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Yuval Dolev
Michael Roubach *Editors*

# Cosmological and Psychological Time

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Yuval Dolev • Michael Roubach
Editors

# Cosmological and Psychological Time

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*Editors*
Yuval Dolev
Department of Philosophy
Bar-Ilan University
Ramat Gan, Israel

Michael Roubach
Department of Philosophy
Hebrew University of Jerusalem
Jerusalem, Israel

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**Part III Temporality and Phenomenology**

# Chapter 4
# Einstein's Bergson Problem: Communication, Consensus and Good Science

**Jimena Canales**

**Abