Sorbonne debate of April 6 within its broader intellectual and social context. Special attention is given to the character of the meeting, which, despite cordial exchanges with other French thinkers such as Brunschvicg and Meyerson, culminated in a largely unproductive exchange between Einstein and Bergson—widely remembered as two monologues rather than a true dialogue.

4.1. The Philosopher and the Physicist

As noted, Bergson and Einstein finally met in 1922 during the latter's visit to Paris to promote the theory of relativity. Although the philosopher had been aware of the theory since 1911, he had not crossed paths with the physicist until this meeting. The encounter was of great significance to Bergson, who had already committed his relativity analyses to paper and eagerly anticipated the publication of his work, *Duration and Simultaneity*. Thus, he was keen to hear Einstein's thoughts on the theory and its reception. During Einstein's visit, Bergson attended his lectures and participated in the subsequent discussions. The philosopher was forced to join the debate at one of those meetings and present his views. Before analysing this interaction, however, it is essential to understand the standing of both the philosopher and the physicist at the time of Bergson's so-called debate with Einstein and the context surrounding the release of his book on relativity.

At that time, Bergson's philosophy had gained widespread recognition and popularity, while Einstein was still in the process of solidifying his reputation following the Eddington expedition three years earlier[122]. The philosopher's prominence at the time was described as "Bergson's vogue", a phenomenon that extended beyond academic circles and across Europe. It began with the publication of *Creative Evolution* in 1907 and lasted until the 1920s, when Bergson ceased teaching at the Collège de France (Scott 2006, pp. 185, 203). In contrast, Einstein was "a growing star in science", admired by many in the scientific community (Canales 2005, p. 1170)[123]. While Bergson engaged with scientific discoveries, commenting on the theory of evolution, the theory of relativity, and promoting emerging disciplines such as sociology or psychology, Einstein was regarded by the physics community as a "philosopher-scientist"[124]. Thus, both men were associated with the realms of philosophy and physics.

Commentators often compare Einstein and Bergson to emphasise their differences. While Einstein was known for his direct approach, preference for clear definitions and distinctions, and provocative formulae, Bergson was praised for his precision and eloquence, skilfully "enveloping the question in a series of concentric manoeuvres before suddenly narrowing the problem to an unexpected point" (During 2020a, p. 43). However, their differences extended beyond mere style and temperament. According to Canales, Bergson and Einstein "belonged to different communities with different cultural and intellectual heritages" (Canales 2015, p. 21). Bergson continued the tradition of French spiritualism, represented by figures such as Boutroux, Lachelier, and Ravaisson, whereas Einstein "focused on an entirely different tradition that revolved largely around the German classics: Lessing, Kant, Schiller, and Goethe" (Canales 2015, p. 22). Karl Popper even described Einstein as a Parmenidean, a label Einstein did not reject but embraced (cf. Robinson 2022; see also Canales 2015, p. 147).

Bergson had a more nuanced understanding of Einstein's theory of relativity than Einstein had of (Bergson's) philosophy. Latour notes that while Bergson "had carefully studied Einstein's theory of relativity and wrote a thick book about it, […] Einstein had only a few dismissive comments

122 As vividly described by Canales, "Bergson was an established figure as a public intellectual and philosopher, hobnobbing in the mornings with heads of state, filling lecture rooms in the afternoon, and providing bedtime reading for many at night; Einstein had only recently become a rising star in the eyer of the public and was still finding his voice outside of scientific spheres" (Canales 2015, p. 9).

123 For an account of the reception of the theory of relativity in France, see Paty (1987).

124 Paul A. Schlipp devoted an entire volume to portraying Einstein in this manner; cf. P.A.Schlipp, *Albert Einstein. Philosopher-Scientist* (New York: MJF Books, 1970).

about Bergson's argument" (Latour 2011, p. 3). Similarly, Landeweerd observes that although Bergson made significant efforts to engage with Einstein's theory, Einstein "did not venture into a serious consideration of Bergson's reflections" (Landeweerd 2021, p. 46). Canales further reports that upon learning of relativity, Bergson immediately began a detailed study of its mathematics. In contrast, Einstein refused to read any of Bergson's works, remarking in a 1914 letter to a friend that he would not even use them to improve his French (Canales 2015, p. 10).

The philosopher and the physicist differed not only in their approach to work and one another but also in their attitudes towards public responsibilities. While Bergson felt a duty to engage in national and international affairs in the service of France and world peace, Einstein used his global fame to enhance the authority of his theories and his reputation as a physicist. These differences were evident in their respective activities within the League of Nations. A few months after the Paris encounter, in August 1922, Bergson and Einstein met again at an institution "founded on the hope that if intellectuals could learn to cooperate, then nations might follow: the International Commission for Intellectual Cooperation (CIC)[125] of the League of Nations[126], a forerunner of UNESCO" (Canales 2005, p. 1169). As early as 1917, Bergson had articulated the idea behind the League of Nations, envisioning it as a path to lasting peace in Europe: "thanks to the organisation which the allied powers would support with all their might until the day when it would become useless" (Cain 1959, p. 406). At the CIC's first meeting[127], Bergson was elected president[128], while

[125] The Commission was composed of representatives from various countries, with the rule that each country could have only one representative. Poland's representative was Maria Skłodowska-Curie. However, according to Andrzej M. Brzeziński, the French government hoped she would be associated with France rather than Poland, thereby allowing France to de facto have two representatives (cf. Brzeziński 2006, p. 144).

[126] The League of Nations was an intergovernmental organisation with a mission to maintain world peace. It was created after the First World War in 1920 and was replaced by the United Nations after the Second World War in 1946.

[127] Most sources posit that Bergson's appointment as president of the CIC occurred at the Commission's first meeting in August 1922 (see, for example, Cain 1959, p. 406). However, some sources suggest that Bergson was appointed as early as 1 April 1922 (cf. Canales 2015, p. 114).

[128] According to Canales, Bergson's nomination was not surprising, given that he was "the single most politically committed intellectual of his time" and the well-known "mender of intellectual schisms" (Canales 2005, p. 1173). Moreover, as Mark Sinclair points out, Bergson accepted the nomination "not only as a national honour but also as a means of making good on the internationalist promises he made to Wilson in 1917" (Sinclair 2020, p. 25). During Bergson's visit to the United States of America in 1917 to convince President Woodrow Wilson to join the Allies in the war against Germany, Bergson was authorised by both the French and British governments to promise Wilson and his administration that the League of Nations would be established under the leadership of the United States. Notably, as Julien Cain describes, Bergson discussed with the president only matters of "the moral imperative", leaving material and political questions aside, since "A certain conception of humanity was involved in the conflict; a whole future for man, for society, for international life" (Cain 1959, p. 405).

Einstein served as a member[129] alongside luminaries such as Madame Curie, George Ellery Hale (director of the Mount Wilson Observatory), Gilbert Murray (a Hellenist from Oxford University), Francesco Ruffini (a law professor from Turin), and Jules Destree, the Commission's sole politician (cf. Cain 1959, p. 406).

Their private lives, too, revealed stark contrasts. Canales observes that "the physicist's bohemian lifestyle contrasted with Bergson's monastic asceticism" (Canales 2015, p. 22). Bergson led a stable family life, while Einstein had numerous love affairs and extramarital children. Similarly, Bergson's calm and composed disposition contrasted with Einstein's more chaotic temperament. Even their eating habits differed: Bergson adhered to a vegetarian and minimalist diet, while Einstein indulged in a more meat-heavy and self-gratifying one. Nonetheless, what truly set them apart—at least as far as this study is concerned—were their distinct perspectives on the nature of time and the respective roles of philosophy and science in shaping its understanding.

Einstein never fully grasped Bergson's argument, neither during their meeting nor from *Duration and Simultaneity* (During 2007b, p. 85)[130]. This is evident from his criticism of Bergson's concept of time, which was misplaced and missed the philosopher's central point[131]. This is perhaps unsurprising, as Einstein neither familiarised himself with Bergson's broader philosophy nor appreciated the extent to which his theory "ultimately requires the philosopher's time to render it coherent and consistent" (Pearson 2002, p. 76). Although Einstein did read *Duration and Simultaneity*, of which Bergson was unaware, there are only a few recorded instances where Einstein alluded to Bergson's works, as noted by Lévy-Leblond (Lévy-Leblond 2007, p. 238).

Bergson, by contrast, was an ardent admirer of Einstein and his revolutionary theory, as he himself proclaimed. He believed it represented a new way of thinking (Bergson 2020, p. 167). Despite facing criticism, Bergson remained steadfast in his support for Einstein's work, even after their encounter. The philosopher was convinced of the value of Einstein's efforts to formulate a comprehensive theory that accurately depicted physical reality. While some of Bergson's

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[129] Einstein was also politically active, albeit in a markedly different manner. He was primarily occupied with promoting his then-new theory and addressing anti-German sentiments, both internationally and among the CIC members. Consequently, he alternated between resigning from and rejoining the CIC (cf. Canales 2005, p. 1174).

[130] A different opinion is held by Robin Durie, who asserts that "Clearly Einstein had followed Bergson's line of thought", but later in the text, Durie claims that Einstein failed to address Bergson's argument (Durie 1999, pp. xiii, xiv). Interestingly, Durie also posits that it is evident that neither Einstein nor Bergson's critics, Becquerel and Metz, managed to "grasp the significance of Bergson's argument that the temporality of time is irreducibly rooted in duration, perhaps because they themselves lack a philosophical understanding of time which has broken from the classical world view" (Durie 1999, p. xvi).

[131] Landeweerd also asserts that "Bergson's concept of time is misrepresented by Einstein" (Landeweerd 2021, p. 45).

statements may appear critical of Einstein at first glance, they were rooted in the underlying principles of Bergson's philosophy of science. These principles were not intended to undermine scientific knowledge but rather to strengthen it through philosophical analysis.

Considering these profound differences between the philosopher and the physicist, it is hardly surprising that their confrontation attracted considerable attention. Intellectuals within the CIC closely monitored their interactions—or rather, their failure to collaborate—in relation to the Commission's objectives, while the broader public interpreted their exchange through the prism of the debate that transpired in Paris. To fully grasp the significance of this encounter, the examination of both contexts is warranted, as they provide crucial insights into the understanding of Bergson's assessment of Einstein's theory and the nature of their mutual criticisms. This broader perspective not only clarifies the intellectual stakes of their debate but also situates it within the larger discourse on the relationship between philosophy and science.

A strong sense of responsibility toward the CIC's activities and a deep commitment to the goal of maintaining world peace motivated Bergson's involvement. Although Einstein shared similar aspirations, his actions did not always align with these ideals. Instead of actively engaging with the Commission's objectives, Einstein rarely attended meetings and openly criticised the CIC, despite being a member. Ultimately, he resigned from his position. Notably, in one of his letters, Einstein stated that his decision was directly influenced by Bergson's response to his theory (Canales 2005, p. 1175). Kreps suggests that "Einstein turned his disagreement with Bergson into an international incident, as a part of his rise from a mere physicist, to the physicist-philosopher of international fame and acclaim he remains to this day" (Kreps 2015, p. 165). Undoubtedly, Einstein leveraged this cooperation to serve his own interests.

A further argument supporting the thesis of Einstein's self-interest in the context of his involvement within the CIC can be found in the Commission's role in defining time[132] and the physicist's keen interest in influencing this process. In particular, the League of Nations as a whole

[132] The CIC was interested in the topic of time due to its organisation, which was "modelled after previous scientific international commissions created for global sciences", such as the commissions for global standards of time, longitudes, weights and measures (Canales 2005, p. 1180). Canales describes this as a painful process of working out a compromise, which could prompt scientists to philosophise (as it did with Henri Poincaré, leading to his philosophy of conventionalism), but which, notably, was not experienced by Einstein (Canales 2005, p. 1180).

played a role in the standardisation of time[133]. As Canales posits, it "was one of a host of competing institutions that tried to forge agreement about time standards and distribution protocols" (Canales 2015, p. 115). Consequently, the Commission's involvement in the Bergson-Einstein debate was more significant than one might initially assume. It related directly to the question of who holds the authority to determine the nature of time and how it should be measured (for further details on this topic, see Canales 2015, pp. 114–125). According to Canales, Einstein was particularly concerned about the League of Nations' influence in defining time, as it posed a potential threat to his efforts to promote the use of light waves as standards for measuring time and length (Canales 2015, pp. 119–120)[134].

In 1924, despite rejoining the CIC, Einstein's dispute with Bergson persisted (cf. Canales 2015, p. 125), particularly concerning *Duration and Simultaneity*, which had already been published by that time. Following continued criticism from Einstein regarding the CIC, Bergson resigned as president of the CIC in 1925 and withdrew from public life[135]. As Canales describes solemnly, "The influence of the French intelligentsia in world affairs decreased in direct proportion to the decline in the health and prestige of its main proponent, Bergson" (Canales 2005, p. 1182). However, although Bergson was no longer involved with the CIC, Einstein's attitude towards the Commission remained unchanged. He continued to skip meetings and criticise its policies (cf. Canales 2015, p. 126). Following Bergson's resignation, Lorentz assumed the role of president, and Painlevé became the French representative.

Although a detailed discussion of Bergson's activities within the CIC lies beyond the scope of this thesis, it is imperative to acknowledge the significance of his contributions[136]. Notably, a parallel can be observed between the debates in which Bergson participated during this period: "Whether it was the League of Nations or the French Philosophical Society, Bergson appeared confident in his positions and fully present in their public and active defence" (Worms 2002, p.

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133 Determining measurement standards was a critical endeavour in the 19th and 20th centuries. After the establishment of the meter and kilogram standards in the 19th century, their international success "served as a model for what they hoped would be the decimalisation and standardisation of time" (Galison 2004, p. 51). Scientists worked diligently to achieve this goal, especially since the establishment of measurement standards was "the main source of scientists' income after modern nation-states replaced previous royal patronage systems" (Canales 2015, p. 103). Notably, Michelson's experiment with the interferometer was designed to measure precise lengths and the speed of light to implement a measurement system based on the properties of light (cf. Canales 2015, p. 103).

134 Einstein's concern arose from the possibility of adopting an alternative system to define units of time and length "in ways that would compensate for the dilation effects" (Canales 2015, p. 112).

135 It is worth noting that the official reason for Bergson's resignation was not his dispute with Einstein but his struggle with arthritis, which began in late 1924 (cf. Kahn 2010, p. 382).

136 However, Bergson was dissatisfied with the activities of the CIC and the marginalised role it ultimately played, as reflected in his final book, *The Two Sources of Morality and Religion*.

191). Furthermore, the interactions between Bergson and Einstein—initially on scientific matters and later extending to political issues—were "most revealing" (Worms 2002, pp. 186, 188). In particular, as Canales argues, the Paris meeting significantly influenced the trajectory of the Commission and its work. A key element in this was Einstein's framing of his activities within the CIC in relation to Bergson's reception of the theory of relativity (cf. Canales 2005, p. 1175).

Einstein's negative reaction to Bergson's critique—and, consequently, to the activities of the CIC, as the physicist argued—may have been politically motivated. At the time, he was actively promoting the theory of relativity, which remained a subject of debate, particularly concerning general relativity. Moreover, rumours circulated that Bergson's intervention had negatively impacted Einstein's Nobel Prize, which was awarded in December 1922 "for his services to theoretical physics, and especially for his discovery of the law of the photoelectric effect and not for relativity" (Canales 2005, p. 1177). Before presenting the award, Svante Arrhenius, president of the Nobel Committee, remarked that Einstein's theory was a matter of epistemology rather than physics and had, as such, been challenged by "the famous" philosopher Bergson in Paris (Canales 2005, p. 1177). These events contributed to framing the encounter between Bergson and Einstein as a legendary clash between two intellectual giants, prompting speculation over which of them had prevailed in the debate on time. Thus, Einstein's resistance to Bergson's critique may not have been solely a matter of defending his scientific position but also of safeguarding a broader intellectual and institutional acceptance of his theory.

Einstein is widely regarded as having won the debate, both at the time and in the broader intellectual discourse. Bergson had much at stake in this exchange, and losing it cost him dearly—his intellectual authority, reputation, and influence all suffered. Guerlac argues that "to a certain extent, this episode staged a public humiliation of Bergson along the gender lines that had always been invoked in criticism of his thought—it was feminine, either in contrast to the virility of (real French) Cartesian philosophy or, in this context, in contrast to the hard truths of science" (Guerlac 2006, p. 13). Even when Bergson was awarded the Nobel Prize in Literature in 1928 for 1927, "Russell's portrayal of Bergson as merely a poet appeared to be officially sanctioned" (Guerlac 2006, p. 13). Some perceived the award as a consolation prize, one that "implicitly affirmed that science had displaced philosophy as the repository of truth—and that the rest was storytelling" (Guerlac 2020, p. 106). According to Canales, the debate and its repercussions are the primary reasons Bergson is scarcely remembered today, whereas Einstein remains an enduring figure (cf. Canales 2015, p. 8).

Beyond Bergson's authority and reputation, something greater was at stake. The clash between Einstein and Bergson is often framed as "another gigantomachy of objective reality versus subjective illusion" (Latour 2011, p. 3). Latour suggests that Bergson himself perceived his defeat as more than a personal loss[137]. Some scholars argue it was "a defeat that impugned not only his own intellectual standing but the authority of philosophy itself" (Guerlac 2020, p. 106). From this point onward, the scientific conception of time became dominant, "keeping in abeyance not only Bergson's but many other artistic and literary approaches, by relegating them to a position of secondary, auxiliary importance" (Canales 2015, p. 6). As science gained prominence, this shift marked the beginning of a gradual decline in the perceived authority of philosophy. It is, therefore, essential to re-examine the debate in order to reassess the merits of Bergson's critique from a contemporary perspective. According to Latour, this re-evaluation is particularly relevant, as the question of who controls the concept of space and time hinges on the outcome of such an analysis (Latour 2011, pp. 3, 4). This is precisely the aim of this study.

4.2. Reception of Einstein and His Theory

The theory of relativity represents a curious case of a new idea, the emergence and popularisation of which can be pinpointed with remarkable precision. Its first appearance dates back to 1905, when Einstein published his famous article outlining the postulates of what he would retrospectively call the special theory of relativity. The so-called general theory of relativity, in turn, emerged around 1915, when Einstein presented the foundations for a more advanced framework that drew on non-Euclidean geometry and complex mathematics. Nevertheless, awareness of the revolution taking place in physics was not universal. For several years, the general public remained largely unaware of the developments, while even within the physics community, opinions were divided over the necessity of rethinking the foundations of the physical world.

One of the fierce supporters of the theory was the French physicist Paul Langevin. He was among the first physicists to integrate the theory of relativity into university curricula. Langevin was particularly well-qualified to speak on the subject as one of the earliest physicists to grasp its significance and the very first French scientist to teach it, beginning at the Collège de France as early as 1906 (cf. Biezunski 1987, p. 178). Langevin's role in disseminating the theory of relativity within French society was recognised by eminent physicists such as Louis de Broglie and even

[137] Nevertheless, Bergson never acknowledged defeat. He did, however, forbid further reprints of *Duration and Simultaneity*.

Einstein himself. Langevin and Einstein had been friends since the first Solvay Congress in 1911 (Paty 1987, p. 124)[138].

Langevin also introduced a “peculiar example” at the Bologna Congress in 1911, later known as the “twin paradox”. A few months later, in the same year, Langevin revisited the concept during a meeting organised by the Société française de philosophie in Paris, attended by figures such as Le Roy and Brunschvicg (During 2014, p. 526). Notably, after this meeting, the philosopher Abel Rey speculated on what Bergson might say about the matter, given Bergson’s philosophy of time, which overturned pre-relativistic theories encumbered with spatial categories (cf. Canales 2015, p. 57). Langevin’s early description of relativity theory in 1911 proved controversial. For instance, he speculated about relativity influencing biological processes, an idea that met with resistance from the assembled philosophers, particularly Brunschvicg and Le Roy (Canales 2015, pp. 58–59). Consequently, Langevin “retreated” from the debate, acknowledging that his perspective was not philosophical and that it was the role of philosophers to adapt the concept of time to align with the theory of relativity (Canales 2015, p. 60). Later in this study, it will become evident that Einstein took the opposite approach when addressing philosophical concerns regarding the concept of time derived from his theory.

Despite his significant contributions, Langevin was far less recognised than Bergson. Canales notes that even students studying science at the Collège de France were often unfamiliar with Langevin but were well-acquainted with Bergson, referring to the Collège as “the house of Bergson” (Canales 2015, p. 56). Regarding Bergson’s understanding of relativity, it has already been noted that he was familiar with the twin paradox, formulated in connection with the special theory of relativity in 1911. Additionally, it can be inferred that Bergson had a basic grasp of general relativity, given his interest in Riemannian non-Euclidean geometry and its exploration of space. It is reported that during Bergson’s 1916 visit to Spain, he emphasised the importance of engaging with scientific theory. As Einstein had announced the general theory of relativity a year earlier, it is plausible that Bergson was referring to it. However, it must be emphasised that this study does not claim Bergson had a comprehensive understanding or fluency in the mathematics of general relativity. Bergson himself acknowledged his limitations in this area. Nevertheless, regarding the theoretical and philosophical aspects of special relativity, Bergson was sufficiently

[138] Einstein’s invitation to Paris, where he would debate Bergson, was largely to Langevin’s credit. In 1923, “to reciprocate Einstein’s acceptance” of the invitation, Langevin travelled to Berlin, where he demonstrated “at a pacifist rally […], posing prominently for photographers alongside Einstein” (Canales 2015, p. 55).

knowledgeable to produce a book on the subject, which was the culmination of many years of research.

The example of Langevin does not represent the full scale of interest in Einstein's theory at the time. Nevertheless, it demonstrates that even then, there were individuals—both scientists and philosophers—who were interested in and familiar with the theory of relativity. This situation changed dramatically in 1919 when Einstein's revolutionary concept captured the attention of the entire world. This shift followed Eddington's expedition, which, in the public view, confirmed Einstein's theses. At that point, there was a genuine surge of enthusiasm for both the theory and Einstein himself. The physicist began to receive invitations to various events and trips aimed at promoting his theory, which he eagerly accepted, recognising the opportunity to establish his theory as the dominant framework in physics and himself as a leading figure in the field. One such trip was to Paris, where Einstein would meet Bergson.

In 1922, the Société française de philosophie invited Albert Einstein to deliver a series of lectures on the theory of relativity at the Collège de France. One of these lectures, held on April 6, was attended by prominent French mathematicians, physicists, and philosophers, including the renowned Henri Bergson. Notably, Einstein's visit to Paris was surrounded by controversies. Initially, he rejected all three invitations he received, including one from the Collège de France. He eventually reconsidered only the invitation from the Société française de philosophie, and this was due to the intervention of Walther Rathneau, Germany's minister of foreign affairs, who persuaded Einstein that the visit would be an excellent opportunity to improve Franco-German relations (Canales 2005, p. 1175). At the time, tensions between France and Germany were still palpable in the aftermath of the Great War (cf. Canales 2015, p. 16). Langevin, a great admirer of Einstein and the most significant advocate of his theory in France, was the driving force behind the invitation from the Collège de France. Interestingly, neither the Académie des Sciences nor the Société française de Physique expressed any interest in inviting Einstein (Paty 1987, p. 137).

Before travelling to Paris, Einstein made two other trips in the preceding year to promote his theory. In April, he visited America, and in June, he travelled to England to deliver a series of lectures on the theory of relativity. The press covered both events extensively, with *The Times* publishing ten articles during his two-week visit. These journeys were successful, achieving not only the goal of explaining the new physical theories but also contributing to healing the still-fresh wounds of the First World War (Friedman & Donley 1989, p. 19). However, in France, public sentiment was far less favourable, and measures were taken to protect Einstein from anti-German factions, including careful selection of the audience for his lectures.

Despite the scientific focus of these lectures, the press maintained a keen interest in the events, extending beyond strictly scientific matters (cf. Friedman & Donley 1989, p. 20). Given the public's fascination with Einstein and his theory, it is unsurprising that his arrival in Paris in 1922 attracted significant attention from both the public and the press. Media outlets provided extensive coverage of Einstein's visit. A crowd, comprising not only friends and officials but also photographers and reporters, eagerly awaited his arrival (Canales 2015, p. 5). Einstein's visit was not merely a scientific event but also a social and political occasion. People were intrigued by what "the genius" had to say as they were by what he was like as a person. During those few days in France, attendees had the opportunity to observe both by attending his lectures.

Following each lecture, Einstein engaged in discussions with the assembled audience. The organisers anticipated that he would present unpublished elements of the theory and clarify questions raised during the sessions. Many hoped that the personal nature of a question-and-answer forum would encourage Einstein to disclose more of his core principles and guiding ideas than his published works alone revealed (Canales 2015, p. 17). The questions posed to Einstein were broad and varied, ranging "from mathematical details of his theory to its broader philosophical implications" (Canales 2020b, p. 19). However, Einstein's responses were often less than comprehensive. In his defence, Einstein was not fully fluent in French, though he had a working knowledge of the language. Speaking French proved to be a challenge for him—something he had feared even before he arrived in Paris, as Canales describes in detail (cf. Canales 2020b, p. 19). In contrast, Bergson was "a noted and experienced orator who knew how to speak impeccable French and English" (Canales 2015, p. 18).

One of the most significant discussions during Einstein's lectures—from the perspective of this thesis—occurred with Paul Painlevé, a French mathematician and statesman. He listened attentively to the physicist's presentations and actively participated in the discussions, asking Einstein several questions. In one of his addresses, Painlevé observed that, although there is no logical contradiction in the theory of special relativity, difficulties arise when transitioning from one inertial system to another. Specifically, he highlighted the lack of equivalent correspondence between the time of an observer who remains stationary within their inertial system and the time of an observer who transitions to a different system. This absence of reciprocity, he argued, creates a dissymmetry. Painlevé further noted that only Langevin appeared to have seriously addressed this issue. His statement is particularly significant because, during another session on 3 April, he questioned the famous twin paradox arising from Einstein's theory. Painlevé posited that the twins would have metrically equal times following the journey of the travelling twin[139]—a point that would prove especially crucial for Bergson's later critique. However, Painlevé was ultimately persuaded by Einstein's explanation, which employed an argument involving three inertial systems rather than two.

During one of the sessions—the same that served as the forum for the Bergson-Einstein debate—a French philosopher Xavier Léon, a founder of the Société française de philosophie in 1901, paid homage to Henri Poincaré. Poincaré was a highly respected founding member of the Société and a distinguished scientist who, according to Léon, had "played a key role in the creation of what has been called the new mechanics" (*La Théorie* 1922, p. 350)[140]. In his speech, Léon reminded the audience that Poincaré had extensively examined the theories of Hertz, Helmholtz, Larmor, J.-J. Thompson, and Lorentz. Moreover, in connection with Michelson's experiment, Poincaré had predicted the emergence of a theory based on the relative motion of material bodies that would surpass Lorentz's framework. As Léon proudly declared, "Einstein provided the solution that Poincaré had been waiting for in his 1905 paper on special relativity; he achieved the revolution that Poincaré had foreseen and presented at a time when the development of physics seemed to be leading to a dead end" (*La Théorie* 1922, p. 350).

Scientists also invoked the authority of Poincaré, including Paul Lévy, a French mathematician, who raised a concern about the language employed by physicists and its implications. Specifically, Lévy argued that, instead of saying that the Sun creates a curvature of space, it would be more appropriate to state that the Sun "modifies the rulers so that they undergo a longitudinal contraction when they approach the Sun radially"(*La Théorie* 1922, pp. 355–356). Lévy believed the former statement implied a level of objectivity that did not truly exist. This assertion referenced Poincaré's conventionalism, which held that "scientists could choose among various ways of describing the same phenomena, and their choice was more conventional than necessary" (Canales 2015, p. 76)[141]. Accordingly, the scientific description of a curvature of space,

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139 This was not the first time Painlevé had challenged Einstein's theory. In December 1921, Painlevé clashed with Langevin at a meeting organised by the Société française de philosophie over the interpretation of the theory (for further discussion, see Canales 2015, pp. 67–68).

140 All translations from *La Théorie* are mine.

141 Incidentally, Poincaré's philosophy was inspired by his work regarding the time-standardisation efforts. As Canales describes, "He saw France, Germany, and Britain engaged in a bitter debate about which country's time and timekeeping methods would prevail and proposed a solution based on determining what was most convenient for the parties involved" (Canales 2015, p. 79). Accordingly, in his book *The Value of Science*, Poincaré argued that there is no single objective procedure for the coordination of time that would definitively determine it (Poincaré 1958, pp. 27–28, 30).

as Lévy pointed out, may be shaped by the scientific community's aspirations for objectivity or precision rather than an inherent necessity.

Despite Poincaré's death in 1912, his influence remained deeply felt among French scientists and philosophers, as evidenced by the speeches of Léon and Lévy. This enduring influence exemplifies the strong French tradition of collaboration between scientists and philosophers. Canales explains that the Société française de philosophie, the organisation that invited Einstein for the series of lectures, sought to promote "agreement and regular meetings between scientists and philosophers" (Canales 2015, p. 74) and included several scientists among its participants. Notably, however, Poincaré—a founding member and a scientist—never mentioned Einstein but did reference Bergson, stating that "The time of scientists comes out of Bergsonian duration" (cited in Canales 2015, p. 73).

On 6 April 1922, everyone, including Bergson, expressed positivity and sympathy towards Einstein, as will become evident in the following analysis. However, this was not representative of the prevailing attitudes in France at the time, particularly within scientific circles. Despite the results of Eddington's expedition, not all scientists embraced the theory of relativity. Some continued to defend theories that preserved the concept of ether, most notably Georges Sagnac[142]. On 3 April, during Einstein's visit, an incident occurred when Einstein was scheduled to be welcomed at the Académie des Sciences. However, thirty members of the Académie reportedly planned to leave as soon as he entered. Fortunately, Einstein was forewarned and chose not to attend, avoiding a potential scandal (cf. Biezunski 1987, p. 179). This episode underscores the hostility some scientific community members felt towards Einstein and his theory, making Bergson's acceptance and engagement with relativity not merely a formality but a demonstration of his progressive thinking.

4.3. 6 April 1922

The lecture and the subsequent discussion commenced with remarks from Xavier Léon. He referenced the late Émile Boutroux, a significant figure in French philosophy and Bergson's teacher,

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142 Sagnac was well known for his research in X-rays and optics. In several articles, he presented the results of experiments he conducted that aimed to prove the existence of the ether, thereby disproving the theory of relativity (Unnikrishnan 2020, pp. 36–37). Alfred Kastler, then a student of Langevin and a future Nobel Prize winner, attended the meetings during Einstein's visit and documented his memories of the events, particularly regarding Sagnac. Kastler recalled that the meetings were not without dramatic moments, one of which occurred "when old Sagnac, the inventor of the ingenious interferometer, gave vent to his anger against the theory of relativity, on which he put all the blame" (cited in Unnikrishnan 2020, p. 36).

who had passed away only a few months earlier (22 November 1921), and paid homage to Henri Poincaré. Furthermore, Léon expressed his hopes that the meeting would yield additional insights beyond the scope of Einstein's writings. He also reminded the audience that the French public was already familiar with Einstein's theory and its implications, largely due to the contributions of Paul Langevin, who was present at the meeting. Additionally, Léon made a prophetic remark, stating that the date of 6 April 1922 "will make history in the annals of our society" (Canales 2015, p. 18).

Bergson attended the meeting to listen to the lecture and the ensuing discussion, as he had done the day before. Although he had already retired from the Collège de France, where he had been a renowned lecturer in previous years, he remained closely associated with the institution, which was still referred to by some as "the house of Bergson" (Canales 2020b, p. 20). However, the meeting on 6 April was held at the Sorbonne, as noted by Charles Nordmann, an astronomer who attended and documented the event (Nordmann 1922, p. 159). Many philosophers were in attendance and eager to contribute to the discussion (Nordmann 1922, p. 160), but Bergson was not among them—he attended the meeting but he was not willing to speak. Nevertheless, one of Bergson's colleagues compelled him to take a stand, making it impossible for him to decline. Unbeknownst to him, this intervention would spark a controversy that would endure for years to come.

Before examining the Bergson-Einstein exchange, this analysis focuses on other exchanges and statements made that day to place the "debate of the day" within the broader context of all discussions that took place on 6 April. The first to speak, immediately following Xavier Léon's opening address, were the physicists and mathematicians. The philosophers waited patiently for their turn to contribute to the discussion. Paul Langevin was the first to take the floor. According to Nordmann, Langevin's speech could have been aptly titled "Why the Philosophers Should Be Interested in the Theory of Relativity" (Nordmann 1922, p. 160).

Langevin characterised the theory of relativity as primarily physical, fundamentally experimental, and arising from the contradictions between electromagnetic theory and mechanics. He emphasised that the theory is grounded in known facts and leads to the prediction of new ones. Moreover, Langevin argued that the theory deals exclusively with observable quantities derived from experience, rejecting all arbitrary absolutes and explicitly challenging Comte's claim that physics is "essentially a scene built with Euclidean space where absolute time reigned" (*La Théorie* 1922, p. 351). With these remarks, he drew a clear contrast between Newtonian and Einsteinan physics.

Furthermore, Langevin emphasised the two main postulates of special relativity, namely the principle of relativity and the principle of the constancy of the speed of light. He observed that Einstein extended Galilean relativity to all areas of physics, rejected the existence of the ether that physicists had long searched for in vain, and proposed the constant speed of light as a fundamental postulate. Langevin explained that each system of inertia possesses its own time and that there is no point in discussing the absolute simultaneity of events at a distance. Additionally, he argued that the principle of causality remains unaffected within the framework of relativity, as nothing can propagate at a speed greater than that of light.

Langevin also mentioned the general theory of relativity, asserting that it extends beyond special relativity by not including inertial systems, thereby making it impossible to define a common time for an entire reference system. He contended that the theory presents profound challenges for philosophers regarding concepts of time and space. Furthermore, Langevin assessed the contributions of Weyl and Eddington to the development of physics, underscoring that Einstein's theory is uniquely grounded in experience, accounts for all known phenomena, and enables the prediction of new ones. Incidentally, during the discussion, Jean Perrin—a future Nobel Prize winner in physics and a close friend of Langevin, who had introduced Perrin to Einstein during the latter's 1913 Paris visit (cf. Canales 2015, p. 55)—expressed his agreement with Langevin's views. Perrin also emphasised the theory's pivotal importance across all areas of physics.

Other scientists who spoke during this session expressed similarly positive attitudes towards Einstein. Jacques Hadamard, a professor of celestial mechanics at the Collège de France (Unnikrishnan 2020, p. 34), suggested that modern physicists had become so proficient in mathematical concepts that they no longer required the assistance of mathematicians. He then outlined two fundamental requirements that any physical theory must meet: it must be coherent and more consistent with experimental evidence than other existing theories. Additionally, Hadamard argued that special relativity is a logical consequence of Maxwell's equations and Lorentz's transformation formulae. Einstein responded to Hadamard by pointing out that he had overlooked another important requirement: a set of clear rules enabling the theory's components to correspond with physical reality[143]. This cordial exchange serves as evidence that Einstein had no reason to feel threatened by the assembled audience.

Another scientist who exhibited a positive attitude towards Einstein that day was Élie Cartan, the French mathematician. Cartan, who had a keen interest in tensors, asked Einstein whether a second tensor—which "when equal to zero expresses that the laws of the propagation of light are the same in special relativity"—was as significant to physics as the matter tensor (*le tenseur énergie-quantité-de-mouvement*). His interest stemmed from the fact that, a year earlier, Cartan had developed a new concept of "space with Euclidean connection from which the notion of distant parallelism (of a Riemannian space) was derived" and had successfully "sifted out the truly geometric notions capable of accounting for Einstein's tensor" (Paty 1987, p. 153). Notably, Cartan would later collaborate closely with Einstein on this concept.

Jean Becquerel, a future critic of Bergson's *Duration and Simultaneity*, also participated in the discussion on 6 April 6 1922, highlighting the latest discoveries concerning the gravitational field. Becquerel had hosted Einstein during his visit to Paris at his home, where he invited numerous guests for further discussion with Einstein. Through these interactions, they became better acquainted, and Becquerel subsequently joined Langevin in defending Einstein against Bergson (cf. Canales 2015, pp. 162, 163). Incidentally, Becquerel was the final scientist to speak that day. The remainder of the meeting was dominated by philosophers, primarily Bergson, Brunschvicg, and Meyerson. The subsequent analysis focuses first on Einstein's interactions with Brunschvicg and Meyerson before turning to the Bergson-Einstein dialogue. Considering the exchanges with Brunschvicg and Meyerson is significant because Einstein's attitude towards them, particularly Meyerson, differed markedly from his stance towards Bergson, even though the subject of the discussion remained similar.

The first philosopher to take the floor that day was Léon Brunschvicg, a lecturer at the Sorbonne. Like Bergson, Brunschvicg published a book about Einstein's theory that same year, titled *Human Experience and Physical Causality* (for the similarities and differences between Bergson's and Brunschvicg's philosophies, see Worms 2005, pp. 43, 46). Brunschvicg revealed that,

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143 A more famous exchange occurred between Hadamard and Einstein during another session. The mathematician enquired about the problem of singularity in Schwarzchild's equation—namely, what the physical meaning of the formula would be if it became infinite (Paty 1987, p. 152). Stunned by the question, Einstein replied that it would be the "Hadamard catastrophe" as the formula would no longer be applicable (cf. Paty 1987, p. 152). Einstein was so perturbed by the question that he presented the relevant calculations to Hadamard the following day. Interestingly, this "Hadamard catastrophe" was "a prefiguration of the hypothesis of the black holes" (Biezunski 1987, p. 174). However, at the time of the meeting, the physics of stellar evolution was not well-known and "it was not decidable whether the embarrassing situation would occur in the case of sufficiently massive stars" (Unnikrishnan 2020, p. 35).

when accepting the invitation of the Societé française de philosophie, Einstein had indicated the problems he intended to clarify—particularly the relationship between his theories and the Kantian conception of science. This was precisely the topic Brunschvicg sought to address. Specifically, he posed a challenging question regarding the relationship between Einstein's theory and Kant's concept of science (Canales 2015, p. 19).

Brunschvicg commenced his speech by praising Einstein for "expanding our idea of humanity" (*La Théorie* 1922, p. 357). He regarded Einstein not merely as a scientist but as a philosopher and examined how Einstein revolutionised our understanding of the world, using Kant's framework as a reference point. The French philosopher observed that in Kant's conception, space and time served as a container, while matter and force constituted the content. In contrast, the Einsteinian world no longer separated the container from its content. According to Brunschvicg, there was no empty space nor homogeneous time as there had been in Kant's worldview. Consequently, he argued that one can no longer describe the universe without accounting for space and time. Interestingly, this perspective had been central to Bergson's stance from the beginning, even before Einstein announced his theory.

Moreover, Brunschvicg contended that Einstein liberated us from the contradictions imposed by Kant's antinomies. He explained that relativity theory resolved these antinomies by accounting for the relationship between measurement and the object being measured. From this perspective, space and time are no longer considered independent of their contents but are instead closely interrelated with them. The Einsteinian world, Brunschvicg argued, is a unified entity without distinctions such as front and back. Therefore, he concluded that relativity theory represents a significant turning point in the history of thought.

Einstein's response to Brunschvicg was somewhat evasive, as he promptly remarked that "every philosopher has their own Kant" (*La Théorie* 1922, p. 359). In doing so, Einstein sought to avoid directly addressing Brunschvicg's comments. Canales suggests that Brunschvicg was seeking "clarification on highly technical aspects of Kant's philosophy in relation to relativity", which explains why he did not receive it (Canales 2015, p. 19). Conversely, Einstein appeared reluctant to become entangled in detailed considerations of Kant's philosophy, despite Brunschvicg informing the gathered audience that Einstein had committed to addressing such issues when he accepted the invitation.

Nonetheless, Einstein acknowledged that his theory was not fully compatible with Kant's philosophy. He regarded the central aspect of Kant's philosophy to be its attempt to construct science based on a priori concepts. While Einstein recognised Kant's apriorism as the notion that "certain concepts pre-exist in our consciousness" (*La Théorie* 1922, p. 359), he argued that such concepts are arbitrary. He linked them to Poincaré's conventions, asserting that both a priori concepts and conventions depict science as being constructed from arbitrary ideas. However, it should be noted that a priori concepts are neither analogous to Poincaré's conventions nor mere arbitrary constructions. Such conclusions reveal either Einstein's insufficient grasp of philosophical nuance or his intention to advance controversial claims for some specific purpose[144].

Einstein's exchange with Brunschvicg highlights his distinct attitude towards this philosopher compared to Bergson. Although Einstein avoided directly answering Brunschvicg's questions and his statement was concise, he nonetheless referred directly to the issues raised by Brunschvicg—something that cannot be said about his interaction with Bergson. However, even greater differences in Einstein's attitude towards philosophers are evident in his discussion with Meyerson, which could be described as distinctly cordial.

Émile Meyerson[145], a French philosopher, spoke immediately after the Bergson-Einstein "debate". He requested clarification from Einstein on two separate matters, both of which were unrelated to Bergson's remarks. It is important to briefly summarise Meyerson's statement and Einstein's succinct response, as they provide valuable insights into the philosophy of physics at the time—an area that also interested Bergson. Moreover, their interaction offers a useful point of comparison with the Bergson-Einstein exchange, as, unlike the latter, Meyerson and Einstein engaged in a substantive, albeit brief, discussion.

Meyerson's initial inquiry concerned the notion of time, a subject already raised by Bergson. Specifically, Meyerson asked whether given that time is fundamentally different from the other three dimensions, it should be treated as a distinct dimension in addition to the three spatial dimensions of reality. To better grasp this perspective, one must consider the commonly used term "four-dimensional universe", which assumes that all four dimensions are similar in nature. However, Meyerson observed that Einstein's theory of relativity suggests otherwise: time is not circular, meaning it does not move backwards as space does. Therefore, it may be misleading to regard all four dimensions as being the same. As Meyerson stated, "We move in time in a very different way from the way we move in space" (*La Théorie* 1922, p. 365). Notably, Meyerson's question touches on the irreversibility of time, a concept also central to Bergson's philosophy.

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[144] It is also possible that such statements stemmed from his insufficient mastery of the French language, as some historians suggest.

[145] Meyerson, who was of Polish-Jewish origin, was born in Lublin in 1859 and passed away in 1933.

Meyerson further referred to the twin paradox, which asserts that the clock of a traveller moving at a speed close to that of light will not align with the clocks of those who remain stationary. However, the difference between the two would have a limit. The French philosopher suggested that this limit arises from the fact that the traveller could never go back in time. Meyerson acknowledged that both pre-relativistic mechanics and Einsteinian mechanics imply the reversibility of time. He argued, however, that this apparent reversibility stems from "our profound tendency to *spatialise* time, a tendency which is expressed here by the simple observation that we use a numerical duration to represent it—because any number can be decreased as well as increased" (*La Théorie* 1922, p. 365). Meyerson's remarks reveal that the concept of the spatialisation of time, which Bergson explored extensively, was deeply ingrained in the awareness of the French intelligentsia. This was not merely a theoretical postulate but a comprehensive explanatory framework. Interestingly, Bergson also contended that the depiction of time as a fourth dimension of space results from the spatialisation of time.

Meyerson explained that one can argue for the irreversibility of time based on statistical analysis, the combination of Planck's quantum hypothesis with the principle of relativity, and observations of everyday life. He noted that, regardless of whether we live in an Einsteinian or Newtonian world, we cannot "walk backwards or digest before we have eaten" (*La Théorie* 1922, p. 366). Canales suggests that, in this self-evident manner, Meyerson sought to ask Einstein how his theory accounts for processes "such as eating and digesting, which always took place in a certain order" (Canales 2015, p. 274). In other words, Meyerson wished to understand how the theory of relavity accommodates the universally experienced irreversibility of time.

The second issue Meyerson sought clarification on from Einstein concerned the influence of Mach's relativity on the development of Einstein's theory. Meyerson argued that the term *relativity* holds two distinct meanings in this context, as Mach's theorem of the relativity of space does not have any significant implications for the relativity theory. Since Mach's influence on relativity was not a focus of Bergson's concern, this analysis is limited to highlighting Meyerson's key observations.

Meyerson sought to demonstrate that, contrary to popular belief, there is no correlation between Mach's ideas and Einstein's theory. To this end, he invoked the physical roots of Mach's thoughts on the concept of the relativity of motion in space and his inspirations from August Comte's views on science. Regarding the latter, he observed that positivists were often entangled in idealism, which led them to extend the thesis of the relativity of space to the relativity of knowledge (cf. *La Théorie* 1922, p. 367). Incidentally, Meyerson—like Bergson—rejected the positivist tradition, which still held considerable influence over French intellectuals at the time (cf. Biezunski 1987, p. 175).

Meyerson concluded his speech by emphasising that Einstein appeared to affirm his view that Mach's ideas were not connected to the theory of relativity. He noted this was particularly evident given Einstein's contributions to the "evolution towards atomism", a perspective opposed by Mach. Indeed, in 1905, Einstein provided an explanation for Brownian motions, which could be seen as his contribution to atomistic theory. Meyerson also referred to Einstein's input at the Solvay Conference on Physics[146] in 1911 (*La Théorie* 1922, p. 368).

In concurrence with Meyerson's beliefs, Einstein briefly criticised Mach's perspective on science as being too narrow, which, in his view, led to Mach's disbelief in the existence of atoms. Einstein further expressed the hope that, if alive, Mach would reconsider his stance on this issue. Regarding the first matter, Einstein merely stated that not all directions are equal in the four-dimensional continuum. However, regardless of what he said on that occasion, it was otherwise well known that Einstein was aware of the problem of a spatialising interpretation (cf. Robinson 2022)[147]. According to Einstein, treating time as a dimension of space like any other amounts to a misinterpretation of his theory of relativity. Thus, unlike with Bergson, Einstein agreed with Meyerson.

It should be noted that years after the meeting, Einstein and Langevin praised Meyerson's book, *La déduction relativiste*, published in 1925. In this work, Meyerson elaborated on the argument he had presented during the meeting, focusing on the distinction between space and time (cf. Čapek 1955, p. 170; Canales 2015, p. 169). Incidentally, in the book, Meyerson proclaimed Einstein's victory, alluding to Bergson's critique (Bianco 2015, p. 97). Notably, prior to Bergson's debate with Einstein, Meyerson was "an old disciple of Bergson" (Canales 2015, p. 169). Canales posits that, while Bergson was initially fascinated by Meyerson's philosophy, their paths eventually diverged due to Meyerson's newly established loyalty to Einstein[148].

Meyerson's *La déduction relativiste* was also commented on by André Metz, a French physicist and an ardent critic of Bergson. Metz praised Meyerson's epistemology of identity, arguing for its superiority over Bergson's philosophy of duration (Bianco 2015, p. 97). Metz even

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[146] At the conference, centred around the eponymous *Radiation and the Quanta*, physicists addressed issues through the lenses of classical physics and quantum theory.

[147] Nevertheless, Einstein later appeared to align closely with the specialised interpretations he had initially criticised (Robinson 2022).

[148] Meyerson wrote in one of his letters to Einstein: "Nothing else, in my career as a philosopher, has made me more proud than the favourable judgment which you have given me" (cited in Canales 2015, p. 169).

wrote an entire book on Meyerson's philosophy and persuaded Einstein to publish parts of their conversation, which amounted to praising Meyerson and making Einstein's endorsement public (cf. Canales 2015, pp. 169–170). Thus, as demonstrated in the preceding analysis, Einstein was capable of engaging in philosophical inquiries—albeit not with Bergson.

4.4. "The Dialogue of the Deaf"

On 6 April 1922, Bergson and Einstein did not so much engage in a formal debate as exchange insights that were only loosely related. Consequently, scholars have aptly described the encounter as two monologues (During 2009, p. 233; Canales 2015, p. 14) or as a dialogue of the deaf (Sinclair 2022; During 2022a; Lévy-Leblond 2007, p. 238). One scholar characterised the events of that day as "a rather saddening illustration of what it means for physicists and philosophers to talk at cross-purpose", calling it a missed opportunity (During 2007b, pp. 84–85; During 2020a, p. 34; similarly, cf. Campo 2022, p. xiv). Another scholar observed that the dialogue during the session on 6 April was short-lived (Worms 2002, p. 188) but described it as a "sort of high point in the relation between science and philosophy that is singularly characteristic of this »moment« of philosophy »in France«" (Worms 2005, p. 43).

Édouard Le Roy, a French mathematician and philosopher, took the floor that day, stating that he had been asked to respond by Xavier Léon himself. Le Roy admitted that he had nothing substantive to add and attributed this to the fact that the problem of time, which is of fundamental importance to philosophers, differs significantly between Einstein's theory and Bergson's philosophy. Le Roy remarked that time and space in relativity theory are defined by their measurement, and thus the physicist's and the philosopher's perspectives, while both legitimate, address two different problems—or, rather, one problem approached from two opposite perspectives. Consequently, Le Roy called on Bergson directly to weigh in on the matter.

After being called upon to respond, Bergson humbly stated that he had come to listen, not to speak. Furthermore, according to Canales, he did not wish to engage in any debate with Einstein (Canales 2005, p. 1170). Bergson had intended to remain silent, as he had during Einstein's lecture at the Collège de France the previous day (Canales 2015, p. 19). However, compelled to speak, Bergson made it clear that he would focus solely on the notion of time, a subject closely aligned with his philosophical interests. Although he had already written a book on the theory of special relativity, he chose not to address the theory directly: "Since we should not talk about time without taking into account the hour, and the hour is late, I will confine myself to some summary indications of one or two points. I will be forced to leave aside the essential" (Bergson 2020, p. 167). Thus, as is evident from his address, he did not wish to confront the physicist, let alone cause a sensation.

During his speech, Bergson revisited the concepts from his forthcoming book, *Duration and Simultaneity*. He began by discussing his theory of duration and its relationship to our understanding of time. Additionally, he explored the relationship between time and common sense, as well as various aspects of Einstein's theory of relativity, which he would elaborate on in the book published later that year. However, for the majority of his address, Bergson concentrated on the notion of simultaneity. He questioned its meaning and its implications for both science and philosophy. Based on his remarks, it was evident that Bergson sought to initiate a discussion with Einstein regarding the underlying assumptions associated with the concept of simultaneity, such as the reliance on a human-based scale or the tendency to conceptualise point-like events.

Later that day, Bergson took the floor for the second time, this time of his own accord. It followed the speech by Henri Piéron, a French psychologist and one of the founders of scientific psychology, who highlighted the role of experiments conducted by psychologists on the issue of simultaneity. Piéron concluded that there is a fundamental inability to determine psychological simultaneity and succession with precision. Consequently, he argued, these should be distinguished from physical time, which, according to a scientific method uncovered by Bergson, requires a spatialisation of time.

When Bergson spoke immediately after Piéron's address, he agreed that psychological observations of simultaneity are indeed less precise than those achieved using scientific instruments, as demonstrated by the experiments. However, Bergson also contended that obtaining readings from any scientific device still requires reliance on psychological observations of simultaneities, no matter how imprecise they may be[149]. Thus, he emphasised the unavoidable entanglement of any physical measurement of time with "an irreducible psychological element" (Canales 2015, p. 246). With this brief but significant assertion, the meeting concluded. It can therefore be said that the last word on 6 April 1922 belonged to Bergson. However, the discussion between the physicist and the philosopher was far from over.

Interestingly, Bergson did not address the issue of the twin paradox, which had puzzled him ever since he first heard about it during Langevin's lecture at the Bologna Congress in 1911. This may well have been because the paradox had already been discussed in another session by Painlevé, as previously mentioned. Bergson was present on that occasion and perhaps did not wish to repeat

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[149] Thus, Bergson dispelled any scientific "dream" of discovering a precise device that would eliminate the need to rely on the imprecise observer (Campo 2022, p. xxi).

the questions that had already been addressed by Einstein. Regardless, Bergson decided to focus on the issue of simultaneity and its temporal meaning, a topic that was central to *Duration and Simultaneity* but far less controversial.

According to During, the audience remembered from Bergson's speech the idea that relativistic time does not contradict the representation of common sense, provided that the latter addresses contemporary flows rather than instantaneous events. This, in turn, suggests that science should take into account the perspective of common sense in its considerations (During 2020a, p. 44). During argues that Einstein could easily agree with this view, as he made the measurements of clocks dependent on local simultaneity. Thus, Bergson's argument was not polemical. However, where Bergson saw the "coexistence of flows", Einstein emphasised the "coincidence of punctual events" (During 2009, p. 235). Their subsequent exchange underscored the depth of mutual misunderstanding and fundamental disparities.

Although admittedly lengthy given the circumstances, Bergson's speech was not merely a reading of a passage from *Duration and Simultaneity*, as is sometimes suggested (cf. During 2020a, p. 42). His presentation did not correspond to any specific section of the book but instead offered a broad overview of the argument presented therein, with a particular focus on the fourth chapter. According to Worms, in the book, Bergson generalised his address from the meeting with Einstein (Worms 2002, p. 190). This thesis concurs with During's observation that, without the philosophical context provided in the book, it is more challenging to follow Bergson's argument (During 2020a, p. 42). Nevertheless, given the brevity of the statement, which Bergson had extended to its limits, one should not expect much more.

Before discussing Bergson's views on time and the theory of relativity as articulated in *Duration and Simultaneity*, it is best to defer to a thorough analysis of the book itself for a comprehensive understanding. Thus, the specifics of Bergson's speech are discussed concurrently with the analysis of the concept of real time in the final part of this thesis, as this directly pertains to the subject. Suffice it to say that during his address, Bergson emphasised that his intention was not to criticise Einstein or his theory but rather to establish the role of philosophy in relation to this new physical theory. As he remarked that day, "We still have to determine the philosophical significance of the concepts it introduces. […] We still have to distinguish between the real and the conventional in the results it achieves, or rather the intermediaries it establishes between posing of the problem and its solution" (Bergson 2020, p. 170). Bergson sought to provide Einstein with a new philosophical framework to complement his groundbreaking new physics.

Following Bergson's grand speech, Einstein immediately took the floor. However, his response was not extensive[150], as he primarily provoked controversy by asserting that there is no such thing as the time of philosophy. According to him, only physical and psychological time exist. Scott argues that this statement epitomised Einstein's conflict with Bergson, reflecting the physicist's conviction of the existence of "an unbridgeable chasm between the respective ground demanded by philosophy and the ground presupposed by physics, most apparent upon their respectively thinking time" (Scott 2006, p. 188). Nevertheless, this chasm did not prevent Einstein from asserting the priority of the physicist's conception time, as becomes evident in the remainder of his address (cf. Scott 2006, p. 188). It seems that Einstein's statement might have antagonised not only Bergson, as it was directed against the authority of philosophy as a whole.

In his article, Élie During provides a nuanced interpretation of Einstein's statement, suggesting that it can be understood in two distinct ways (cf. During 2020a, p. 45). The first interpretation was proposed by Charles Nordmann, an astronomer present at the meeting. According to Nordmann, Einstein argued that the philosophical concept of time should align with science. However, this interpretation is neither controversial nor polemical and would likely not have been contested by Bergson. Indeed, Bergson himself would have been among the first to agree with Einstein had that been his statement. Rather, it is more plausible that Einstein meant that there is no problem relating to time in which philosophy has any significant role to play[151]. In other words, the philosopher's task, as Einstein saw it, is merely to assist physicists in clarifying certain notions of time as employed within a specific scientific or psychological framework. "But no serious philosopher can accept that", including Bergson (During 2020a, p. 45). Even Bertrand Russell, a vocal critic of Bergson[152], acknowledged that philosophy has a legitimate role in independently addressing the problem of time (cf. During 2020a, p. 45).

The distinction made by Einstein between the simultaneity of perceptions and the simultaneity of events is a significant aspect of his response. According to him, the agreement on perceiving something concurrently implies its objective reality. He further asserted the existence of objective events independent of individuals and suggested that their simultaneity is not contradictory, owing to the high-speed propagation of light. Therefore, there is either psychological time, associated with

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[150] As previously mentioned, some commentators speculate that Einstein's response to Bergson was brief due to his lack of fluency in French (cf. Lévy-Leblond 2007, p. 238).

[151] Notably, a similar argument to Einstein's was recently advanced by Rovelli (cf. Rovelli 2020).

[152] Bertrand Russell, in his 1914 book *Our Knowledge of the External World*, made even more far-reaching statements about time in the theory of relativity. However, he removed these from the 1926 edition (During 2020a, p. 45; During 2022b, pp. 99–101).

the simultaneity of perceptions, or physical time, characterised by the simultaneity of events, as there is “a rigorous difference in kind” between the two (Durie 1999, p. xiv)[153]. Einstein went further by stating that one can transition from the concept of simultaneity of perceptions to that of the simultaneity of events and subsequently to a temporal order of events. However, in Bergson’s view, this progression is only possible if, by “events”, one understands “mental constructions, logical beings” (Bergson 2020, p. 171). Notably, according to Robin Durie, with this distinction, Einstein anticipates a line of criticism that Bergson would later face regarding his book on the theory of relativity, namely, that he illegitimately introduces an observer into the theory (cf. Durie 1999, p. xiv).

Although Einstein accepted that the time of physics is not vastly different from the time in the usual sense of the word—the time to which one refers when checking the clock—he called for a stricter definition (cf. During 2009, p. 234). In other words, while Einstein recognised the fundamental role of the observer, he still insisted that relativity theory deals with measuring instruments and reference systems, i.e., “events themselves” (cf. Durie 1999, p. xiv). Thus, according to Élie During, Einstein aimed to demonstrate that even if the time of physics belongs to everyone, not everyone can define it—only a physicist can. As Merleau-Ponty reconstructs it, Einstein believed that “it is to science alone we must go for the truth about time and everything else. And the experience of the perceived world with its obvious facts is no more than a stutter which precedes the clear speech of science” (Merleau-Ponty 1964, p. 197). In this attack on the authority of philosophy, During perceives a concealed but very real “violence” on Einstein’s part, while Merleau-Ponty goes as far as to speak of the “crisis of reason” (During 2009, p. 234; Merleau-Ponty 1964, p. 197). Canales similarly notes Einstein’s resistance to granting philosophy, particularly Bergson, “any role in the matters of time” (Canales 2005, p. 1170). This stance appears even dismissive when one considers, as Susan Guerlac rightly observes, that Bergson dedicated his life’s work to establishing a philosophy of time (Guerlac 2020, p. 106).

Einstein’s conclusion that psychological time differs from physical time but there is no “philosopher’s time” that combines the two was particularly striking given the fact that the audience consisted predominantly of philosophers and the event itself was organised by philosophers (cf. Canales 2015, pp. 19–20). However, the two ways of understanding time that Einstein distinguished —physical and psychological—would come to dominate the twentieth century, effectively

[153] Kreps, drawing on Canales, notes that scientists—mainly physiologists or astronomers—had known as early as 1795 that the perception of simultaneity differs from “physical” simultaneity. Thus, they conclude that “Relativity, in this respect, had only rediscovered what had already been known” (Kreps 2015, p. 165).

marginalising philosophy from the discussion (Canales 2015, p. 5). According to Prigogine, Einstein believed that "lived experience cannot save what has been denied by science" (Prigogine 1984a, p. 294). Yet, while Einstein denied the existence of a "philosopher's time"[154], Bergson maintained that a physicist's time is "no time at all when it is separated from duration" (Durie 1999, p. xiv).

Conversely, while Bergson asserted the cosmological relevance of his notion of time and space, which he sought to integrate carefully within "Einstein's remarkable discoveries, Einstein argued that there was only one time and space—that of physics—and that what Bergson was after was nothing more than *subjective* time—that of psychology" (Latour 2011, p. 3). Einstein's stance has even been described as clinging to the pre-relativistic scientific ideal, a position with tragic consequences, as it embroiled him in irresolvable paradoxes and contradictions "which he never sought as a physicist or a man" (Merleau-Ponty 1964, p. 197). Why, then, did the physicist so adamantly oppose the philosopher? What prompted such an abrupt reaction from Einstein?

Einstein's apparent aversion to philosophical perspectives can be traced to his views on the role of philosophy within society (Canales 2005, p. 1170). He expressed scepticism about the contributions of philosophers to scientific inquiry, aligning more closely with the belief that scientists were better suited to addressing philosophical questions related to science. In Einstein's view, philosophers could only contribute to inquiries concerning psychological time. However, even in this domain, he believed psychologists were better equipped for the task despite his low regard for psychological time itself. Einstein dismissed psychological time as nothing more than an illusion of the mind. His views on the role of philosophy were even more radical, as he asserted that philosophy should concern itself solely with the overlap between psychology and physics—despite his belief that no such overlap existed (cf. Canales 2005, p. 1176).

Thus, when Bergson addressed the necessity for a coherent concept of time to emerge from the new physics, alongside a notion of simultaneity reconciled with common sense, Einstein sought to discredit his standpoint by marginalising the role of philosophy in discussions of time. While Bergson emphasised the significance of the simultaneity of flows, Einstein highlighted the importance of the simultaneity of events, which involved discrete cuts rather than continuous duration. Finally, when Einstein posited the independence of physical and psychological time, Bergson insisted on the psychological dependence of physical measurements. Despite both addressing the concept of time, their assertions did not align in terms of content or their

154 It should be clarified that the issue here is not the ontological existence of something termed "philosophers' time" but rather the right of philosophy to determine what time is.

assumptions regarding the role of physics and philosophy in shaping the overall conception of time. What transpired between Bergson and Einstein that day was essentially two monologues rather than a dialogue.

The clear picture of the "debate" between Bergson and Einstein that day, which, according to most accounts, was not satisfactory in the sense that it only left audiences wanting more, contributes to a better understanding of Bergson's book and its subsequent fate. Furthermore, it sheds light on the source of the disagreement between Einstein and Bergson and the associated Bergsonian critique of the notion of time in 20th-century physics. As Keith Ansell Pearson observes, "The gulf that divided them continues to inform the relation between philosophy and physics on the question of time" (Pearson 2002, pp. 51–52). Consequently, this debate provides a foundation for understanding the divergence of paths between physics and philosophy and, in a broader context, between the humanities and the so-called exact sciences[155].

[155] Canales even describes this as "splitting the century into two cultures and pitting scientists against humanists, expert knowledge against lay wisdom" (Canales 2015, p. vii), or even science against "the rest" (Canales 2015, p. 7).

Summary of the second part:

Often overlooked, *Duration and Simultaneity* remains a key illustration of Bergson's philosophy of science. Originally conceived as a note, the work evolved into a comprehensive critique of the theory of relativity, reflecting Bergson's conviction that Einstein's redefinition of time had deep philosophical implications. While rich in scientific and mathematical references, the book remains primarily a philosophical project—one that diverges from the prevailing analytical approaches by actively engaging scientific claims in pursuit of metaphysical clarity.

Despite Bergson's effort to bridge disciplines, *Duration and Simultaneity* faced criticism from both scientists and philosophers, eventually prompting its author to withdraw it from further publication. Yet Bergson continued to reflect on the issues raised in the book, suggesting a lasting commitment to its core concerns.

By the time Bergson met Einstein in Paris on 6 April 1922, his book on relativity had already been completed. Einstein's theory, meanwhile, had gained international validation—especially following the Eddington expedition—and enjoyed widespread acceptance, even if met with some scepticism, notably in France. In public lectures and private meetings during his visit, Einstein was lauded as a revolutionary figure reshaping the foundations of physics.

Unlike Einstein's cordial exchange with Émile Meyerson, his interaction with Bergson was neither amicable nor substantive. Bergson defended the philosophical relevance of his concept of simultaneity and argued that the nature of time could not be settled by physics alone. Einstein, by contrast, insisted that such questions fell exclusively within the domain of physics. Their exchange, often described as a "dialogue of the deaf", marked a public rift that would shape the reception of both the book and the broader relationship between philosophy and science.

Part III

Bergson and Relativity: The Main Physical Issues Relating to Time

Having examined Bergson's critique of pre-relativistic physics and his initial engagement with Einstein's theory of relativity—culminating in *Duration and Simultaneity* and the 1922 Paris debate—this part of the thesis turns to a more detailed analysis of the book's content. Focusing on its physical aspects, it explores how Bergson interpreted key elements of relativity theory relating to time, thereby illuminating both the philosophical depth and the scientific ambition of his response.

This thesis contends that the physical analyses in *Duration and Simultaneity* exemplify Bergson's engaged approach to science. Through his detailed examination of scientific results, he demonstrated both independence and rigour in evaluating Einstein's theory. These analyses were not merely technical; they formed an integral part of his broader philosophical project by anchoring his evolving concept of time in the context of contemporary physics. As the following part of the thesis will show, this scientific engagement laid the conceptual groundwork for Bergson's hypothesis of universal time.

Bergson's aim was not to reconstruct the theory of relativity—numerous analyses had already explored it in depth[156]—but to examine its conceptual foundations and propose a philosophical account of time that could incorporate its insights while remaining continuous with common-sense temporal notions (DS, p. 9). Although the notion of time he developed will be examined in the next part of the thesis, its formulation requires first a critical inquiry into the basic assumptions of relativity theory and the novel physical hypotheses it introduced. This inquiry, which underpins Bergson's philosophy of time, forms the focus of the present part.

Before outlining the structure of this part, it is worth noting the technical character of *Duration and Simultaneity*. The book's early chapters involve numerous formulae and calculations. Bergson revisited Michelson's interferometer experiment to scrutinise its procedure and outcome. He also offered a detailed discussion of Einstein's thought experiment involving a train on the tracks, expanding it with his own interpretation. While some critics have argued that these technical explanations obscure the clarity of his argument (cf., for example, During 2009, p. 223), they remain integral to his analysis. As Čapek observes, they cannot be dismissed without inconsistency

[156] Bergson examined studies in popular science rather than strictly scientific works (for further reading, see During 2009, p. 248).

by those who uphold relativist principles (Čapek 1971, p. 239; reiterated in Čapek 1991, pp. 297, 299).

This thesis, however, deliberately avoids the use of equations. This methodological decision reflects both a concern for accessibility[157] and a critique of the often gratuitous use of mathematical formalism in the humanities[158]—a tendency noted by Philip Kitcher in his criticism of certain trends among logicians (Kitcher 2023, p. 63).

This part examines Bergson's interpretation and critique of key physical issues in relativity theory related to time. It begins with his account of why earlier models—particularly the ether theory and the Fitzgerald–Lorentz contraction hypothesis—failed to provide an adequate description of reality. This discussion sets the stage for Bergson's transition from what he termed "half-relativity" to his analysis of the principle of reciprocity, which he regarded as central to relativity theory. The following chapters then consider Einstein's major theoretical contributions and their implications, including time dilation and the concept of space-time, as viewed from Bergson's philosophical standpoint. The final chapter of this part turns to the twin paradox and the problem of acceleration, framed through Bergson's distinction between special and general relativity, which underpins his broader critique of Einsteinian physics.

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[157] This concern was famously raised by Stephen Hawking, following the assertion of his publishers that "every equation would halve the sales of *A Brief History of Time*" (Stewart 2012, p. viii). While Ian Stewart argues that equations are fundamental to science and reality itself, he acknowledges that they can also complicate matters. He concedes that "even those of us who love equations can be put off if we are bombarded with them" (Stewart 2012, p. viii).

[158] I recently came across a publication that presented an equation related to Galileo's principle of relativity regarding velocity. According to this principle, the velocity of a moving object on a boat sailing along a river relative to a riverbank is determined by simply adding the boat's velocity to that of the object. It can be argued that this concept is sufficiently straightforward to be understood without requiring an explicit mathematical formulation.

Chapter 5. Inadequacy of Existing Solutions

This chapter presents Bergson not as a detached critic but as a philosopher of science deeply engaged with the conceptual foundations of contemporary physics—a portrayal that aligns with the analysis developed in previous chapters. His treatment of relativity reveals both a firm grasp of its technical elements and a commitment to clarifying their broader philosophical implications. In this way, Bergson laid the groundwork for his more expansive critique of Einsteinian physics, which the next part of the thesis will address in detail.

In his critique, Bergson aimed not only to highlight the groundbreaking character of Einstein's postulates but also to challenge lingering conceptual habits rooted in Newtonian thinking. This chapter argues that Bergson's reflections served two key purposes: to offer a final rejection of the Newtonian worldview and to reveal how entrenched assumptions continued to distort interpretations of relativity.

This chapter begins by examining Bergson's analysis of the Michelson-Morley experiment, which Einstein regarded as foundational to his theory. The philosopher's engagement with this and related developments—such as the Fitzgerald–Lorentz contraction hypothesis and the Lorentz transformation formulae—demonstrates his effort to expose the limitations of pre-relativistic physics. Central to his approach is the notion of "half-relativity", a transitional model that anticipates but falls short of Einstein's full theory, particularly the principle of reciprocity[159].

The chapter then focuses on Bergson's analysis of Einstein's two central postulates: the rejection of the ether and the constancy of the speed of light. The philosopher scrutinised the empirical and conceptual status of these claims, and in one case, elevated a postulate Einstein regarded as provisional to the status of a physical law—illustrating his serious and independent engagement with the theory. His distinction between half-relativity and full reciprocity proves essential here: by failing to observe it, we risk generating illusory problems and philosophical confusion, which Bergson sought to dispel.

5.1. The Michelson-Morley Experiment and Lorentz Transformations in "Half-Relativity"

The presentation of the experiment offered by Bergson arguably provides a more accurate account than conventional portrayals, as it aligns with the original perspective held by Michelson and

[159] This was the prevailing approach among most physicists before Einstein announced the theory of relativity, and indeed for a significant period afterwards, including figures such as Lorentz, Fitzgerald, and Michelson.

Morley themselves. At the time of their experiment, they operated under the assumption of the ether's existence and did not yet incorporate the principles of Einstein's relativity. Instead, they sought to provide evidence for the ether, a framework entirely consistent with the half-relativity position Bergson described. Michelson was untroubled by the lack of displacement of the interference fringes and did not regard this as grounds for questioning pre-relativistic physics. On the contrary, in 1903, he wrote that physics was such a well-established field that it was unlikely any forthcoming discoveries could alter it (cf. Sady 2020, p. 45). Furthermore, he did not regard Einstein's interpretation of the experiment—that it proved the non-existence of the ether and necessitated a reassessment of the notions of time, simultaneity, and space—as a viable explanation (Canales 2015, p. 109).

Duration and Simultaneity begins with a detailed account of the Michelson-Morley experiment[160]. Although the experiment was not the foundational basis of the theory of relativity, Bergson regarded it as highly significant. He argued that it had the notable advantage of presenting the problem in concrete terms and laying out the elements of its potential solution in a manner that is readily accessible (DS, p. 9). According to Bergson, the experiment thus served to illustrate the issue at hand and offer a glimpse of the theoretical framework that would later evolve. As Zawirski notes, the Michelson-Morley experiment is particularly well-suited to introduce the new theory, as it provides a clear, tangible sense of the difficulties that relativity aimed to resolve (Zawirski 1924, p. 104). By positioning the experiment at the beginning of his analysis, Bergson effectively sets the stage for exploring the broader implications of relativity.

In 1881, Albert Michelson, a distinguished American physicist, conducted an experiment which he later repeated in 1887 with the collaboration of Edward Morley, another American physicist. According to Bergson, Morely and Miller undertook the experiment again in 1905 "with even greater care" (DS, p. 10). The experiment aimed to explore the properties of the ether using light and mirrors. Michelson and Morley utilised an interferometer to detect the Earth's motion through the ether by measuring variations in the propagation speed of light.

The experiment relied on the interference of emitted and reflected light rays. If the ether existed, the two light beams would exhibit differences in travel time depending on the interferometer's orientation relative to the Earth's motion. In other words, as the device was rotated, interference fringes were expected to shift, revealing this difference. However, the results showed

[160] As Élie During observes, "His educational concern often leads him, as he himself admits, to revisit the same questions from several angles, to vary the scenarios at the risk of creating weariness or an impression of repetition" (During 2009, p. 223).

no observable shift in the inference fringes when the interferometer was rotated relative to the direction of the Earth's orbital motion (Sady 2020, p. 43). This unexpected outcome suggested that the Earth remained stationary within the ether[161].

As noted, Bergson provided a detailed account of the Michelson-Morley experiment[162]. The experiment involved directing a beam of light from point P to point O, where it bifurcated. One beam reflected off point O and travelled perpendicularly upwards to point A, while the other passed through O and continued towards point B, which lay along the same line as P. Mirrors positioned at points A and B reflected the beams back toward O. As a result, both beams returned to point O, with the beam from point A continuing in a straight line to point R, while the beam from B travelled perpendicularly downward to point R, where the measurements were taken.

It is widely accepted that if the apparatus remains stationary and light propagates at the same speed in all directions, the travel times of the two beams of light will differ. However, this disparity is independent of the interferometer's rotation angle and is, therefore, unaffected by the presence of the ether. Crucially, the apparatus used in the Michelson-Morley experiment participated in the Earth's orbital motion. According to Bergson, this implies that the beam travelling to and from point A should, in principle, have reached point R later than the beam travelling to and from point B. He supported this claim with mathematical formulae and concluded that a shift in the interference bands should have been observed, given the differing effects of the Earth's motion on the two beams. Yet, no such shift occurred, regardless of the number of repetitions. From this, Bergson inferred that the experiment's results indicate the equal paths of the light beams, the constancy of the speed of light relative to the Earth, and the Earth's stationary position within the ether (DS, p. 13).

This account of the Michelson-Morley experiment aligns its underlying assumptions, objectives, and outcomes with historical records. The physicists conducting the experiment neither suspected nor seriously considered the possibility that ether might not exist. On the contrary, they aimed to examine its properties by determining the Earth's velocity relative to the ether. At the same time, Bergson highlighted that, contrary to Einstein's later claims, the Michelson-Morley experiment did not establish the nonexistence of the ether. Instead, it could be understood as supporting the notion that the Earth remains stationary within the ether. As previously noted, this

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161 For a detailed description of this interpretation, see During 2009, p. 262. For further details on the concept of "ether" in *Duration and Simultaneity*, see During 2009, p. 256.

162 Notably, Bergson further used the experiment to illustrate the Lorentz transformation formulae through a concrete example—formulae that later became fundamental for special relativity, which makes Bergson's application of them to the experiment a particularly valuable perspective (cf. During 2009, pp. 255–256).

was precisely the assumption of the experimenters—Michelson, in particular, did not question the validity of Newtonian physics and did not regard his findings as indicating anything beyond the distinctive properties of the ether.

Hendrik Lorentz, a distinguished Dutch theoretical physicist, first proposed an explanation for the null result of the Michelson-Morley experiment, which was later reiterated by George Francis Fitzgerald, a prominent 19th-century Irish physicist. This explanation, known as the Fitzgerald-Lorentz contraction theory, employed the Lorentz transformation formulae and aimed to reconcile the experiment's outcome with Newtonian physics. Specifically devised for this purpose (cf. During 2009, p. 263), the theory preserved the concept of the ether, which complemented the Newtonian framework and provided a unified explanatory model[163]. According to this theory, an object that is moving relative to the ether undergoes contraction only in the direction of motion, with the contraction factor given by the Lorentz transformation formulae. Notably, this contraction is not an actual physical compression but a coordinate effect due to motion through the ether[164]. Applied to the Michelson-Morley experiment, this implies that the second beam of light, OB, would undergo contraction due to its motion, thereby ensuring that its travel time matches that of the first beam, OA.

Bergson critically examined the Fitzgerald-Lorentz contraction theory, arguing that it accounts for the outcome of the Michelson-Morley experiment by making it appear as though light propagates at a constant speed in all directions (DS, p. 14)[165]. He emphasised the need to explain why measurements of the speed of light, "c", consistently produce the same result, regardless of the Earth's motion. While the theory assumes contraction, he suggested an alternative explanation involving transverse expansion or a combination of both. More significantly, Bergson challenged a fundamental implication of the theory, stating that if all moving objects, irrespective of their velocity, contract along this direction of motion, this effect would be undetectable from within the moving frame (DS, p. 13). However, he argued that while this contraction remains imperceptible on Earth, it would, in principle, be observable from a fixed reference frame within the ether itself (DS, p. 14). This reasoning led him to consider the implications of a hypothetical observer positioned within the ether frame.

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[163] Since the ether was considered "one universe-wide reference frame", it constituted the link that made pre-relativistic physics "whole again" (Friedman & Donley 1989, pp. 49, 46).

[164] For a detailed description, see, for example, Friedman & Donley 1989, pp. 53–55.

[165] Interestingly, this implies that even under the assumption of the constant speed of light, the concept of the ether can still be upheld.

In *Duration and Simultaneity*, Bergson contrasted the perspectives of two observers: one stationed on Earth and the other situated in the ether. To illustrate the relationship between a stationary and a moving system, Bergson employed the Lorentz transformation formulae to establish the mathematical relations between time, length, and velocity. He emphasised that these two observers—one at rest, the other in motion—would perceive each other's system and respective speeds differently. An observer in the stationary system, S, would immediately detect variations in the moving system, S', as soon as it departs from S. However, an observer in S' would remain convinced that their own time is identical to that of S. Bergson argued that an observer in motion perceives their own system as stationary, leading them to believe that time within S' is the same as in S[166].

Expanding on this, Bergson explained that an observer in S would perceive the passage of time in S' as stretching—analogous to an extended elastic band or an arrow appearing enlarged under a magnifying glass (DS, p. 15). However, he clarified that this does not indicate any physical alteration in the clock's mechanism or functioning. Instead, time itself expands, making the unchanged clock appear to run more slowly (DS, p. 15). Consequently, he concluded that as time dilates, movement and change within the system also decelerate, as both function as representations of time and can thus be regarded as clocks.

In Bergson's view, expanding his thought experiment involving two observers—one at rest in the ether frame, the other in motion—was necessary to directly incorporate the Michelson-Morley experiment and illustrate the consequences of Lorentz transformations more effectively. He replaced the experiment's mirrors with people to examine the double journey of light and the feasibility of measuring its speed using two clocks synchronised through the transmission of optical signals. Since synchronisation depends on the exchange of light signals, instantaneous communication between observers is impossible, necessitating the establishment of invariant conditions governing their transmission.

According to Bergson, only the ether provides such a medium, as only an observer at absolute rest can fully perceive the transformations occurring in a moving system. In this scenario, the two observers recognise, for instance, that while light follows a longer trajectory when travelling between two points in the moving system, this asymmetry does not apply to its return journey (DS,

[166] According to the theory of relativity, the time of the moving system S' would necessarily differ from that of the stationary system S. However, in his analysis of this hypothetical scenario, Bergson deliberately adhered to Newtonian physics to demonstrate the inadequacy of pre-relativistic explanations.

p. 21). They further conclude that achieving true simultaneity requires adjusting the clocks within the moving system accordingly.

From the vantage point of the ether reference frame—in Bergson's depiction—three modifications occur and are visible within a moving system. First, all lengths contract in the direction of the system's motion, with this contraction proportional to the original lengths of the stationary system by the gamma factor (also known as the Lorentz factor). Secondly, time within the moving system dilates, with each second extending proportionally to the original second by the same Lorentz factor. Thirdly, events that are simultaneous in the stationary system occur successively in the moving system.

From these modifications, Bergson concluded that the moving system duplicates the stationary system. In other words, this system moves through space while contracting in the direction of its motion. Consequently, its seconds lengthen, causing time to dilate, and events that were simultaneous in the stationary system become so widely separated that they occur in succession (DS, p. 22). However, these modifications are perceptible only to the stationary observer, while the moving observer remains unaware of them.

The names Peter and Paul were given by Bergson to designate the observers in the fixed and moving observatories, respectively[167]. He assumed that both could communicate, enabling him to construct a hypothetical dialogue between them. According to Bergson, Peter provides Paul with the gamma factor—which he terms "the correction formulae"—so that Paul can adjust clocks in his system accordingly. However, Paul does not perceive any modifications in his own system and is therefore reluctant to make such adjustments. He believes that applying the formulae would render his system incoherent. Consequently, he chooses to take no action, particularly since, from his perspective, his system is identical to Peter's.

However, in this hypothetical scenario, Bergson identified one instance where Paul would be compelled to adjust his measurements according to Peter's correction formulae. This occurs when constructing a unified mathematical representation of the universe that accounts for all events across multiple reference frames moving at different velocities relative to Peter (DS, p. 24). In this context, Paul's position becomes analogous to adopting an absolute perspective, wherein all points

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[167] It is difficult to overlook the resemblance between this aspect of Bergson's thought experiment and the twin paradox, particularly in the choice of names—Peter and Paul—assigned to the observers (cf. During 2014, p. 523). However, at this stage of his analysis, Bergson continued to set aside the theory of relativity, which introduces and develops the paradox.

in the universe must be defined in relation to a fixed coordinate system[168]. Therefore, to maintain consistency with this absolute framework, Paul must adopt Peter's perspective on time and space by adjusting his measurements using the correction formulae.

Paul's necessity to adjust his time to Peter's arises from the existence of the universal, all-pervading ether. Without it, all reference frames would be equally valid, making it impossible to determine which time measurements and simultaneities are objectively true. However, since pre-relativistic physics (and, thus, Bergson's concept of half-relativity) presupposed the ether's existence, a privileged frame of reference remained. Bergson further argued that the ether is essential in demonstrating the independence of the speed of light from the motion of its source (DS, p. 23). He maintained that within a moving system, the motion of the light source is irrelevant, as it does not transfer its movement to the emitted light.

In interpreting the results of the Michelson-Morley experiment through the framework of the Fitzgerald-Lorentz contraction theory, Bergson employed pre-relativistic physics to derive the equations governing the stationary system (i.e., Galilean transformations) and applied the Lorentz transformation formulae to describe the system undergoing modifications—specifically, one moving at or near the speed of light. In doing so, he underscored the differences between the equations of pre-relativistic physics and those derived from Lorentz transformation formulae. Furthermore, he sought to elucidate the precise meaning of each term within these formulae, as they constitute the algebraic foundation of special relativity (cf. During 2009, p. 250), the ultimate focus of his analysis.

The Lorentz transformation formulae, according to Bergson, have a crucial implication: they guarantee the invariance of electromagnetic equations (DS, p. 29), thereby upholding Einstein's postulate that the speed of light remains constant in all inertial frames. This invariance ensures that Maxwell's equations, which govern electromagnetism, retain their form across different reference frames. Unlike Galilean transformations, which fail to preserve the structure of these laws, Lorentz transformations maintain their consistency across inertial frames. Consequently, under Bergson's hypothetical scenario, Paul's system, like any other in motion, must undergo the same correction formulae dictated by Peter.

For Bergson, however, the deeper significance of this invariance lies in its implication of independence from the observer's perspective. Because Lorentz transformations ensure that electromagnetic equations remain identical in all inertial frames, a privileged reference frame is

[168] Bergson contended that this requires determining the position of every point in space based on its distance from three fixed planes (DS, pp. 24–25).

unnecessary. Consequently, while space and time depend on the observer's motion, the fundamental laws of physics remain unchanged. In this context, it is necessary to concur with During's assertion that Bergson regarded this invariance as both a metaphysical constraint on relativity and a demonstration of its epistemological orientation (During 2009, pp. 254–255). Although the theory relativises time and space, it simultaneously preserves the invariance of certain physical relations, regardless of the chosen frame of reference. Accordingly, despite discrepancies in their measurements of time and length, all observers describe electromagnetic phenomena using the same fundamental equations.

In analysing the Michelson-Morley experiment and the Fitzgerald-Lorentz contraction theory through the lens of the Lorentz transformation formulae, Bergson sought to identify elements uniquely attributable to Einstein's theory of relativity. This examination laid the groundwork for his adoption of the "half-relativity" perspective—one that, despite its differences, continues to offer valuable insights into the theory of relativity (cf. During 2009, p. 254). Bergson's broader objective was to develop a concept of time that could be described as "half-relativist", designed to address the paradoxes posed by the new physics. Furthermore, he aimed to evaluate the state of scientific knowledge at the turn of the 20th century, intentionally excluding Einstein's theory from his analysis. His examination demonstrates that prevailing physics was insufficient to fully account for the results of the Michelson-Morley experiment or the Lorentz transformation formulae. Despite the notable efforts of Fitzgerald and Lorentz, their contraction hypothesis failed to represent reality accurately—an issue only resolved with Einstein's theory of relativity.

5.2. Towards Reciprocity

Through the analysis of the Michelson-Morley experiment and the Fitzgerald-Lorentz contraction theory using transformation formulae, the relationship between S' and S—as well as that of S to S'—came under Bergson's consideration, particularly in the context of the inverse reference frame. Applying this to his thought experiment involving two observers, he concluded that Peter perceived his system as stationary, while Paul's system appeared to be moving. What Bergson sought to examine further was how Paul perceived Peter's system—a question he approached through the concept of reciprocity, which forms the focus of the present analysis.

Bergson also examined the concept of the reciprocity of motion, interpreting it as central to Einstein's perspective. He emphasised that, regardless of his subsequent analysis, the conclusions he had already drawn—particularly those concerning the modifications of the moving system and the Lorentz transformation formulae—remained valid within Einstein's framework. According to Bergson, the key distinction was that, for Einstein, these modifications were reciprocal. As he explained, the observer in one reference frame, S', would attribute to the other frame, S, the same assertions that the observer in S had made about S' (DS, p. 30). Thus, from Paul's perspective, his system, S', is stationary, while he views Peter's system, S, as in motion.

Consistent with Einstein's theory of relativity, Bergson argued that once an observer designates a particular reference system, this system becomes stationary. In other words, a chosen frame remains at rest relative to itself. He linked this idea to his concept of half-relativity, asserting that any system could serve as the stationary frame, S, in which Peter is located, simply by being designated as the observer's frame of reference—thereby rendering it immobile through an act of thought (DS, p. 25). He further maintained that motion is always relative to the reference system in which it is described. Thus, what appears to be in motion from one reference frame (e.g., Peter's perspective) may seem stationary from another (e.g., Paul's perspective), and vice versa. From this, Bergson concluded that changing the reference frame alters the description of motion. This interpretation aligns with Einstein's relativity, which asserts that selecting a different frame of reference effectively shifts the observer's vantage point, thereby altering how motion is perceived.

The relativity of motion is not synonymous with reciprocity. While relativity concerns the dependence of motion on the chosen frame of reference, reciprocity requires a fully interchangeable perspective in which no frame is privileged. Bergson distinguished between these concepts, emphasising that relativity is more straightforward, as it merely involves motion to denote the relative distance between two points in space. For instance, if a train moves away from a station, it is equally valid to say that the station moves away from the train. Nevertheless, relativity alone does not entail reciprocity. Although the train's and the station's motions are relative, the physical effects observed within each frame are not necessarily reciprocal. Fully grasping this distinction necessitates a return to the fundamental principles of relativity.

Einstein formulated his theory of relativity based on two fundamental postulates: the constancy of the speed of light and the Galilean principle of relativity, now extended to all (inertial) reference frames. Though seemingly straightforward, these principles had profound implications for both physics and the prevailing worldview. While Einstein adopted Lorentz's transformation formulae, he reinterpreted their significance. Rather than viewing length contraction and time dilation as real phenomena arising from motion through an absolute ether, as previously assumed, he argued that these effects result purely from the relative motion between observers (cf. Čapek 1971, p. 241). Crucially, although Lorentz's transformations are reciprocal—each observer perceives the other's time as dilated—Lorentz himself assumed the existence of the ether and regarded these transformations as describing how objects behave within absolute space.

In response to these divergent interpretations, Bergson advocated for a rigorous reassessment of which claims were factual and which remained hypothetical. His insistence on adhering only to what is real, observable, or demonstrable highlights his commitment to empirical evidence. He asserted that the motion of one system relative to another constitutes an observable fact, comparable to the constancy of the speed of light, which should be regarded as fact "until proven otherwise" (DS, p. 32). By contrast, he argued that the concept of a motionless ether, in which a system is at rest, had never been observed and must therefore be treated as a hypothesis. Thus, Bergson emphasised the need to ground physics in empirical facts, rejecting the hypothesis of a motionless ether. Consequently, he called for a reconsideration of the first fact regarding the motion's relativity, maintaining that both systems are in motion relative to each other, without any absolute point of reference. He termed this mutual motion "a reciprocity of displacement".

The fact that neither the theory of relativity nor any other theory or experiment has definitively disproved the existence of the ether did not elude Bergson. He noted that even Einstein did not unequivocally dismiss it, as evidenced by his 1920 lecture "The Ether and the theory of Relativity" (DS, p. 32). As previously discussed, the concept of the ether could have been retained within modern physics, yet it was no longer necessary. The ether had been valuable to science when it functioned as an absolute reference point, completing the Newtonian universe while aligning with Maxwellian physics, particularly in relation to light. Einstein, however, dispensed with the ether, rendering it redundant and ultimately obsolete.

Once the notion of an absolute privileged reference point is abandoned, Bergson maintained that an observer within a system can no longer determine whether the system is in motion or at rest. Without an external point of comparison, their position cannot be definitively established. Consequently, observers can only compare their location relative to the position of other observers, each equally justified in asserting which of them is in motion and which is at rest. However, Bergson argued that the distinction between being objectively at rest or in motion is ultimately irrelevant, as observers may define it for themselves—provided they remain consistent with their chosen frame of reference.

After establishing the factual grounds of the new physics, Bergson sought to clarify its fundamental terms to prevent any possible misinterpretation. He identified the "system of reference" as the most basic concept, defining it as a system in which every point remains at rest relative to the others. As long as a system of reference serves as the point of reference, it remains immobile. Bergson argued that even if a reference system is conceived as being in motion, this necessarily implies that another system has been provisionally chosen as stationary. Conversely, if the second system is then regarded as moving, the first is immediately reinterpreted as immobile. This reciprocal alternation underscores the inherent relativity of motion.

The term “system” was further refined by Bergson to distinguish it from a “system of reference”. According to him, a system is a fixed frame—a collection of points that remain at rest relative to one another, much like a system of reference. However, unlike a system of reference, a system only has the potential to become a system of reference; the latter, by contrast, has already been designated as such. Thus, a system can be elevated to the status of a system of reference. For instance, the Earth may be considered a system that could become a system of reference. Within a system, displacements and changes occur, yet events appear as though they were images passing through one’s consciousness. If the Earth is chosen as a system of reference, it ceases to be merely a system and assumes the status of a system of reference.

Distinguishing between a system and a system of reference was a significant point for Bergson. He criticised the theory of relativity for conflating the two, arguing that it treated them as equivalent. According to Bergson, relativity implicitly assumed the Earth to be stationary due to its negligible motion in everyday experience. As a result, the theory adopted this “composite system” as the system of reference without explicitly acknowledging the underlying assumption. Nevertheless, this implicit assumption enabled relativity to account for the “invariability” observed in the Michelson-Morley experiment (cf. DS, p. 42).

Other fundamental concepts in the theory of relativity, including “clocks” and “observers,” were also the subject of Bergson’s further analysis. He distinguished between the two, asserting that clocks are instruments designed to record time according to specific laws or rules. At the same time, observers interpret or read the time recorded by these clocks. Recognising the distinction between these concepts is essential, as neither clocks nor observers are necessarily physical entities, despite often being treated as such. Bergson argued that understanding these differences is crucial to avoid conflating the philosophical significance of time within the theory of relativity (cf. DS, p. 43).

According to Bergson, comprehending these fundamental terms of relativity, alongside the factual basis of the theory, is essential to maintaining a clear understanding of the concept of “reciprocity of displacement”—a crucial and foundational idea within relativity. To further clarify this notion, he drew on his earlier analyses of the perception of matter and his reflections on absolute motion. In summary, immediate perception consists of a continuity of extension[169]. However, a body is not immediately perceived, even though it is part of matter in its continuity. Bergson argued that the perception of a particular body arises from the division or fragmentation of matter through the act of perception. He emphasised that this description is consistent with psychological analysis and similar to the physical account of a body. As he noted, physics "dissolves" the body into a "virtually infinite number of elementary corpuscles", while simultaneously illustrating the body's interconnectedness with other bodies through innumerable reciprocal actions and reactions (DS, p. 39). Therefore, for Bergson, the division of matter into the perception of a body is an artificial and conventional act.

Since the perception of a body within extension is a matter of convention, as argued by Bergson, the same principle applies to the motion affecting such a body. Without exploring the details of his argument on movement, it suffices to note that the motion of matter—aside from the motion "that our effort brings to our attention" (DS, p. 39)—is perceived as a visual change in position, the exact nature and location of which remain unknown. In other words, motion is typically perceived as a change in the position of an object, but there is no precise understanding of exactly where or how the object is moving. The only motion that can be fully apprehended is directly experienced through one's efforts, such as when moving the body. Bergson further contended that the concept of absolute motion—where an object is thought to be moving independently of anything else—is superfluous. He argued that the motions studied by science are perceived as changes in position within measurable space, and that all motion observed in everyday life is relative. Therefore, such motions are meaningful only in relation to other entities, consisting, as Bergson described it, of a "reciprocity of displacement" (cf. DS, p. 35).

Through this description of motion, Bergson emphasised the core idea behind reciprocity, or what he termed "double relativity", which he defined as the reciprocal displacement of bodies in space. In contrast, "single relativity" refers to motion's dependence on the chosen reference frame and allows for interpretations rooted in pre-relativistic physics, such as Lorentz's contraction hypothesis, which assumes a privileged reference frame. "Double relativity", however, rejects such

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[169] The concept of extension (*étendue*) is significant for Bergson's philosophy and is intricately linked to matter and space. In *Matter and Memory*, he distinguished extension from space, asserting that concrete extension is not in space; rather, space is imposed upon concrete extension (Guerlac 2006, p. 166). With regard to matter, he defined it as extension in space (MM, p. 139) or as a concrete extension and divided extension (Guerlac 2006, pp.167, 171). For the sake of simplicity, this study treats extension as synonymous with matter. Nevertheless, the conceptual complexities of this distinction must be acknowledged.

views by adopting a strictly reciprocal perspective[170]. It remains unclear whether Bergson understood "single relativity" as the principle of relativity independent of the reciprocity of motion or as a form of "half-relativity", grounded in pre-relativistic physics. This thesis argues that his concept represents a synthesis of both perspectives: while accepting the theoretical framework of relativity, this stance retains—at least conceptually—certain assumptions of pre-relativistic physics[171].

While the principle of relativity excludes the possibility of a privileged reference frame, Bergson argued that the reciprocal motion of two systems is typically analysed by designating one as the "system of reference" (DS, p. 31). This effectively renders it immobile, thus functionally replacing the role once attributed to the ether. According to Bergson, once motion is formulated mathematically, the distinction between reciprocity and "single relativity" disappears (cf. During 2009, p. 270). This occurs because, whether one assumes a motionless ether or a stationary system relative to others, the mathematical treatment remains identical: a mathematician must perform calculations as though the system were stationary, using the same equations applied to a privileged reference frame. Therefore, the distinction exists only for a philosopher—or for a scientist adopting a philosophical perspective (cf. During 2009, p. 271).

In Bergson's view, the failure to distinguish between a system being stationary relative to other systems and a system being stationary relative to the ether is particularly problematic. He argued that, even after recognising the distinction between unilateral relativity and reciprocity, there remains a tendency to revert to the former. This tendency, according to him, gives rise to numerous "false problems", which he sought to address in *Duration and Simultaneity*. The most prominent of these is the confusion between false times and real time, a subject examined in the following chapter. Overcoming this tendency, as described by Bergson, can be illustrated using Jankélévitch's metaphor of actor and spectator. Under unilateral relativity, everyone is, in a sense, a spectator—like Peter, who adjusts his measurements for Paul, and like Paul, who adjusts his for Peter, with neither transcending this relationship. In contrast, reciprocity enables them to become actors as

[170] Within a framework of special relativity, both reciprocity and the relativity of motion hold, ensuring that motion remains mutual between observers in different inertial frames. However, this reciprocity breaks down under acceleration, disrupting the symmetry of motion.

[171] Although Bergson explicitly stated that in single relativity, "one still posits an absolute point of reference, a motionless ether" (DS, p. 30), the computational framework he described relies on the Lorentz transformations. These transformations already presuppose and are consistent with the principle of relativity, yet they do not strictly necessitate it—at least in their original formulation, which allowed for the possibility of an absolute reference frame. This conceptual flexibility enabled Bergson's notion of single relativity to retain the assumption of a privileged frame while still incorporating the mathematical structure of relativity.

well. Through the effort of sympathy[172], consciousness takes sides, allowing them not merely to imagine but to perceive. In doing so, Peter and Paul regain their freedom, realising that each can claim for the other what they can for themselves (cf. Jankélévitch 2015, pp. 24–25).

Even though the theory of relativity endorses the reciprocity principle, according to Bergson, it also allows for a worldview rooted in half-relativity. This conclusion led him to question whether Einstein's theory implicitly assumes the existence of a single absolute time and extension independent of duration (DS, p. 30). If this assumption holds, it would render Einstein's worldview deterministic and, more significantly, have profound implications for the concept of time within physical theory—an issue of central concern to Bergson. Furthermore, he sought to explore whether the reciprocity of points or systems in motion—corresponding to measured time—implies the existence of multiple times and whether these times are real or merely fictitious.

[172] This refers to Bergson's concept of sympathy, which is a kind of intuition. For more on the subject, see, for example, CM, p. 190; Meyer 1985, p. 101; Lacey 1999, p. 166; Lapoujade 2018, p. 44; Lawlor 2012, p. 35; Pearson 2018, p. 168.

Chapter 6. Einstein’s Revolutionary Propositions

Einstein’s theory of relativity introduced a radical shift in the understanding of time, replacing the Newtonian notion of a single, absolute temporal framework with a plurality of times, each bound to its own reference frame. Bergson regarded this development as a promising step forward and approached relativity with cautious optimism, anticipating that it might offer a more refined account of time than Newtonian mechanics had provided. In *Duration and Simultaneity*, he critically examined the theory’s physical and mathematical foundations—particularly its treatment of simultaneity, relativistic effects, and space-time structure—to assess whether it could account for the qualitative, lived experience of time. His broader aim was to formulate a philosophy of time capable of responding to the conceptual challenges posed by modern physics.

Building on the previous chapter’s analysis of the Michelson–Morley experiment, the Fitzgerald–Lorentz contraction hypothesis, and the principle of reciprocity—reflections that allowed Bergson to situate relativity within the broader context of early 20th-century physics—this chapter turns to the temporal implications of Einstein’s theory, which formed the core of Bergson’s philosophical engagement with relativity.

The chapter begins with Bergson’s treatment of key relativistic effects—temporal multiplicity, the breakdown of simultaneity, and longitudinal contraction—highlighting the distinctive character of his response to these phenomena. It then turns to his analysis of light figures, examining their function in illustrating these effects. Finally, it considers Bergson’s critique of Einstein’s space-time model, focusing in particular on the representation of time as a fourth dimension. Together, these discussions support the broader claim, developed throughout this thesis, that Bergson’s engagement with relativity exemplifies both the methodological rigour of the philosophy of science and a more confrontational approach aimed at rethinking the concept of time itself.

6.1. Relativity Effects Relating to Time

The fourth chapter of *Duration and Simultaneity*, which stands out as both the most extensive and controversial part of the book, contains Bergson’s developed account of these issues. Its complexity reflects the depth of the questions at stake, and its reception has been shaped by considerable debate, particularly in response to Bergson’s interpretation of the so-called twin paradox. This chapter of *Duration and Simultaneity* serves as a key site in which he tested the empirical and conceptual foundations of Einstein’s theory, offering a sustained philosophical intervention into contemporary scientific discourse. Before turning to his critique of the twin paradox, however, it is necessary first to examine the theoretical framework he established through his analysis of temporal phenomena and other core features of relativity. This preliminary inquiry not only reflects Bergson's close engagement with the scientific literature but also clarifies the philosophical stakes of his project, particularly his concern with rethinking time at the intersection of science and philosophy.

As the analysis thus far has shown, the relativity theory does not posit the existence of absolute motion or rest. Instead, all systems are understood to be in reciprocal motion relative to one another. However, designating one system as the reference frame effectively immobilises it, rendering it stationary in appearance, while the other system is perceived as moving. To clarify his analysis, Bergson posited the existence of two such systems, denoted as S and S', treating them as exact replicas that together constitute the entire universe. Each physicist, situated in either S or S', would thus perform Lorentz transformations relative to the other. This results in two mathematical representations of the universe that, while identical in the relational structure of their phenomena, differ in their numerical data. Bergson argued that this difference is, paradoxically, the condition of their identity (DS, p. 70). Accordingly, the reciprocity at the heart of relativity renders the two systems not only symmetrical but mutually constitutive.

a) The Plurality of Times

What are the implications of Einstein's principle of reciprocity between reference frames? Bergson identified three key relativity effects pertaining to time, one of which is the existence of a multiplicity of times. This effect follows from the principle that all inertial systems in Einstein's theory are equally valid. Since each system's clock indicates a different time, and no frame is privileged, every such indication must be regarded as equally real. Accordingly, the theory implies a plurality of times, with each system possessing its own time, distinct from that of others. In Bergson's hypothetical scenario, in which two systems together constitute the entire universe, this leads to the conclusion that the time in one system necessarily diverges from that in the other. As a result, events that are simultaneous in one frame may appear successive in the other, and spatial distances must be measured differently depending on whether the system is considered to be at rest or in motion.

The validity of a plurality of times was initially questioned by Bergson, who argued that, from the standpoint of common sense, only one real time exists. However, he also sought to assess this claim from a scientific perspective. Specifically, he asked whether, under the principles of relativity itself, these multiple times could be considered equally real. To address this, he first needed to clarify what it means for time to be real. In *Duration and Simultaneity*, Bergson proposed that reality is defined by what is or can be perceived by a conscious entity. On this basis, he argued that the time measured by a beam of light in a stationary system (S) is real, insofar as a consciousness experiences a determinate duration during its journey. Thus, according to Bergson, the motion of a clock's hands serves as a symbol of temporal passage, corresponding with the inner duration experienced by consciousness.

In Bergson's hypothetical scenario, in which only two systems exist, a physicist situated in system S perceives their system as stationary and, therefore, does not need to apply Lorentz transformation formulae to determine time. The time measured by this physicist is directly experienced as part of their consciousness. Similarly, a physicist in system S' perceives their system as motionless and, thus, also does not need to use Lorentz transformations to measure time. The time measured in system S' is experienced by the physicist in S' in the same way that the time measured in S is experienced by the physicist in S. Consequently, the time in both systems S and S' can be considered real, as each is directly experienced by the respective physicist within their own frame of reference.

Did this inference lead Bergson to conclude that common sense had misled him and that the plurality of times constitutes the experienced reality? Far from it. He rejected this conclusion and instead proposed a radical alternative: the times associated with systems S and S' are not separate but represent one and the same, real time. In this view, only one real time exists—an overarching temporal framework shared across all reference frames. The multiple times found in the mathematical formulations of relativity are not separate temporal realities but mathematical representations of a single system observed from the perspective of another. Therefore, Bergson argued that while these distinctions may be valid within the confines of relativity theory, they fail to reflect the underlying unity of time, which he maintained remains consistent and indivisible. Accordingly, the single, real time is common to both physicists in his hypothetical scenario, regardless of their respective frames of reference, and is experienced identically by both, even though the phenomena they measure may differ due to their relative motion.

The explanation of this striking conclusion begins with Bergson's assertion that system S′ is a replica of system S. He argued that the time experienced and measured by the physicist in S' is identical to the time lived and recorded by the physicist in S. This equivalence arises because both physicists regard their respective systems as reference frames, thereby rendering them stationary.

Consequently, neither physicist perceives time as undergoing dilation[173], nor do they see the need to apply Lorentz transformation formulae to their respective systems. Bergson concluded that, since both physicists experience undilated time and assume they are contemporaneous, the systems S and S' are interchangeable.

Thus, Bergson's interpretation of reciprocity within the context of relativity theory frames it as the interchangeability of points of view. It is evident that his conclusion follows directly from his assumption that system S' is merely a replica of system S. This conceptualisation of the theory in terms of duplicates persists throughout Bergson's account of Einstein's theory and his understanding of time in science, ultimately undermining the strength of his argument (cf. During 2009, p. 267). However, it remains consistent with the principles of special relativity to regard inertial systems as interchangeable, since each can function as a reference frame and be substituted for any other, all being equally valid (cf. Murphy 1999, p. 68).

More than merely asserting the existence of a singular, real time, Bergson argued that the alternative times—mathematically formulated by physicists and adjusted through Lorentz transformations—are ultimately illusory. In his view, the temporal frameworks posited by the theory of relativity, particularly those attributed to systems moving at different velocities, are not grounded in lived experience and therefore lack ontological reality. As these times are neither directly perceived nor inhabited by anyone, Bergson regarded them as imaginary constructs. Accordingly, he characterised Einstein's relativistic universe as "irreal, that is to say, uninhabitable" (Worms 2005, p. 43). This critique, which targets the experiential legitimacy of relativistic time rather than its scientific utility, becomes clearer when revisiting the earlier example involving two physicists situated in reference frames S and S', respectively.

Consider two reference frames, S and S', each occupied by a physicist—Mary in S and Lucy in S'. Both physicists are capable of perceiving time in the other's frame. Mary designates S as the system of reference, effectively treating it as stationary. From this vantage point, she perceives Lucy's time as diverging from her own and notes that events which are simultaneous in her frame appear as successive in Lucy's. This observation prompts a critical question in line with Bergson's critique: does the time Mary attributes to Lucy's system correspond to the time Lucy herself actually experiences?

To address this question, it is essential to consider the scenario from Lucy's perspective. The time Mary attributes to her system, S', is derived through the Lorentz transformation formulae; yet

[173] The dilation of time, or the "slowing down" of time, refers to the perception of time in a system as observed from an external frame of reference, to which Lorentz transformation formulae are applied.

this is not the time Lucy experiences as her own. Since she treats S’ as the reference frame—rendering it stationary—no transformation is required from her standpoint. Consequently, the time ascribed to S’ by Mary, and thus to Lucy herself, is not lived by either physicist. While this may suggest that such a time is, indeed, imaginary, in light of Bergson’s definition of reality previously mentioned, one must further ask whether it *can* be lived by anyone at all.

If Mary were to imagine Lucy, she would envision her treating S’ as the reference frame, thereby rendering it stationary through that very act. However, in doing so, Mary would have to relinquish her own frame of reference and, as a result, could no longer remain herself. She would, in effect, have to imagine herself as Lucy. In other words, it is not enough to imagine another person in order to grasp the full extent of their lived experience. One would have to *become* that person, for only through direct experience can one fully embody another’s individuality[174]. By contrast, representation and imagination remain inherently generalising due to their symbolic and abstract nature (cf. Mullarkey 2000, p. 113).

If someone attributes dilated time to another person—without attempting to truly understand that person by adopting their perspective, as Mary must do for Lucy to fully grasp her experience—but instead merely assigns them to a reference frame with time dilation, then—as Bergson argued—they cease to perceive the other as a human being. Instead, they regard the other as an empty “outer envelope” (DS, p. 72). In other words, when one treats another instrumentally—by imposing a projected identity onto them rather than recognising their true individuality—one no longer sees them as a subject, but as an object of reference. Bergson contended that the distinction lies in the fact that while a living person can refer to another living person, an imagined person can only be referred to.

Building on the earlier example involving the physicists, if Mary were to attribute a slowed-down time to Lucy’s system S’, she would cease to recognise Lucy as a person, instead reducing her to what Bergson described as an “empty envelope”—a mere abstraction devoid of true individuality. This shift occurs because Mary, by attributing time dilation to Lucy’s system, imposes a mathematical construct onto her, rather than engaging with Lucy’s lived experience. The time that Mary assigns to S’, while consistent with the mathematical framework of relativity, is fundamentally a symbolic representation. Bergson contended that such mathematical expressions, though useful for coordinating reference frames, are not reflective of the actual temporal experiences of either Mary or Lucy. Instead, these abstract formulations simply serve as tools for

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[174] This argument closely mirrors Bergson’s discussion of freedom and the impossibility of predicting an individual’s future behaviour.

describing and comparing systems, without capturing the depth or reality of the time that each physicist lives.

The next step in Bergson's argument against the existence of multiple times is his redefinition of reality. He asserted that reality is not something abstract or merely theoretical but is instead grounded in the measurements made by a real physicist—one who engages with and experiences the world directly. In contrast, anything that is merely represented in the mind of a real physicist, as measured by an illusory physicist or through imagined constructs, is deemed unreal or fictitious. In the example under consideration, reality is found in the measurements made by Mary and Lucy, each operating within their respective reference frames. These measurements, grounded in actual experience, are considered real because they reflect their lived realities. However, the time measurements that Mary imagines for Lucy, or vice versa, are viewed as illusory because they are projections of one physicist's imagination, rather than based on direct, lived experience. As such, they cannot be considered part of the real temporal experience of either Mary or Lucy.

In Bergson's framework, fictitious times are not genuinely measured but are merely represented as such, existing only as abstract constructs within the framework of mathematical models. In contrast, During criticises Bergson for failing to recognise that the variables in the equations of relativity correspond to measured, or at least measurable, quantities (During 2009, p. 294). Furthermore, During asserts that even if Bergson characterised dilated time as either someone else's time or as one's own time perceived from another's perspective, this dilated time remains a measured quantity, rather than a mere representation. He argues that while dilated time differs from undilated time in how it is measured, it is still quantifiable, a distinction Bergson fails to fully acknowledge (During 2009, p. 295).

Although During's observation is valid in the context of the mathematical and empirical aspects of relativity, it is crucial to recognise that Bergson's primary concern was less with the technicalities of measurement and more with the experiential nature of time. For Bergson, the question is not merely whether time can be measured, but whether it is truly lived and experienced by a conscious subject. Therefore, while Bergson might have acknowledged that dilated time is measurable in a strict mathematical sense, he would not have readily conceded that it is actually measured or experienced by anyone. Bergson's concern is that the time represented by relativity, though measurable in abstract terms, lacks the immediacy and individual quality that characterise real, lived time. This distinction is at the heart of his critique: that time, as represented by relativity, becomes detached from the direct experience of the individual, turning it into an abstract, impersonal concept rather than a lived reality.

Beyond merely asserting that the time attributed by one observer to another differs numerically, Bergson advanced a deeper critique of the underlying assumptions involved. He introduced a more profound qualitative distinction between fictitious and real time, arguing that the observer to whom time is attributed in this manner is not a genuine, embodied person but instead a construct of imagination. However, this should not be interpreted as a solipsistic stance on his part. On the contrary, Bergson emphasised the fundamental need to recognise others as conscious, autonomous beings, capable of their own experiences. He advocated for the respectful treatment of individuals, insisting that they be seen not as projections of one's own conceptual framework, but as unique subjects with their own reality, deserving of acknowledgement and empathy.

This argument can be framed within moral philosophy, akin to Kant's principle of treating others as ends in themselves rather than mere means. However, Bergson's primary concern in this context was not moral, but epistemological and, ultimately, ontological. He focused on the nature of real time, which, for him, necessitates the presence of conscious beings. Bergson argued that only living beings—not mere figments of imagination but real persons who themselves imagine—can truly experience and therefore speak of time. This perspective may explain why Deleuze claims that Bergson transcended the relativist hypothesis—instead of focusing on the numerical differences in time between the two systems, Bergson emphasised a qualitative distinction (Deleuze 1991, p. 84). This shift marked a significant development in Bergson's critique of Einstein's theory, enabling him to argue that the plurality of times proposed by relativity is virtual. He contended that these times belong to imagined observers, not to actual, conscious beings.

As the analysis thus far shows, Bergson argued that only one real time exists, with all other times being merely imaginary (DS, p. 77). In his critique of the relativity of time and the plurality of times it proposes, he contended that such plurality does not negate the existence of a single, real time. On the contrary, it affirms it, as the interchangeability of systems within reciprocity necessitates the concept of one real time. Therefore, if time is attributed to an observer, there must also be a lived experience of time, for without a conscious, living observer, there would be no one to assign time to another observer, nor could distinct reference points be established (cf. Fradet 2012, p. 62). In other words, it is through observers that meaning is ascribed to relative and interchangeable points of view (Worms & Soulez 2002, p. 190).

Before proceeding further, it is essential to consider how Bergson's conclusions might apply to the practice of physics—specifically, whether physicists would agree with his assertion that they are dealing with only one real time, while all other times are merely mathematical constructs. Bergson addressed this issue by emphasising the distinction between half-relativity and reciprocity, as previously discussed. He argued that, in selecting one system over another, physicists inevitably abandon the principle of reciprocity in favour of a privileged reference frame, thus operating within a framework of non-reciprocity. In analysing a specific system, physicists must adopt one of the two systems as the reference point and focus exclusively on it, effectively disregarding the other. Given that no mathematical distinction exists between the two systems, the physicist may remain unaware of the implications of their chosen stance in relation to reciprocity.

Although a physicist adopts relativity and acknowledges the possibility of choosing between two reference frames—that of Mary and Lucy—they must ultimately commit to one frame, as it is not possible to reference events within both systems simultaneously. If the physicist selects Mary's frame of reference, they will observe both Mary's lived time and the time she attributes to Lucy, while disregarding Lucy's own experiential perspective. Conversely, should the physicist adopt Lucy's frame, they will observe the time that Lucy experiences, along with the time Lucy assigns to Mary while neglecting Mary's lived experience. This leads the physicist to the conclusion that Mary's time differs from Lucy's, a distinction that arises because measuring one system's time necessarily involves applying the Lorentz transformation equations, which relate the time measurements in one frame to those in the other. Thus, the physicist's observations are shaped by their choice of reference frame, which limits their ability to fully reconcile the two perspectives simultaneously.

In contrast to physicists, Bergson argued that it is the philosopher's task to engage with Einstein's principle in its entirety by situating themselves within the domain of reality —that is, the world as it is, or as it can be perceived. The philosopher must therefore navigate between both perspectives, shifting from Mary's viewpoint to Lucy's and vice versa. Unlike physicists, philosophers cannot simply adopt one reference frame; they must consider both. Although unilateral and reciprocal relativities are mathematically interchangeable, the distinction between them emerges only from a philosophical standpoint. Ultimately, Bergson contended that, upon recognising the limitations of their method, the physicist would converge with the philosopher's broader perspective.

As the reactions of physicists to Bergson's *Durée et simultanéité*—discussed in the previous chapter—indicate, his expectation that physics would ultimately converge with the philosophical perspective did not materialise. According to the Polish scholar Orbik, the source of this divergence lies in a fundamental epistemological misalignment: physicists frequently interpret statements derived from physical theory as though they were philosophical claims (Orbik 2017, p. 65). Conversely, philosophical arguments are often dismissed by physicists as either irrelevant to scientific inquiry or lacking in practical utility, with their significance going unrecognised within the framework of empirical investigation. Despite this persistent disconnect, Bergson remained committed to his project of bringing philosophy into dialogue with physics, insisting that such an encounter was not only possible but necessary for illuminating the ontological implications of scientific theories.

In his reflections on Bergson's philosophy, Gilles Deleuze draws particular attention to Bergson's conclusion regarding the existence of multiple unreal times, interpreting it as a critique of Einstein's susceptibility to the intellect's habitual tendency to spatialise time and mistake such spatialised constructs for the real. According to Deleuze, this error arises from a deeper confusion between the virtual and the actual—specifically, between the virtual multiplicity proper to time and the actual multiplicity characteristic of space (Deleuze 1991, p. 85). He argues that the defining feature of temporal multiplicity is its implication of singularity: time, as conceived by Bergson, is unified precisely through its multiplicity, which does not fragment it but rather discloses its ontological depth. This singularity, Deleuze notes, becomes intelligible only when time ceases to function merely as a descriptor—an adjective qualifying motion or change—and is instead understood as a substantive entity in its own right (Deleuze 1991, p. 117). From this standpoint, Einstein's theory, rather than transcending the spatialisation of time, rearticulates it within a novel conceptual framework. Thus, Deleuze concludes that Einstein produced not a genuinely temporal physics, but a new and more sophisticated method of spatialising time (cf. Deleuze 1991, p. 85).

However, as Guerlac—drawing on Merleau-Ponty—notes, Deleuze appears to invert the distinction between the virtual and the actual. She argues that what Deleuze refers to as "virtual multiplicity" aligns with "the actual or the real"—grounded in concrete experience, perception, and action. It is this grounding, she contends, that enables an intuition of time as "a passage between before and after" (Guerlac 2020, p. 113). This reinterpretation stems from the fundamentally vitalist orientation of Bergson's philosophy, which concerns not simply life, but the very act of living. Guerlac emphasises that Bergson's distinctive contribution lies in extending this vital orientation beyond individual organisms, proposing a vision of the universe as itself living (Guerlac 2020, p. 113).

b) The Breakdown of Simultaneity

During his meeting with Einstein, Bergson defined simultaneity "in the commonly accepted sense of the word" as "an instantaneous perception" and "the possibility for our attention to be shared without being divided [*se partager sans se diviser*]" (Bergson 2020, pp. 168–169), or as "local coincidence" (During 2022b, p. 118). To illustrate this, he referred to the example of two instantaneous flashes emitted from distinct points, which he described as being both one and two simultaneously: "One as my act of attention is indivisible, two as my attention is nevertheless divided [*se répartit*] between them and is split [*se dédouble*] without being split apart [*se scinder*]" (Bergson 2020, p. 168). Another example he offered is that of a melody played by an orchestra: one may perceive the music either as a unified whole or as a collection of distinct melodic lines performed by individual instruments. For Bergson, this capacity for simultaneous perception—whether of unity or multiplicity—constitutes a fundamental and "mysterious" aspect of psychological life.

The form of simultaneity outlined above, Bergson maintained, aligns with common sense and may therefore be termed "common-sense simultaneity". He regarded it as absolute in the sense that it does not rely on mathematical equations or physical theorems[175]. In *Duration and Simultaneity*, he referred to this mode of simultaneity as "intuitive", emphasising its basis in concrete psychological experience. While affirming its reality and immediacy, he also acknowledged its limitations, describing it as imprecise and subjective—or, at most, intersubjective. This form of simultaneity corresponds to the experiential alignment of an event with the moment indicated by the clock—what Bergson called the "simultaneity of an event with the clock reading that gives us its time" (DS, p. 83).

In contrast to intuitive simultaneity, Bergson identified a second form: learned simultaneity, which is based on the "identity between the readings of clocks synchronised through an exchange of optical signals" (DS, p. 83). This conception of simultaneity aligns with the definition used in the theory of relativity, which, as Bergson emphasised, is "of a completely different order" (Bergson 2020, p. 169). Unlike intuitive simultaneity, which is grounded in immediate perception and psychological experience, learned simultaneity is constructed through scientific conventions that require an objective frame of reference. Specifically, it relies on a system of synchronised clocks to measure spatial and temporal intervals between events, thereby determining whether those events occur simultaneously. Crucially for Bergson, such a framework necessitates an observer within the reference system S, who perceives that system as stationary.

To establish the simultaneity of events, scientists must ensure that these events occur within the same reference system, S. Once this condition is satisfied, it becomes possible to directly compare the readings of two or more clocks, each assigned to a particular event. As Bergson

[175] However, this form of simultaneity, as interpreted by Bergson, should not be understood as absolute in the Newtonian sense—that is, as denoting the coincidence of all events at a single, universal moment.

explained, the clocks are synchronised through an exchange of electromagnetic signals, based on the assumption that the signal follows the same path both outward and back, ensuring consistent timing across the system (Bergson 2020, p. 169). Thus, if the clocks display identical readings at the moment of measurement, indicating that the events occur at the same time, they are considered simultaneous.

The concept of simultaneity, particularly in relation to clock synchronisation using light signals, was examined by Poincaré well before 1905 (Unnikrishnan 2020, p. 27). Given Bergson's familiarity with Poincaré's works, it is unsurprising that he incorporated these aspects of relativity into his own philosophy[176]. However, contemporary French physicist Jean-Marc Lévy-Leblond critiques Poincaré—and, by extension, Bergson—for treating clock synchronisation, which assumes that signals propagate at the speed of light, as a conventional procedure. Lévy-Leblond argues that, following Minkowski's 1908 formulation of space-time, it became evident that the theory of relativity no longer relies on external conventions such as measurement methods or clock synchronisation techniques. Instead, it reflects the intrinsic structure of space-time itself (Lévy-Leblond 2007, p. 243). Despite this critique, it appears that Bergson was not challenging the method of physical measurement per se, but was rather contemplating the very possibility of making such measurements in the first place.

Despite its scientific importance and apparent simplicity, Bergson argued that learned simultaneity could not exist without intuitive simultaneity. While clocks are commonly used to specify the time of events, they are rarely compared directly to one another. Instead, when events are perceived as simultaneous, clocks are adjusted accordingly to reflect this perception. If a clock were to display a time inconsistent with an event, it would be deemed faulty. As Bergson stated, without the ability to determine the time of an event, "the clocks would serve no purpose" (Bergson 2020, p. 170). He further explained, "For we buy them only to find what time it is. But »to find out what time it is« is to note the simultaneity of an event, of a moment of our life or the outside world, with a clock reading" (DS, p. 83). In other words, the utility of a clock depends on the assumption that it accurately represents time; without this assumption, its use would be meaningless.

According to Bergson, it is implicitly assumed that the time indicated by a clock corresponds to the present moment an individual is experiencing—their "now". He suggested that this assumption is so deeply ingrained that one may not even be consciously aware of it. Moreover, this assumption is crucial for asserting that the time displayed on one clock aligns with that of another,

[176] The influence of Poincaré's thought on Bergson is evident in several aspects of his philosophy of science and time, as explored in this thesis.

thereby allowing for the understanding of simultaneity in its scientific sense. Without this assumption, the very concept of simultaneity would become incomprehensible. In other words, without presupposing the simultaneity of a clock's reading with a scientist's perception, the foundation of scientific simultaneity would lose its coherence and validity.

The argument that intuitive simultaneity underpins learned simultaneity was illustrated by Bergson through the example of two events, E and E', each associated with a clock, H and H', respectively. In the context of physics, including the theory of relativity, simultaneity is defined by the alignment of the clock readings: it occurs when H and H' display the same time. This is an inherently relative concept, as it depends on the synchronisation of the clocks. According to Bergson, this raises the question of whether the time displayed on clock H is simultaneous with event E, and similarly, whether the time on clock H' is simultaneous with event E'. He argued that such simultaneity cannot be determined solely by the clocks or the events themselves; rather, it is realised through "the perception that unites them in an indivisible act", which, in his view, represents the form of simultaneity grounded in common sense (Bergson 2020, p. 170).

The French philosopher argued that the practice of clock synchronisation through the exchange of optical signals demonstrates that the theory of relativity both acknowledges and relies on intuitive simultaneity. He asserted that relativity physicists must track the precise moment when these signals depart, arrive, and return (DS, p. 84). In his view, learned simultaneity is termed "simultaneity" only because it is assumed that it can be converted into intuitive simultaneity at any given moment. Lévy-Leblond, while recognising the significance of intuitive simultaneity, observed that although physics avoids addressing the correspondence between a clock's reading and the event it indicates, it cannot be "reproached" for failing to provide a comprehensive answer to the questions that arise from this issue (Lévy-Leblond 2007, p. 245). It seems that Bergson did not reproach physics either; rather, he aimed to provide those answers himself—or, at the very least, to pose the fundamental questions that emerge from them.

In his further critique of Bergson's claim that intuitive simultaneity forms the foundation of scientific simultaneity, Lévy-Leblond argues that "intuitive" simultaneity has limited relevance to "relativistic" simultaneity. He asserts that in physics, particularly within the framework of relativity, the distinction of distance and the measurement of time intervals are objective, rooted in the "absolute spatio-temporal measurement of the speed limit" (Lévy-Leblond 2007, p. 244). This position builds upon his earlier argument that clock synchronisation through the exchange of electromagnetic signals is not a mere convention but reflects the intrinsic structure of space-time. However, since Bergson conceived of "intuitive" simultaneity as absolute—independent of any mathematical equations or physical theorems, including that of the constant speed of light—it appears that his aim was not simply to address the coordination of clocks through electromagnetic signals, but rather to challenge the fundamental assumptions underlying our understanding of time and simultaneity.

When physicists determine simultaneity within a moving system, they often rely, as Bergson argued, on intuitive simultaneity[177]. He claimed that they frequently conflate learned simultaneity with the intrinsic qualities of intuitive (or "innate") simultaneity, such as its materiality or solidity, failing to recognise that they have shifted from one form of simultaneity to another. Bergson compared this tendency to magic[178], suggesting that individuals, often unconsciously, move between these two forms of simultaneity, making the distinction between them elusive and difficult to fully comprehend.

In response to Bergson's position, Lévy-Leblond argues that physics is largely unconcerned with the correspondence between a clock's reading and the moment to which it relates (Lévy-Leblond 2007, p. 245). He contends that, by its very nature, physics does not seek to provide a comprehensive answer to the broader philosophical questions regarding time. Instead, its purpose is to offer a representation of the world that, while necessarily partial, remains reliable (Lévy-Leblond 2007, pp. 245–246). Bergson, however, would likely agree with this standpoint in terms of the limits of scientific inquiry. It was Einstein, during his debate with Bergson, who maintained that the study of time belongs solely to the domain of physics and that no other discipline—except for psychology—has the authority to address it.

Building on Bergson's analysis of the foundational role of intuitive simultaneity in relation to the scientific simultaneity defined through the synchronisation of optical signals, it may be argued that the very possibility of measuring time depends upon a nuanced interplay—a mutual correspondence—between what Bergson described as "absolute" simultaneity and the operational simultaneity employed in scientific practice (cf. Scott 2006, p. 186). Scientific time, understood as quantifiable and measurable, implicitly presupposes real duration, which underpins our ability to perceive and interpret temporal succession (cf. During 2009, p. 235). In this regard, Bergson reintroduces a form of lived temporality into the scientific conception of time by attributing to it the characteristics of a qualitatively distinct temporal mode—one defined by "succession, becoming, duration […] that we experience or perceive prior to all physics" (Merleau-Ponty 1964, p. 195). The

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[177] Bergson suggested that physicists no longer search for the identity of clock readings but rather for the correspondence between an event and the reading of a clock.

[178] In *Duration and Simultaneity*, Bergson provocatively asked whether "science acts upon us like ancient magic?" (DS, p. 91).

implications of this argument, particularly the interdependence between measurement and lived time.

Having examined the concept of simultaneity within both relativity and Bergson's philosophy, it is now possible to reconsider its implications in the context of its breakdown when a second reference frame is introduced. Bergson maintained that this significantly complicates the situation. In such a case, an observer within system S', moving relative to system S, will treat their own frame as stationary and regard the other as being in motion (Bergson 2020, p. 169). Consequently, events that appear simultaneous to an observer in S will be perceived as successive by an observer in S′. From the standpoint of relativity, then, simultaneity becomes frame-dependent: the same pair of events may be judged as simultaneous from one perspective and successive from another. Bergson concluded that this relativity of simultaneity undermines any claim to its absoluteness, as it permits contradictory temporal interpretations depending on the observer's frame of reference.

To account for the disparity between perceived and experienced simultaneity, Bergson argued that an individual synchronises clocks within their own reference frame, which they presuppose to be at rest. In this context, the optical signals exchanged between clocks—regardless of the distance separating them—are considered to take equal time for the outward and return journeys. This condition applies equally to both systems, S and S′, rendering the simultaneity within each system not only operational but also potentially intuitive and experientially grounded. However, an observer in system S, observing system S' (which they perceive as being in motion), will note that the clocks in S' indicate events as successive rather than simultaneous. This discrepancy arises because, from the perspective of system S, the propagation of optical signals within the moving frame S′ occurs asymmetrically: the durations of the outgoing and return paths are unequal, thereby disrupting the internal coherence of simultaneity as experienced within that system.

The key question that arises here is whether the observed simultaneity or succession is, in fact, real. Bergson argued that what appears to be a transformation of simultaneity into succession constitutes a necessary condition for the coherence of physical laws—it is precisely this transformation that allows such laws to operate consistently across different frames of reference (DS, p. 89). In essence, for the laws of physics to retain their form, the relationship between simultaneity and succession must remain coherent both within a given system and when viewed from an external frame. Accordingly, events that are simultaneous for an observer within a system must appear as successive to an external observer, owing to the unequal lengths of the light beam's outward and return journeys. However, whether this configuration is interpreted as simultaneity or succession ultimately rests on convention—specifically, on whether the two paths of the light signal are deemed equal (signifying simultaneity) or unequal (indicating succession).

In terms of intuitive and learned simultaneity, Bergson maintained that these two forms coincide for an observer situated within a given system. However, for an external observer who perceives the system as being in motion, learned simultaneity no longer applies, while intuitive simultaneity remains. As the velocity of the system increases, the discrepancy between the outgoing and return paths of the light beam becomes more pronounced, thereby converting apparent simultaneities into successions. Significantly, because learned simultaneity is defined solely by the equal duration of the light signal's double journey—and does not necessarily indicate the presence of intuitive, or real, simultaneity—Bergson argued that the term "simultaneity" is misleading in this context. He proposed that what is conventionally referred to as learned simultaneity ought to be renamed, as it is called "simultaneity" only due to its conventional association with the presence of intuitive simultaneity.

In his continued exploration of simultaneity, Bergson underscored the foundational significance of the constancy of the speed of light—irrespective of a system's state of motion—in determining how the apparent breakdown of simultaneity should be interpreted. He posed a fundamental question: why does a beam of light in the Michelson–Morley experiment behave identically regardless of whether the system is at rest or in motion, thus yielding the same result in both cases? To address this, Bergson revisited his earlier distinction between reference frames. He suggested that a conscious, living physicist inhabits system S, whereas the physicist in system S′ exists only as a conceptual construct—imagined from the standpoint of S. The physicist in S' cannot be regarded as conscious, as this would require the system S' to be stationary—an assumption that contradicts the principle of reciprocity. Nevertheless, this explanation provides only a partial resolution to Bergson's question.

To fully account for the null result of the Michelson–Morley experiment, Bergson offered a nuanced interpretation grounded in the relativity of simultaneity. He proposed that the physicist in system S imagines a counterpart in system S′ replicating the experiment, this time by placing two clocks at either end of the light beam's one-way path. From the perspective of the observer in S, who regards system S′ as being in motion, the light appears to require more time to traverse the distance between the two clocks in S′ than within their own stationary frame. However, despite this apparent discrepancy in travel time, the readings on the clocks in S′ indicate that the emission and reception of the light beam occur simultaneously. In effect, what appears as successive events from the standpoint of S is interpreted—based on internal measurements in S′—as a case of simultaneity.

Consequently, regardless of their respective frames of reference, both observers arrive at the same value for the speed of light. Bergson concluded that this outcome accounts for why physicists rely on a definition of simultaneity grounded in the conventional synchronisation of clocks.

The distinction between simultaneity and succession, as observed within system S′, was perceived by Bergson as fundamentally dependent on the frame of reference and, as such, conventional. From the standpoint of an observer within system S—who perceives S′ as being in motion—the temporal order of events in S′ is determined by the method used to synchronise clocks under the specific conditions present within that frame. The observer in S interprets as successive those clock readings in S′ that have been synchronised in such a way that, from an external perspective, the outgoing and returning paths of a light signal no longer appear symmetric (cf. DS, pp. 85–86). In this regard, simultaneity and succession do not constitute inherent properties of events but, instead, emerge from the interpretative framework adopted by observers situated in different inertial systems. Thus, what appears simultaneous from within a system may be perceived as successive from outside it, indicating that the definition of simultaneity is not universally fixed but contingent upon the observer's frame of reference. For Bergson, this underscores the fundamentally conventional character of simultaneity when assessed across multiple frames, even if, from within a single frame, it may seem objective.

Reality, as Bergson maintained, is determined by the conventions one is willing to accept; yet, he was careful to emphasise that, in this specific context, such conventions do not warrant speaking of time in terms of duration. For him, duration entails an inner, qualitative experience—a genuine succession of moments in consciousness, marked by a lived sense of "before" and "after". In the scenario under consideration, however, no such temporal experience is present. Consequently, when reality is constructed solely through mathematical or operational conventions, it results in a form of reality that is itself merely conventional—one that lacks the depth, continuity, and immediacy characteristic of lived time.

On this basis, Bergson argued that within the moving system S′, all phenomena remain perceptually identical to those in a system at rest, with the sole exception of the beam of light's two-way journey. Since this constitutes the only observable difference, he maintained that it is ultimately irrelevant whether S′ is considered to be at rest or in motion. In either case, "real simultaneity remains real simultaneity; and succession, succession" (DS, p. 90). Accordingly, the simultaneity experienced within system S, by the observer internal to that frame, is lived and therefore real, as are the successions that unfold therein. In contrast, the simultaneity and succession ascribed to S' from the perspective of S are relative constructions: they are not lived but imagined—not directly experienced but inferred through representational and abstract means. Bergson suggested that such representations become increasingly distorted as the relative velocity of the system increases.

Whether physicists would ultimately endorse Bergson's conclusion concerning the reality of simultaneities in both stationary and moving systems remains unresolved. The philosopher himself consistently maintained that, despite formally adhering to the framework of double relativity, physicists often conduct their analyses implicitly within the terms of unilateral relativity. He attributed this tendency to the mathematical equivalence of the two formulations, which renders them interchangeable in practice. However, this formal equivalence does not eliminate the conceptual differences between them. For Bergson, the persistence of unilateral thinking reflects an underlying intuitive bias. Despite the theoretical commitments of double relativity, it remains challenging to detach entirely from the more immediate and accessible perspective of unilateral relativity. Consequently, even when physicists describe phenomena following the principles of double relativity, their interpretations may still be shaped by the conceptual habits of the unilateral model.

The criticism on Bergson's part was not directed at this attitude per se, but rather at the tendency of physicists to proceed as if their mathematical reasoning were not grounded in unilateral relativity. In doing so, they often conflate two distinct perspectives: the observer within the system and an external observer. This conflation leads to a fundamental misunderstanding, wherein simultaneity and succession, as observed from an external vantage point, are mistakenly regarded as objective, rather than conventional constructs dependent solely on the round-trip of optical signals. For Bergson, such external observations, mediated by signal travel times, lack the immediacy of lived temporal experience. He therefore maintained that only an observer within the system is in a position to regard simultaneities and successions as "final and unchanging" (DS, p. 93).

An "ambiguity that has been the cause of a good many misunderstandings" (DS, p. 94) was illustrated by Bergson through a critique of Einstein's *The Theory of Special and General Relativity*. He focused on Einstein's well-known thought experiment involving two flashes of light, observed from both a stationary railway embankment and a moving train. Although Einstein allowed for either the embankment or the train to serve as the frame of reference, Bergson identified a critical oversight: Einstein failed to account for the relative motion of the railway embankment with respect to the train (Čapek 1991, p. 310). Referring to Einstein's original diagram, Bergson added arrows to indicate this motion, thereby emphasising how the physicist's presentation conflates distinct frames of reference. In particular, Bergson argued that Einstein does not make it sufficiently clear that what is simultaneous from the standpoint of the embankment is not simultaneous from that of the train—when considered from the embankment's perspective.

This oversight on Einstein's part was attributed by Bergson to the limitations inherent in the language of physics, which, he argued, is ill-equipped to express the subtle yet crucial distinction between an internal perspective—that of an observer within the system—and an external perspective, situated outside it. While this distinction is of considerable philosophical significance, it holds limited importance for physicists, as both standpoints lead to identical mathematical formulations and are thus treated as interchangeable within the formal structure of the theory. It is important to emphasise that the oversight in question does not concern the validity of the physical theory itself—which Bergson did not dispute—but rather the manner in which it is presented and interpreted, particularly in Einstein's exposition[179].

Notably, Einstein's thought experiment has also been revisited by scholars of Bergson, particularly those engaging with his critique of relativity. Among them, Unnikrishnan argues that Einstein's asymmetrical conclusion regarding simultaneity arises not from the physics itself, but from his arbitrary designation of the platform as the stationary frame and the train as the moving one. Since both frames are physically equivalent within the framework of special relativity, Unnikrishnan maintains that their simultaneities should also be considered equivalent. The perceived asymmetry, therefore, reflects a bias introduced by Einstein's framing rather than a genuine consequence of the theory (cf. Unnikrishnan 2020, p. 33). Čapek, adopting a similar line of criticism, asserts that Einstein's example is fundamentally misleading in its representation of relativistic effects. He further suggests that this misrepresentation may have influenced Metz to construct an equally flawed analogy involving a moving sidewalk in his response to *Duration and Simultaneity* (cf. Čapek 1991, p. 310).

The role of philosophers—fundamentally distinct from that of physicists—was once again emphasised by Bergson, as exemplified in his analysis of the plurality of times. He argued that philosophy must engage with both perspectives: it must fully incorporate Einstein's theory of relativity while addressing aspects of reality that transcend purely scientific constructions. Whereas a physicist is compelled to select one of two moving objects as the frame of reference—thereby committing to a particular observational standpoint—a philosopher is not bound by this constraint. Instead, philosophers may situate conscious observers within both reference frames and explore the lived experience of time from each observer's perspective. According to Bergson, this approach

[179] For a more detailed discussion, see During (2009, pp. 297–299).

entails rejecting reliance on a single reference frame, alongside resisting the temptation to pursue a purely mathematical representation of the universe. As During notes, it is the philosopher's privilege to remain free from the necessity of adopting a specific frame of reference, and thus to engage directly with "the real" (During 2009, p. 299).

It is worth emphasising once again that Bergson's analysis of simultaneity in relation to Einstein's theory of relativity—at least in the form examined thus far—relies exclusively on a scenario involving two systems: one a duplicate of the other, each containing identical and isolated events, with no possibility of communication between them (cf. During 2009, p. 297). As Élie During observes, this configuration closely resembles Poincaré's treatment of analogous problems—a hardly surprising resemblance, given that Bergson, as previously discussed, drew extensively on the work of contemporary scientists, including Poincaré, to inform his philosophical reflections. Bergson's subsequent decision to introduce either two qualitatively distinct systems or, more intriguingly, an example involving three separate systems is, however, more difficult to account for. Nevertheless, this shift marks a significant development, as the third system becomes central to his later analysis of acceleration.

c) The Line of Simultaneity and Longitudinal Contraction

The line of simultaneity was presented by Bergson as fundamentally linked to the breakdown of simultaneity. This conceptual connection plays a crucial role in clarifying his broader critique of relativistic physics and provides an essential foundation for understanding his interpretation of longitudinal contraction. He argued that the breakdown of simultaneity carries significant epistemological consequences—specifically, the impossibility of anticipating future events with certainty, a claim based on the concept of the line of simultaneity.

In *Duration and Simultaneity*, Bergson introduced a diagram that corresponds to what is now known as Minkowski's light cone[180], albeit in a slightly simplified form and without explicitly naming it. Within this framework, he posed the provocative question of whether such a representation could serve as a reliable tool for predicting future events. However, Bergson's underlying aim was to revisit, from a different perspective, a central conclusion he had already reached regarding the breakdown of simultaneity. It remains valuable, nevertheless, to analyse his

[180] Given the terminology employed by Bergson in his discussion of light figures, it is reasonable to infer that his reflections were informed by Einstein's construction of the light sphere. For a detailed analysis of the various light figures in the theory of relativity, see Walter (2018).

example more closely, as it offers further insight into both the notion of the line of simultaneity and Bergson's broader argument for the concept of simultaneity.

An observer, A, was situated by Bergson within a moving reference frame, S'. Within this system, he posited three events occurring at spatially equidistant points: M', N' and P'. He further maintained that observer A is located at N' and that the events at all three points are, initially, regarded as belonging to A's present. However, from the standpoint of Einstein's theory of relativity, the simultaneity of these events is not absolute but depends on the velocity of the moving system. Specifically, while the event at N'—the point of A's location—is determinate, the simultaneity of the events at M' and P' with that at N' is contingent upon the frame's relative motion. As the velocity of S' changes, so too does the set of events that can be considered simultaneous with A's present moment.

A second observer, B, was further introduced by Bergson, situated outside the moving system S' and within the stationary system S, which serves as B's own frame of reference. From B's perspective, the clock at point M' appears to run faster than the clock at N', while the clock at P' runs more slowly than the clock at N'. This asymmetry leads to a striking conclusion: for observer B, events occurring at M'—which, from A's point of view, belong to the same present as the event at N'—now appear to lie in the past, whereas events at P' appear to lie in the future. In other words, B perceives the past at M' and the future at P' as occurring simultaneously with A's present at N'. Furthermore, Bergson emphasises that the magnitude of this discrepancy is directly related to the velocity of system S'. The greater the speed of S' relative to S, the more pronounced the divergence between the events at M' and P' in relation to N' becomes. Events that once formed part of A's present are, from B's standpoint, increasingly displaced—into the past at M' and the future at P'—as the speed of S' increases.

Within the framework of the preceding example, Bergson introduced the concept of the "line of simultaneity", which he defined as a straight line passing through point N' that, from the perspective of observer B, connects an event in the past at M' with one in the future at P' (DS, p. 98). This line contrasts with what Bergson termed the "line of events": a straight line linking the spatially equidistant points M', N', and P' within system S'. As the velocity of system S' increases relative to S, the line of simultaneity diverges progressively from the line of events. Bergson observed that some physicists might interpret this divergence as implying that an observer situated at N' could perceive both past events at M' and future events at P'. However, he firmly rejected this interpretation, regarding it as illusory. In his view, it is impossible to foresee the future at P' by observing it from N’, and he criticised relativity physicists for failing to clearly articulate this conceptual limitation.

Although the line of simultaneity may diverge from the line of events as the system’s velocity increases, Bergson pointed out that it can never exceed the speed of light. This is because the speed of light is not only constant and invariant but also constitutes a “finite speed limit[181] for the propagation of causal influences” (During 2009, p. 299). Even under the hypothetical condition that the line of simultaneity were to travel at the speed of light—and that observer A possessed instantaneous visual perception—information could still not be transmitted to another observer faster than light. In Einstein’s view, “there are no mere spatial distances at all” (Čapek 1971, p. 232)—a formulation that highlights the inherent impossibility of superluminal communication within the framework of relativity.

Irrespective of the constraints imposed by the speed of light or the hypothetical capacity for instantaneous vision, Bergson further contended that the events in system S’—which observer B perceives as belonging to the future at point P’ and the past at point M’—are, in fact, simultaneous with the present moment at point N’, where observer A is situated. Significantly, Bergson maintained that these events in S’ are also contemporaneous with those occurring at points P and M in system S, both of which lie within observer B’s present frame of reference. This position directly challenges the relativistic conception of simultaneity introduced by Einstein’s theory. It is, therefore, essential to examine more closely the structure and implications of Bergson’s argument.

In formulating his argument, Bergson once again assumed that system S’ is a duplicate of system S, for the sake of simplicity, and that the scenario under consideration takes place at the precise moment of their separation—when system S’ undergoes instantaneous acceleration. He further posited that the same event occurs at corresponding points N and N’ (as well as P and P’, and M and M’), and that events at M and P are simultaneous with N, just as events at M’ and P’ were simultaneous with N’ prior to the disconnection. Despite the increasing velocity of system S’, observer A, located at N’ within S’, continues to perceive this system as being at rest. Consequently, the events at M’ and P’ remain part of A’s present, irrespective of the system’s acceleration. Similarly, for observer B at N in system S, the events at M and P are included in the present. Given the reciprocity between S and S’, Bergson concluded that the clocks in S’ operate for observer A

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[181] While Einstein established the speed of light as the upper limit of all physical velocities—thereby rendering it, in a sense, an absolute—modern physics, particularly in the realm of quantum theory, entertains theoretical scenarios where faster-than-light speeds are considered (cf. Dragan & Ekert 2020; Dragan et al. 2023).

exactly as those in S do for observer B. On this basis, the corresponding events must be regarded as simultaneous.

The confusion surrounding the simultaneity of these events was argued by Bergson to stem from the necessity of selecting a frame of reference. Once system S is regarded as stationary and thereby designated as the reference frame, simultaneity, according to Bergson, becomes absolute. Within this framework, the clocks in S are synchronised on the assumption that the optical signals between points N and P traverse equal distances in both directions. As a result, an observer in S perceives that the light signals exchanged between clocks at N' and P' in the moving system S' cover unequal distances—a discrepancy that increases with the velocity of S'. The observer in S, therefore, concludes that the clocks in S' register not simultaneity but succession, as determined by the synchronisation convention of their own frame. Moreover, as the speed of S' increases, the observer in S displaces events at M' into the past and those at P' into the future relative to the corresponding events in S.

The events which observer B in system S designates as belonging to the past and future of points M' and P' respectively—both located in the moving system S'—constitute, according to Bergson, the conscious present of observer A situated at N'. Crucially, no other events, whether past or future, are contemporaneous with those at N' from A's perspective. Bergson's argument is that, irrespective of the velocity of system S', the event occurring at P'—which, from the standpoint of observer B at N, forms part of the present in S—is simultaneously experienced by observer A at N' as part of their immediate present. Nevertheless, owing to the relativistic synchronisation conventions employed within system S, observer B interprets this same event at P' as occurring in the future of N'. Hence, Bergson maintained that it is mistaken to speak of the "future" of P': what appears to be future from one frame of reference is, in fact, already present within another.

The misunderstandings surrounding simultaneity that Bergson sought to address originate in the mathematical and physical formulations of the (special) theory of relativity. In order to accommodate relativistic effects, physics must conceptually reconfigure simultaneity by treating the stationary system S as if it were in motion—that is, by imagining it under the designation S (DS, p. 104). In this mental operation, system S' becomes a temporally displaced or "skewed" projection of system S in the observer's mind (DS, p. 106). However, according to Bergson, the attribution of events that are present at N' to the future of P'—as perceived by an observer at N—is not merely an interpretative distortion but a scientific necessity, no less fundamental than the postulate of the constant speed of light. From this perspective, Bergson acknowledged a genuine displacement in simultaneity, albeit one of a strictly mathematical order. Crucially, he maintained that this displacement should not be understood as a break or disintegration of the present itself but rather as a modification that preserves the coherence of lived simultaneity (cf. During 2009, p. 300).

Accordingly, Bergson contended that it is somewhat misleading to claim that the observer at N is unable to transmit to the inhabitants of P' the events they perceive as lying in the future. From Bergson's perspective, the observer at N does not actually perceive future events but rather those that belong to the present. The apparent futurity of these events arises solely from relativistic effects and the frame-dependent nature of simultaneity. Crucially, the issue is not one of transmitting information but of interpretation: what the observer at N conveys is merely a representation of the system in motion, shaped by the conventions of relativistic physics. The impossibility in question is therefore not physical but conceptual or metaphysical in nature, since—according to Bergson—past, present, and future, as defined from the standpoint of the observer, possess no independent ontological reality (cf. During 2009, p. 300).

The final relativistic effect Bergson addressed is longitudinal contraction. He characterised this as "the spatial manifestation of the double temporal effect" (DS, p. 107)—that is, the spatial expression of two interrelated temporal distortions: time dilation and the disruption of simultaneity. His reasoning closely parallels his earlier arguments. Bergson maintained that when an observer in the stationary system S observes two points, A' and B', located in the moving system S', their respective clocks display the same time, indicating simultaneity. However, due to the relativistic conventions employed, the observer concludes that the clock at B' lags behind the one at A'. Accordingly, the observer infers that the clock at B' is simultaneous with the clock at B in system S only after the clock at A' was concurrent with the clock at A. On this basis, Bergson argued that the observer in S determines the spatial interval A'B' to be shorter than AB, thereby arriving at the phenomenon of contraction.

Conversely, Bergson maintained that the observer in system S' would reach precisely the opposite conclusion: namely, that S' is at rest while S is in motion—and in the reverse direction to that which S' appears to move from the standpoint of S. As a result, the observer in S' judges the length AB in system S to be shorter than the length A'B' in their own frame. However, Bergson argued that, in reality, both lengths are equal. This is because observers in both systems measure the distance between points A and B in S, and A' and B' in S', from within their respective frames only when those frames are treated as stationary. Since each system yields identical measurements when regarded as immobile, the lengths must be interchangeable and, therefore, equivalent. On this basis, Bergson concluded that extension does not truly contract, just as time does not genuinely slow down, nor does simultaneity undergo actual fragmentation (DS, pp. 108–109).

Therefore, Bergson maintained that the source of numerous speculative misinterpretations and metaphysical assumptions surrounding all relativity effects lies in the arbitrary selection and subsequent immobilisation of a reference frame. He argued that grounding all phenomena in a single perspective encourages the experimenter to treat their own frame as central, thereby constructing an imaginary domain marked by temporal and spatial distortions—distortions he likened to the visual effects of diplopia (cf. DS, p. 111)—in an effort to make their physics appear universally applicable. Moreover, Bergson contended that this approach exposes the inadequacy of the language of relativity for philosophical interpretation, compelling the philosopher to speak not of reality itself, but of "phantoms" or "phantasmal effects"—a move that, in his view, undermines any faithful account of the real.

Significantly, it may be argued that Bergson erroneously conflated them with the perspective effect in his treatment of relativistic effects. He illustrated this analogy with the example of a painting in which an artist depicts two individuals of equal height: one positioned in the foreground, the other in the background. Let them be called Mary and Lucy, respectively. To convey depth, the artist portrays Lucy as smaller than Mary, not because she is in fact smaller, but because this reflects how she appears from a distance. The painter, of course, understands that both figures are of equal stature in reality. Bergson contended that a similar logic applies to the relativistic interpretation of physical systems: what appears as time dilation, temporal succession, or spatial contraction is, in his view, akin to Lucy's apparent smallness in the painting—a representational distortion rather than an actual physical transformation. He insisted that one must resist the tendency to reduce Lucy to a mere figure within the frame of a painting, and instead recognise her full ontological presence in reality.

While relativistic effects are reciprocal and frame-dependent, this does not render them illusory, as Bergson appears to suggest. Yet to claim, as Čapek does (Čapek 1971, p. 244), that Bergson outright denied their occurrence seems an overstatement. Bergson maintained that observers cannot directly experience time dilation, length contraction, or the relativity of simultaneity within their own frames of reference. Nevertheless, he accepted these effects as legitimate mathematical consequences of relativity theory. His position, rather, appears to underestimate the extent to which observers might apprehend events beyond their own frames. Metz (1969, p. 156) raises a similar concern in his critique of *Duration and Simultaneity*, arguing that Bergson's account confines conscious experience to a single observer at a time, thereby undermining the reciprocity essential to a fully symmetrical interpretation of relativity.

However, whether Bergson advanced a solipsistic position, committing the fallacy of simple location[182], as Čapek suggests (1971, p. 244), seems unlikely. Equally contestable is the applicability of Whitehead's concept of the fallacy of simple location to Bergson's philosophical framework. Engaging fully with this question would necessitate a thorough analysis of Whitehead's use of the term—an inquiry that exceeds the scope of this thesis. For present purposes, it is sufficient to observe that Bergson did not assert that the two inertial systems, S and S', comprise the entirety of the universe. Rather, he employed this assumption as a methodological simplification to advance his argument. Whether this simplification was philosophically and scientifically warranted remains a separate issue.

6.2. Space-time and Light Figures

The discussion of light figures represents a significant advance in addressing the philosophical problem of real time, marking a decisive moment in its conceptual development (During 2009, p. 301). For Bergson, the analysis of light figures offers a means of engaging more deeply with the spatiotemporal structure that underlies relativity theory, thereby enabling a more nuanced understanding of space-time itself. His examination is grounded in prior reflections on key relativistic effects—time dilation, the relativity of simultaneity, and longitudinal contraction—which provide the conceptual basis for his critique and reinterpretation.

In his initial engagement with the concept of light figures, Bergson reinterpreted the outcome of the Michelson-Morley experiment by translating its implications into visual representations structured by light lines. Through this interpretative move, he sought to demonstrate how the plurality of times posited by the theory of relativity can, in a precise and literal sense, "take physical shape" (DS, p. 114). Within this framework, light lines— representing the paths of light signals—serve as an abstraction that becomes physically meaningful due to the constancy of the speed of light, which underpins the structure of space-time. This depiction enables Bergson to illustrate how time is related to space within the relativistic framework. In *Duration and Simultaneity*, he argued that if light lines are employed to represent time, they are not merely symbolic of it; rather, they are time, insofar as physics fundamentally identifies "the thing with its measurement" (DS, p. 122). This identification leads Bergson to articulate what he regards as the foundational principle

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[182] The term "fallacy of simple location", as used by A.N. Whitehead, refers to the conception of space-time as merely indicating the position of matter as "here", "in a perfectly definite sense which does not require for its explanation any reference to other regions of space-time" (Whitehead 1997, p. 50).

underlying all relativistic effects: because the speed of light remains invariant across all frames of reference, any alteration in spatial configuration must necessarily be accompanied by a corresponding alteration in temporal structure (cf. During 2009, pp. 301–302).

In his study, Bergson emphasised the distinction between duration and mathematical time[183] by analysing the differing lengths of light lines in both stationary and moving systems. He argued that, although the lengths of light lines may vary depending on direction, their total sum remains constant. For Bergson, this constancy indicated the presence of a single duration and supported the reality of simultaneity. He maintained that duration and light lines coincide only in a stationary system; in contrast, when the system is in motion, the light lines come to represent conventional time, which no longer captures the essence of duration. According to Bergson, duration cannot "slow down" or "accelerate", irrespective of whether the system is at rest or in motion. His primary concern, therefore, was not with the metrical equality of time intervals, but with the underlying continuity or "topological invariance" of the temporal dimension of space-time (During 2007b, p. 88).

Élie During identifies a compelling parallel in Bergson's analysis of light figures. Although Bergson did not make the comparison explicitly, During relates his account to Zeno's paradox of the "moving rows", which concerns reference frames in relative motion. He suggests that Bergson effectively replaced the moving rows with a light ray oscillating back and forth. When observed from reference frames moving at different velocities, the trajectory of the light ray—the so-called light figure—appears slanted or distorted, forming shapes of varying lengths. Each of these configurations can be understood as a valid spatial projection of the same temporal interval, as determined by the observer's frame of reference (During 2022b, p. 128). As noted, Bergson regarded these distortions not as elements of lived experience but as mathematical constructs arising from the conditions of measurement, specifically, from the correlation of all elapsed durations with spatial trajectories (During 2022b, p. 128).

In his critique of Einstein's theory, Bergson also engaged with Hermann Minkowski's formulation of space-time, a geometric model introduced in 1908 by the German mathematician and later integrated into Einstein's theory of relativity. Although Bergson's treatment of this model is relatively concise, it remains significant, as it synthesises his earlier philosophical reflections and presents a nuanced critique of the reduction of time to the fourth dimension of space in Minkowski's framework. Bergson challenged the notion that time can be entirely encapsulated

[183] For Bergson's reasoning behind characterising this conception of time as mathematical rather than physical, see DS, p. 122.

within a spatial structure, highlighting the limitations of representing time within the mathematical confines of space-time.

The chapter in *Duration and Simultaneity* devoted to the concept of space-time has received relatively little scholarly attention. As Élie During suggests, this neglect may stem from the fact that it is arguably the least controversial section of the work. Bergson's characterisation of space-time as a purely mathematical construct aligns closely with a widely accepted view within the physics community (During 2009, pp. 306–307). Nevertheless, this consensus should not obscure the significance of Bergson's analysis. His treatment of space-time reinforces key elements of his critique of relativity and sheds new light on the methodological and epistemological foundations of his broader philosophy of science and conception of time.

In his analysis, Bergson focused exclusively on Minkowski's formulation of space-time, which marked a significant conceptual departure from the framework of pre-relativistic science. Prior to the advent of relativity, time was generally conceived as an independent parameter, distinct from the three spatial dimensions, even when formally designated as the fourth dimension. Within this earlier context, time functioned autonomously and remained unaffected by spatial transformations. By contrast, Einstein's theory of relativity—particularly in its Minkowskian formulation—reconceptualises time and space as interdependent components of a four-dimensional continuum. This integration establishes the invariance of the space-time interval across all inertial frames of reference, thereby fundamentally transforming the role of time within physical theory (Deleuze 1991, p. 86). While geometrical representations employing time as a spatial axis existed prior to relativity, Minkowski diagrams[184] introduce a qualitatively different structure. They represent not merely motion through space over time, but the relativistic fusion of temporal and spatial dimensions. This structural integration sets Minkowski diagrams apart from traditional space-time graphs, which do not account for the relativistic transformations of simultaneity, duration, and spatial separation (During 2012a, pp. 160–161).

The idea of time as a fourth dimension, according to Bergson, was already embedded in both pre-relativistic science and everyday language (DS, p. 134). However, the concept of space-time only became viable once the notion of absolute time had been dismantled[185]. In Minkowski's formulation, time is not simply appended to space as an independent dimension but is structurally

[184] During explains that, in contrast to the speculative description of space-time, the representations of space-time presented by Minkowski (who himself did not call them diagrams) constitute their author's much more important contribution to the philosophical reflections on the theory of relativity; cf. During 2012a, p. 161.

[185] As During observes, the idea of space-time was constructed "on the ruins" of absolute space and time (During 2008b, p. 136).

integrated with it, forming a four-dimensional continuum. Bergson's critique centres on the philosophical implications of this integration, particularly the spatialisation of time—a concern shared by both physicists and philosophers[186]. Rather than merely recounting the mathematical structure of space-time, Bergson sought to uncover its conceptual genesis. His method, grounded in attentiveness to lived experience, aimed to expose how the interrelation of time and space culminates in the very form of space-time. In this respect, his concern was not with the mechanics of relativity per se, but with how Minkowski's model redefines the ontology of time by subordinating it to spatial representation.

The interplay between space and time, particularly as it is reconfigured in the concept of space-time was a crucial point of Bergson's examination. He described time as being "amalgamated with space" (DS, p. 124), using this term to highlight the specific nature of their fusion within the relativistic framework[187]. According to During, Bergson viewed this amalgamation as producing a seemingly unified structure, in which space and time merge into a single, coherent entity. This synthesis is illustrated by the image of the "lace of light"—a flexible geometrical figure governed by the speed of light (c), which serves as the conversion factor between spatial and temporal dimensions (During 2009, p. 304). However, for Bergson, this fusion represented a mathematical fiction: a virtual construct that abstracts from the lived, qualitative realities of space and time. Although the space-time model presents these dimensions as interdependent, he argued that their apparent interpenetration applies only at the level of symbolic or conceptual representation. In Bergson's view, real time and real space remain fundamentally distinct and irreducible to one another.

Rather than merely extending three-dimensional space by adding time as a fourth coordinate, the theory of relativity introduces a structural transformation in the modelling of physical reality. This shift gives rise to what has been termed chronogeometry—a conceptual framework in which spatial and temporal dimensions are no longer independent but instead form a unified, dynamic manifold (During 2012a, p. 162). Within this model, space is no longer conceived as a passive backdrop for events; it is implicated in motion, causality, and change, all of which unfold within the interdependent continuum of space-time. Consequently, the fabric of the natural world is no longer described solely in geometrical terms, but through a "chrono-geometrical" perspective, in which

[186] It is sufficient to invoke figures such as Meyerson, or even Einstein himself during the debate discussed in the previous part.

[187] According to Deleuze, Bergson's critique of this "close-knit mixture" was a part of his critique of the "composite" in general (Deleuze 1991, p. 86).

time is not simply measured but structurally embedded within the intelligibility of spatial relations (cf. Čapek 1955, pp. 174, 181–182).

A key aspect of Bergson's critique of space-time lies in his distinction between things and their expressions—a distinction that, in his view, the theory of relativity fails to uphold. Bergson defined "things" as "what is perceived", and "expressions" as conceptual substitutes introduced by the intellect to render those things calculable (DS, p. 127). Whereas things belong to what he terms a "real vision", expressions arise from a "phantasmal vision" and are therefore virtual. These two registers are not merely different but metaphysically opposed, occupying distinct ontological domains. Nevertheless, scientific practice, as Bergson notes, treats them as equivalent. While he conceded that this equivalence is methodologically defensible—given that no mathematical criterion can distinguish between the real and the virtual—he insisted that it must not be mistaken for metaphysical identity. It is precisely this conflation, he argued, that underpins the uncritical attribution of ontological significance to Minkowski-Einstein space-time—including its depiction as a kind of container or a "block", as Bergson called it—where the virtual schema of four-dimensionality is mistaken for the reality it seeks to represent.

The analysis of space-time was advanced by Bergson through an emphasis on the challenge of coordinating and articulating shifts in perspective across different reference frames. He argued that only measurements taken within a given system—specifically by an observer situated within that system—can be considered genuinely real. When compared to measurements from other systems, these real measurements are coordinated in such a way that certain relationships between them remain invariant (DS, p. 132). In contrast, Bergson distinguished these real measurements from what he termed "alterations" or "distortions": measurements imagined by observers located outside the system in question. Crucially, these two types of measurement differ fundamentally in nature (During 2009, p. 308). This ontological distinction plays a central role in Bergson's broader critique of the relativistic conception of space-time.

Given that human perception is limited to three-dimensional space, the notion of a fourth dimension poses a significant conceptual challenge. As Bergson noted, any space beyond three dimensions exists solely as a mental construct and bears no correspondence to empirical reality (DS, p. 135). To address this difficulty, he turned to a thought experiment originally proposed by Einstein, involving two-dimensional beings unable to conceive of a third spatial dimension. While acknowledging the limitations of this analogy, Bergson nevertheless regarded it as a useful tool to help visualise how a fourth dimension could be conceived and to consider the implications such a dimension would have for the structure of reality. Significantly, his objective was not to assert the metaphysical reality of a fourth dimension, but to render the relativistic model more accessible to the imagination. For Bergson, such imaginative efforts were essential in revealing conceptual ambiguities within relativity, especially those arising from the tendency to conflate mathematical abstraction with ontological description.

The thought experiment envisions beings confined to a two-dimensional world who must grapple with conceiving time as a third dimension. Bergson pointed out that this task is particularly challenging because time is not simply an additional dimension in the spatial sense. Instead, it introduces a set of conceptual and philosophical complexities. He argued that time simultaneously contributes and subtracts something (DS, p. 136). On the one hand, it introduces the possibility of an infinite number of alternative processes through which a given thing might have come into being (DS, p. 140); on the other hand, it erases the very becoming that characterises lived duration. This dual nature of time—at once generative and reductive—underscores the inadequacy of representing it within a purely geometrical framework and highlights the tension between mathematical abstraction and temporal experience.

To better grasp Bergson's understanding of time as a fourth dimension, it is essential to first consider the idea of subtraction, as this underpins the process of addition. He contended that when time is conceived as a fourth dimension, it effectively eliminates the concept of "becoming", since science is concerned solely with predicting the position of a moving object at a particular moment. In this framework, science focuses exclusively on the outcome or final state of an object's motion. Moreover, it creates the illusion that the boundaries, or what Pearson and Mullarkey refer to as the "extremities of an interval of time", are indistinguishable from the interval itself (cf. Pearson & Mullarkey 2002, p. 30). This occurs because, in Bergson's view, the mind compensates for the removal of becoming by re-establishing it, or at least perceiving it as re-established (DS, p. 139).

According to Bergson, the elimination of becoming in turn facilitates the integration of time with space in various distinct combinations. Once time merges with space to form space-time, the resulting block of the universe, as described by Bergson, loses the duration that once shaped it and no longer retains the traces of its origin. This fusion opens the possibility of constructing multiple alternative versions of the universe, each as conceivable as the one that actually exists. Bergson referred to this as a "thousand different mental operations", which could just as easily reconstruct the universe in thought, even though it has been concretely realised in a specific, singular form (DS, p. 147). Moreover, the elimination of becoming replaces succession, the essence of duration, with juxtaposition, a characteristic of space (de Saint-Ours 2003, p. 126).

As a consequence of this twofold philosophical difficulty, Bergson maintained that the unfolding history of the universe comes to appear as if it is given "all at once in eternity" (DS, p. 140). He maintained that people often assume the existence of an infinite array of equally valid ways to distribute time and space, overlooking the fact that space-time, as conceived within the framework of relativity, is constructed from concrete, determinate instances of both. According to Bergson, this misconception arises from a failure to recognise the symbolic nature of measurable time. Since time is necessarily represented through spatial means, the resulting symbol both exceeds and falls short of the temporal reality it is meant to express. That is, spatial representation introduces a conceptual surplus, allowing for infinite recombinations, while at the same time lacking the dynamic quality that defines lived duration (DS, p. 140).

In contrast, as Bergson conceived, real time is defined by its inherent qualities of change and duration, dimensions he considered fundamental to the nature of time and movement. These aspects are intimately connected with both organic life and conscious experience. For Bergson, the human being, embedded in the organic world through the body and immersed in consciousness through the mind, experiences the passage of time as a continuous unfolding marked by invention and creative evolution (DS, p. 145). This lived, dynamic temporality, irreducible to quantitative representation, reveals a dimension of reality that escapes the spatialised abstractions of time as a fourth dimension. Accordingly, real time is, for Bergson, the only form of temporality worthy of genuine philosophical inquiry.

Bergson's understanding of time as a fourth dimension sharply contrasts with the treatment of time within the theory of relativity. According to him, while relativity physicists regard time as merely another dimension, akin to the three spatial dimensions, Bergson viewed this as a fundamental misunderstanding of the nature of time. In his view, the relativistic framework reduces time to a mere coordinate, failing to account for its inherent dynamism and the qualitative aspects of temporal experience. For Bergson, time is not a static dimension but a fluid, continuous process of becoming, which cannot be adequately captured by mathematical abstraction alone. He cautioned that there is a serious risk of misinterpreting the theory's implications without a critical philosophical intervention to address this reduction. In particular, there is the danger of assigning metaphysical significance to a purely mathematical model, mistakenly treating it as a transcendent reality rather than recognising it as a symbolic abstraction designed to model specific aspects of physical phenomena (DS, p. 148)[188].

Even from a mathematical standpoint, time fundamentally differs from the three spatial dimensions, often being referred to by mathematicians as the imaginary dimension (DS, p. 149). However, for space-time to function as more than a purely geometrical abstraction, it must possess a genuine physical capacity to express and represent aspects of reality (During 2009, p. 310). Consistent with his distinction between one real time and a multiplicity of fictitious times, Bergson maintained that four-dimensional space can only be considered real insofar as time is spatialised, whether through measurement or linguistic description. Crucially, though, he contended that the reality of four-dimensional space holds only if time and space remain distinct from one another.

Although mathematical time, i.e., time that has been spatialised, can be treated as an additional spatial dimension, a move that is indeed scientifically necessary for certain formulations in physics (DS, p. 137), Bergson maintained that it remains possible to uphold a conception of time that is fundamentally distinct from space. This distinction resembles the separation between measurable time and lived duration (cf. During 2008a, p. 264). In other words, according to Bergson, while physicists working within the framework of relativity must incorporate time into a four-dimensional manifold, fusing it with space to preserve the internal consistency of their models, this does not necessarily undermine the possibility of maintaining a concept of time as separate from space.

Throughout his philosophical-mathematical analysis, Bergson drew attention to the distinct responsibilities of physicists and philosophers in relation to the conceptualisation of space-time, much as he did in his discussion of relativistic effects. He argued that mathematicians and physicists are not primarily concerned with the question of metaphysical reality; instead, they focus on the practical application of four-dimensional space-time within their theoretical frameworks. In contrast, philosophers are responsible for examining these scientific models for internal inconsistencies and conceptual contradictions. Therefore, Bergson urged philosophers to remain sceptical of hypothetical or “phantasmal” observers, advocating that they ground their analyses in what is perceptually accessible. However, it is important to note a limitation in Bergson’s position: he did not adequately distinguish between the roles of mathematicians and physicists. As During (2009, p. 308) points out, physicists are not restricted to mere mathematical calculations but are

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[188] Bergson cited examples of such misinterpretations in works such as Eddington’s *Space, Time and Gravitation* and Silberstein’s *The Theory of Relativity* (DS, p. 148). During argues that, in this context, the metaphysics of space-time can be understood as a form of Platonism (During 2009, p. 309).

entitled to provide physical interpretations of their theories, a nuance Bergson appears to have overlooked.

The analogy with the relativistic effect was extended by Bergson, who argued that time and space merge only as a consequence of a system's motion, thus rendering space-time an imaginary construct. He maintained that real space and real time—those corresponding to the lived experience of a real physicist conducting the Michelson-Morley experiment—never actually converge. He explained that this is because the physicist, as earlier analysis demonstrated, remains at rest within their own frame of reference. When a system moves, the physicist effectively withdraws from that frame and repositions themselves within a newly immobilised system, thereby reasserting the separation between time and space. In Bergson's view, only abstract, mathematically constructed representations of time and space can be made to intersect, whereas real, experienced time and space remain fundamentally distinct and can only be conceived as unified through a symbolic mathematical fiction devised to model certain aspects of physical reality (DS, p. 155).

As noted, the distinction between the real and the imaginary holds particular significance for philosophers, whose task is to defend a coherent account of reality. By contrast, within the framework of the theory of relativity, the real is conceived merely as a special case of the imaginary, and physicists are concerned only with what can be calculated and theoretically formulated. Accordingly, Bergson argued that while physicists must construct a space-time model that fuses time and space to facilitate mathematical operations, philosophers must remain critical of the metaphysical implications of treating time as a fourth spatial dimension. They must not lose sight of the fact that this fusion is ultimately an illusion, comparable to the previously discussed relativistic effects of time dilation, length contraction, and the breakdown of simultaneity.

The analysis of space-time in *Duration and Simultaneity* concludes in Bergson's claim that the invariance of the space-time interval under Lorentz transformation formulae, as formulated by Minkowski and Einstein, constitutes a symbolic construction rather than a reflection of objective reality (cf. DS, p. 156). In his view, space-time does not reflect the actual structure of the universe but functions instead as a conceptual model expressing a system of regulated correlations (During 2009, p. 310). It serves not as the fabric of reality itself, but as a representational tool employed within theoretical physics. Accordingly, since space-time is fundamentally unperceivable, the notion of time as a fourth dimension pertains solely to mathematical formalism and lacks any grounding in lived, perceptual experience (Bergson 1946, p. 301).

Consequently, it may be argued that Bergson did not fully engage with, or perhaps did not entirely grasp, Minkowski's construction of space-time, particularly the fusion of time with space, which he dismissed as a merely conceptual articulation (During 2008a, p. 264). The very notion of space-time appears to have eluded him (During 2012a, p. 162; Čapek 1953, pp. 41–42), as he never developed a philosophical account of his own, referring only to Minkowski's formulation. In contrast, thinkers such as Whitehead sought to reinterpret or integrate the concept within their own metaphysical systems (for further discussion, see During 2007b, p. 79). Bergson's reluctance may be attributed to his enduring commitment to the idea of temporal becoming, which stands in fundamental opposition to the geometrisation of time (cf. During 2007b, p. 79). Accordingly, he consistently cautioned against the spatialisation of time embodied in the concept of space-time[189].

In his analysis, Bergson emphasised how the spatialisation of time leads to its conceptualisation as a fourth dimension of space, aligning with Minkowski's formulation of space-time (cf. During 2009, p. 306). Jean-Marc Lévy-Leblond underscores the acuity of Bergson's critique, noting its perceptiveness in identifying the often implicit tendency to spatialise time through its formal mathematisation (Lévy-Leblond 2007, p. 239). In a similar vein, Oliver Costa de Beauregard points out that this form of spatialisation, further intensified by the identification of time as a fourth dimension, goes even further than in pre-relativistic science—a temporal framework Bergson had persistently opposed (Costa de Beauregard 2016, p. 284).

For Bergson, space-time constitutes a new convention[190], an abstract framework that exists solely in the realm of thought rather than in external reality. He maintained that real time and real space are fundamentally distinct and cannot be genuinely fused into a single entity. From this standpoint, space-time is not a physical reality but a mathematical construct devised to formalise certain correlations within physical theory. As such, it provides only limited insight into the nature of time as it is actually lived or experienced. Indeed, Bergson regarded this geometrical model as potentially misleading, insofar as it blurs the crucial distinction between what is real and what is merely virtual, thereby distancing thought from the immediate experience of temporal becoming.

[189] Notably, this concern was not unique to Bergson; it reflected a broader tendency among both philosophers and physicists, including Einstein, Weyl, and Meyerson, to warn against this spatialisation of time (cf. Čapek 1955, pp. 170–171).

[190] This conclusion, notably, aligns with Poincaré's perspective (cf. During 2009, p. 307).

Chapter 7. Beyond Special Relativity?

Thus far, the analysis has addressed issues arising directly from the special theory of relativity, particularly relativistic effects in the form of the plurality of times, length contraction, and the breakdown of simultaneity. It has also examined the concept of space-time, which Einstein adopted from Minkowski and integrated into his theoretical framework. The subsequent discussion turns to problems raised by Bergson in connection with the general theory of relativity, particularly those concerning acceleration. Central to this is the twin paradox—a thought experiment that has prompted ongoing debate as to whether it falls strictly within the domain of special relativity or requires interpretation through the lens of general relativity. Accordingly, scholarly opinion remains divided on whether the paradox can be fully resolved within the framework of special relativity alone or whether it necessitates recourse to the broader principles of general relativity.

Bergson drew a sharp conceptual distinction between the special and general theories of relativity, emphasising their differences in both meaning and spirit. He regarded special relativity as the outcome of a collective intellectual endeavour, shaped by contributions from figures such as Lorentz, Michelson, Morley, Poincaré, and Einstein, and as primarily a reformulation of previously established results. In this sense, it functions as a scientific theory in the strict sense: a framework through which physical phenomena may be reinterpreted (DS, p. 158). General relativity, by contrast, represented for Bergson a singular achievement—a method of investigation and an instrument of discovery (DS, p. 158), reflecting Einstein's intellectual originality. Whereas the special theory deals exclusively with uniform motion, general relativity extends its scope to accelerated motion. Yet Bergson did not regard the latter as a mere extension of the former, but rather as a distinct and more profound conceptual innovation (for further discussion, see During 2009, p. 252).

The question of how mathematically demanding special relativity actually is remains a matter of debate. While some argue that its foundations can be grasped by motivated secondary school students (During 2020a, p. 35; see also Heller 2006, p. 277), others maintain that it remains counterintuitive and conceptually demanding (Savitt 2021, p. 93). In any case, Bergson understood it sufficiently well to formulate a critical response to its conception of time.

Despite his focus on general relativity, Bergson felt compelled to engage with the conception of time developed in the special theory, likely due to its relative accessibility. Aware of his limited mathematical training, he avoided the formal complexities of general relativity (cf. During 2009, pp. 224, 311–312), yet, somewhat unexpectedly, chose to examine the problem of acceleration—

a concept more commonly associated with general relativity. His engagement was motivated not by a concern with physics per se, but by a desire to explore the implications of acceleration for the nature of time.

In *Duration and Simultaneity*, Bergson articulated a conceptual distinction between time and space as they are presented in the two theories of relativity. He argued that, whereas special relativity is primarily concerned with time, general relativity is more fundamentally oriented towards space. However, he maintained that time and space do not share the same ontological status (DS, p. 157). Space, as conceived in general relativity, corresponds with everyday experience and is directly perceptible; by contrast, time, as posited in special relativity, lacks any comparable experiential grounding. For Bergson, the only observable form of time is duration, which cannot be reduced to quantitative measurement. Conversely, he held that spatial measurement and space itself are, in effect, identical.

Although Bergson associated the general theory of relativity primarily with space—and the issues addressed in this chapter arise from that framework—the present analysis remains focused on the concept of time. His engagement with acceleration—particularly as illustrated by the twin paradox—served as a means of exploring this theme. The paradox offered a compelling case study in time dilation, one to which Bergson returned repeatedly, culminating in *Duration and Simultaneity*[191].

This chapter addresses some of the most contested passages in Bergson's treatment of relativity. These have attracted sustained criticism, both from his contemporaries and from later commentators, due in part to his extension of the principle of reciprocity to non-inertial frames of reference (cf. During 2009, p. 253). The discussion begins with the twin paradox, examining its formulation, implications, and Bergson's interpretation of it. The chapter then turns to the question of acceleration, considering Bergson's analysis and its broader implications for his conception of time.

7.1. Twin Paradox

The twin paradox posed a significant intellectual challenge for Bergson and his contemporaries, as it confronted not only established scientific frameworks and modes of thoguht but also intuitive conceptions of time grounded in common sense. It likewise demanded a rigorous response from

[191] Bergson continued to reflect on the concept of time as formulated within the theory of relativity up to his final publication, *La pensée et le mouvant* (1934).

physicists, as it presented a scenario that tested the explanatory capacity of the nascent theory of relativity.

Although the so-called “twin paradox” is commonly attributed to the French physicist Paul Langevin, he neither described it as a paradox nor referred to twins in his original account (During 2014, p. 514). The underlying concept can, in fact, be traced back to Einstein’s 1905 work, where it appeared in a more abstract and technical form (cf. Lévy-Leblond 2007, p. 248). Rather than involving specific characters, Einstein’s account centred on the comparison of “proper times” measured by clocks associated with living organisms in relative motion (During 2020a, p. 48; cf. During 2014, p. 520). It was Langevin’s later reinterpretation that transformed the scenario into a more accessible and narratively compelling form, which later came to dominate public understanding and academic discussions of relativity.

Langevin played a pivotal role in popularising Einstein’s theory of relativity and elucidating its broader implications. He first presented what would later be termed the “twin paradox” at the Fourth International Congress of Philosophy, held in Bologna in the spring of 1911 (Canales 2015, p. 53). The congress brought together a distinguished assembly of scientists and philosophers, including Henri Bergson, Henri Poincaré, Wilhelm Ostwald, Federigo Enriques, Émile Durkheim, and Bertrand Russell (During 2020a, p. 43). On 10 April, Langevin delivered a lecture in which he vividly illustrated some of the implications of Einstein’s then-nascent theory, offering what he referred to as a “striking example”.

Langevin’s example involved observers in relative motion and a space expedition aboard a projectile, an image inspired by Jules Verne’s *From the Earth to the Moon* (During 2014, p. 515). In presenting this scenario, Langevin extended Einstein’s theoretical considerations by introducing a human element: a conscious subject capable of comparing clock measurements with experienced time. Such a depiction naturally attracted Bergson’s attention, as he was deeply concerned with the role of lived time within the framework of relativity. However, Langevin’s narrative introduced certain ambiguities; it could be interpreted as implying that humans had discovered a way of prolonging their lives through space travel. Bergson criticised this interpretation, firmly rejecting what he regarded as an overly literal and reductive understanding of relativistic time dilation.

First introduced at the Bologna Congress, the twin paradox underwent a series of conceptual transformations, eventually finding its final expression in Bergson’s *Duration and Simultaneity*. In 1913, Max von Laue contributed to its popularisation by referring to it as “Langevin’s paradox” in his textbook on relativity, where he analysed a scenario involving accelerated observers (During 2020a, p. 48). The narrative developed further in 1918, when Hermann Weyl replaced the generic observers with the more vivid image of two twins—a formulation later echoed by Max Born in 1920 (During 2014, p. 521). Bergson ultimately adopted this framework, naming the twins Peter and Paul (During 2020a, p. 49).

Although Langevin's lecture left a lasting impression on Bergson, his response was delayed by the outbreak of war and other pressing publishing commitments (cf. During 2020a, p. 43). He eventually engaged with the topic in his 1922 work *Duration and Simultaneity*, where he explicitly referenced Langevin's 1911 address (DS, p. 78). In this context, Bergson formulated a version of the twin paradox involving a passenger aboard a projectile launched from Earth at a velocity approaching the speed of light, who travels to a distant star and returns at the same speed. Within the relativistic framework he outlined, only two years elapse for the traveller, while two hundred years pass on Earth[192].

According to Bergson, a closer examination reveals that the twin paradox does not constitute a genuine paradox. To support this claim and offer a philosophical interpretation of Einstein's theory (DS, p. 75), he compared two perspectives: that of Paul, the traveller aboard the projectile, and that of Peter, who remains on Earth. Bergson noted that, within the relativistic framework, the journey is understood to begin from a reference frame in which the Earth is considered stationary. From Peter's perspective, during the interval between Paul's departure and return, Peter, as a conscious subject, undergoes two hundred years of continuous lived duration (assuming he survives that long).

When considering Paul's perspective, Bergson addressed him directly to determine the duration of time he would experience[193]. Crucially, Bergson treated Paul as a living subject, unlike Peter's hypothetical construct. From this standpoint, since the projectile constitutes Paul's reference frame, it is considered stationary, while the Earth appears to be in motion. Drawing on the principle of relativity, which asserts the equivalence of all inertial frames, Bergson argued that the frames of reference for both Peter and Paul are relative and, therefore, interchangeable. Consequently, he concluded that, if both twins occupy equivalent reference frames, they must experience the same duration of lived and mathematical time and, by extension, age identically. However, it is logically inconsistent for both twins to be younger than the other simultaneously, as it is impossible for both

[192] Bergson presented the paradox in the following terms: "Imagine—we are told—a passenger in a projectile launched from the earth at about one twenty-thousandth less than the speed of light, which meets a star and returns to the earth at the same speed. Having aged, say, two years up to the time he gets out of his vehicle, he discovers that our globe has aged two hundred years" (DS, p. 74).

[193] Bergson's treatment of the twins' differing perspectives closely parallels his analysis of relativistic effects through the example of two observers—referred to in this thesis as Lucy and Mary—underscoring his consistent emphasis on the individuality of each observer's perspective.

their times to be dilated. Therefore, Bergson contended that the apparent discrepancy in ageing is illusory, and he rejected time dilation as a physical reality, instead interpreting it as a conceptual artefact.

Certain philosophical paradoxes had previously been identified by Bergson as paradoxes in name only, as outlined in the first chapter. It is therefore unsurprising that he regarded Langevin's paradox—much like Zeno's—not as a genuine physical dilemma but as a conceptual thought experiment[194]. For Bergson, the symmetry between the twins' reference frames rendered them interchangeable; the apparent disparity between Paul's predicted two-year lifespan and Peter's hundred-year lifespan was, in his view, an illusion produced by the mathematical framework of time dilation. In "reality", he argued, both Peter and Paul would have to account for reciprocal slowing of time, resulting in equivalent durations. Were this interpretation accurate, Langevin's "paradox" could indeed be dismissed as a mere thought experiment. However, current scientific understanding has demonstrated that this is not the case.

As a side note, Élie During draws an insightful parallel between Bergson's interpretation of the twin paradox and his analysis of Zeno's "Stadium" or "Moving Rows" paradox. During notes that, within the Stadium paradox, when two bodies move at different velocities, the duration associated with one of them may appear doubled when measured by the displacement it leaves relative to the other (During 2022b, p. 128). In Zeno's account, therefore, a single duration, when observed from distinct reference frames in relative motion, can effectively be counted twice (During 2020a, p. 38). This suggests that the measurement of time is not absolute but contingent upon the spatial and kinematic context of observation. Accordingly, the Stadium paradox anticipates a central feature of the twin paradox—namely, the dependence of temporal measurement on relative motion and the structure of reference frames.

Bergson's interpretation of the twin paradox is internally coherent and logically consistent; however, it overlooks a crucial aspect: Peter and Paul do not follow the same space-time trajectory (During 2007b, pp. 83–84). His treatment of the paradox as a conceptual thought experiment remains tenable, but only under the condition of uniform motion within inertial frames (cf. During 2022b, p. 129). That is, when the analysis is restricted to inertial reference frames—systems in relative and uniform motion without acceleration—and where reciprocity between frames is maintained, the scenario aligns with Bergson's account. In such cases, proper time remains identical

[194] The connection between Zeno's paradoxes and Langevin's "projectile travel" was repeatedly emphasised by Jankélévitch (cf. Jankélévitch 2015, pp. 24–25, 60, 152; see also Lundy 2018, pp. 108–110).

across frames, time dilation is reciprocal, and the durations experienced by each twin are effectively identical (cf. During 2022b, p. 130).

Although the principle of relative motion allows for the interpretation that each twin is equally entitled to claim the other has aged less (During 2023, p. 193), Bergson's conclusion regarding the paradox ultimately lacks validity. He failed to consider certain crucial factors that might have redirected his attention to the physical discontinuity introduced by the travelling twin's journey. As a result, he did not recognise that, according to the theory of relativity, only one twin ages less upon return. This recognition eliminates the paradoxical character of the scenario and exposes the underlying asymmetry in their respective motions.

The singular yet consequential error lies in Bergson's refusal to acknowledge this inherent dissymmetry. Because the twins follow divergent worldlines—owing to the acceleration and deceleration involved in one twin's voyage—their space-time paths are necessarily distinct, resulting in a demonstrable difference in elapsed time. Bergson neglected this essential dimension largely because he consistently minimised the role of space-time frameworks in his interpretation (During 2022b, p. 129). He treated the concept of space-time not as a representation of ontological reality, but as a purely mathematical construct. This stance led to a fundamental misreading of time dilation and reveals a critical limitation in his understanding of the deeper metaphysical implications of relativistic space-time.

Similarly, in the previously cited polemic, Metz argues that Bergson failed to recognise that Paul's journey involves two distinct frames of reference rather than a single one, thereby rendering the principle of reciprocity inapplicable. As reciprocity applies solely to inertial motion, it cannot account for the full trajectory of the projectile, from departure to return (Metz 1969, p. 155; Lovasz 2021, p. 113). In other words, even within the framework of special relativity, the twin paradox requires a change of inertial frame at the turnaround point—when Paul shifts direction from travelling away from Earth to returning towards it—thereby introducing an asymmetry that invalidates the reciprocal nature of time dilation.

Nevertheless, in response to Metz's critique, Bergson continued to uphold the principle of complete reciprocity. He argued that the perceived asymmetry arises solely from the choice of reference frame: if Peter is considered the observer, Paul appears to transition between two reference frames; conversely, if Paul's frame is adopted, it is Peter who seems to occupy two. For Bergson, the crucial point was that relativity theory precludes the simultaneous adoption of multiple frames of reference—only one frame can be consistently applied at a time (Bergson 1969, pp. 170–171).

Moreover, Bergson maintained—consistent with his broader critique of relativity theory—that it is the responsibility of philosophers, rather than physicists, to engage with the ontological implications concerning the reality of observers and their respective times. In his view, physicists are only required to adopt a single frame of reference—either Peter's or Paul's—and remain within it, regardless of whether they fully endorse the theory of relativity. For Bergson, this methodological constraint contributed significantly to the confusion surrounding the theory. As previously discussed, since both reciprocity and non-reciprocity can be expressed using the same mathematical formulations, the distinction between them becomes effectively imperceptible from a scientific perspective[195]. Consequently, he argued that what may appear to be the freedom to choose between two coordinate systems is, in practice, reduced by mathematical formalism to a single, determinate option (DS, p. 77).

Bergson's treatment of the twin paradox—particularly as outlined in his response to Metz—closely parallels the position advanced by the French mathematician Paul Painlevé on 5 April 1922. On the eve of the well-known Bergson-Einstein debate, a lesser-known but significant exchange occurred between Einstein and Painlevé, briefly discussed in the preceding part of the thesis. Painlevé argued that if both twins in the paradox were moving uniformly towards one another, the Lorentz transformations would predict identical time dilation effects for each, resulting in both recording the same duration (cf. During 2020a, p. 49). This line of reasoning closely aligns with Bergson's analysis presented in *Duration and Simultaneity*[196].

During the same meeting, Einstein emphasised that the twin paradox involves not merely two but three frames of reference—the third being the return journey of the travelling twin (or the train, in Painlevé's analogy). The asymmetry, he argued, arises from the fact that one twin experiences acceleration, thereby transitioning between inertial frames (cf. During 2014, p. 522). Einstein's explanation thus anticipates Metz's later critique of Bergson, effectively aligning with it. Although Painlevé did not pursue the issue further and a consensus seemed to be reached, Bergson remained unconvinced.

No questions were posed by Bergson during the meeting on 5 April, nor did he address the issue when he famously confronted Einstein the following day. Nevertheless, the twin paradox

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[195] It should be noted that the perspectives of reciprocity and non-reciprocity are indistinguishable only at the level of mathematical formalism. While both yield identical calculation results, they diverge significantly when considered from the standpoint of a physical representation of the universe. In this respect, Bergson's argument holds: if the physicist's concern is limited to predictive calculation, then the choice of reference frame becomes inconsequential. However, this equivalence breaks down when broader ontological implications are taken into account.

[196] In *Duration and Simultaneity*, Bergson referenced Painlevé's remarks from his exchange with Einstein.

constitutes the central problem around which his analyses in *Duration and Simultaneity* revolve. Significantly, Bergson's reasoning and objections in the text closely reflect Painlevé's interpretation of the paradox. Lévy-Leblond also identifies conceptual affinities between the two thinkers (cf. Lévy-Leblond 2007, p. 243). It remains a matter of speculation whether, had Bergson engaged more attentively with Einstein's explanation during the meeting, his treatment of relativity in the book might have been more comprehensive and critically attuned.

Unfortunately, Bergson placed excessive confidence in the symmetry of perspectives between the twins, extending the principle of reciprocity to—and beyond—its legitimate limits. His adherence to this notion of radical reciprocity was grounded primarily in metaphysical considerations (cf. During 2009, p. 276). However, in evaluating whether the staunch criticism he later received was justified, it is essential to consider the scientific understanding of the twin paradox at the time. The issue should be assessed not only through the lens of contemporary physics but also within the context of the knowledge available in 1922, the year *Duration and Simultaneity* was published. From this historical perspective, Bergson's reluctance to accept time dilation as an empirical fact appears more defensible. Given his emphasis on grounding scientific claims in observable evidence, his scepticism was arguably reasonable, particularly in light of the absence of experimental validation during his lifetime.

Before Bergson's death in 1941, several experiments had been conducted to test time dilation, including the Ives-Stilwell experiment (1938) and the Rossi-Hall experiment (1941) (During 2014, p. 519). However, these experiments confirmed time dilation only in systems undergoing uniform relative motion—a phenomenon Bergson did not dispute. Crucially, none addressed the specific asymmetry central to the twin paradox. As During observes, it was not until 1971 that experimental evidence emerged which might have led Bergson to reconsider his critique of Einstein's theory: the Hafele-Keating experiment demonstrated a measurable delay in atomic clocks transported aboard aircraft in circular motion around the Earth. This phenomenon was further confirmed in 1977 by Ross and Bailey through tests conducted at CERN's particle accelerator (During 2020a, p. 37)[197].

Thus, in 1922, no experiment had unequivocally confirmed the time dilation effect as described in the twin paradox. There was no empirical evidence to support the claim that two synchronised clocks, when subjected to relative motion, would display different elapsed times upon

[197] For a detailed account of the 1971 Hafele-Keating experiment, see, for instance, Savitt (2021, p. 91) or Borella (1996, p. 78). The latter, however, argues that the experiment was unnecessary for demonstrating the relativistic effects associated with the twin paradox. Instead, Borella maintains that its results were, in fact, incompatible with the theory of relativity, insofar as they revealed a non-reciprocal phenomenon (cf. Borella 1996, p. 79). He further contends that Bergson's interpretation of the twin paradox was more coherent and defensible than Langevin's, as it did not involve any internal contradiction (cf. Borella 1996, p. 77).

reunion. It also remained unclear whether time dilation should be regarded as an observable physical phenomenon or merely as a mathematical consequence of the theory. Moreover, within the framework of Einstein's relativity, time dilation was conceived as a reciprocal effect: when two systems move uniformly relative to one another, each observer perceives the other's clock as running more slowly.

It is therefore unsurprising that Bergson did not accept time dilation, as formulated in the theory of relativity, as an empirical fact. Instead, he regarded it as a perspectival effect, comparable to the visual distortions encountered in aesthetic perception—an analogy he returned to repeatedly through the example of a painting viewed from different angles[198], as discussed in *Duration and Simultaneity* (cf. DS, pp. 109, 163–164). For Bergson, such relativistic effects belonged more to the domain of representation than to that of concrete physical reality. Indeed, he went so far as to argue that time dilation would never be amenable to experimental confirmation. It seemingly never occurred to him that the phenomenon might one day become accessible to empirical verification.

The mistaken conclusions Bergson advanced become more comprehensible when one considers not only the state of scientific understanding at the time but also the significant number of inaccuracies introduced by physicists in their efforts to communicate the theory of relativity to a wider audience (cf. Lévy-Leblond 2007, pp. 254–255). What is most noteworthy, however, is not merely that these scientists occasionally erred, but that the explanatory models they provided—particularly those relating to general relativity—were often conceptually misleading or insufficiently precise. Non-specialists such as Bergson, who relied on these accounts to engage critically with the theory, were thus inadvertently misled. His misinterpretations, in this context, reflect not simply a philosophical divergence but also the shortcomings of the scientific discourse upon which his understanding was based.

Another factor that shaped Bergson's contested interpretation of the twin paradox—particularly his treatment of acceleration—was the continued uncertainty surrounding general relativity itself, a theory with which he engaged at least in part. Despite the widely publicised support for Einstein's theory following Eddington's 1919 solar eclipse expedition, the theory remained a subject of significant debate within the scientific community well into the early twentieth century (During 2009, p. 274). In this context, it would be overly simplistic to attribute Bergson's position to a mere failure of understanding. His scepticism should instead be situated within the broader landscape of theoretical ambiguity and the evolving status of empirical

[198] According to During, Bergson's optical metaphors—such as the analogy of the painting—offer greater conceptual clarity than any representation based on the notion of a "time-substance" (During 2007b, p. 86).

validation. Nevertheless, some critics, most notably Sokal and Bricmont, have dismissed his views as evidence of a fundamental misunderstanding of relativity (cf. Sokal & Bricmont 1997, p. 247), thereby overlooking the historical and conceptual complexities that shaped his engagement with the theory.

In examining the twin paradox, it is essential to consider not only its physical implications but also its philosophical dimensions. Significantly, the twin paradox, as conventionally formulated, presupposes subjects who experience the passage of time—conscious, embodied beings rather than abstract, interchangeable entities[199]. Bergson's concern lay precisely in this experiential aspect. Rather than limiting his analysis to formal or mathematical abstractions, he sought to explore how time, as altered by relativistic effects, would be lived and perceived by actual human beings. In this sense, his approach foregrounds the philosophical implications of the paradox, shifting the focus from theoretical constructs to the reality of time as it is concretely experienced.

To make sense of the twin paradox, Bergson placed particular emphasis on the indispensable role of communication. For him, the possibility of dialogue between the twins was not merely incidental, but constitutive of the problem itself. Communication allows for the comparison of their respective proper times and, crucially, reveals the quantitative asymmetry between them. It is through this ongoing exchange that a shared temporal framework is established, enabling any meaningful discourse about time to take place[200]. Langevin's "striking example" presupposed such communication, envisaging a continuous exchange of signals between the Earth-bound twin and the traveller, facilitated by the Doppler effect, as a means of maintaining connection across relativistic intervals (cf. During 2014, p. 522). Even Metz, in his critique of *Duration and Simultaneity*, acknowledged the conceptual necessity of communication between observers, recognising it as a vital component in the interpretation of relativistic time (Metz 1969, pp. 141–142)[201].

In the context of the twin paradox, one might ask—as many did at the time—whether undertaking a journey analogous to Paul's would allow an individual to live longer or experience more than a stationary counterpart like Peter. The answer, perhaps counterintuitively, is negative. Paul would not, in any meaningful sense, outlive Peter. For instance, assuming an equal willingness

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[199] As Ó Maoilearca observes, the twins cannot be substituted for one another "without losing something in the process" (Ó Maoilearca 2023, pp. xi–xii).

[200] The significance of communication between "Einstein's observers" has also been highlighted by Ilya Prigogine, who links it to the broader issue of irreversibility—such as the irreversibility of time itself (Prigogine 1984a, p. 295).

[201] However, in the course of his polemic with Bergson, Metz eventually adopted the position that observers could be replaced by recording instruments, thereby shifting the emphasis away from embodied experience (cf. Gunter 1969, pp. 187–188).

and capacity to read, Paul would not be able to read more books during his two-year voyage than Peter could during the same period on Earth. Bergson reached a similar conclusion, wryly remarking that "we shall have to look for another way not to grow old" (DS, p. 75). From a mathematical or physical standpoint, Peter's time may be said to "pass faster" than Paul's due to relativistic effects. Yet, in terms of lived or psychological time, both would experience duration in a broadly comparable fashion. Although the calendar dates of their deaths would differ, the subjective length of their lives would be essentially equivalent[202]. Nevertheless, it would be reductive to interpret Bergson's position as limiting time purely to its psychological dimension; such a reading would fail to account for the broader philosophical context in which he approached the issue.

It is important to recognise that, despite his engagement with contemporary scientific developments, Bergson approached the theory of relativity not as a physicist but as a philosopher. The primary aim of his intervention was philosophical: to explore the conceptual and experiential implications of the theory, rather than to dispute its mathematical or physical validity. As he consistently emphasised, including during the 1922 debate, his intention was not to criticise the technical aspects of relativity, such as the Lorentz transformations or the postulate of the constant speed of light. Nor did he object to the theoretical elimination of the ether, a position that, at the time, marked a decisive break from pre-relativistic physics. Instead, Bergson sought to examine how such scientific innovations redefined fundamental philosophical concepts of time, simultaneity, and space. His critique was thus directed not at the internal coherence of the theory itself, but at the broader metaphysical interpretations that, in his view, were often uncritically or prematurely extrapolated from it.

What Bergson sought to examine was not the mechanics of time as measured by physics, but rather the condition that renders time real—namely, its role as a medium of coexistence. As Élie During argues, the primary function of time is coordination: it enables beings and events to endure together within a shared temporal field, transcending the abstract or schematic form of coexistence implied by the conventional structure of space-time (During 2022b, pp. 117, 119). Bergson's focus on the lived coexistence of the twins is thus integral to his broader metaphysical and cosmological project, which is grounded in the idea of the unity of time.

Before turning to the question of acceleration, it is necessary to determine whether the twin paradox lies wholly within the scope of special relativity or whether its comprehensive articulation

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202 This analysis sets aside any physiological consequences of space travel, such as the effects of weightlessness or variations in gravitational force, on Paul's body and life span.

and resolution require the framework of general relativity. This distinction is particularly significant when evaluating Bergson's engagement with the paradox. Although he explicitly claimed to confine his analysis to special relativity—which, in his view, primarily addresses the nature of time—there are indications that his reflections implicitly extend beyond these limits. His discussion of acceleration—albeit relegated to the appendices of *Duration and Simultaneity*—suggests a broader interpretative reach that encroaches upon concepts more closely associated with general relativity. Any assessment of Bergson's position must, therefore, take into account not only his declared methodological constraints but also the conceptual demands posed by the paradox itself.

It was repeatedly maintained by Bergson that his engagement with the twin paradox was confined to the framework of special relativity (see, for example, DS, p. 77). In another passage, when discussing the selection of a reference frame and its significance in physics, he reiterated that it is the special theory of relativity that is under consideration, since his inquiry was concerned solely with the concept of time (DS, p. 78). However, elsewhere in *Duration and Simultaneity*, Bergson appeared to concede that the resolution of the paradox ultimately falls within the domain of general relativity, revealing a degree of conceptual tension that complicates his stated methodological limits[203].

Paul's journey necessarily involves changes in velocity—at the initial departure, at the turning point of his voyage, and again upon his return to Earth. These shifts imply that Paul cannot be said to remain within a single inertial frame throughout his journey. Special relativity, as Bergson understood it, applies strictly to inertial frames—those moving at constant velocity relative to one another, without acceleration. The asymmetry introduced by Paul's period of acceleration, in contrast to Peter's consistent inertial state, renders the scenario incompatible with the exclusive application of special relativity. Consequently, given that acceleration plays a central role in generating the apparent paradox, Bergson argued that a proper account must draw upon the principles of general relativity, which alone can adequately account for the complexities introduced by non-inertial motion.

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203 Bergson explicitly remarked that "Even purely from the standpoint of physics, it [the paradox] raises certain difficulties because we are here no longer in special relativity. As soon as speed changes direction, there is acceleration, and we are dealing with a problem in general relativity" (DS, p. 78).

Bergson's position was arguably well-founded within the intellectual context of his time, particularly given the prevailing consensus among both physicists and philosophers at the time[204]. It was widely accepted that the special theory of relativity applies exclusively to inertial frames, whereas any deviation in the world line—as required by the twin paradox—introduces acceleration, thereby falling within the scope of general relativity. This interpretation likely reflected the dominant scientific understanding when *Duration and Simultaneity* was written. Notably, Einstein himself acknowledged that the reversal of the direction in the travelling twin's motion placed the problem beyond the limits of special relativity. In a 1918 publication, he explicitly rejected the resolution of the twin paradox within the framework of special relativity, presenting it instead as a matter for general relativity (Unnikrishnan 2020, p. 20)[205]. However, Einstein's stance on this issue was inconsistent over time (During 2009, p. 294).

Contemporary interpretations of the twin paradox have largely moved beyond the earlier assumption that its resolution necessarily requires the framework of general relativity. Many physicists now argue that the paradox can be formulated such that acceleration is no longer essential, allowing for its resolution entirely within the scope of special relativity (During 2007a, p. 285)[206]. As During notes, special relativity is not, as was once assumed, confined to strictly inertial frames in uniform motion (During 2007a, p. 285). In this context, the temporal asymmetry between the twins is understood not as a consequence of acceleration, but as a manifestation of the path-dependence of proper time—an aspect that, as Savitt emphasises, is fundamental to the structure of special relativity itself (Savitt 2021, p. 92).

Sokal and Bricmont, by contrast, contend that a proper analysis of the twin paradox within special relativity necessitates its formulation from the standpoint of an inertial system. They argue that once the discussion extends beyond inertial frames, one must rely on conceptual tools of general relativity (cf. Sokal & Bricmont 1997, p. 262). In light of such divergent views—both

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204 See, for example, Zawirski 1924, p. 111; Friedman & Donley 1989, p. 60; Borella 1996, p. 76; Čapek 1991, p. 305; Murphy 1999, pp. 68, 69–70. According to Unnikrishnan, resolving the twin paradox solely within the framework of special relativity not only contradicts Einstein's own 1918 treatment of the problem but also violates the equivalence principle without offering any justification for doing so (Unnikrishnan 2020, p. 23). He further explains that it was only after 1941, following empirical confirmation of time dilation through the extended lifetime of cosmic ray muons, that it became evident that acceleration plays no direct role in the phenomenon of time dilation (Unnikrishnan 2020, p. 24).

205 As Unnikrishnan notes, Einstein's 1918 account of the twin paradox was that "the pseudo-gravitational field experienced during the acceleration phase (during the reversal of the velocity for the return journey) resulted in a sufficient amount of gravitational modification of relative time in the spaceship frame" (Unnikrishnan 2020, p. 21).

206 The author goes as far as to claim that the twin paradox can be formulated solely within the framework of special relativity (cf. During 2009, p. 294), as it fundamentally emerges from the symmetrical situation between the observers—each twin perceiving themselves as stationary while viewing the other as in motion.

historical and conceptual—it is essential to clarify that, in contemporary physics, the twin paradox is regarded as a purely kinematic effect. Its resolution lies in the comparison of proper times along the distinct world lines of the twins, with acceleration no longer considered a decisive factor, as it can be confined to an arbitrarily brief interval without altering the relativistic outcome. Accordingly, the special theory of relativity is sufficient to explain and resolve the paradox. That said, it remains crucial not to assess the validity of Bergson's claims solely through the lens of current scientific understanding[207].

7.2. Acceleration

Acceleration was tackled by Bergson primarily from a historical perspective. He highlighted the longstanding failure of pre-relativistic physics to extend Galileo's principle of relativity to accelerated motion. Although Galileo had asserted that the laws of physics remain unchanged under transformations between inertial frames, Bergson contended that the behaviour of systems undergoing acceleration remained conceptually unresolved. This unresolved status, he argued, was not a minor issue but a fundamental lacuna that left physicists in a state of intellectual unease, exposing the limitations of the prevailing theoretical frameworks.

While the principle of relativity had been successfully applied to inertial frames—an achievement further advanced by Einstein's elimination of the notion of an absolute reference frame in special relativity—the problem of describing accelerated systems within a fully consistent theoretical framework remained unresolved. It was only with the formulation of general relativity around 1915 that Einstein extended the principle of relativity to arbitrary frames, providing a comprehensive and coherent account of the dynamics of accelerated motion and thereby addressing a longstanding conceptual gap in physics.

This analysis deliberately refrains from engaging with the details of acceleration presented by Einstein, as incorporating general relativity would exceed its scope; Bergson himself did not examine the theory in depth, despite addressing certain related issues. Instead, the focus remains on Bergson's treatment of acceleration. His primary concern was not acceleration in itself, but rather whether the insights he had previously developed regarding relativistic effects in inertial frames could also be extended to accelerated frames. This line of inquiry was notably prompted by the

[207] This perspective is echoed by, among others, Pierre-Alexandre Fradet, who emphasises that Bergson "was writing at a time when a good number of works clarifying the major postulates of Einsteinian thought had not yet been published" (Fradet 2012, p. 55).

critical reception that followed the publication of *Duration and Simultaneity*, particularly in relation to his treatment of the twin paradox.

Bergson's analysis of acceleration was published as appendices to his book a year after its initial release and was later incorporated into the 1923 reprint of *Duration and Simultaneity*. According to Jacques Chevalier, a close associate of Bergson, these appendices were a direct response to the criticisms levelled against him by Langevin and Becquerel (Bergson 2009, p. 386). Throughout the appendices, Bergson critically engaged with Becquerel's arguments. Initially, he referred to a letter from an unnamed physicist, explaining to Chevalier that he had wished to avoid controversy by withholding Becquerel's name (Bergson 2009, p. 387). However, in later sections of the appendices, Bergson directly quoted the physicist.

In his critique, Becquerel primarily argued that Bergson had misinterpreted the twin paradox. The physicist presented his own account of the journey, placing particular emphasis on the differing times indicated by the twins' clocks. Adopting Bergson's framework, Becquerel named the twins Peter and Paul, sending Paul on a journey at near-light speed while leaving Peter stationary on Earth[208]. However, in contrast to Bergson's interpretation, Becquerel maintained that the clocks would not remain synchronised. He asserted that, due to the effects of time dilation, Paul's travelling clock would run slower than Peter's stationary one. Through this argument, Becquerel sought to highlight what he perceived as a fundamental flaw in Bergson's understanding of relativistic time.

Becquerel also contended that Bergson's thesis on the reciprocity of acceleration is fundamentally incompatible with established physical principles[209]. He emphasised the inherent asymmetry of acceleration, arguing that a physical point, upon departing from and returning to a uniform system at a later stage in its worldline—analogous to Paul's situation in the twin paradox—undergoes acceleration, resulting in a different passage of time compared to a point moving uniformly, akin to Peter's situation. This distinction, Becquerel argued, introduces an asymmetry between the two types of motion. He concluded that, unlike uniform motion, acceleration cannot be regarded as relative but instead possesses an absolute character, marking a significant departure from Bergson's interpretation (DS, p. 179).

In his response to Becquerel's criticism, Bergson defended the reciprocity of acceleration, asserting that, since acceleration is reciprocal, the two systems, S and S', are interchangeable (DS,

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[208] Although Becquerel's example reiterates the twin paradox, some of his conclusions regarding the twins' times were not entirely accurate from a contemporary perspective.

[209] Although Bergson addressed acceleration only in the appendices to his book, Becquerel's conclusion is supported by Bergson's treatment of the twin paradox, presented in *Duration and Simultaneity*.

p. 173). Building upon his earlier analysis of the distinction between real time and fictitious times in uniform motion, he reiterated his position that the concept of space-time, as understood in relativity theory, is inadequate for capturing this distinction. Specifically, Bergson argued that space-time fails to properly account for the separation between real time and fictitious times. He also introduced the notion of "proper time" within the framework of relativity, defining it as the time measured locally, or "on-site". Bergson placed this concept in direct relation to his earlier critique, applying it to accelerated systems and thereby extending his distinction between real time and fictitious times beyond the context of uniform motion.

Undoubtedly, Bergson's theses on acceleration were in direct opposition to the established understanding of physics, particularly from the standpoint of contemporary scientific knowledge. However, it is crucial to consider the context in which *Duration and Simultaneity* was written, as the scientific community was still grappling with the acceptance of general relativity. This is evident from the remarks made by a Nobel committee member during the presentation of the Nobel Prize to Einstein. Notably, some members of the scientific community concurred with Bergson's conclusions. Indeed, Bergson consulted Édouard Le Roy, one of his disciples and a mathematician, about his responses to critics (Heller 2006, p. 278). Nevertheless, fully understanding Bergson's perspective on acceleration and assessing potential sources of error in his reasoning requires a careful reconsideration of his reflections on the subject. Such a re-examination enables a more nuanced evaluation of the strengths and limitations of his arguments.

Adhering to the principle of reciprocity, as introduced by special relativity and thoroughly analysed by Bergson, ultimately led him into a significant error, a flaw that becomes apparent in the subsequent analysis. His commitment to this principle shaped his interpretation of acceleration, but it also constrained his understanding, causing him to overlook crucial aspects. Before delving into a detailed examination of these issues, it is important to highlight that Bergson deliberately excluded certain phenomena, such as a jolt, from his analysis. He argued that while such phenomena are associated with acceleration, they do not introduce any asymmetry between the accelerated systems. Consequently, Bergson maintained that they posed no threat to his central thesis of reciprocity, as these phenomena do not contradict the fundamental symmetry between accelerated systems (DS, pp. 173–176).

In his analysis, Bergson sought to explore whether his earlier conclusions about uniform motion could be extended to encompass accelerated motion, particularly in the case of a projectile following a modified trajectory. This line of inquiry, however, led to further criticism, most notably from André Metz, Bergson's fiercest critic. The two engaged in a rigorous exchange of critiques within the pages of *Revue de philosophie*. Nevertheless, this analysis refrains from delving into the specifics of their debate, as these discussions lie outside the scope of the current inquiry, which centres on an examination of *Duration and Simultaneity*. Moreover, some aspects of their exchange have already been addressed earlier in this thesis, particularly in the section on the twin paradox. It is also worth noting that Bergson's stance, as articulated in the book, remained steadfast, while Metz failed to engage meaningfully with the fundamental aspects of Bergson's argument, as previously discussed.

The argument on acceleration was introduced by Bergson through a reference to the projectile experiment described by Becquerel, alongside his own analogy concerning the role of perspective in determining the perception of time. According to Bergson, the time of the travelling twin, Paul, is dependent on the perspective from which Paul is observed. From a distant vantage point, Paul appears to experience time more slowly than Peter, the stationary twin. Bergson further developed this idea by drawing a comparison to how figures are portrayed in a painting. In this analogy, Paul is depicted from a distance, making him appear much smaller, while Peter, painted from close up, is shown in his usual, larger proportions. Thus, Bergson argued that the apparent slowing of Paul's time is a product of the observer's perspective rather than a change in time itself.

In comparison to the optical illusion of perspective, which makes two identical objects appear differently sized depending on the observer's vantage point, Bergson argued that Paul's time appears to slow down, but is not genuinely dilated. The apparent discrepancy in time, therefore, is not a true alteration of Paul's experience but a product of the observer's perspective. Specifically, Bergson contended that the time Paul seems to experience is not the actual time he perceives, but rather an imagined time that Peter constructs from his point of view. Thus, it is not Paul who "reads" or experiences time during his journey, as Becquerel suggested, but rather Peter who imagines Paul experiencing time in a slowed state. In this framework, only Peter's experience of time is real and actual, while Paul exists solely as a projection of Peter's imagination, an abstract construct that reflects Peter's perception rather than any objective change in Paul's temporal reality.

Given the fluctuating distance between them, which increases and decreases throughout the journey, it is impossible to claim that both Peter and Paul are immobile. Bergson maintained that immobility, as understood in the theory of relativity, is a matter of perspective. For him, immobility is not an intrinsic quality of a system, but rather the result of an observer's position relative to that system. As a consequence, when there is a distance between Peter and Paul, only one of them can be regarded as immobile. In an insightful observation, Bergson highlighted that this choice had already been implicitly made by designating Paul as the traveller and Peter as the stationary observer on Earth. By making this distinction, Peter's perspective is automatically adopted, thereby rendering Peter's system immobile, while Paul's system is viewed as being in motion from the observer's point of view.

According to Bergson, the reciprocity of acceleration does not exist within the mathematical framework of the theory of relativity. Instead, it becomes apparent only when the distinction between the real and the imaginary is reinstated. In Bergson's view, systems in accelerated motion exhibit reciprocity and share a single, real time, regardless of the directions of their velocities. However, he argued that the directions of these velocities cannot be definitively determined. Defining them as opposites would require an observer situated within a third system—an assumption that the theory does not accommodate. The theory, in fact, only considers two systems: Peter's and Paul's, or S and S'.

Therefore, Bergson argued for the necessity of incorporating a third system of reference when considering systems in accelerated motion with differing directions. He maintained that the real physicist, whether engaged in experimental work or theoretical analysis, must situate themselves within this third system (S''). From this vantage point, the physicist can analyse two systems, S and S', with one in uniform motion and the other in accelerated motion. According to Bergson, these two systems, S and S', can only be understood as moving in relation to S'', the third system, which remains stationary due to the physicist's position within it. Thus, the physicist's position within S'' enables a clearer understanding of the relative motions of the other two systems.

The clocks and physicists within systems S and S' should be regarded, in Bergson's view, as imaginary. This conclusion is based on several key principles: the established reciprocity between systems, the fact that only one system can be immobile, and the physicist's actual position within the third system. According to Bergson, if the physicist were to move from S'' to either S or S', the system in question would then assume the status of the real reference system. However, he maintained that the focus of physics remains on the relationship between systems S and S', with the assumption of a third reference system, S'', remaining largely implicit. This presumption, he argued, is essential for understanding the dynamics of accelerated motion but is typically overlooked in practical analyses.

Following Bergson's reasoning, since system S is in motion, any physicist located within it—as well as the system itself—must be regarded as imaginary, insofar as the real physicist is situated within the third system, S''. Consequently, any statements made by the imagined physicist in S regarding system S' would amount to nothing more than a mental image of a mental image—what Bergson referred to as a "double phantom". It is these phantoms, he argued, that physicists ultimately examine in their theories and equations. Bergson further maintained that the asymmetry between the two systems, as discussed by Becquerel, arises solely from the measurements assigned by the real observer in S'' to the imagined systems S and S'. This asymmetry, therefore, is illusory, as these measurements were not genuinely carried out within systems S and S' (DS, p. 182).

Bergson underscored the importance of analysing the reciprocal relationship between two real systems, S and S'. When a real observer is situated within one of these systems, that frame of reference is perceived as stationary, causing the other to exhibit time dilation. For instance, if the observer is located in system S, time in system S' appears to pass more slowly relative to S. If the observer then relocates to system S', the situation is precisely reversed, with time in S now appearing dilated. This alternation does not indicate any absolute asymmetry but rather highlights a fundamental and complete symmetry between the two systems, each adopting the role of the stationary frame depending on the observer's location.

Building on this symmetry, Bergson argued that any perceived asymmetry arises not between two real systems but between a real system and the mental representation of another (DS, p. 183). In accordance with the reciprocity inherent in the Lorentz transformation formulae, he maintained that when a physicist transitions from one system to another—thereby rendering the new system stationary—the time dilation previously ascribed to it ceases to apply. This interpretation, however, stood in direct opposition to the prevailing view among physicists, who rejected the idea that time dilation could be eliminated simply by altering the observational frame (cf. Durie 1999, p. xvii).

Extending this line of reasoning, Bergson claimed that all motion, whether uniform or accelerated, is defined solely in relation to a third system, S'', in which the real physicist is situated. While he rightly acknowledged that an accelerating observer would register changes in velocity, he overlooked a fundamental principle of special relativity: that acceleration constitutes an absolute, not a relative, phenomenon (Durie 1999, p. xvii) By making acceleration dependent on the reference frame of S'', Bergson effectively reduced it to a relational concept. Consequently, in his account, both motion and immobility exist only with respect to the observer's system, S''.

From this standpoint, Bergson concluded that time does not, in fact, slow down, since the only truly real system is the one rendered motionless by virtue of containing the real observer. Consequently, the only real time is that indicated by the clock within this stationary system. Although the observer may transition between systems—albeit occupying only one at any given moment—their capacity to render the current system motionless moves with them, as does the clock that measures what Bergson considers to be real time. On this basis, he maintained that real time is never subject to dilation.

Although Bergson's conclusions diverge from the prevailing scientific understanding of the 20th and 21st centuries, they do not exhaust the scope of his reflections on acceleration. In responding to the critique advanced by Becquerel, Bergson not only defended his position but also challenged the philosophical presuppositions underpinning his critic's argument. He acknowledged that it is "the philosopher's concern" to distinguish between the lived experience of a conscious individual—Paul—and the abstract figure constructed by the physicist—Paul as conceptualised by Peter (DS, p. 171). This distinction, between a concrete, embodied person and a theoretical construct or "phantom", formed the basis of Bergson's call for physicists to engage with such representations with philosophical rigour and intellectual integrity.

Bergson did not dismiss Becquerel's work outright; on the contrary, he expressed appreciation for the precision of his mathematical reasoning, finding much of his technical analysis to be sound. Nevertheless, he maintained that Becquerel operated on certain unexamined assumptions, likely without being fully aware of them. Most notably, Bergson argued that Becquerel conflated empirical measurements made within one frame of reference with imagined or inferred measurements that would be made in another—a conceptual slippage which, in Bergson's view, compromised the coherence of the argument. He further contended that this form of conflation was not unique to Becquerel but indicative of a broader pattern among physicists who, despite their formal precision, frequently overlook the implicit philosophical presuppositions informing their interpretations. Accordingly, Bergson cautioned against the uncritical acceptance of such positions, urging a more reflective engagement with the conceptual foundations underlying scientific claims.

In particular, Bergson argued that physicists, although necessarily situated within the temporal and spatial coordinates of their own practice, often speak as if they occupy an abstract position that is simultaneously "everywhere and nowhere"—a disembodied vantage point detached from any particular frame of reference (DS, p. 184). He maintained that this attitude leads to the projection of virtual selves into multiple locations, fabrications that have little connection to the concrete reality of physical observation. For Bergson, such projections give rise to what he identified as a metaphysical illusion, which During terms the "hypostasis of the multiple times" (During 2009, p. 320). According to During, this illusion stems from the physicist's unexamined assumption that scientific knowledge can transcend the interpretative work required by different perspectives, thus presenting itself as a neutral, all-encompassing vision of reality (During 2009, p. 320). Within this framework, the world is imagined as already constituted and complete—a fixed, "ready-made" structure awaiting discovery—rather than a dynamic process, shaped by the shifting conditions of observation.

Bergson famously cautioned scientists to abandon certain modes of expression that, in his view, risk misleading even the physicist about the metaphysical implications of their own theories (DS, p. 185). A notable example of this tendency can be found in Einstein's assertion that scientists possess a more reliable understanding of the philosophical ramifications of their theories than philosophers do (cf. Holsinger Sherman 2020, p. 143). Specifically, Einstein maintained that philosophers are justified in engaging with the philosophy of science only when dealing with theories that are already grounded in solid empirical foundations.

Einstein reinforced this stance in relation to the theory of relativity, asserting that during periods of foundational uncertainty, physicists cannot delegate to philosophers the task of critically examining the theoretical underpinnings of their discipline. As he put it, they alone are best placed to recognise "where the shoe pinches" (Einstein 1936, p. 349). Yet, in light of Bergson's critique, such confidence may itself be problematic. By claiming privileged access to the philosophical implications of their theories, scientists risk advancing metaphysical claims without fully acknowledging their speculative character. For Bergson, it is precisely this lack of philosophical self-awareness that can lead even the most methodologically rigorous scientific reasoning into metaphysical error.

This concern was illustrated by Bergson through the case of Hermann Minkowski, emphasising how scientists often fail to consider the philosophical implications of the concepts they employ. He argued that Minkowski's formulation of the world line, while operationally useful for physicists, effectively erases the distinction between the real and the imaginary—distinction that may seem negligible from a scientific perspective but carries profound philosophical implications. Although the conceptual issue of the world line has been addressed in more detail in the preceding analysis of space-time, the example itself serves to reinforce Bergson's broader contention: that scientific language, when left unexamined, risks obscuring the metaphysical assumptions it implicitly upholds.

A further metaphysical error Bergson identified in certain physical statements concerns the implicit denial of a definitive system of reference. He argued that this assumption shifts discourse from the domain of empirical reality into the abstract realm of the Absolute or the "Platonic Idea". When such universal formulations are applied to specific reference frames, they are mistakenly regarded as concrete manifestations of an immaterial, overreaching essence—much like the Platonist who descends from the pure Idea, which contains all individuals of a genus, to one particular instance within it (DS, p. 183). This way of thinking, Bergson warned, promotes the erroneous belief that all reference systems are ontologically equivalent, thereby obscuring the fact that only one—the system occupied by the real observer—can be considered genuinely real.

While physicists often disregard distinctions such as those between the real and the imaginary—considering them irrelevant to mathematical formulations—Bergson argued that it is the responsibility of philosophers to reinstate their significance. This philosophical vigilance, he maintained, would ultimately benefit physicists as well, by encouraging a greater awareness of the metaphysical assumptions embedded in their claims. Crucially, Bergson did not suggest that philosophers held exclusive authority over philosophical inquiry, nor did he advocate for a rigid separation between physics and philosophy. On the contrary, he deliberately avoided appealing to authority or denouncing representatives of either field as incompetent (cf. During 2007a, p. 264). His goal was not to establish boundaries between the two disciplines but to foster a meaningful, critical dialogue with scientists—an approach that aligns with the confrontational yet collaborative spirit of his broader philosophy of science.

Although Bergson's arguments on acceleration and related concepts remain consistent, particularly in the application of the principle of reciprocity, his conclusions regarding acceleration ultimately prove to be flawed. While time dilation shares some similarities with the narrowing of perspective, it cannot be equated with accelerated systems in the way Bergson suggests (During 2020a, p. 38). Furthermore, Čapek critiques Bergson for conflating the terms "apparent" and "unobservable" (Čapek 1991, p. 303), a confusion that weakens the clarity of his argument. He also draws a comparison between Bergson's observer—situated within a system of reference—and Leibniz's monad, an entity devoid of external perspective. However, this comparison is not warranted by Bergson's argument. Ultimately, Bergson's error can be attributed to the lack of empirical evidence for the observability of time dilation at the time[210], which limited his ability to fully account for the complexities of accelerated systems.

Despite any errors Bergson may have made, his most vocal critics committed even more significant mistakes (cf. Čapek 1991, p. 297; for a detailed discussion of Metz's errors, see Čapek 1991, pp. 306–307). However, the central issue at hand is not whether Bergson or his critics were wrong in their respective positions. Bergson's primary objective was not to resolve the intricacies of the twin paradox, a matter that more clearly belongs to the domain of physics. Instead, his focus was on addressing the philosophical misunderstandings and misinterpretations surrounding the

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[210] There is, of course, the issue of the Fizeau experiment, which—as Metz pointed out in his critique—confirmed time dilation, as well as the experiments of Kaufmann, Bucherer, and de Guye, mentioned by Čapek (cf. Čapek 1991, p. 308). However, Bergson did not consider these experiments relevant to his account of relativity theory.

theory of relativity, which are examined in greater depth in the following chapter. Furthermore, Bergson sought to offer a critical perspective on Einstein's cosmology, potentially proposing an alternative that would challenge the assumptions underlying modern physics (cf. Latour 2011, p. 3).

Summary of the third part:

In *Duration and Simultaneity*, Bergson presented the Michelson-Morley experiment as a pivotal moment in the history of physics, marking the inadequacy of previously dominant models. In particular, the experiment rendered the ether hypothesis untenable. Attempts to preserve the Newtonian framework—most notably through the contraction theory advanced by Fitzgerald and Lorentz—proved insufficient. Bergson demonstrated this by applying the Lorentz transformation formulae from the perspective of what he termed “half-relativity”. He argued that only by adopting the principle of reciprocity, as introduced by Einstein, could the results of the experiment involving mirrors and light be coherently explained.

In his further analyses, Bergson explored the implications of Einstein’s theory, focusing on its postulation of a plurality of times, the dissolution of simultaneity, and longitudinal contraction. He contended that these effects were ultimately artefacts of the theory’s mathematical framework rather than features of physical reality. According to Bergson, Einstein’s formulation implicitly presupposes the existence of a single, real time, with all other times being derivative or conventional. Consequently, both the relativity of simultaneity and the phenomenon of contraction should be understood not as empirical realities but as outcomes of mathematical abstraction. Bergson extended this critique to the very concept of space-time, which he viewed not as an intrinsic structure of reality but as a spatialised representation of time.

For Bergson, the most pressing issue raised by the theory of relativity in relation to time was the so-called twin paradox. He argued that the phenomenon of time dilation depicted in the paradox was not a physically real effect, but rather a perspectival one, akin to an optical illusion. While later experimental evidence would challenge this conclusion, it is essential to contextualise Bergson’s position within the scientific limitations of his time, when empirical confirmation of time dilation had yet to be achieved. Moreover, although the paradox is now commonly treated within the framework of special relativity, it was historically associated with general relativity and the problem of acceleration. Bergson’s treatment of acceleration mischaracterised certain key aspects of Einstein’s theory—a misjudgement that drew significant criticism and contributed to the decline of his philosophical authority in this domain.

Part IV

Bergson and *Le Temps Réel*: The Hypothesis of Universal Time

The analysis thus far has traced Bergson's critique of pre-relativistic conceptions of time, situated *Duration and Simultaneity* within its intellectual and historical context, and outlined the widely discussed exchange with Einstein during his 1922 visit to Paris—shortly before the book's publication. The discussion then turned to Bergson's engagement with the central conceptual challenges posed by relativity theory, including relativistic effects, the structure of space-time, the twin paradox, and the role of acceleration. Together, these lines of inquiry establish the conceptual groundwork for this part of the thesis, which considers Bergson's metaphysical response to Einstein's framework and its broader philosophical implications.

The central difficulty in this project lies in the concept of simultaneity, which Bergson initially treated as a spatial construct, but which assumed greater philosophical significance over the course of his analysis. Simultaneity ultimately became a focal point in *Duration and Simultaneity*, informing many of its core arguments—including his controversial reading of the twin paradox. Since the problem of coexistence cannot be addressed without reference to simultaneity, Bergson was compelled to examine it with particular rigour. In this respect, this thesis endorses During's view that simultaneity is as fundamental to the nature of time as duration and succession (During 2023, p. 179). It is this concept that Bergson sought to illuminate through his philosophy of time.

This section therefore examines Bergson's reconceptualisation of time in light of the theory of relativity, arguing that *Duration and Simultaneity* seeks to articulate a philosophical model of time that integrates both lived experience and the formal structures of modern physics. Central to this endeavour is his hypothesis of a universal time, comprising two interrelated elements: the concept of duration, derived from his earlier philosophy and refined through engagement with Einstein; and the notion of real time, formulated through a critical reading of relativity.

Accordingly, this part begins by examining Bergson's metaphysical reinterpretation of Einstein's theory, drawing attention to both its limitations and the more contentious aspects of Bergson's response. It then turns to his conception of time, focusing in particular on the notions of real duration and real time, and their potential integration within the hypothesis of universal time. The final chapter addresses the question of simultaneity and the related problem of coexistence, as these arise from both the relativistic framework and Bergson's evolving philosophy of time.

Chapter 8. The New Metaphysics For Einstein's Theory

Bergson's critical engagement with the theory of relativity, as examined in the preceding part of the thesis, enabled him to formulate a metaphysical framework capable of addressing the conceptual challenges posed by Einstein's groundbreaking theory. This chapter seeks to clarify the philosophical motivation behind Bergson's intervention by identifying the perceived limitations within relativity theory that prompted his inquiry, and by outlining the metaphysical assumptions implicit in Einstein's position. It then turns to the argument that has attracted the most sustained criticism from Bergson's detractors, contending that, despite potential inaccuracies or misjudgements on his part, this argument merits a more nuanced and in-depth analysis. In doing so, the chapter prepares the ground for a detailed examination of the central components of Bergson's proposed metaphysics in the following chapter.

As noted, Bergson did not oppose the new physical theory; on the contrary, he embraced it as a transformative framework that opened new paths for philosophical reflection. He regarded relativity as a crucial development that enabled a more precise confrontation between his concept of duration and the scientific conception of time—one no longer anchored in Newtonian absolutes. Bergson spoke of Einstein with admiration, even describing him as a genius, and expressed sincere appreciation for the groundbreaking shift in physics that characterised the early twentieth century. Nevertheless, despite the profound influence of Einstein's work on the physical sciences, Bergson argued that it failed to provoke a corresponding transformation within metaphysical thought. This disjunction, he contended, necessitated a philosophical response—one that his own metaphysical framework sought to provide.

The analysis of the theory of relativity undertaken by Bergson revealed a fundamental tension at its core: while the theory marked a departure from pre-relativistic physics, it simultaneously introduced an invariant that resists relativisation—namely, the constant speed of light (cf. Campo & Ronchi 2022, pp. 142–144, 161). Rather than dismantling the foundations of absolute reference underpinning Newtonian mechanics, relativity reconfigures them by positing a new universal constant. In doing so, it preserves a deterministic framework closely aligned with the mechanistic worldview characteristic of pre-relativistic science. This continuity extends beyond the physical sciences domain, informing a broader conceptual perspective, reinforcing a vision of the universe as governed by necessity and law-like regularity (cf. Miquel 2022, p. 91; Landeweerd 2021, p. 46).

This interpretation of Einstein's theory is not without precedent, particularly when considered in the light of responses to the Bergson–Einstein debate. At the time, numerous commentators regarded the theory of relativity as preserving a fundamental continuity with pre-relativistic frameworks, including Newtonian mechanics and Cartesian philosophy (cf. Canales 2015, p. 32), especially with respect to the worldview it implicitly endorsed[211]. Indeed, numerous commentators have argued that relativity reaffirms a long-standing belief in the certainty and objectivity of scientific knowledge. Friedman and Donley, in their interdisciplinary analysis, suggest that while the metaphors of science have shifted, the deterministic cosmology of pre-relativistic physics endures. Whereas Newton envisioned a divine clockmaker as the universe's governing force, Einstein's model substituted this figure with the image of a cosmic computer programmer (Friedman & Donley 1989, p. 66). Furthermore, the constancy of the speed of light, as a fundamental invariant across all domains of physics, reinforces a mechanistic and law-governed conception of the universe (Costa de Beauregard 1969b, p. 249).

Bergson's critique centres on the reconfiguration of time in Einstein's theory of relativity, where time is treated as a functional variable within each reference frame: calculable and coordinated, yet incapable of accounting for novelty or genuine becoming (cf. Fradet 2012, p. 58). While the theory marked a significant transformation in the physical sciences regarding the concept of time by abandoning Newtonian absolutes, its philosophical implications are less radical. Relativity replaced the linear, universal time of pre-relativistic physics with Minkowski's space-time: an irregular, four-dimensional continuum that nevertheless retains essential deterministic features. Within this model, time becomes observer-dependent, varying with relative velocity and gravitational influence. Though it may dilate or contract, it always does so according to fixed, law-governed relations. This geometrisation of time rendered it measurable, but not experienced, reinforcing a spatial bias that, for Bergson, undermined any genuine account of becoming (Landeweerd 2021, p. 46)[212].

Einstein's shift from Newton's conception of time as a container for events to viewing it as a fourth spatial dimension does not fully dismantle the possibility of time existing independently of change—it is precisely this static concept of time that directly contradicts Bergson's perspective. The notion of time as an objective, quantifiable phenomenon, though revolutionary in its scientific context, fails to address the deeper metaphysical dimensions of time, which, for Bergson, lie in its lived, dynamic nature. Einstein's geometric time, in Bergson's view, is a construct subject to

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211 As Guerlac (2006, p. 40) observes, Einstein's commitment to determinism is crucial to understanding the fundamental divergence between Einstein and Bergson.

212 Gunter advances this line of interpretation further, suggesting that Einstein's universe—so thoroughly structured by spatial determinism—ultimately eliminates time altogether, privileging a conception of reality that is fundamentally space-like rather than time-like (Gunter 2023, p. 124).

mathematical formalisation, which facilitates its spatialisation[213] (cf. Landeweerd 2021, p. 41), which, in turn, enables the presence of classical assumptions in Einstein's theory[214]. He argued that the assumption of time as spatial is not merely a technical oversight but a foundational commitment that requires a profound philosophical re-examination. This spatialisation, according to Bergson, ignores the non-measurable, irreducible quality of subjective time, which cannot be reduced to the deterministic, law-bound framework that underpins the theory of relativity (cf. Landeweerd 2021, p. 44).

On the one hand, the theory of relativity presents time as independent of the conscious observer, determined solely by the exchange of optical signals and the resultant synchronisation of clocks (cf. Landeweerd 2021, p. 46). On the other hand, as Murphy notes, Einstein's philosophical position reveals a deeper scepticism regarding the ontological status of time. He considered time to be a phenomenological construct—an illusion generated by human perception rather than a feature of physical reality (Murphy 1999, p. 70). This stance becomes more explicit in Einstein's later writings, where he increasingly drew on Spinozist metaphysics. According to this perspective, all finite entities, including particles, are conceived as modes of a single, unified substance—an absolute reality that expresses itself through determinate structures (Gunter 2023, p. 124). Within such an ontological framework, change and temporality are relegated to the realm of appearance, reinforcing a metaphysical vision that privileges necessity, structure, and coherence over becoming and contingency.

Even within the scientific domain, Einstein's conception of time has been criticised as unsatisfactory. Olivier Costa de Beauregard, a French physicist and philosopher, argues that in the theory of relativity, time is effectively reduced to a mathematical function of the speed of light—a reduction that, in his view, yields the most spatialised conception of time imaginable. This account, he contends, fails to acknowledge the irreducible originality of temporal experience (Costa de Beauregard 1969b, p. 250). In aligning himself more closely with Bergson's understanding of

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[213] Čapek offered an opposing interpretation, arguing that Minkowski's formulation of space-time represents a "dynamisation and temporalisation of space rather than a spatialisation of time" (Čapek 1969, pp. 314–315). On this basis, he proposed the alternative term *time-space* to better reflect the temporal dimension inherent in the concept (see also Čapek 1971). Curiously, the Polish term for space-time—*czasoprzestrzeń*—literally translates as time-space, with the components merged into a single word, signalling an integrated unity regardless of lexical order. Nonetheless, this linguistic nuance does not significantly alter the prevailing interpretation, in which time is still typically conceived as linear or as a functional element within mathematical formulations, rather than as a dynamic or qualitative dimension.

[214] The classification of both Newtonian and Einsteinian physics as forms of classical physics is thus justified not only on scientific grounds—due to their shared commitment to determinism—but also on philosophical grounds, as both endorse a metaphysical outlook more aligned with classical conceptions of order and necessity than, for instance, quantum mechanics.

time, Costa de Beauregard expresses the hope that future advances in physics might produce a conception more attuned to its experiential reality (cf. Costa de Beauregard 1969b, p. 250). For Bergson, time could not be subsumed under the technical procedures of measurement or observation; it exceeds the purview of science, demanding recognition as a qualitative and lived phenomenon. He insisted on an experiential conception of time—one that reflects the universality of temporal lived experience. Thus, for Bergson, time must be approached not merely as a scientific construct, but as a shared existential condition.

The philosopher sought to develop an alternative metaphysical framework that could both engage with the scientific advances of relativity and preserve the irreducibility of lived temporal experience[215]. This tension is particularly apparent in Einstein's later alignment with Spinozist metaphysics, which, for Bergson, collapsed time into a system of causal necessity. In doing so, it negated the reality of duration, spontaneity, and genuine novelty—key elements of Bergson's philosophical vision (cf. TFW, pp. 208–209). What Einstein regarded as a theoretical breakthrough, Bergson saw as a continuation of metaphysical conservatism, albeit under a more sophisticated form.

Significantly, Einstein himself acknowledged the limitations of his framework in capturing the qualitative reality of time. As reported by Carnap, Einstein expressed profound uncertainty regarding the experience of "the Now"—a dimension central to human consciousness but absent from the formal structure of physical theory (cited in Prigogine 1984b, p. 441)[216]. For Bergson, this omission was not a minor theoretical gap but a symptom of a broader metaphysical oversight: the failure to recognise time as an irreducible, experiential, and creative force. Consequently, his critique was not an outright rejection of the scientific validity of relativity, but rather a call to reconsider its philosophical implications—specifically, to restore the centrality of time as a lived and dynamic phenomenon.

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[215] In this light, Jacob Holsinger Sherman rightly contends that Bergson's engagement with Einstein's theory transcends mere philosophical commentary, constituting instead a direct challenge to the philosophical foundations underlying Einstein's scientific framework (cf. Holsinger Sherman 2020, p. 144).

[216] The quotation from Carnap originally appears in *The Philosophy of Rudolf Carnap* (Schilpp, 1963), where Carnap recounts a revealing exchange with Einstein. He notes: "I remarked that all that occurs objectively can be described in science: on the one hand, the temporal sequence of events is described in physics; and, on the other hand, the peculiarities of man's experiences with respect to time, including his different attitude toward past, present and future, can be described and (in principle) explained in psychology. But Einstein thought that scientific descriptions cannot possibly satisfy our human needs; that there is something essential about the Now which is just outside of the realm of science" (quoted in Prigogine 1984b, p. 441; also in Prigogine 1984a, p. 214). This reflection highlights Einstein's own recognition of a tension between scientific formalism and lived temporal experience. In a similar vein, Étienne Klein questions whether physics is equipped to address the phenomenon of the "Now", or whether such inquiry inevitably leads beyond the confines of the physical sciences (cf. Étienne Klein 2022, p. 13).

Accordingly, Bergson's critique sought to sever the remaining connections between the theory of relativity and the classical, spatialised conception of time (Murphy 1999, p. 69). He aimed to reorient the theory's metaphysical implications by articulating a concept of time that could emerge from within the framework of relativity itself. As noted, Bergson's intervention in the philosophy of science, particularly through *Duration and Simultaneity*, situates his thought outside the confines of the analytic tradition, whose emphasis on logical formalism and linguistic precision often precludes the kind of metaphysical inquiry he pursued. This external positioning is not incidental but necessary; only by resisting the metaphysical assumptions that continue to underpin scientific theories in classical terms could Bergson attempt to recover relativity as a genuinely novel account of time[217].

Within the framework of space-time, Bergson insisted that scientific engagement with temporality must remain attentive to the inner, lived dimension of experience. He argued that neglecting this experiential aspect risks subordinating scientific theories to "a metaphysic grafted upon science" (DS, p. 63)—that is, to a set of ontological assumptions that permeate theoretical models without being subjected to critical scrutiny. Bergson criticised the tendency of scientists to construct theoretical frameworks based on sense data, only to disavow the experiential foundation from which those frameworks initially arose. In his view, such a methodological stance does not constitute genuine progress in scientific understanding; rather, it signals a regression into unexamined metaphysical commitments that undermine the possibility of an adequate account of time.

At the core of Bergson's critique of the theory of relativity lies a profound concern with its reliance on reference frames—a methodological commitment that, in his view, fragments perspective and confines observation within isolated systems. For Bergson, this approach risks reducing the universe to a collection of self-contained centres of perception, akin to Leibnizian monads, each detached from a broader, unifying context (During 2009, pp. 240–241). He argued that this is not merely an epistemological or technical issue, but one that has deep metaphysical implications. By fracturing reality into discrete, isolated reference frames, relativity, in his view, distorts the nature of becoming by disregarding the open totality, or Tout, which is essential for genuine becoming. Without this holistic perspective, time becomes disjointed and static—a "block universe" in which all events are predetermined and exist in a fixed, unchanging state.

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[217] As Durie (1999, p. v) aptly puts it, Bergson sought "to rescue the theory from the paradoxical interpretations to which it had been subjected, interpretations whose contradictions, we may surmise, stem precisely from their rootedness in the classical world-view".

This conception of time, for Bergson, reflects the dominant scientific worldview, which treats reality as though it is given to all observers simultaneously, rather than as something that endures and unfolds[218]. The scientific tendency, he argued, is to model time as a mere coordinate on a fixed framework, overlooking the dynamic, lived experience of duration[219]. In contrast, Bergson sought to reassert the unity of consciousness and matter, contending that both must be understood as participating in an ongoing, interconnected process. He envisioned the universe as a continuous, intertwining melody, where each moment of duration contributes to the broader harmony of becoming. As Élie During aptly captures, this dynamic, evolving whole can be likened to the "basso continuo," a musical metaphor that evokes the enduring, interwoven nature of reality (cf. During 2009, p. 242).

A central and contentious aspect of Bergson's metaphysics is the role he ascribed to consciousness in shaping our understanding of time. In his critique of relativity theory, he emphasised a deep commitment to prioritising the real, participating observer over abstract instruments, such as clocks, in explaining the nature of time. Barbara Skarga, in her analysis, rightly highlights that Bergson recognised the impossibility of excluding the observer from any experiment, regardless of how objective the instruments employed may be (Skarga 2014, p. 92)[220]. While relativity establishes relations between different frames of reference, it is only through an individual's lived experience that one can directly engage with a specific frame of reference (Riggio 2016, p. 220). Bergson's stance here sharply contrasts with the aims of special relativity, which seeks to depict the universe as independent of the real observer's perspective (cf. Mullarkey 2000, p. 112), effectively disregarding the role of consciousness in determining time.

This aspect of Bergson's critique has been frequently contested—not only by scientists but also by philosophers, as illustrated by Pearson and Mullarkey (2002). They argue that Bergson transformed the observer into a phenomenological consciousness, rather than acknowledging the possibility of the observer being a machine or device (Pearson & Mullarkey 2002, p. 29). The most

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[218] Such a perspective can be likened to the concept of "Laplace's demon", a hypothetical entity possessing perfect knowledge of the universe, capable of determining the precise location of every atom and, based on this information, predicting the motion of all particles throughout space and time (Canales 2020a, p. 31).

[219] In line with critiques of eternalism, Kurt Gödel offers a significant perspective, though his conclusions differ from Bergson's. Gödel dismisses the possibility of change and the passage of time (Gödel 1970, p. 558), advocating instead for a static interpretation of Minkowski's space-time, as explored by Čapek (cf. Čapek 1991, pp. 331–332).

[220] Although experiments may be conducted using instruments rather than human observers, the role of the observer remains indispensable in interpreting and understanding the results. Skarga further argues that the continued development of physics will likely support Bergson's position, stating that "every act of cognition already changes reality, as surely as any change occurring in the observed reality is not indifferent to the observer" (Skarga 2014, p. 92).

prominent scientific critique, however, comes from the distinguished physicist and philosopher of science Michał Heller. Heller contends that Bergson introduced extraneous elements into the theory of relativity by embedding conscious observers into its framework. He maintains that Bergson's focus on the experiences and consciousness of observers amounts, at best, to a fundamental misunderstanding of the theory (Heller 2006, p. 285).

Heller's critique of Bergson's emphasis on conscious observers within the framework of relativity theory stems from his broader conception of the philosophy of science's role[221]. For Heller, philosophers of science should refrain from introducing extraneous metaphysical elements into scientific theories. Their primary responsibility is to provide a rigorous and faithful reconstruction of a theory in its original form, preserving its internal coherence and conceptual structure. Any deviation from this methodological discipline, Heller argues, constitutes a significant error in philosophical practice (Heller 2006, p. 286). In his view, the philosopher's task is not to challenge or alter a theory's foundational assumptions but to clarify its conceptual framework and elucidate its world as it stands (cf. Heller 2006, pp. 285–286)[222]. In this respect, Heller's approach aligns with the dominant analytical tradition in contemporary philosophy of science, which prioritises clarity, precision, and the integrity of a theory's original structure.

These critiques, however, fail to engage with the core of Bergson's intervention. Rather than distorting the theory, Bergson's incorporation of conscious observers provides a critical expansion of relativity, imbuing it with a profound metaphysical dimension. Through his analysis, Bergson exposes the often-unexamined assumptions underpinning Einstein's framework—assumptions that, within mainstream scientific discourse, typically remain unnoticed or implicit. In unveiling these hidden presuppositions, Bergson uncovers what he termed the "hidden metaphysics of savants", thus drawing attention to the philosophical foundations that are frequently overlooked or insufficiently addressed in the development of modern scientific theories. In so doing, Bergson not only critiques the theory itself but also invites a broader reflection on the nature of scientific knowledge and its deep interconnection with metaphysical considerations.

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221 Although Heller hesitates to classify Bergson as a philosopher of science, Bergson's work in *Duration and Simultaneity* undeniably constitutes a philosophical investigation with far-reaching implications for the philosophy of science. As this thesis contends, Bergson's approach should be recognised as an engaged philosophy of science, offering critical insights into scientific concepts and challenging established frameworks.

222 A perspective on the philosophy of science that closely mirrors Heller's interpretation is found in the works of Reichenbach. Reichenbach argues that philosophers of science should focus on the logical analysis of a completed theory, including the relationships that validate it. Interestingly, however, he suggests that even physicists—especially those as creative as Einstein—should prioritise their own "creed" over the "logic of the analytic philosopher" (Reichenbach 1970, p. 291).

It is, nevertheless, important to acknowledge that Bergson's critique of relativity was not without error. His engagement with the physical dimensions of the theory—particularly in relation to acceleration and time dilation—was occasionally marked by inaccuracies. A notable example is his disproportionate emphasis on metrical simultaneity, especially in the twin paradox. A further point of contention lies in Bergson's interpretation of space-time. While he understood Einstein's universe as constituted by geometric relations (Worms 2005, p. 43), Bergson conceptualised space-time as a "hyper-cinematograph"—a metaphor that extends his earlier critique of the cinematographic illusion, as articulated in *Creative Evolution* (CE, pp. 296–299; During 2012b, p. 156; During 2023, p. 186). Although initially philosophically productive, this analogy ultimately became, as During argues, an epistemological hindrance. It led Bergson to conflate distinct temporal notions, preventing a clear distinction between local time—the time registered along the specific space-time trajectory of a measuring instrument—and relative time, which refers to the time measured within a particular inertial frame (cf. During 2012b, pp. 154–155). In other words, Bergson's framing fails to account for the differentiation between time measured locally—by a clock at rest within a reference frame and designated by a concerete space-time trajectory (local time) and time measured from another reference frame, especially one that is moving relative to the observed system (relative time).

However, the inaccuracies occasionally found in Bergson's arguments do not compromise his project's overall coherence or philosophical significance—namely, the construction of a metaphysics of scientific time that, crucially, foregrounds the problem of coexistence. From a contemporary standpoint, it is reasonable and necessary to resist the inclination to dismiss an entire body of thought based on isolated errors, particularly when comparable, if not more significant, inaccuracies by some of Bergson's most vocal critics have gone largely unexamined. A particularly telling example is that of the physicist Jean Becquerel, one of Bergson's principal interlocutors, whose treatment of the twin paradox—set out in his correspondence with Bergson and subsequently included in the first appendix to *Duration and Simultaneity*—contains conceptual missteps that have received little critical scrutiny. Becquerel's interpretation of the twin paradox fails to align with the theoretical foundations of today's physics, revealing inconsistencies in the treatment of time intervals as measured by observers. His analysis rests on the flawed assumption that Peter's clock would merely register a direct multiplication of Paul's elapsed time—an inference that unduly simplifies the relativistic framework. In a rigorous critique, Jean-Marc Lévy-Leblond highlights that this reasoning overlooks the finite speed of electromagnetic signalling, which is fundamental to the observation process. Once this constraint is properly accounted for, the resulting temporal relations diverge significantly from Becquerel's conclusions and, in certain respects, prove counterintuitive. In his analysis of the twin paradox, Lévy-Leblond disputes Becquerel's assertion that, although Paul's journey lasts two years, it would appear— from the vantage point of the stationary observer, Peter—to span two centuries. According to Bercquerel, at the midpoint of the journey—after one year on Paul's clock—Paul would observe that a hundred years had elapsed for Peter; conversely, Peter would register only one year of elapsed time for Paul. Lévy-Leblond refutes this interpretation, arguing that after one year of travel, Paul would perceive no more than two days as having elapsed on Peter's clock, which contradicts Becquerel's assumptions. This discrepancy, however, arises from the distinction between proper time and observed time, the latter being shaped by the finite speed of signal transmission and the relativistic conditions governing observation. Moreover, Lévy-Leblond explains that during Paul's return journey—lasting another year from his frame of reference—he would observe Peter's clock accelerating dramatically, registering the passage of nearly two centuries on Earth, minus the two days previously observed during the outward phase of his voyage. This abrupt shift in apparent flow of time reflects the asymmetry introduced by the reversal of motion and highlights the significance of signal transmission in relativistic observation. Conversely, from Peter's perspective, during the first half of Paul's journey, his own calendar would record the passage of two centuries, similarly reduced by two days. In a striking reversal, it is only during these final two days—corresponding to the second year of Paul's voyage—that Peter would observe Paul completing his return and reappearing on Earth (cf. Lévy-Leblond 2007, p. 254)[223].

While Becquerel's formulation of the twin paradox contains conceptual inaccuracies—particularly in his treatment of observational time—these do not undermine the fundamental point he correctly identified: that the two observers, Peter and Paul, would experience different durations. Time dilation remains an empirically verified consequence of relativistic physics. By the same reasoning, any inaccuracies in Bergson's engagement with contemporary physics should not automatically discredit the broader philosophical claims he advanced. His analyses of real time and simultaneity, especially as they pertain to the problem of coexistence, merit critical consideration not on the basis of isolated errors, but in light of their overall conceptual coherence and philosophical significance.

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[223] Admittedly, evaluating Becquerel's by the standards of contemporary physics may seem unjust. Yet is this not precisely what Bergson's critics have done—and continue to do?

Chapter 9. From Real Duration to Real Time

Although Einstein's theory of relativity marked a profound transformation in the history of physics, it retained a fundamentally deterministic worldview that rendered it open to philosophical critique. As the preceding chapter demonstrated, Bergson engaged seriously with the conceptual and metaphysical implications of relativity, seeking to determine whether its conception of time could be reconciled with his own. This chapter builds on that analysis by turning more directly to the philosophical substance of Bergson's intervention, focusing in particular on his treatment of scientific time in *Duration and Simultaneity*. It situates this account in relation to his established notion of duration and evaluates its ongoing relevance within both philosophical and scientific contexts.

While time occupies a central place in Bergson's philosophy, he maintained that it had been persistently misunderstood throughout the history of thought, primarily due to its conflation with spatial measurement. This diagnosis underpins much of his work, as he sought to recover the specificity of temporal experience through the concept of duration. The advent of relativity, however, introduced a new challenge[224]. In *Duration and Simultaneity*, Bergson offered his most sustained response, asking whether his notion of a universal duration—comprising heterogeneous rhythms—could be reconciled with the relativistic conception of time in modern science—an inquiry cosmological in scope (cf. During 2009, p. 240; Worms 2009, p. 8). His aim was not to reject science, but to develop a philosophical framework capable of accommodating its insights without reducing time to its merely quantitative dimensions. This ambition—to construct a philosophy that complements rather than opposes science—remained a defining feature of his metaphysical project (cf. During 2007a, p. 260).

The chapter is structured around two interrelated dimensions of Bergson's thought: duration and real time. This distinction should not be understood as indicating a strict ontological separation; rather, it functions as a methodological device to clarify the conceptual nuances of his position. References to real time inevitably arise in discussions of duration, just as reflections on duration inform his analysis of real time. This mutual implication reinforces a central claim: temporality cannot be conceived without duration, just as the empirical articulation of time remains unintelligible without reference to real time.

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[224] Bergson noted that "The theory of relativity has supplied us with the occasion for resuming it [studies on time] and carrying it a bit further" (DS, p. 6).

The discussion of duration focuses exclusively on *Duration and Simultaneity*, without attempting a full reconstruction of Bergson's broader philosophy of time, which was addressed in the first chapter and lies beyond the scope of this one. Nevertheless, the analysis draws on insights from his earlier writings where relevant, as Bergson's treatment of duration in the book on relativity represents both a continuation and a refinement of his previous work. The chapter begins by examining how Bergson rearticulates the notion of duration in response to the scientific conception of time found in relativity theory. This provides the foundation for a critical exploration of his concept of real time and the potential for their integration within a metaphysical hypothesis of universal temporality.

9.1. Real Duration

In *Duration and Simultaneity*, Bergson devoted considerable attention to his concept of duration, articulating its key characteristics in dialogue with the emerging framework of relativity theory. These reflections build upon the philosophical trajectory of his earlier works, in which the notion of time is progressively developed. Beginning with *Time and Free Will*, where duration is introduced as inherently bound up with change and motion, and continuing through *Matter and Memory* and *Creative Evolution*, which elaborate a robust conception of enduring reality, Bergson gradually advances towards attributing a physical dimension to duration[225]. This development, however, becomes fully articulated only with the advent of the theory of relativity in the early twentieth century, which provided the conceptual conditions for rethinking duration in relation to the contemporary scientific understanding of time.

There are several persistent misconceptions surrounding Bergson's conception of time. Chief among these is the widespread conflation of real time (*le temps réel*), as developed in *Duration and Simultaneity*, with real duration (*la durée réelle*), a concept originating in his earlier philosophical writings. Equally mistaken is the tendency to equate real time with either lived duration or the duration of matter (cf. (During 2009, p. 230; Sinclair 2020, p. 23; Fradet 2012, p. 65). Such interpretations overlook the fact that these terms refer to distinct dimensions of temporality. Duration, as Bergson conceived it, denotes a lived, qualitative experience of time that resists spatialisation and escapes mathematical formalisation (cf. During 2023, p. 188). Real time, by

[225] For instance, Bergson's claims in *Matter and Memory*—specifically that matter is imbued with duration—laid the groundwork for his later reflections in *Duration and Simultaneity* on the duration of the universe, which is examined in the analysis that follows.

contrast, refers to a form of temporality that, while still rooted in experience, lends itself to measurement and scientific articulation. This physical time is best understood as the time of matter, insofar as matter "lends itself to measurement" (During 2022b, p. 111). To conflate duration with real time, therefore, is to overlook the critical evolution in Bergson's thinking and to misrepresent the nuanced distinction he drew between qualitative and measurable forms of temporality.

A particularly influential misreading of Bergson's concept of real time—at least within Polish philosophical literature—appears in Stanisław Borzym's interpretation of *Duration and Simultaneity*. Writing in the 1980s as a prominent Polish commentator on Bergson's thought, Borzym contends that Bergson conflated real time with lived duration, thereby abandoning the position he had previously articulated in *Matter and Memory* regarding the multiplicity of rhythms of duration (Borzym 1984, pp. 256–257). On this reading, Bergson's critique of the plurality of times in relativity theory is construed as a repudiation of his earlier claim that multiple rhythms of duration—each exhibiting a distinct degree of tension relative to the universe—can coexist. Borzym further argues that real time cannot be measured, since he identifies it with the lived experience of time, as opposed to the measurable time of physics (Borzym 1984, p. 257). However, this interpretation overlooks the key development in *Duration and Simultaneity*, where Bergson explicitly maintained that real time, while rooted in lived experience, is also susceptible to measurement. Far from renouncing his earlier insights, Bergson rearticulated them within a framework that brings his philosophy of time into a dialogue with contemporary physics.

Notably, equating real time with duration is unsupported when considering the distinctiveness of Bergson's concepts across his various works. He developed his philosophical insights through a series of books, each presenting an autonomous framework with its own conceptual structure. Accordingly, the conception of time in *Creative Evolution* diverges significantly from that in *Time and Free Will*, and a similar distinction can be made with respect to the time in *Duration and Simultaneity* (During 2009, pp. 229–230). Moreover, in *Duration and Simultaneity*, the boundary no longer primarily separates duration from spatialised time, as was the case in his earlier works, but instead distinguishes between real time and fictitious times (Panero 2016, p. 156). This shift reflects a significant evolution in Bergson's understanding of time, demonstrating a more nuanced and developed perspective in his later writings.

The distinction between real time and duration warrants further examination, particularly with regard to the inherent complementarity between these two concepts. As Jankélévitch points out, this complementarity is grounded in the immediate, intuitive apprehension of real time by consciousness, which constitutes a fundamental aspect of Bergson's theory of duration (cf.

Jankélévitch 2015, p. 25). Furthermore, During argues that real time facilitates the integration of distinct durations, even when their measured elapsed times differ. Additionally, real time plays a crucial role in the philosophical analysis of how concrete durations coexist, a consideration essential to Bergson's broader temporal framework (cf. During 2023, pp. 188, 178).

Another widespread misinterpretation of Bergson's conception of time in *Duration and Simultaneity* is the assumption that real time—mistakenly equated with duration—is synonymous with psychological time, and thus opposed to physical time (cf. During 2020a, p. 40; During 2022b, p. 111). Einstein initially introduced this dichotomy between psychological and physical time during his debate with Bergson on 6 April 1922, previously examined in this discussion[226]. Influenced by Einstein's framing, many commentators have misread Bergson's reflections on real time as privileging subjective, internal experience over objective, scientific accounts of temporality. Within this interpretative framework, Bergson is frequently seen as either emphasising the psychological dimension of time or rearticulating physical concepts in phenomenological terms. His critics, in particular, have accused him of replacing the "observer" with a phenomenological consciousness (Pearson 2002, p. 64).

In truth, Bergson neither privileged a psychological account of time nor attempted to reduce physical concepts to the domain of subjective experience. As previously discussed in connection with his debate with Einstein, Bergson did not defend the psychological dimension of time in opposition to physical time[227]; rather, he rejected such dichotomies altogether. Real duration, as he conceived it, is neither synonymous with psychological time[228] nor a mediating category that reconciles psychological and physical temporalities. To interpret his position in these terms is to misrepresent its philosophical complexity and to trivialise the ambitions of *Duration and Simultaneity* (cf. During 2009, p. 225). As During rightly emphasises, Bergson's arguments should not be read through a psychological lens (During 2007b, p. 86). Similarly, Bergson did not seek to undermine scientific thought by appealing to phenomenological subjectivity or by replacing empirical observation with introspective analysis (Pearson 2002, p. 64). Instead, his project was to reconceptualise the nature of time in a manner that remained philosophically rigorous, while

[226] Einstein, along with his philosophical interpreter Ernst Cassirer, fundamentally misconstrued Bergson's intentions in this context (cf. Scott 2006, pp. 190–191).

[227] During contends that "If the philosopher and the scientist were confronting each other from the two opposite sides of the subjective/objective divide, they would be speaking at cross-purpose and their quarrel would appeal pointless, turning around a homonymous use of »time«" (During 2022b, p. 111).

[228] Cf. Worms 2005, p. 48: "The reality of duration is not of a merely psychological and interior order".

critically engaging with—rather than opposing—the theoretical developments of contemporary science.

The final—and arguably most damaging—misconception addressed in this thesis is the claim that Bergson's conception of duration in *Duration and Simultaneity* represents an attempt to revive the notion of absolute, universal time associated with pre-relativistic physics (cf. Čapek 1953, p. 43). While Bergson did indeed propose a hypothesis of a single universal time, equating this with the Newtonian model of absolute time constitutes a significant misreading. As outlined in the first chapter, Bergson consistently critiqued the metaphysical foundations of pre-relativistic physics, particularly its treatment of time, which he deemed fundamentally inadequate. His conception of universal time, therefore, does not signal a return to outdated scientific models; rather, it is a part of a broader philosophical endeavour to reconceptualise temporality beyond the reductive frameworks of classical physics.

Bergson's critique of Newtonian time was both longstanding and unequivocal, even during periods when it remained widely accepted in scientific discourse. Unlike the absolute time of pre-relativistic physics—which presupposes a privileged frame of reference and treats time as a substantial entity, often linked to the ether—Bergson conceived of time as a qualitative, continuous flow of duration, inseparable from lived experience. As Mark Sinclair observes, although certain passages in *Duration and Simultaneity* may appear to evoke Newtonian absolute time, the accusation that Bergson sought to restore it is ultimately unfounded. To interpret his proposal in such terms is to disregard the philosophical innovation at the core of his temporal theory and, as Sinclair aptly puts it, to imply that he postulated a return to a pre-Bergsonian time (Sinclair 2022).

This misreading is particularly striking given that even those scientists whom Bergson admired—such as Poincaré and Michelson—were committed to the idea of a universal time grounded in a privileged reference frame, typically associated with ether theory. However, Bergson explicitly rejected the notion that Newtonian time could be rehabilitated by assigning special status to conventionally chosen reference systems. As During notes, Bergson consistently denied that Newton's absolute time could be philosophically salvaged in this way (During 2022b, p. 109). In fact, his rejection of such frameworks further underscores his critical distance from both classical physics and reductive psychological interpretations. As Keith Robinson rightly observes, it is unfortunate that, even a century after the publication of *Duration and Simultaneity*, it remains necessary to correct persistent misunderstandings about what Bergson actually argued—and, more significantly, what he did not (Robinson 2022).

In his book on Einstein's theory, Bergson reaffirmed his distinctive conception of duration as the immediate, lived experience perceived as temporal flow. He maintained that individuals do not apprehend time as a sequence of discrete, measurable instants but as a continuous unfolding—a qualitative passage experienced directly and internally. Crucially, this continuity, or *durée*, does not presuppose the existence of a "thing" that passes; rather, it is the passage itself that endures. For Bergson, any attempt to arrest or quantify this flow inevitably distorts its nature, stemming from the imposition of spatial categories upon temporal experience. Duration, by contrast, is defined by the dynamic relation between before and after—not as juxtaposed points in time, but as mutually interpenetrating phases within an indivisible whole. Echoing his earlier philosophical writings, Bergson emphasised that duration is fundamentally bound up with memory and change, which preserve the past within the present and thus form a continuum irreducible to isolated moments or mathematical equations.

In *Duration and Simultaneity*, Bergson maintained the foundations of his earlier philosophy of time while extending and transforming them in response to developments in contemporary science. Beginning with the immediate, concrete experience of individual duration—central to his prior works—he broadened this concept to encompass the totality of reality. Drawing on his previous reflections on the duration of matter, Bergson reformulated his theory to accommodate what he termed "impersonal time", a notion developed through his engagement with the theory of relativity[229]. In this context, he re-examined and rearticulated the roles of body and consciousness, emphasising the dynamic, continuous, and indivisible nature of duration. This expansion of his temporal framework necessitated a corresponding reconsideration of consciousness and memory, extending these concepts beyond the human subject to include non-human and even inanimate forms of endurance. Only through this broadened perspective could Bergson formulate his hypothesis of a universal time—*le Tout*—conceived as a unified temporal field in which all individual durations participate.

In his 1922 book, Bergson reiterated that time is perceived through the lived experience of one's own endurance. He likened this experience to a melody—continuous, qualitative, and indivisible—unfolding throughout the entirety of conscious life. This temporal flow, he argued, cannot be broken down without fundamentally altering its nature; any attempt to divide it results not in a fragmentation of duration itself, but merely of the spatial representation imposed upon it—a distortion he evocatively compared to passing a blade through a flame (DS, p. 49). For Bergson,

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[229] Bergson first introduced the notion of "impersonal time" during his debate with Einstein on 6 April 1922 (cf. Bergson 2020, p. 168).

as discussed earlier, duration—whether of the self or of the external world—resists quantification precisely because it is not composed of discrete, measurable units. At the heart of this conception lies the role of consciousness, which, as he elaborated in *Matter and Memory*, is not a cognitive faculty in the scientific sense, but an active, temporal force intrinsically bound to memory. Through memory, consciousness retains the past within the present, thereby sustaining the continuity of temporal experience (Guerlac 2020, p. 109). Bergson's focus, therefore, is not on analysing consciousness in scientific terms, but on using it as a philosophical notion to illuminate the temporal perception of reality.

According to Bergson, reality comprises not only the inner continuity of duration but also its active participation in the external physical world. Although he did not fully elaborate on this participatory aspect, it can be understood—following Guerlac—as the interaction between an individual's duration and their environment, mediated through the body (cf. Guerlac 2020, p. 114). Guerlac characterises this interplay as a form of participation between nature and consciousness, in which individuals remain attuned to their inner temporal experience while simultaneously engaging with the world around them (cf. Guerlac 2020, p. 113)[230]. Through the body, reality is apprehended as a process of ongoing invention and emergence—an experiential unfolding in which time is neither a fixed entity nor something passively given once and for all, but a continual becoming shaped through lived engagement with the world (Scott 2006, p. 184).

Having established the connection between individual duration and the external world, Bergson sought to articulate their mutual endurance within a shared temporal framework. In his exchange with Einstein, he contended that all human consciousnesses appear to "live in the same duration" (Bergson 2020, p. 167), suggesting that individual experiences, despite their qualitative differences, unfold simultaneously within a common temporal field. He identified this shared field with what he called "impersonal time", arguing that even when events are regarded as occurring independently of any particular perspective, they nevertheless take place within a universal temporal milieu—"an impersonal time in which all things flow" (Bergson 2020, p. 168).

Moreover, since individual consciousnesses are immersed in impersonal time, they project their own duration onto the external world, which thus comes to appear as enduring alongside them. Bergson contended that this projection develops gradually, as individuals find no compelling reason to confine their experience of duration solely to the immediate vicinity of the body (DS, p. 45). This

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[230] The distinction between "inside" and "outside" is not ontological but methodological, as there can be no "internal world" from which one is excluded, just as there can be no "outside world" of which one is not already a part (cf. Lapoujade 2007, pp. 441–442).

extension of temporal continuity beyond the self forms a pivotal aspect of Bergson's temporal ontology. As Guerlac notes, this move marks an expansion of the scope of duration—not only beyond individual inner experience but also beyond the evolutionary framework outlined in *Creative Evolution*, with its emphasis on the *élan vital*—towards what Bergson ultimately refered to as the "duration of the universe" (Guerlac 2021, p. 112)[231].

What Bergson termed the duration of the universe emerges from his broader hypothesis of universal time—an idea that posits all forms of consciousness, including that of matter, as participating in a single duration, albeit at different rhythms. This unity, which he designated *le Tout*, entails a form of impersonal consciousness and memory that is fundamentally distinct from human faculties. According to Bergson, the universe endures as a whole, and with this endurance arises its own consciousness and memory, since no reality can endure without some form of consciousness (cf. DS, p. 48). However, this consciousness bears no resemblance to human consciousness, nor does this memory function like personal memory. Rather, as Guerlac notes, it should be understood as "memory with change itself" and as an impersonal form of consciousness, both of which remain inseparable from the measurable time of physics—what Bergson elsewhere described as the "time of things" (cf. Guerlac 2020, p. 110).

The conceptual risks involved in ascribing consciousness and memory to the universe, particularly given the anthropomorphic connotation of these terms, were not lost on Bergson (DS, p. 48). To address this concern, he proposed a thought experiment: one should envisage a moment of universal time as a static "snapshot", entirely without duration and detached from any form of consciousness. Attempting then to recall a second moment and relate it to the first reveals the necessity of a minimal form of memory—what Guerlac characterises as "something like a memory of reality itself" (Guerlac 2020, p. 111). Without such a connective memory, the two moments would remain disjointed, yielding nothing more than isolated instants devoid of succession—and, therefore, of any meaningful conception of time. Through this reflection, Bergson reinforced the view that even the most abstract and impersonal conception of time necessarily presupposes a form of continuity—namely, the memory and consciousness intrinsic to duration itself.

The transition from individual to universal duration, as Bergson conceived it, entails a mode of perception grounded in the interplay between inner and outer realities—what Guerlac describes as a participatory relation between interiority and exteriority (Guerlac 2020, p. 111). This

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231 Bergson's position is best understood as a philosophy of time rather than a philosophy of being—a distinction drawn by Merleau-Ponty in relation to Schelling (cf. Guerlac 2021, p. 104).

participation is made possible by the impersonal consciousness immanent in *le Tout*[232], the universal duration within which all consciousnesses endure. On this basis, Bergson argued that all things flow within impersonal time, irrespective of human consciousness, precisely because they constitute the medium through which enduring consciousnesses are interconnected (cf. Durie 1999, p. xxiii). An event becomes temporal not merely by occurring, but through its participation in a shared "flow of duration". In doing so, it functions as a point of convergence between different durations, generating a unified experience that unfolds within a single temporal continuity (cf. Durie 1999, p. xxiii). Without such participation, events would be reduced to discrete instants, lacking succession or depth. The same applies to scientific or "objective" time: it acquires the status of time only through its implicit grounding in the continuity of duration.

In his analysis of relativistic effects, Bergson examined a specific scenario involving two systems, one effectively a duplicate of the other. He concluded that observers situated within these systems would experience the same duration. Although he did not explicitly address the rhythms of duration in this context, his earlier writings suggest that he would have endorsed their equivalence[233]. This claim carries significant philosophical weight, particularly in light of the reciprocal structure of the systems and the interchangeability of the observers. It raises the compelling question of whether, under such conditions, the two observers might be regarded as the same person. Moreover, Bergson extended his conclusion regarding the identity of (rhythms of) duration—albeit with minor modifications—to all other systems (cf. DS, p. 82). It follows from his assumption that he can legitimately represent the totality of reality through two (reciprocal) systems. Thus, any statement regarding these two systems must be—following his assumption—inferred to any other system of the universe. The philosophical repercussions of Bergson's claims not only reveal his distinctive conception of physical reality but also expose certain limitations in his analysis—most notably, an unwavering adherence to the principle of reciprocity, which leads to a conceptual conflation of the systems and, ultimately, of the observers themselves.

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[232] Barry Allen proposes that, in Bergson's thought, consciousness is merely another name for duration (Allen 2023, p. 22). However, this interpretation appears reductive, as Bergson's notion of impersonal consciousness does not equate to duration itself, but rather serves as the means by which participation in universal duration (*le Tout*) becomes possible.

[233] In *Duration and Simultaneity*, Bergson stated that "We see no reason why an observer transferring from one system to another should not react the same way psychologically, live the same inner duration, for supposedly equal parts of the same mathematical, universal time", and "The two people in S and S' can be led mentally to coincide, like two equal superimposed shapes; they will have to coincide not only with respect to the different modes of *quantity* but even, if I may so express myself, in respect to *quality*, for their inner lives have become indistinguishable" (DS, p. 81). He also uses epithets like "exactly the same duration" or "the same inner duration" (DS, p. 81).

Some scholars interpret Bergson's concept of duration through the example of a sailing boat observed from the river bank—a scenario he employed to demonstrate that a passenger walking on the deck in the direction of the boat's motion appears, from the perspective of a stationary observer on the shore, to move more slowly than previously assumed. Gilles Deleuze offers a notable reading of this example, suggesting that it reveals the coexistence of distinct rhythms of duration corresponding to the water, the bird, and the observer standing on the riverbank (Deleuze 1991, p. 80). Although Bergson did not intend the example to illustrate rhythms of duration, Deleuze's interpretation nonetheless captures a significant aspect of the experiential multiplicity that underlies Bergson's philosophy of time.

Craig A. Lundy offers a related yet distinct interpretation, proposing that one's duration brings together two autonomous fluxes of motion—namely, the movement of the water and the birds (Lundy 2018, p. 107). He contends that duration, understood in this way, constitutes the source of temporality (Lundy 2018, p. 108). This interpretation aligns with Bergson's broader view that the world is perceived as enduring through its participation in individual duration. However, Lundy's argument becomes more contentious when he claims, drawing on Bergson's critique of special relativity, that "objective time is relative with respect to duration" (Lundy 2018, p. 108). This assertion risks blurring the intricate interconnection between Bergson's concepts of scientific time and duration.

In his interpretation, Deleuze also introduces conceptual difficulty by conflating Bergson's notion of physical time with that of duration, thereby attributing distinct local temporalities to different rhythms of duration. This reading misrepresents the intent behind Bergson's example. His primary concern in the sailing boat scenario was with the physical effects of motion. Bergson emphasised that, from the standpoint of a stationary observer on the riverbank, the moving boat appears contracted—an effect characteristic of motion that encompasses the various modifications experienced within the moving system. Deleuze's reading thus risks distorting the explanatory scope of the example by replacing physical considerations with metaphysical ones that Bergson did not explicitly introduce in this context.

In *Duration and Simultaneity*, Bergson further developed his account of duration in relation to the concept of space-time. He argued that a philosophical perspective which affirms the reality and efficacy of duration could, in principle, accommodate Minkowski's formulation of space-time, insofar as it acknowledges the distinctiveness of the fourth dimension. However, as noted, Bergson also emphasised the fundamental impossibility of recovering real duration from Minkowski's framework. In his view, the very duration that initially enabled the fusion of time and space into a unified schema is subsequently eliminated, with time reduced to a mere fourth dimension of space, stripped of its qualitative character. Bergson thus regarded this reduction as a metaphysical misstep masquerading as science—one that denies the lived experience of duration, which, paradoxically, underlies the conceptual construction of space-time itself.

A review of the preceding examples of Bergson's engagement with duration within the context of relativity theory highlights persistent difficulties in drawing a clear distinction between physical time and duration, thereby necessitating a more nuanced analysis of both. While Bergson's account of duration in *Duration and Simultaneity* has already been outlined, further clarity requires a deeper examination of his conception of real time and its relation to lived duration. Central to this task is the notion of movement, which, for Bergson, mediates the transition from duration to real time. The following analysis, therefore, turns to Bergson's reflections on the interplay between time and motion, with particular emphasis on the dynamics of bodily movement. This line of inquiry culminates in a close reading of his treatment of movement in *Duration and Simultaneity*, through which the transformation from experiential to measurable time is brought into sharper focus.

In developing his account of motion in the book on relativity, Bergson revisited and elaborated on insights from his earlier works—most notably *Matter and Memory* and *Introduction to Metaphysics*—to challenge the prevailing scientific conception of motion as the quantifiable displacement between fixed spatial points. He rejected this spatialised and abstract model, arguing instead that movement is not reducible to a sequence of positions in space, but must be understood as a qualitative, continuous transformation—an expression of change that unfolds in duration. For Bergson, genuine motion is an indivisible process, irreducible to static geometrical representations, and more accurately captured by the lived temporality of experience than by any spatial metric.

In *Duration and Simultaneity*, Bergson critically examined the historical development of the scientific understanding of relative motion, tracing its trajectory from the early formulations of Galileo and Descartes to the groundbreaking contributions of Einstein (cf. DS, pp. 35–37). He observed that, although the concept of motion as inherently relative had emerged as a recurring theme in scientific discourse since the time of Galileo, it had not always been pursued with sufficient depth or conviction (DS, p. 35). Bergson attributed this reticence to the perceived difficulty of conceptualising the relativity of accelerated motion—a challenge that, in his view, had long hindered its full acceptance.

Even the relativity of uniform motion, Bergson argued, posed significant conceptual challenges. Physicists often circumvented these difficulties by abandoning attempts to account for such motion within the framework of Galilean relativity. Instead, they tended to rely on explanatory models that implicitly presupposed a privileged frame of reference. As a revealing example of this tendency, Bergson pointed to the conventional scientific practice of describing the motion of a train while assuming the tracks to be stationary—even when acknowledging the reciprocal nature of the movement; that is, conferring that the motion could just as legitimately be attributed to the tracks in relation to the train (cf. DS, p. 35).

The reluctance to extend the principle of relativity to accelerated motion, which persisted until Einstein's formulation of the general theory of relativity, Bergson described as "an important date in the history of ideas" (DS, p. 37). However, his purpose in revisiting this intellectual trajectory was not merely to provide a historical account for its own sake. Instead, he sought to use the evolving treatment of motion within physics to uncover the deeper conceptual tensions that underpinned its scientific application. In doing so, Bergson aimed to emphasise the philosophical implications of these developments, particularly their role in the broader shift from lived duration to real, measurable time.

To articulate the conceptual shift from duration to real time, Bergson examined the relationship between motion as a dynamic, lived reality and its spatial representation. Central to this analysis is his distinction between two distinct types of movement. The first involves movements that one performs oneself and experiences internally—movements directly apprehended through consciousness and embedded within lived experience. The second type refers to movements observed in others, accessible only from an external, visual standpoint, and lacking the immediacy of inner experience.

To uncover the true nature of motion in both cases, Bergson turned to the epistemological framework of intuition, developed in *Introduction to Metaphysics*. There, he characterised intuition as the distinctive method of metaphysics—complementary to, yet divergent from, the abstract methods of science. Its primary aim, he argued, is to penetrate the inner reality of things by experiencing them from within. Accordingly, to grasp the essence of one's own motion, the metaphysician must perform it themselves, perceiving it simultaneously from within and without. By contrast, understanding the movement of others necessitates the exercise of sympathy—another concept Bergson elaborated in his previous works—as a means of apprehending the inner experience of another being.

In addition to the distinction between movements directly experienced and those merely observed in others, Bergson identified a third category concerning the motion of matter in general. Such motions, he argued, are apprehended as the "reciprocal displacement of bodies in space" (DS, p. 35), thereby reinforcing the principle of the relativity of motion and rendering the classical notion of absolute motion obsolete. From a metaphysical standpoint, however, Bergson cautioned against equating these spatial displacements with motion in its essence. Rather, he maintained that they represent only the visible manifestations of changes in inertia, not motion itself. Accordingly, the metaphysician may reasonably infer that the perception of reciprocal displacement merely registers the external signs of more fundamental dynamical processes—processes that remain inaccessible to direct perception yet underlie the phenomena observed.

Particular emphasis was placed on the primacy of movements one performs oneself, which Bergson regarded as the most philosophically significant form of motion. Although such movements may appear, from an external perspective, to amount to a mere reciprocal displacement, he argued that they in fact constitute "an absolute internal change occurring somewhere in space" (DS, p. 34). Bergson highlighted the dual nature of these movements: internally, they are experienced as muscular sensations embedded in the continuity of consciousness; externally, they are registered as visual events occurring in space. It is this convergence of individual, inward immediacy and objective, outward visibility, he contended, that renders such movement a fundamental basis for the scientific measurement of time.

Bergson further contended that the internal and external dimensions of movement are fundamentally interdependent: there can be no visual perception of movement without a corresponding internal change, just as there can be no measurable time without the lived experience of duration. He argued that real duration underpins the very possibility of measuring time, as it provides it with qualitative content and, consequently, with meaning. In representing the unfolding of time, Bergson observed that science typically relies on the Earth's rotation to establish a standard unit. Yet he maintained that this astronomical model is not essential. Rather, it is sufficient, he claimed, to conceive of duration as a form of motion in space, from which "the rest would follow" (DS, p. 52).

Accordingly, the concept of motion served Bergson as a methodological tool for clarifying the transformation of lived, qualitative duration into measurable, quantitative real time. Yet this is only one route through which he approached this philosophical transition. An equally critical method involves his treatment of simultaneity—a concept situated at the intersection of his metaphysical framework and his critique of Einstein's special theory of relativity. Simultaneity occupies a central place in both his broader philosophical inquiry and his effort to reconcile metaphysical insight with scientific accounts of time. However, before examining Bergson's analysis of simultaneity, it is necessary first to consider his notion of real time more closely, which provides the conceptual foundation for his understanding of simultaneity.

9.2. Real Time

Bergson's concept of real time is distinctive in that it emerges exclusively in *Duration and Simultaneity*[234], where it develops through his critical engagement with the principles of relativity theory. Why did Bergson require a new concept of time? As noted, although the notion of duration had been extensively developed in his earlier works, his engagement with the theory of relativity necessitated a more refined articulation of time as it is understood within the physical sciences—what he termed *the time of things*. This conception of time is defined by quantifiable intervals, typically measured by clocks and represented through the spatial displacement of their hands. While conventional understanding often equates such measurable time with duration, Bergson insisted on a fundamental distinction. In his view, duration is an irreducibly qualitative experience that resists mathematical representation. The divergence between duration and the abstract, spatialised time posited by relativity theory thus prompted Bergson to introduce a new conceptual category: *real time*.

What is the relationship between real time and other temporal constructs discussed in *Duration and Simultaneity*? As noted, real time stands in a complementary relationship to duration, sharing with it a grounding in lived experience, yet differing in that it allows for quantification. Crucially, real time should not be conflated with mathematical time, which is abstract and purely symbolic, nor with lived duration, which is qualitative and resists all forms of measurement (During 2012b, p. 141). One of the most significant distinctions to draw is that between real time and spatialised time. Although both can be subjected to measurement, real time cannot be reduced to the abstract, spatialised temporality that characterises the latter.

Notably, During situates the concept of real time in an intermediary position between pure duration and homogeneous extension. This intermediary status, he argues, accounts for the distinctive character of real time: it is neither reducible to mathematical abstraction nor identical with lived duration, yet it retains sufficient affinity with the latter to risk appearing, at times, nearly indistinguishable from it (During 2009, p. 282). On this reading, Bergson's project can be understood as an attempt to reconceptualise physical time by analytically tracing the point of

[234] However, Bergson had already used that term "real time" in his previous works, *Time and Free Will* and *Creative Evolution*, where it referred either to genuine conscious duration or to the flux and mobility of things—aspects that elude mechanistic analysis (During 2009, p. 278). In *Duration and Simultaneity*, Bergson explicitly reintroduced the term *temps réel* when highlighting philosophy's responsibility to assess the extent to which Einstein's conception of time can be regarded as "real" time (DS, p. 42; see also Bergson 2009, p. 39).

convergence between duration and *le temps commun*, thereby developing a novel theoretical account for understanding real time (During 2009, p. 279).

What is the basis upon which Bergson designated this form of time as "real"? What, precisely, did he mean by "reality" in this context? Bergson acknowledged that neither philosophers nor scientists can agree on what constitutes the real. Confronted with this impasse, he restricted his inquiry to a single uncontested reality: time itself (DS, p. 65). His approach involves proceeding only from propositions that would likely meet with general agreement. For Bergson, time is fundamentally characterised by succession—the presence of a before and an after—which intrinsically connects it to the concept of duration. As previously discussed, such a succession is intelligible only through the faculties of memory and consciousness; without them, even the measurable time of the sciences would lack temporal coherence. The critical question, therefore, is: what ensures that this succession is not merely apparent, but genuinely real?

In his examination of the concept of time, Bergson outlined the criteria for determining its reality. For him, the key to recognising the reality of something lies in whether it can be perceived or whether one can become conscious of it. He proposed that time could be conceptualised as a line, but only if the relation between its parts could be understood as a succession (DS, p. 66). This idea is central to his philosophy: time becomes real when it can be reorganised into a succession of moments, each one flowing into the next. In contrast, when time fails to exhibit this characteristic—when it cannot be experienced as a continuous succession—Bergson regarded it as unreal. This distinction becomes particularly significant in the context of his critique of relativity theory, where he argued that the time described within the theory, often depicted as an abstract, measurable quantity, fails to meet the conditions of "real" time.

In addressing the reality of time, Bergson rigorously adhered to facts, which he regarded as the foundation of scientific inquiry. As During notes, Bergson recognised only one legitimate authority in science: that of firmly established facts (During 2020a, p. 37). However, Bergson also maintained that scientific facts are not merely observed; rather, they are produced by scientific theories through their explanatory coherence (cf. During 2020a, p. 37). A theory, in this view, generates facts by providing a framework within which certain observations acquire the status of facts. This position is reflected in Bergson's treatment of the constancy of the speed of light. Although Einstein introduced this as a postulate, Bergson accepted it as a fact precisely because the theory of relativity endowed it with explanatory necessity. Thus, it is not empirical verification alone that confers factual authority, but the theoretical structure that renders a proposition intelligible and indispensable within scientific discourse.

Some scholars interpret Bergson's reliance on facts as indicative of an empirical orientation[235]. Čapek, for instance, contends that Bergson's philosophy exemplifies what may be called radical empiricism[236]—indeed, he argues that Bergson embodied this stance even before William James formally introduced the term (Čapek 1971, p. 193). Whether or not Bergson's epistemology can be categorised as empiricist, it is nonetheless marked by a consistent commitment to engaging with reality across both philosophical and scientific domains. His approach moves beyond abstract speculation to confront directly the foundational assumptions underpinning the theory of relativity. Central to this engagement is Bergson's distinction between "real time" and what he termed "fictitious times", a conceptual opposition formulated in response to the plurality of times posited by relativity. For Bergson, real time is that which is lived, or at least capable of being lived—time that is experienced, or experienceable, by actual physicists and characterised by a genuine succession of moments. In contrast, fictitious times are theoretical constructions devoid of any connection to lived succession; they are abstractions generated by the mathematical formalism of relativity and attributed to hypothetical or imaginary observers.

In academic discussions on Bergson's critique of the theory of relativity, the distinction between real time and fictitious times is often regarded as one of the most conceptually challenging aspects (During 2009, p. 283). At the heart of this difficulty lies the notion of fictitious times and the criteria by which a temporal framework is deemed "fictitious". According to Bergson, such times are not empirically measurable and are fundamentally linked to spatial representation. They are not experienced but merely conceived—abstract constructions resulting from the spatialised operations of measurement (During 2009, p. 283). On this view, fictitious times bear no relation to any lived or livable temporality; instead, they emerge as artefacts of the mathematical formalism of relativity. As During observes, they serve as idealised expressions of the transformations that affect temporal measurements when shifting between inertial frames (During 2022b, p. 110). Devoid of

[235] This thesis argues that the classification of Bergson as an empiricist, as suggested by certain commentators, is ultimately unconvincing. Bergson himself never adopted this label, and the term "empiricism" invokes a specific philosophical tradition, typically defined in opposition to another, like rationalism. His thought resists such binary categorisations, favouring instead a method that seeks to move beyond dualisms. This point becomes particularly significant when compared to Einstein, who, despite his engagement with empirical science, was more closely aligned with the tradition of logical empiricism (cf. Holsinger Sherman, 2020, p. 144). However, scholars such as During argue that Bergson's association of the real with what is perceived or perceptible clearly reflects an empiricist orientation (During 2009, p. 251). While such an interpretation identifies an important strand in Bergson's thought, it risks overlooking the extent to which his philosophy aims to transcend traditional epistemological divisions.

[236] Pearson contends that Bergson's empiricist orientation contributed to the problematic articulation of his position in *Duration and Simultaneity*, leading to widespread criticism and persistent misunderstandings. According to Pearson, this outcome was largely due to the excessive rigour of Bergson's philosophical demands, which extended beyond the practical requirements of physics as well as the internal boundaries of his own philosophical system (Pearson 2002, p. 65).

succession and detached from consciousness, these temporal constructs, for Bergson, remain theoretical fictions lacking any foundation in real time.

Bergson's principal motivation for engaging with the theory of relativity was to distinguish between real time and what he termed fictitious times (During 2009, p. 231). This distinction forms the core of *Duration and Simultaneity*, a point emphasised by Jankélévitch, who extends Bergson's analysis through complementary dichotomies such as the immediate versus the mediate, and the effective versus the attributed (Jankélévitch 2015, p. 26). Building on Bergson's conceptual framework, Jankélévitch introduces the notion of "idols of distance"—illusions that obscure the boundary between lived temporality and abstract representations.

Central to this critique is a well-known scenario from relativity theory involving two observers in separate inertial frames. The second observer, located in system S′, is not empirically perceived but merely posited, and is therefore fictitious in Bergson's terms. As previously discussed, Bergson compared this situation to the perspectival effect in vision, where distant objects appear smaller not due to an actual change in size, but as a consequence of spatial perspective. Analogously, the observer within the fictitious temporal framework of S′ is subject to illusions—foremost among these being the illusion of real existence. Jankélévitch's "idols of distance" aim precisely to expose such distortions, from the transformation of simultaneity into succession to the "unsolvable problems", like the twin paradox—all of which, for Bergson, result from conflating mathematical constructs with lived experience (cf. Jankélévitch 2015, p. 24).

A commitment to common sense—central to both his philosophy and his reflections on science[237]—profoundly shaped Bergson's conception of time. Within this framework, common sense is closely aligned with analytical reasoning—the method by which science approaches its objects through a range of specialised and partial perspectives, rather than through an immediate apprehension of the whole (Robinson 2022). This analytical orientation corresponds to the broader structure of common sense, which Bergson conceived as encompassing the totality of our practical and psychological knowledge (Worms 2005, p. 41). From this standpoint, science does not approach objects for their intrinsic value, but rather according to the pragmatic demands of human activity. Scientific knowledge, therefore, is neither neutral nor absolute; it is shaped by the

[237] Bergson's use of terms such as "hypothesis" or "belief" serves to illuminate the dual character of his philosophical project—anchored, on one hand, in scientific discourse and, on the other, in the domain of common sense (During 2009, p. 249).

instrumental logic of common sense, which ultimately conditions how time is conceived, measured, and represented[238].

Contrary to Kügler's (2021) interpretation, Bergson did not endorse common opinion as a legitimate means for resolving theoretical ambiguities within scientific discourse. While he acknowledged the foundational role of common sense in scientific investigation—providing an initial conceptual orientation and grounding for empirical inquiry—he did not elevate it to the status of an epistemological authority. Bergson's position is more nuanced: although science emerges from the practical demands and schemas of common sense, it must ultimately transcend them. As Worms observes, science pushes to its limits the rupture between this action-oriented knowledge and the deeper structure of reality—one accessible only through a different mode of thought (Worms 2005, p. 41).

The concept of common sense, or *l'opinion commune*, occupied a foundational position in Bergson's philosophy, serving not only as the epistemological basis of scientific reasoning but also as a key element in the formulation of his hypothesis of universal time—an essential component of his theory of duration. As outlined earlier, this hypothesis encompasses both real duration and real time, and constitutes the central focus of Bergson's temporal analysis in *Duration and Simultaneity*. In this context, common sense underpins, for example, Bergson's claim that all human consciousnesses are fundamentally alike and partake in the same lived duration. He posited an imagined multiplicity of such consciousnesses, dispersed throughout the universe yet interconnected in such a way that they participate in a shared temporal experience. This imagined unity, according to Bergson, reduces the primacy of individual consciousness and gives rise to his conception of impersonal time (DS, p. 47)—an idea previously discussed in relation to the notion of duration. Nevertheless, he ultimately argued that such theoretical constructs are of limited relevance to the practical concerns of everyday life, where individuals typically focus on expanding their immediate physical environment through the imaginative exercise of their faculties.

In addressing the ambiguities inherent in common-sense assertions, Bergson characterised the concept of universal time as "a mere hypothesis". However, he emphasised that, despite its hypothetical status, the notion remains a well-founded belief that does not conflict with Einstein's theory. Bergson's conviction in the fundamental unity of time is further substantiated by his assertion that, without such unity, it would be impossible to comprehend nature as a coherent and

[238] It must be recognised that even proponents of relativity theory implicitly depend on common sense— at the very least to establish the simultaneity between an event and its recording by a clock (Worms 2002, p. 189).

connected whole (During 2007b, p. 89). Accordingly, Bergson sought a conceptual framework that would enable the unified conception of the universe's durations—allowing them to be brought together into a single whole, without reducing them to an absolute time that is fixed and detached from the process of becoming (During 2009, pp. 241–242).

Bergson identified a conceptual affinity between his hypothesis of universal time and certain interpretations of Einstein's theory, suggesting that the notion of a temporality shared across all entities may find an analogue within the scientific framework of relativity. Notably, Einstein did not initially characterise his theory as one of relativity in the conventional sense, but rather as a "theory of point of view" (During 2007a, p. 281). This phrase, however, should not be interpreted in phenomenological terms, as if the theory were confined to the subjective experiences of individual observers. Instead, Einstein's use of "point of view" designates the internal coherence or organic interdependence of the conceptual and mathematical structures that constitute the physicist's representational system (During 2007a, p. 283).

What is at stake in this formulation is not merely the relative perception of events from different observational standpoints, but a more fundamental philosophical concern: how the diverse durations that exist across the universe might be meaningfully connected and unified—a question that, as During argues, lies at the heart of the theory of relativity (During 2007a, p. 281). In response to this challenge, Bergson proposed a distinctive philosophical strategy that departs from the conventional scientific practice of adopting two distinct reference systems. Rather than treating these systems as interchangeable or equivalent, he advocated for a perspectival transition from one observer to another that preserves the irreducibility of each standpoint (cf. During 2007a, p. 290)[239]. This approach reveals the plurality of temporal rhythms, all unfolding within the dynamic continuity of a single, albeit complex, universal duration.

Ultimately, Bergson argued that Einstein's theory of relativity did not undermine but rather substantiated his hypothesis of a single, universal time, especially in light of the shortcomings of pre-relativistic physics in justifying such a concept. He pointed to Lorentz's transformation formulae as scientific evidence lending support to his metaphysical stance. At the same time, he critically examined the relativistic concept of multiple temporalities, maintaining that these are not ontologically equal. This allowed him to argue that Einstein's theory, far from opposing common sense, actually upheld its logic and, by extension, his own philosophical framework.

[239] Campo and Ronchi persuasively argue that this perspective involves a significant philosophical challenge. In response, they compellingly advance the notion of sympathy as a possible "organum scientiae"—a guiding principle or instrument of understanding (Campo & Ronchi 2022, p. 153).

The central claim concerning the relationship between Bergson's metaphysical notion of time and the theory of relativity rests on the view that, although Einstein's framework allows for a plurality of times, these are not ontologically equivalent. He maintained that real time pertains to the reference frame in which the actual physicist is situated. To illustrate this point, Bergson introduced a thought experiment involving two physicists, each located in a distinct inertial frame. From the perspective of the first physicist, situated in frame S, the phenomenon of time dilation is observed not within their own system, but in the motion of an external system, designated S′. Yet from the standpoint of the second physicist, positioned in S′, the situation appears symmetrical: time dilation is likewise attributed to the external frame S. On this basis, Bergson argued that each observer experiences the passage of time in the same way[240], and that the systems are, in this respect, interchangeable. He thus concluded that each reference frame embodies one real time, thereby preserving the notion of a universal time within the relativistic framework.

The central conclusion of Bergson's argument is that the plurality of times posited by the theory of relativity is merely mathematical, rather than indicative of multiple, ontologically distinct temporal realities. For Bergson, no inertial frame holds ontological precedence; the temporal metrics of each are relative and mutually dependent. This position reflects Einstein's rejection of a privileged reference frame, replacing it with the principle of reciprocity. Accordingly, Bergson maintained that an observer in frame S is equally justified in attributing temporal succession to an external system S′ as an observer in S′ is in identifying simultaneities within their own frame. Such reciprocal symmetry, he argued, implies a single, shared temporal reality: one real time in which all observers, irrespective of their relative positions or motions, are equally embedded. It is this underlying unity—obscured by the apparent multiplicity of temporal coordinates—that Bergson sought to recover within the relativistic framework.

If Bergson's analysis were confined to the claim that all systems within the Einsteinian universe share the same physical time, his position would indeed be untenable from the standpoint of relativity theory. However, in formulating his seemingly "paradoxical" assertion, he narrowed the scope of his argument. Rather than addressing every system in the universe, Bergson focused on a more specific and illustrative case: two inertial reference frames, S and S′, treated as

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[240] According to Bergson's philosophy of duration, it is impossible to claim that two individuals can identically experience time. Yet, his ultimate conclusion aligns with this very notion: the distinction between the two dissolves, for they are, in essence, not separate individuals but manifestations of a single, unified consciousness.

interchangeable on the grounds that one is effectively a duplicate of the other (DS, p. 81)[241]. Within this restricted scenario, he contended that the observers in S and S′ could be led to mentally coincide—that is, to experience the same duration. It is on this basis that he claimed both systems partake in one real time, thereby affirming the continuity of lived duration beneath the apparent multiplicity of temporal perspectives.

By contrast, Bergson observed that the worldview of pre-relativistic physics presupposed the existence of a privileged frame of reference. As a result, each inertial system was conceived as occupying a distinct position or maintaining a unique relation to an absolute central frame—even in cases where two systems might be considered duplicates (DS, pp. 80–81). Based on this assumption, Bergson argued that, although such systems could be assigned identical mathematical times, it remained impossible—within the constraints of this theoretical model—to demonstrate with strict logical certainty that observers in each frame experience the same inner duration, and thus participate in the same real time (DS, p. 81). While he conceded that it may be reasonable to suppose a shared lived duration between the observers, he insisted that such an inference could not be upheld with the "rigour and precision" (DS, p. 81)—unlike the conclusion permitted within the relativistic framework.

Following Bergson's interpretation, the well-known example from special relativity—two inertial reference frames, S and S′, whose observers register different time readings—reveals a divergence that pre-relativistic physics is fundamentally unequipped to address. Grounded in the assumption of a privileged frame of reference, a defining feature of the Newtonian worldview, pre-relativistic physics could not interpret such discrepancies as merely mathematical, as Bergson contended relativity does. Admittedly, pre-relativistic physics did not engage with systems moving at velocities approaching the speed of light; it was confined to phenomena within the so-called medium dimensions, where relativistic effects are negligible. Consequently, it never confronted the issue of divergent time readings between reference frames. Instead, all systems were understood to participate in a single, absolute temporal order: Newton's universal time.

However, if the plurality of times introduced by special relativity were interpreted through the conceptual framework of pre-relativistic physics—as well as the notion of unilateral relativity—then, according to Bergson, one would be compelled to conclude that systems S and S′, even if structurally identical, possess genuinely distinct times. On this reading, absolute time would be

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[241] This analysis sets aside the question of whether Bergson's restriction of his conclusion stemmed from an awareness of its inapplicability to the general theory of relativity or from the mistaken assumption that the principle of reciprocity extends to all systems within Einstein's universe. This thesis leans towards the latter interpretation.

located in the privileged frame S, while the simultaneity registered within it would break down when observed from the perspective of the duplicate system S′, owing to its relative motion. In this way, Bergson highlighted the incompatibility of pre-relativistic assumptions with a purely mathematical interpretation of the plurality of times, thereby drawing a sharp contrast with the reciprocity that underpins Einstein's special relativity.

In this light, it is unsurprising that Bergson extolled the achievements of the theory of relativity. He argued that the theory not only advanced both science and philosophy but also lent substantial support to his hypothesis of universal time. For Bergson, Einstein's theory, much like his own philosophical project, affirmed the existence of a single real duration, with all other times functioning merely as symbolic abstractions. Nevertheless, Bergson's defence of the reality of a singular time remains open to critique—particularly his extension of the principle of interchangeability from inertial to non-inertial frames. His tendency to depict reference systems as duplicates constitutes a simplification that overlooks the importance of their actual coexistence (During 2009, p. 299)—a feature which, ironically, might furnish support for his own conception of universal time. The analysis that follows seeks to develop this line of argument further.

Chapter 10. The Fundamental Problem of Coexistence

The concept of simultaneity—closely linked to the question of coexistence—occupies a central place in Bergson's conception of time. In *Duration and Simultaneity*, it serves as a crucial lens through which he seeks to elucidate the nature of real time and its relation to lived duration. This analysis focuses on that account, situating it within Bergson's broader engagement with Einstein's theory of relativity. In his earlier works, Bergson attributed little philosophical significance to simultaneity, privileging succession as the defining feature of temporal experience and viewing simultaneity as characteristic of spatialised time. However, the emergence of relativity theory prompted a shift in emphasis: simultaneity became philosophically indispensable—not only within physics but for any serious philosophy of time seeking to engage with scientific thought. The following discussion traces the evolution of Bergson's treatment of simultaneity, ultimately foregrounding the deeper issue of coexistence that underpins his critique.

While the first part of this chapter draws primarily on *Duration and Simultaneity*, with reference to Bergson's earlier writings, the second moves beyond the strict confines of his argument to critically assess and further develop his account of temporality, particularly with regard to coexistence. Although this concept is implicit within his broader metaphysical framework, Bergson's limited engagement with accelerated reference frames—most notably in his (mis)reading of the twin paradox—restricted his ability to formulate a coherent account of coexistence within the context of relativistic physics. His analysis remained confined to reciprocal inertial systems and failed to address adequately the complex geometries of space-time that are central to Einstein's theory. In light of this limitation, the chapter aims both to clarify the philosophical implications of this omission and to extend the idea of coexistence beyond Bergson's original formulations, while remaining faithful to the spirit of his philosophy of time.

The analysis is divided into two parts. The first traces Bergson's progression from the concept of duration to that of real time, as briefly noted in the previous chapter. It examines the nature of simultaneity and the methods by which it may be established, with particular emphasis on Bergson's thought experiment involving a superhuman observer and a world of microbes—an example that helps to clarify how simultaneity is conceived within his framework. The second part revisits the twin paradox, situating the notion of real time within the context of space-time geometry. This provides a basis for a more thorough investigation of how the twins might be understood to coexist, and how this issue contributes to Bergson's critique of relativity.

10.1. Bergson On Simultaneity

Bergson's initial engagement with the concept of simultaneity in *Time and Free Will* situates it in a relatively marginal position, functioning merely as a transitional element—a "hyphen"—linking time and space. This treatment is further developed in *Creative Evolution*, where simultaneity is addressed more concretely as a means of marking successive positions along a trajectory (cf. During 2009, p. 284). It was only in response to the scientific developments introduced by the theory of relativity that Bergson came to recognise the need to revisit and substantially reconceptualise the philosophical significance of simultaneity (cf. Durie 1999, p. vii). As the concept assumed increasing prominence within physics, he was compelled to reassess its status—not merely as a peripheral notion, but as central to any scientifically grounded conception of real time.

In *Duration and Simultaneity*, the concept of simultaneity assumes a central role, marking a significant shift in Bergson's philosophical engagement with time in response to the theory of relativity. Previously treated as a marginal or derivative feature of temporal experience, simultaneity now becomes pivotal to understanding the nature of real time. For Bergson, it is through this concept that one can grasp how real time—conceived as both measurable and irreducible to spatial extension—emerges from pure duration. Simultaneity thus functions as a mediating category, bridging the continuous flow of lived experience and the discrete instants that structure scientific time. It reconciles intuitive duration with formal measurement, enabling the transformation of qualitative temporal experience into a form amenable to scientific representation, without reducing it entirely to spatial constructs (During 2009, pp. 282–283).

To clarify the transition from pure duration to real time, Bergson introduced a crucial distinction between two forms of simultaneity. The first concerns the coincidence of two external instants within separate motions, which enables the measurement of a temporal interval. The second, by contrast, involves the coincidence of these external instants with corresponding moments in an individual's inner duration, thereby conferring genuine temporal significance upon the act of measurement (DS, p. 57). While the former form underpins the scientific conception of time as measurable and objective, the latter—anchored in lived experience—is largely overlooked within scientific discourse, which remains preoccupied with external synchronisations and quantifiable instants. However, this reliance on measurable simultaneity entails an implicit assumption: that time can be entirely reduced to a series of countable intervals. Bergson challenged this presupposition, arguing that by privileging discrete instants and measurable simultaneities, science fails to apprehend the qualitative nature of duration, which ultimately resists complete spatialisation.

As noted, the theory of relativity conceives simultaneity primarily in terms of synchronisation of spatially separated clocks. Bergson, however, argued that this scientific conception implicitly presupposes a more fundamental form of simultaneity, one rooted in the continuity of lived duration. This deeper, experiential simultaneity makes clock synchronisation possible; for without presuming a form of simultaneity that is independent of, and prior to, mechanical coordination, the very act of synchronisation would be rendered meaningless—there would be nothing to synchronise, no framework within which synchronisation could occur. For Bergson, then, the scientific measurement of time tacitly depends upon a mode of temporal co-presence that it cannot itself fully account for—one that emerges not from external measurement but from the inner continuity of duration (DS, p. 55).

What, then, is this form of simultaneity that lends temporality to scientific time measurement? Bergson identified it as the simultaneity of flows—a concept deeply embedded in the structure of duration. Unlike the mere coordination of external instants, this form of simultaneity arises from the consciousness's ability to hold phenomena together within a shared temporal frame. Bergson characterised this experience as the perception of elements that are "divided without being split up" (DS, p. 52), signifying a unity that preserves the distinctiveness of its components. It illustrates how diverse sensory inputs—such as typing sounds, the aroma of coffee, and street noise—can be apprehended not as disconnected events, but as components of a unified temporal experience. Whether these events are apprehended as separate or unified depends on the focus and scope of one's attention.

Crucially, consciousness's capacity to hold such events together in an indivisible act of awareness endows them with simultaneity (Durie 1999, p. viii). Without such synthesis, events that merely coincide externally would remain disconnected, lacking any intrinsic temporal unity. This perspective aligns with Merleau-Ponty's insight that simultaneity is not inherent in things themselves (Merleau-Ponty 1964, p. 185), but conferred by consciousness. On this account, consciousness does not simply register simultaneous events; it actively institutes their temporal relatedness, rendering simultaneity a function of lived experience rather than an objective feature of the world.

Bergson further clarified that external flows can be considered simultaneous only insofar as they are integrated into the same duration as the perceiving consciousness. When attention is directed exclusively inward, the duration experienced remains strictly one's own. However, when attention extends outward to encompass phenomena beyond the self—such as sights, sounds, or movements—these external flows may be drawn into the same experiential field. In such cases, they are apprehended together within a single, indivisible act of perception, becoming part of the same duration (DS, p. 52). Simultaneity, therefore, is not a relation that exists independently between objects, but a function of conscious synthesis—a unifying operation performed by consciousness itself. As Durie notes, only those objects present to consciousness in this integrative way can meaningfully be regarded as simultaneous (Durie 1999, p. viii).

Thus, for Bergson, the most fundamental form of simultaneity is the simultaneity of flows—a mode of temporal coexistence rooted in duration and sustained by the consciousness apprehending it. Nevertheless, he also turned his attention to the simultaneity of instants, arguing that an instant is not merely analogous to a mathematical point but is also intrinsically connected to duration. A mathematical point only becomes a temporal instant when placed within the context of duration; without such context, the instant remains devoid of temporal significance. As Bergson observed, an instant might be conceived as a potential termination of duration—only if duration were to cease, which it never does (DS, p. 53).

For the instant to become real time, in Bergson's view, it must not only be embedded within duration but also situated within spatialised time. In this framework, time is represented as a continuous line composed of discrete, successive points, each corresponding to the position of a moving body at a given instant. However, these instants are not objective features of reality but rather mental abstractions, whose status and meaning are shaped through the conceptual framework and language through which motion and change are represented. According to Bergson, this mental representation of time arises from identifying real time with spatialised time, allowing for the general discussion of time that transcends concrete durations. Consequently, to attribute genuine temporality to such instants, one must move from the simultaneity of flows to the simultaneity of instants—that is, one must abstract from the concrete experience.

To elaborate, Bergson argued that the simultaneity of flows and the simultaneity of instants are not opposed, but rather mutually reinforcing and fundamental to the structure of temporal experience. The concept of an instant, he maintained, presupposes the continuity of flowing experience, which is itself grounded in duration. However, the transition from the simultaneity of flows to that of instants entails a conceptual abstraction—namely, a detachment from lived duration and a reconceptualisation of time as a spatial dimension. This process, which Bergson termed the *spatialisation* of time, enables the alignment of past, present, and future along a single representational axis, thereby producing the illusion of their coexistence (DS, p. 59). Although duration resists mathematical quantification, spatialised time permits a mode of measurement that is standardised and communicable. Crucially, Bergson insisted that this spatialised time does not entirely efface temporality: insofar as consciousness remains active, it continues to infuse the abstract, spatial framework with the qualitative richness of real time.

But what, ultimately, is the purpose of this transformation? Why did Bergson insist on the necessity of transitioning from the simultaneity of flows to the simultaneity of instants? He regarded this shift as indispensable not only for enabling a generalised discourse on time but, more fundamentally, for anchoring temporal experience to clock time—that is, for establishing a correspondence between lived simultaneity and a specific temporal reading (Pearson & Mullarkey 2002, p. 31). This alignment between two forms of simultaneity renders time susceptible to measurement and allows it to be articulated within shared frameworks of reference (cf. Scott 2006, p. 186). Furthermore, it plays a crucial role in grounding the concept of physical simultaneity—that is, simultaneity at a distance, defined by the synchronisation of disparate clock readings across spatial intervals (cf. During 2008a, p. 267). In this light, one of the principal objectives of *Duration and Simultaneity* is to demonstrate how the conversion of the simultaneity of flows into the simultaneity of instants enables the transition from lived duration to real time.

This prompts a critical question: is the notion of spatialised time—infused with duration through consciousness, as articulated in *Duration and Simultaneity*—identical to the spatialised time that Bergson so rigorously criticised in his earlier works? In texts such as *Time and Free Will*, Bergson offered a sustained critique of conventional conceptions of time, which he characterised as predominantly spatial and, as such, fundamentally incompatible with the notion of duration. Similarly, in *Duration and Simultaneity*, he warned against what he described as “the metaphysics immanent in the spatial representation of time” (DS, p. 61), advocating a sceptical stance towards the assumption that spatialisation offers a more precise representation of what he regarded as a misconceived idea of “pure duration” within human consciousness. For Bergson, spatialised time remains a theoretical construct—an abstraction that diverges from the lived, qualitative immediacy of duration. And yet, the form of spatialised time that emerges through the transition from the simultaneity of flows to the simultaneity of instants assumes a distinct function. Although it remains conceptually separate from duration, this spatialised time becomes indispensable to the articulation of scientific or “real” time, insofar as it enables the coordination, comparison, and measurement of time necessary for a temporal discourse.

Bergson’s treatment of simultaneity operates across multiple conceptual levels, extending beyond the previously examined distinction between the simultaneity of flows and that of instants.

He further introduced a critical distinction between intuitive and learned simultaneity. Intuitive simultaneity refers to the immediate, lived perception of events as occurring together—rooted in consciousness and irreducible to external measurement. Learned simultaneity, by contrast, is a constructed notion, grounded in the coordination of clock readings rather than in direct experience. Crucially, however, Bergson argued that learned simultaneity presupposes intuitive simultaneity: the act of associating an event with a particular clock reading already involves an implicit recognition of simultaneity at the level of consciousness. Intuitive simultaneity, then, provides the experiential foundation upon which the very possibility of learned simultaneity rests. Accordingly, Bergson's primary philosophical concern lay with intuitive simultaneity, which he regarded as fundamental to any coherent account of temporal measurement.

In developing his account of simultaneity, Bergson identified a fundamental tension between scientific abstraction and lived experience, particularly regarding the perception of spatial separation between simultaneous events. Scientific reasoning and common sense typically assume that simultaneity applies irrespective of spatial distance, a premise Bergson acknowledged as conceptually indispensable, since the entire structure of science, he observed, relies on the capacity to represent the universe schematically through spatial models[242]. Yet he also emphasised the limitations of such representations. Revisiting a thought experiment from his earlier work, Bergson proposed a hypothetical universe in which all processes occur at twice their normal speed. While this modification would leave scientific formulations unaffected, it would profoundly alter the temporal experience of a conscious observer. Extending this reasoning, he imagined an expanded or contracted universe in which dimensional proportions remain constant (cf. DS, p. 56). Even in such a universe, where scientific calculations would still hold, the perception of simultaneity would vary according to the observer's scale and conscious awareness. Thus, for Bergson, although science may abstractly maintain simultaneity across spatial distances, the lived experience of simultaneity is inextricably shaped by the temporal and spatial conditions of consciousness.

The question of spatial distance between events regarded as simultaneous is particularly relevant to Bergson's conception of intuitive simultaneity. He acknowledged the conceptual intricacy of this form of simultaneity, noting its resistance to straightforward definition. Crucially, Bergson argued that immediate perception—central to intuitive simultaneity—could, in principle, encompass spatially distant events, depending on the observer's vantage point or the perceptual apparatus through which simultaneity is apprehended. To illustrate this, he devised a thought

[242] "No physics, no astronomy, no science is possible if we deny the scientist the right to represent the whole universe schematically on a piece of paper" (DS, p. 56).

experiment involving a hypothetical superhuman being endowed with a vastly extended field of vision, capable of perceiving the simultaneity of events separated by immense distances in much the same way that humans perceive the simultaneity of proximate events (Bergson 2020, p. 169; DS, p. 86). From this superhuman perspective, events that appear successive to ordinary human consciousness could be perceived as truly simultaneous.

Bergson developed a parallel line of reasoning through his widely cited example of microbes, discussed in *Duration and Simultaneity* and reiterated during his public exchange with Einstein on 6 April 1922. He envisioned microscopic organisms situated at two points, E and H—E representing an event and H the corresponding clock reading. This example serves to illustrate that a spatial distance perceived as simultaneous by human observers would, for these organisms, appear temporally extended due to their radically different perceptual scale. In this scenario, an intelligent[243] microbe, equipped with two microbial clocks, would synchronise each clock with one of the events and regard them as simultaneous only if the clock readings coincided. While human clocks are synchronised through the exchange of optical (electromagnetic) signals—based on the assumption that the signal travels symmetrically to and from its destination—Bergson proposed that microbial clocks would require a method of synchronisation appropriate to their own scale (cf. Bergson 2020, pp. 169–70).

In an intriguingly ironic fashion, Bergson extended his microbe thought experiment by imagining a hypothetical dialogue between these microscopic observers and Einstein himself. Challenging Einstein's assumption of simultaneity between event E and the human clock reading at H, the microbes would reject such a claim based on their own perceptual framework. From their perspective, what appears simultaneous to a human observer would be experienced as successive. Bergson imagined them replying that, in fact, they are more Einsteinian than Einstein, since they fully acknowledge that simultaneity, from the standpoint of an external observer, lacks any intuitive or absolute character (Bergson 2020, p. 170; DS, p. 56).

The dictum that microbes are "more Einsteinian than Einstein" quickly became a touchstone among scholars, who cite it as a concise summation of Bergson's critique. Fundamentally, the remark underscores the futility of seeking absolute simultaneity—understood as the exact coincidence of two clock readings—even at the microbial scale. Bergson's thought experiment demonstrates that for any such determination of simultaneity, one can always imagine smaller

[243] Notably, the description of the microbe as "intelligent" is significant, as it indicates that the microbe represents the scientific perspective—one in which simultaneity is defined by the coordination of clock readings (cf. During 2009, p. 287).

beings—“submicrobes”—for whom the same events would register as merely successive. Hence, no lived experience can provide a basis for absolute simultaneity (cf. During 2020a, p. 41).

Extending this insight, Bergson argued that simultaneity is not intrinsically limited to proximate events; it can be extended to occurrences separated by vast distances, contingent on the perceptual scale involved. In doing so, he dismantled the illusion that there exists a divinely ordained, universally shared “now” encompassing all observers, irrespective of how accurate the measuring instruments may be (cf. Mullarkey 2000, p. 115). If no moment is commonly experienced across all frames of reference, then the notion of absolute simultaneity becomes philosophically untenable (cf. Kreps 2015, p. 164).

The notion of a progressive imprecision in temporal perception leads to the imprecise intuitive simultaneity at infinity. This conceptual progression, envisioned through increasingly smaller observers equipped with ever-smaller microbial clocks, demonstrates that there is always a possibility of finding simultaneity at a distance, which is “hidden” under the intuitive simultaneity (cf. During 2009, p. 287). Despite its lack of absolute precision, Bergson cautioned against disregarding this intuitive grasp of simultaneity, or the broader psychological factors underpinning it (cf. Gunter 1969, p. 128). In his response to Henri Péron on 6 April 1922, he reaffirmed that this flawed, approximate mode of apprehension is nevertheless the only available means to determine events as simultaneous (cf. Bergson 2020, p. 172).

Bergson challenged what he regarded as the underlying logic of the scientific conception of time—specifically, the assumption that intuitive simultaneity can be set aside in favour of a mathematically exact determination based solely on clock synchronisation (During 2009, pp. 291–292). He argued that this pursuit of absolute temporal objectivity rests on a metaphysical presupposition: the belief that, prior to the evolving and contingent nature of human knowledge, there exists a complete, atemporal form of understanding that coincides directly with reality and remains eternally fixed (DS, p. 84). For Bergson, such a view does not characterise the metaphysics of relativity itself but rather reflects a more rigid, scientistic attitude towards science—one that neglects the temporal, dynamic, and lived dimensions of experience in favour of abstract, static idealisations.

A further distinction central to Bergson’s critique is that between local simultaneity and simultaneity at a distance. He linked local simultaneity—the immediate coincidence of two instantaneous events—to his microbe thought experiment, showing that any scientific account of such coincidence is inseparable from intuitive perception. Simultaneity at a distance, by contrast, concerns the coordination of events separated in space and therefore depends on deliberate clock synchronisation. Yet this tidy division collapses when differing perceptual scales are considered: even the tiniest spatial interval that seems negligible to human observers would appear immense to a microbe fashioning clocks on a microscopic scale (DS, p. 84). Bergson thus underscored that the most rigorous scientific synchronisation is inevitably conditioned—and ultimately constrained—by the perspective and experiential capacities of the observer.

Some commentators have inferred from Bergson's discussion of intuitive simultaneity that he was challenging physicists' reliance on local coincidence—the concurrence of two events at the same spatial point (During 2022b, p. 118). A further misconception is that Bergson denied the distinction between 'local' and 'distant' regions of space-time, or that he reduced it to a mere matter of observational scale. His objective, however, was altogether different: he sought to demonstrate that an intuition of simultaneity, although rooted in immediate experience, can in principle be extended to encompass the entire universe—an outcome made possible by the relativity of space (During 2009, p. 287)[244].

Bergson emphasised the considerable challenges inherent in the concept of simultaneity at a distance, particularly within scientific discourse, where the precise synchronisation of events occurring at spatially separated locations is a fundamental concern. These difficulties are intricately tied to the central tenets of the theory of relativity, as well as to Bergson's own philosophy of time. During situates these challenges within the problem of coordinating local times across varying reference frames to establish global simultaneity—a coordination that ultimately breaks down when transitioning between different reference frames (cf. During 2009, p. 235). This breakdown exposes a profound conceptual tension at the heart of the debate over simultaneity, a tension that arises from the conflict between objective measurement and experience-based observation, and which extends beyond the framework of Bergson's thought.

10.2. Towards Coexistence

Although the notion of simultaneity at a distance occupies a place within Bergson's framework, its role is illustrative, intended to demonstrate the contingency of simultaneity relative to an observer's frame of reference, rather than to posit any intrinsic connection between spatially separated events.

[244] According to During, the core of the misunderstanding between Bergson and Einstein lies in their differing conceptions of simultaneity. Einstein referred to local simultaneity as the strict co-occurrence of events at the same point in space-time, whereas Bergson conceived simultaneity in terms of proximity with a necessarily variable extension. Unlike Einstein's notion, Bergson's concept "is rooted in the lived experience of a simultaneity in the instant, itself inseparable, as we have seen, from a simultaneity of flux" (During 2009, p. 287).

For Bergson, such simultaneity does not constitute a feature of reality but rather a conceptual artefact—a pragmatic convention lacking ontological substance (cf. During 2008a, p. 268). This perspective is exemplified in his thought experiment involving hypothetical intelligent microbes, through which he investigated the capacity of consciousness to perceive distant events as if they were proximate. In Bergson's view, simultaneity is real only insofar as it arises from the immanent continuity of lived duration; it is local and experiential by its very nature. When applied to spatially distant events, it remains merely conventional (cf. During 2008a, p. 268).

Nevertheless, the notion of simultaneity at a distance remains crucial for a more comprehensive understanding of coexistence—a foundational concept within the philosophy of time, and a central concern of this thesis. While Bergson's reflections inform this aspect of the inquiry, it is not wholly determined by his specific treatment of the issue. Furthermore, the significance of simultaneity at a distance extends beyond philosophy of time into the philosophy of physics, where it plays a pivotal role in articulating the relativity of simultaneity and in elucidating the spatio-temporal structure defined by Einstein's theory of relativity. In this context, the concept is no longer merely a theoretical construct, as Bergson regarded it, but rather a vital explanatory tool for describing the nature of the physical universe.

The concept of simultaneity at a distance is rooted in purely spatial terms: once time is defined in relation to the speed of optical signals used to synchronise clocks, what remains is a comparison of spatial trajectories—namely, the measurement of relative distances traversed in different directions (During 2009, p. 297). This form of simultaneity is closely related to local simultaneity: whereas the latter pertains to the temporal coordination of events occurring in close spatial proximity, the former concerns the alignment of events that are temporally concurrent but spatially remote. Simultaneity at a distance thus corresponds to the notion of universal simultaneity and, by extension, to the experiential and operational coordination of disparate local times (cf. During 2009, p. 235).

Simultaneity at a distance must be clearly distinguished from the notion of universal simultaneity, the latter being conceived as an absolute construct. As noted, Bergson rejected the existence of absolute simultaneity—understood as a single, universal "now" encompassing all consciousnesses and events. This stance is consistent with developments in modern physics, particularly the theory of relativity, which marks a decisive break from the Newtonian conception of absolute time. While Newtonian physics assumed a uniform temporality invariant across all frames of reference, relativity demonstrates that simultaneity is relative to the observer's frame, thereby rendering the idea of universal simultaneity untenable. Friedman and Donley (1989) further develop this perspective, contending that the relativistic universe is partitioned into discrete reference frames that preclude the experience of a shared temporal moment. Nevertheless, they acknowledge the persistent cultural and symbolic appeal of universal simultaneity, suggesting that, although scientifically indefensible, it continues to serve an important imaginative and existential function (Friedman & Donley 1989, p. 59).

Given that Bergson denied the existence of universal simultaneity and regarded simultaneity at a distance as a conceptual abstraction rather than a feature of reality, the question arises: how can one conceive of a form of simultaneity that extends beyond merely local experience to encompass spatially remote events within the framework of his philosophy of time? The answer lies in rethinking simultaneity at a distance through the lens of lived temporal flows rather than discrete instants. As Bergson argued, simultaneity should not be understood as the static coincidence of isolated events, as it is in Einstein's account, but as a dynamic interweaving of continuous durations (During 2008a, p. 267). When reconceptualised in this way—as a fluid, evolving interplay of temporal flows rather than a geometrical point fixed in spatial coordinates—simultaneity at a distance transcends the limitations imposed by Einstein's relativity, which renders it relative to a particular reference frame. This alternative conception is central to Bergson's understanding of real time, insofar as it allows for the recovery of a sense of connectedness and unity across the universe (During 2022b, p. 117).

When considered in this light, the notion of simultaneity at a distance deepens the understanding of real time as it emerges within the geometry of space-time. However, any meaningful account of real time also requires a clear demarcation of what it is *not*. This thesis challenges interpretations advanced by certain physicists and philosophers—most notably Langevin—who conflate Bergson's concept of real time with the notion of proper time in physics. Proper time designates the local time attributed to individual conscious beings as they move along their respective worldlines in space-time. It is understood in physical theory as the time measured by clocks that remain at rest in relation to the mechanical system they monitor (During 2020a, p. 47), and exemplified in the twin paradox by the distinct times registered by Peter on Earth and Paul aboard a projectile.

However, Bergson considered proper time largely irrelevant to his philosophical project, as it represents merely a localised and quantitative sequence of events, devoid of any notion of simultaneity (During 2023, p. 190). From his perspective, proper time fails to capture the dynamic and qualitative dimension of temporal experience. It constitutes a spatialised representation of succession (During 2023, p. 191), abstracted from any broader temporal unity or shared temporal horizon. By contrast, real time cannot be captured through isolated, individual measurements. Rather, it requires a framework of temporal comparison between multiple observers—a conception of time that accommodates the possibility of simultaneity across perspectives. Accordingly, since proper time does not account for simultaneity between distinct worldlines, it cannot serve as a basis for the apprehension of real time.

Yet, real time cannot be reduced to local time either. Local time refers to the elapsed time measured along a specific worldline and is determined by the observer's velocity and trajectory. It remains intrinsically bound to the process it measures and, for this reason, cannot be aligned with the notion of a universal becoming—an idea that presupposes a more encompassing temporal continuity in which all individual becomings participate (During 2011, p. 466). Likewise, coordinate time also fails to capture the essence of real time. As a frame-dependent abstraction tied to a specific reference frame or class of equivalent coordinate systems (During 2022b, p. 113), coordinate time lacks any experiential depth or qualitative richness. While it enables the calculation of time differences between events from within a given frame—unlike proper time, which is intrinsic to a single trajectory—it remains an impersonal and detached construct, insufficient for articulating the lived temporality at the heart of Bergson's conception of real time (cf. During 2015, p. 122).

If real time is neither reducible to proper, local, nor coordinate time, the question arises: what, then, constitutes real time? Addressing this requires a conceptual reorientation that reintroduces the notion of simultaneity—not as a relativistic construct, but as a genuine form of temporal coexistence that transcends the mere succession of isolated "here-nows". This rethinking, as During (2023, p. 190) suggests, opens a perspective beyond fragmented instants and directs attention to the deeper problem at the heart of Bergson's philosophy: the problem of coexistence.

To speak meaningfully of coexistence in the context of the twin paradox, the presence of consciousness is indispensable. In the absence of conscious observers, the twins are effectively reduced to mere clocks, engaged in a purely spatial configuration devoid of lived temporal experience. As During observes, it is consciousness alone that endows space-time trajectories with genuine duration (During 2023, p. 193). For such duration to arise, consciousness must apprehend the temporal situation not merely from within a local frame, but from a reflective distance capable of integrating disparate experiences into a coherent whole.

Neglecting the role of consciousness in interpretations of the twin paradox risks endorsing an impersonal, objective time as ontologically real. Yet for Bergson, such time is illusory: it neither acts, nor changes, nor truly exists. As he argued, duration is inconceivable apart from consciousness. Referring to the Painlevé–Einstein exchange, Bergson noted that the audience and interlocutors simply assumed the possibility of communication between the twins, without addressing the conceptual complexity that this assumption entails. In the absence of conscious beings to interpret the clocks' readings, the paradox dissolves into a series of mathematical abstractions—data without interpretation, measurements without meaning—ultimately rendering the notion of coexistence irrelevant.

Addressing the problem of coexistence also necessitates a reassessment of a central flaw in Bergson's engagement with Einstein's theory of relativity. At the core of this flaw is Bergson's insistence on the identity of temporal measurements in the twin paradox—an assumption demonstrably at odds with the relativistic framework. His misreading stems from a fundamental reluctance to acknowledge time dilation as a real phenomenon. By placing undue emphasis on the principle of reciprocity, Bergson maintained that the two inertial frames involved are entirely symmetrical: any temporal claim made by one observer about the other should, in principle, be reciprocated. On this basis, he concluded that Peter, stationary on Earth, and Paul, travelling at relativistic speeds, would register identical times along their respective worldlines.

However, this interpretation fails to account for the crucial asymmetry embedded in the structure of the twin paradox—namely, that only one twin (Paul) undergoes acceleration and deceleration, or shifts between reference frames, thereby undermining the presumed equivalence between the two. Bergson's symmetrical reading thus collapses under the weight of relativistic effects that are not merely perspectival but empirically substantiated. His conclusion—that the twins' local times are identical—is therefore not only philosophically problematic but scientifically indefensible.

This particular misjudgment on Bergson's part has attracted sustained scholarly critique. Canales famously describes it as his "Achilles' heel", identifying it as a key vulnerability in his engagement with the theory of relativity (cf. Canales 2015, p. 62). Pearson likewise locates the core of the error in Bergson's conflation of the unity of universal duration—which accommodates metrically divergent times—with the mistaken assumption of their metrical equivalence (Pearson 2002, p. 72). In contrast, Čapek, drawing on Zawirski, finds the mistake especially striking, given that the concept of varying metrical rhythms in general relativity appears not only compatible with but, in many respects, supportive of the metaphysical framework set out in *Matter and Memory* (Čapek 1971, p. 249). Offering a more speculative interpretation, Landeweerd argues that Bergson did not assert the metrical equivalence of the twins' local times but rather maintained that the travelling clock forfeits its distinct temporal frame upon re-entry to Earth (Landeweerd 2021, p. 43).

The final interpretation, while aligning with this thesis's sympathetic reading of Bergson[245], lacks sufficient textual support, given that Bergson explicitly affirmed the metrical identity of the twins' times. Nevertheless, it is perhaps more reasonable—and indeed more accurate—to view Bergson's position not as a failure to comprehend relativity, but as a rigorous extension of the principle of reciprocity. His emphasis on the symmetry of inertial frames, particularly in his analysis of the twin paradox, can thus be understood not as a conceptual error but as a radical amplification of one of relativity's foundational postulates. In this light, Bergson's own provocative remark at the 1922 meeting on microbes may be applied to his stance: by pushing the reciprocity principle to its extreme, he was, in a sense, more Einsteinian than Einstein[246].

Although Bergson's interpretation of relativity may be scientifically flawed—particularly in his conflation of the twins' local times—this misjudgment does not fundamentally compromise the philosophical integrity of his project. His broader endeavour to elucidate the nature of real time and to defend the notion of a singular, universal temporality remains coherent and firmly grounded in physical reality through a sustained critical engagement with relativity theory. Crucially, the core of Bergson's argument does not rest on the metric identity of twins' times, but rather on the ontological issue of their coexistence. From this perspective, the divergence in measured times between observers is secondary to the more fundamental concern of their simultaneous existence within a shared temporal framework. Thus, while Bergson may have placed undue emphasis on metric time, this does not detract from the continued relevance and rigour of his philosophy of time.

Whether or not the twins' metric times are mistakenly considered identical—as Bergson arguably presumed—this has no bearing on the possibility of their coexistence, since their eventual reunion does not depend on the equivalence of measured times. Rather, it occurs within a shared temporal moment that transcends metric discrepancies. As Pearson notes, disparate metric times are framed by the same sequence of successive moments and are thus contemporary, representing complementary aspects of a single, continuous stretch of universal duration (Pearson 2002, p. 72). Accordingly, the unity of time remains intact despite the diversity of measurable intervals, as it is grounded in the "thick present"—a mode of temporality linked to Bergson's concept of universal duration, which resists reduction to quantitative measurement. Crucially, this thick present diverges

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245 As Barbara Skarga states, "[…] a philosopher wants to consider thoroughly another philosopher's argument" (Skarga 2014, p.91).

246 John Mullarkey aptly describes Bergson's project as an attempt to "relativise relativity" (Mullarkey 2000, p. 114). Whereas Sokal and Bricmont, while they critique him for being excessively relativistic ("il est trop » relativiste«"), they also argue that he falls short of full relativism by denying equal reality to the proper times of both twins in the paradox (Sokal & Bricmont 1997, p. 262).

markedly from the metrical "now" of analytic philosophy of time, which lacks the conceptual resources to adequately account for genuine simultaneity. Indeed, as some commentators argue, within the framework of McTaggart's A- and B-series, the concept of the "now" is too impoverished to meaningfully capture what it means for events and entities to occur together in time (During 2008a, p. 262; Robinson 2022).

Thus, somewhat against Bergson's own emphasis on the identity of metric time—but fully in line with the spirit of his philosophy of time—it can be argued that the twins not only grow old, but grow old together, despite the disparity in the measurement of their proper times (cf. During 2009, p. 242). They share a history that evokes what During characterises as a "sheaf" or "envelope" of shared temporality, suggesting a deeper temporal unity beneath the apparent divergence in metrical times (During 2022b, p. 120). Merely tracing their trajectories is insufficient, as the parametrisation of motion does not, in itself, yield time, let alone lived duration (During 2023, p. 191). Despite experiencing differing spans of measured years, the twins coexist within a temporal interval that renders their reunion intelligible. Without this shared temporality, the very possibility of reunion—of being present to one another after the journey—would be unintelligible, as would the paradox itself. Bergson associated the time elapsed between separation and reunion with a "thick interval of the extended present" that both twins inhabit simultaneously, forming a shared "region of contemporaneity" (During 2023, p. 188).

The concept of the thick present encompasses the durations of the twins. To further elucidate this notion, During draws on Bergson's recurring analogy of waiting for sugar to dissolve in a glass of water. He argues that the relationship between two distinct rhythms of duration—namely, the sugar's gradual transformation and the consciousness that patiently attends to it—provides "our best phenomenological access to duration" (During 2023, p. 177). This coexistence of heterogeneous temporal rhythms within a unified present moment exemplifies the temporal structure that also characterises the twins' experience. Just as the sugar and the observing consciousness persist together, each unfolding according to its own rhythm, so too do the twins: though they experience time differently, they endure within the same temporal framework, from their separation to their potential reunion and beyond[247].

Given that the twins in the paradox coexist, the central question becomes how this coexistence can be reconciled with the differing measurements of their proper times. If both endure within the

[247] Rovelli challenges this perspective, arguing that while it may be reasonable to speak of people ageing together on Earth, such assumptions should not be extended to scenarios beyond direct experience—such as the case of the twins in the twin paradox (cf. Rovelli 2022, p. VIII).

same temporal framework, as previously argued, why does one appear to age less? This apparent contradiction partly stems from a widespread misconception prevalent at the time of Bergson's *Duration and Simultaneity*—namely, the belief that the travelling twin's time physically slows down, thereby offering a means of avoiding ageing. Such interpretations rely on spatial metaphors that treat time as something that can be stretched or compressed, reinforcing outdated conceptions of time as a fixed, substantial entity akin to the ether. These metaphors derive from the geometrical and kinematic language of pre-relativistic mechanics, itself grounded in the visual observation of motion through space (Čapek 1971, p. 248).

In reality, however, time does not alter its intrinsic pace, nor does the travelling twin evade the process of ageing. The crux of the matter lies not in spatial displacement, but in the twins' continued coexistence within the same temporal field. As Lévy-Leblond observes, their perception of passing duration remains the same (Lévy-Leblond 2007, p. 253). What is commonly termed "time dilation" should not be understood as a physical distortion of time itself; rather, it refers to discrepancies in the measurement of elasped time along distinct space-time trajectories. These variations reflect differences in proper time arising not from any modification of time per se, but from the reference frames and experimental conditions under which such measurements are made (cf. During 2023, pp. 178–79; During 2007b, p. 81; 2007a, p. 291). Hence, the divergence in ageing is not a matter of one twin living through "less" time, but of time being operationally registered within differing relativistic contexts.

To further clarify the seemingly paradoxical scenario in which the twins, though coexisting, register differing metric durations, it is necessary to return to the concept of proper or local time. The continuous desynchronisation of local times across different systems arises because each system sustains a distinct relationship with the universe as a whole. Thus, locally measured time does not reflect Bergson's underlying real time; rather, it expresses the observer's dynamic involvement with the totality of physical relations (During 2022b, p. 115; During 2020a, p. 48).

In the case of the twin paradox, the travelling twin appears to "age less" because his engagement with the universe—particularly during phases of acceleration—differs fundamentally from that of his stationary sibling. The inertial forces encountered during acceleration introduce a relational asymmetry that distinguishes their respective trajectories (During 2022b, p. 122). The discrepancy in their recorded durations, therefore, results not from any modification of time itself, but from the differing physical and relational conditions under which time is operationally measured. This interpretation sustains the possibility that the twins, despite differing proper times, nonetheless coexist, and invites a reconsideration of contemporaneity beyond merely metrical time.

How, then, might we conceive the coexistence of the twins—both with each other and with the universe—beyond mere metrical equivalence? More specifically, how might we account for the shared "thick" present previously introduced? One approach lies in shifting the focus from the equality of time intervals to their identity. Rather than treating the twin paradox merely as a case of metric divergence alone, it may be more illuminating to approach it through a topological lens[248] (cf. During 2008b, p. 145).

In this context, identity does not imply numerical sameness but refers to the preservation of structural continuity between two events—departure and reunion—within spatio-temporal trajectories that are metrically distinct (cf. Čapek 1991, pp. 313–314). These events, although measured differently within each twin's frame of reference, nonetheless retain their position within a coherent relational structure. Both twins experience the same departure and reunion, albeit as embedded within distinct yet interconnected life-worlds. What thus endures across their divergent timelines is not a uniform measure of time, but a relational and topological consistency of experience. This perspective allows for a coexistence grounded not in simultaneity as synchronised temporal coordinates, but in the structural continuity of relational events.

Another way to articulate the coexistence of the twins is through its negative condition, as proposed by Whitehead and elaborated by During. The enduring character of the universe, they argue, precludes the possibility of absolute disconnection between two proper durations of the universe (During 2008b, p. 146). From this standpoint, the twins coexist because their respective durations are never entirely isolated. Their relational continuity is sustained precisely through the absence of complete disjunction.

Complementing this view, Lapoujade contends that the coexistence of multiple durations is possible only insofar as they are integrated within a broader duration that encompasses them (Lapoujade 2007, p. 445). This encompassing duration should not be conceived as an abstract or external container, but rather as a shared participation in the temporal unfolding of a more

[248] In his essay on the concept of time, Zygmunt Zawirski, a prominent Polish philosopher affiliated with the Lwów-Warsaw School, echoes Hans Reichenbach's assertion that physics concerns itself primarily with the topological, or qualitative, properties of time. Zawirski links these temporal properties to analogous spatial characteristics, identifying them as features such as the ordering of time series and the comparison between distinct temporal sequences. These topological aspects, he argues, encompass notions of succession and contemporaneity, including the simultaneity of separate time series, which together articulate the dynamic behaviour of distant events (Zawirski 1936, pp. 117–118). A condensed version of this essay was published in *Scientia* under the title "L'évolution de la notion du temps" (cf. Zawirski 1934, pp. 249–261). For further reflections on the topological unity of time underpinning the multiplicity of relativistic temporalities, see Čapek (1971, p. 248; 1991, pp. 333–334). Additionally, Ilya Prigogine has argued that a topological approach to dynamical systems does not require the appeal to trajectories and is achievable within a thermodynamic framework (cf. Prigogine 1984b, p. 441).

fundamental totality—most notably, that of the universe itself. In both accounts, coexistence is not predicated on simultaneity in the conventional sense, but on the structural and ontological interdependence of distinct durations within a continuous and enduring temporal field.

What, then, does it mean for the twins to coexist with the universe at large—particularly when this relationship underpins both their metric and non-metric modes of existence? More fundamentally, how should we understand coexistence itself? To address these questions, it is necessary to reconsider simultaneity beyond conventional spatial constraints, especially as it pertains to distant events. Although the twins are spatially separated and characterised by differing proper times, they nonetheless coexist through parallel yet distinct flows of duration that unfold in real time (During 2022b, p. 120; Campo & Ronchi 2022, p. 148). Crucially, this form of simultaneity is not grounded in spatial proximity or coordinate synchronisation but emerges from the temporal alignment of these desynchronised durations within a shared ontological framework.

In this respect, coexistence with the universe is not spatial but fundamentally dynamic and relational. The twins—and, by extension, all entities—coexist through mutual processes of "co-acting" or "co-evolving" with the universe (Campo & Ronchi 2022, p. 148). Genuine connection arises not merely from the persistence of being across successive moments—or "the simple fact of existing from one moment to the next"—but from the ongoing interplay of temporal flows (During 2020b, p. 358). This simultaneity of flows, in turn, is enabled by their (co)existence within the same universe. Although distinct, these interlocking durations remain temporally attuned to one another, effectively "surveying" each other across time (During 2022b, p. 121). It is this thick present, constituted by the coexistence of flows of duration, that substantively supports Bergson's hypothesis of the unity of time and completes his philosophy of time.

Summary of the fourth part:

Bergson's critique of time in the theory of relativity, as articulated in *Duration and Simultaneity*, is fundamentally philosophical. His aim was to construct a metaphysical framework capable of accommodating the profound implications of the emerging physical theory. Although Einstein revolutionised scientific thought, Bergson argued that his worldview remained embedded in pre-relativistic assumptions. In particular, Einstein continued to conceive of the universe as fundamentally determined—structured by absolutes which, though no longer Newtonian, ultimately led to the conception of a block universe rather than a dynamic, enduring present. Moreover, Bergson challenged Einstein's portrayal of his theory as philosophically neutral, contending that it covertly embodied a specific metaphysical stance—what Bergson referred to as a "metaphysics grafted upon science". In response, Bergson developed a concrete philosophy of time that sought to recover the qualitative dimension of temporality and to account for the lived reality of physical time.

In this context, *Duration and Simultaneity* not only presents a critique of the theory of relativity but also marks a significant development in Bergson's philosophy of time. In this work, he advanced a metaphysical hypothesis of universal time, grounded in impersonal consciousness and cosmic memory. Crucially, he distinguished between his earlier concept of duration—introduced in *Time and Free Will*—and the novel notion of real time, developed in direct response to the challenges posed by relativity. While real time refers to measurable, physical time, it neither corresponds to Newtonian absolute time nor reduces to a merely subjective, psychological experience. Bergson did not advocate a phenomenology of time, nor did he propose a return to the pre-relativistic absolutes; rather, he introduced a conception of physical time which, when integrated with duration, forms the basis of his metaphysical hypothesis of universal time.

The concept of simultaneity plays a pivotal role in this hypothesis. For Bergson, this notion originates in the comparison between internal duration and external events. This intuitive foundation underpins the scientific definition of simultaneity, typically established through the exchange of optical signals and the synchronisation of clocks. The transition from intuitive to scientific simultaneity is facilitated by a shift from the simultaneity of flows, characteristic of duration, to the simultaneity of instants, which pertains to real time. In this way, Bergson sought to reintroduce temporal thickness into a domain increasingly governed by abstract, mathematical representations.

Extending this framework beyond Bergson's original formulation, particularly with respect to his reading of the twin paradox, enables a more robust account of coexistence. Bergson mistakenly assumed that the twins' metric times were identical and regarded simultaneity at a distance as a mere construct. In contrast, their coexistence can be affirmed on the basis of their topological identity and the continuity of shared events, despite the divergence in their metric times. As long as both remain alive, they coexist within the same world. This "thick present" does not depend on their respective space-time trajectories, but on the shared events of separation and reunion that define their mutual history. Their coexistence thus rests upon a shared ontological reality and interwoven durations, dynamically embedded within the broader temporal fabric of the universe.

Conclusion

The study aimed to present Bergson's philosophical critique of the concept of time in 20th-century physics, particularly concerning the theory of relativity. In pursuit of this objective, the study transcended philosophical reflection, which constituted the primary axis of the analysis, and incorporated historical and physical considerations. In a manner akin to Bergson's own philosophy, this thesis did not lend itself to being confined to a single discipline or theme, and instead drew from a diverse range of intellectual traditions. As a result, the reader may find themselves, at one moment, engaging with a philosophical analysis, and at another, with a historical investigation or a study in the history of ideas. They may even encounter a discussion rooted in a physical analysis. The overarching aim was to capture the dynamic evolution of Bergson's thought and elucidate the work's principal theses through concrete examinations—not only of Bergson's writings, but also of other instances in which he engaged with the philosophical foundations of science.

Duration and Simultaneity constituted the principal focus of the study, with only a brief discussion of the concept of time in Bergson's earlier works included in the first chapter. In order to sustain a coherent and focused analysis of Bergson's critique of temporality in modern physics, the thesis deliberately set aside a detailed examination of his broader notion of time as duration. This concept was addressed only to the extent that it informed his philosophy of science. Given the wide-ranging scope of Bergson's philosophical reflections, a comprehensive exploration of his broader intellectual project lay beyond the confines of this study.

The central argument of the thesis comprised two interrelated components. First, it sought to demonstrate that Bergson's analysis of the theory of relativity in *Duration and Simultaneity* constitutes a form of engaged philosophy of science. Second, it argued that, through this engagement, Bergson refined and extended his philosophy of time by incorporating insights drawn from his critical examination of the theory of relativity. These claims were developed from distinct perspectives and varied approaches across all ten chapters.

The first part of the thesis, comprising Chapters 1 and 2, established that Bergson's philosophy of time was, from the outset, inseparable from his engagement with the scientific thought of his period. Chapter 1 examined how Bergson, beginning with *Time and Free Will*, developed his concept of duration in response to the spatialised and deterministic models of time found in Newtonian physics. Chapter 2 then situated this critique within the broader transformation of physics, tracing the transition from the pre-relativistic worldview to Einstein's theory of relativity. Together, these chapters demonstrated that Bergson rejected the pre-relativistic framework of absolute time, space, and motion, offering instead a conception of time as qualitative duration—an approach grounded in lived experience, yet consistently attuned to developments in the sciences.

The second part of the thesis, comprising Chapters 3 and 4, was devoted to a detailed examination of the reception of *Duration and Simultaneity* and the circumstances surrounding Bergson's encounter with Einstein. Chapter 3 explored the genesis, philosophical character, and contested reception of the book, highlighting Bergson's ambition to engage critically with contemporary physics and positioning the work as a significant—if often overlooked—contribution to the philosophy of science. Chapter 4 turned to the confrontation between Bergson and Einstein, shedding light on their personal and institutional roles, their respective influence within the intellectual community, and their divergent approaches to defining time. Particular attention was given to their notable encounter on 6 April 1922, which was situated within the broader reception of relativity. Together, these chapters laid the groundwork for the more conceptually focused analyses of physical time and relativity developed in Parts III and IV. This part further demonstrated that Bergson's intervention—far from being a marginal or reactionary gesture—reflected a sustained and forward-looking mode of philosophical engagement with science. It also underscored the personal, institutional, and intellectual stakes of the 1922 debate, showing that Bergson's critique, while pointed, remained grounded in a constructive and dialogical approach to the scientific redefinition of time.

Bergson's philosophy of science, as exemplified in his engagement with the physical implications of the theory of relativity in *Duration and Simultaneity*, formed the central focus of the third part of the thesis. Across Chapters 5 to 7, this section aimed to demonstrate the constructive yet critical nature of Bergson's response to Einstein's theory, particularly in relation to key physical issues concerning time. It explored Bergson's distinction between "half-relativity" and the principle of reciprocity, his critique of relativistic effects such as time dilation and the breakdown of simultaneity, and his interpretation of the concept of space-time. The discussion also addressed his polemical engagement with physicists on contentious topics such as acceleration and the twin paradox. While Bergson acknowledged the limitations of his mathematical training—particularly with regard to general relativity—his analysis nonetheless demonstrated a strong grasp of the relevant physics and a consistent commitment to philosophical clarity. His treatment of these themes exemplified the depth and coherence of his broader philosophical project: to engage with scientific theories without relinquishing the lived, qualitative dimension of time.

The fourth part examined the development of Bergson's philosophy of time as shaped by his engagement with Einstein's theory of relativity[249]. Chapter 8 focused on his critical response to the metaphysical assumptions underlying relativity, outlining the philosophical motivations for his intervention and the perceived limitations of Einstein's framework. Building on this foundation, Chapter 9 explored the refinement of Bergson's concept of duration in *Duration and Simultaneity*, introducing the notion of real time and advancing the hypothesis of a universal time capable of integrating both scientific and experiential dimensions of time. Finally, Chapter 10 addressed the conceptual difficulties surrounding simultaneity and the problem of coexistence, both of which Bergson reinterpreted as central to his—and any adequate—philosophy of time. Together, these chapters traced the emergence of a metaphysical model in which real time and simultaneity are not only compatible with modern physics but essential to a fuller understanding of temporal reality.

This study advances a novel interpretation by presenting Bergson's thought as a philosophy of science. Departing from dominant traditions that often reduce the discipline to narrowly technical concerns, the thesis offers an alternative lens through which to engage with contemporary scientific discourse. In line with the renewed scholarly interest in Bergson's work, it emphasises the ongoing relevance of his scientific reflections. The study also aims to challenge enduring misconceptions surrounding *Duration and Simultaneity*, such as the assumption that Bergson sought to refute the theory of relativity on physical grounds or that the work merely reasserts a notion of pre-relativistic absolute time. Furthermore, it underscores the pivotal role that *Duration and Simultaneity* plays within Bergson's broader philosophy of time. In doing so, the thesis moves beyond a treatment of duration alone, offering a sustained analysis of Bergson's concept of real time and contributing to the relatively limited body of scholarship on the problem of coexistence.

Another contribution of this thesis lies in its engagement with Polish sources. Although the central theme of the study remains underexplored in Polish scholarship, one of the objectives of was to incorporate the perspectives of Polish authors. Written in English, the thesis thus serves as a bridge between Polish and international academic discourse: it introduces English-speaking readers to Polish interpretations of Bergson, while also presenting underdeveloped aspects of his thought to Polish scholars.

This study has shown that Bergson's critique of the theory of relativity—particularly its conception of time, along with his corresponding philosophical account of time as it appears in

[249] The study does not address *Two Sources of Morality and Religion* (1932), a work published after *Duration and Simultaneity* and regarded by some scholars as the completion of the development of Bergson's philosophy of time (cf. Sinclair 2020, p. 3, see also Camille Riquier's *Archéologie Bergson*, published in PUF in 2009).

physics—retains considerable contemporary relevance. Despite certain limitations, Bergson's broader assessment of the temporal implications of Einstein's theory continues to resonate, especially in light of subsequent developments in physics. First, he brought to the fore aspects of time that cannot be fully captured through scientific abstraction—most notably, the role of consciousness in the lived experience of temporality. This experiential dimension, largely marginalised by Einstein and his followers, has proven not only philosophically significant but also increasingly pertinent in the context of quantum physics. Second, Bergson's analyses of real time and simultaneity contributed substantially to the philosophy of time in ways that parallel and enrich modern scientific concepts, such as space-time. Although he did not formulate a comprehensive theory of space-time himself, his critique opened the door to alternative interpretations—such as those advanced by Whitehead—and continues to inspire contemporary thought. Third, Bergson's philosophy of science exemplifies a model of philosophically engaged reflection on scientific practice, one that is largely absent from the dominant analytic tradition. In this regard, his work remains highly relevant today, offering a compelling alternative for reimagining the relationship between science and philosophy, and for redefining the role of philosophy in contemporary discussions of time.

Building on the conclusions of this study, there remains considerable potential to further develop Bergson's philosophy of time beyond the scientific framework that originally constrained it. As contemporary physics continues to evolve, revisiting Bergson's notion of real time in dialogue with current theoretical advancements could yield valuable insights. For instance, a more rigorous philosophical elaboration of the concept of coexistence may facilitate a reconceptualisation of relative simultaneity—an idea Bergson himself did not articulate, yet one that may be meaningfully grounded in his metaphysical understanding of time. In this light, Bergson's thought remains not only historically significant but also fertile ground for future inquiry at the intersection of philosophy and science.

Another area warranting further exploration is the relationship between Bergson's philosophy and later developments in physics. It remains an open question whether the trajectory of scientific progress aligns—as Bergson long posited—with his conception of time, matter, and their role in the universe[250]. Among the branches of physics most likely to intersect with his thought are

[250] In a letter to Milič Čapek, Bergson asserted that his "conception de la matière", developed throughout his works in conjunction with his "théorie de la durée", had anticipated "les conclusions de la physique d'aujourd'hui" and would, in his view, ultimately converge with the trajectory science was destined to follow: "qui était en même temps *dans la direction* où la physique s'engagerait tôt our tard…" (cited in Čapek 1971, p. 401).

thermodynamics and quantum theory. Bergson regarded the second law of thermodynamics as the most metaphysical of all scientific principles, interpreting entropy as indicative of the intrinsic character of the irreversibility of time. This insight gained broader recognition only in the latter half of the twentieth century, most notably through the work of Ilya Prigogine, whose theories of non-equilibrium systems echoed Bergsonian intuitions. According to Gunter, this line of influence may also be traced in more recent thermodynamic models, particularly those developed by Jeremy England (Gunter 2023, pp. 135–144). Moreover, quantum theory—unlike classical physics—introduces fundamental indeterminacy into the structure of physical reality, offering a conception of time as contingent and non-linear (cf. de Broglie 1969, p. 56). The uncertainty principle, as articulated by Heisenberg and others, raises compelling questions regarding its philosophical compatibility with Bergson's vision of a universe characterised by dynamism and perpetual flux. While some studies have begun to examine these convergences[251], the field remains underdeveloped, indicating a promising direction for future research at the intersection of metaphysics and contemporary science.

Finally, it may prove valuable for Bergson scholarship to examine the reception of his philosophy of science in Poland, both during his lifetime and in contemporary discourse. While this study has highlighted the relative neglect of these issues within Polish philosophical literature, further investigation into the reasons for this oversight may yield valuable insights—particularly concerning the intellectual orientation of Polish philosophy and its limited engagement with Bergsonian thought. At the time of *Duration and Simultaneity*'s publication, the Polish philosophical milieu was largely shaped by logical empiricism and strongly influenced by the Vienna Circle, which may have contributed to the marginalisation of Bergson's ideas. A critical analysis of this historical context could not only illuminate the dynamics of his reception in Poland but also enrich broader reflections on the disciplinary scope of the philosophy of science. Such a perspective may help foster a renewed approach to the field—one informed by Bergsonian metaphysical insights rather than constrained by the prevailing analytic tradition.

[251] For discussions relevant to this intersection of Bergson's thought and modern physics, see, for instance, Costa de Beauregard (1969a), de Broglie (1969), Dolbeault (2012), Guerlac (2006, pp. 198–205), Gunter (1991), Gunter (2023, pp. 103–118, 135–144), Kreps (2015, pp. 165–170), Landeweerd (2021, pp. 49–55), Prigogine (1984b), Watanabé (1969), and Zapalačová (2022).

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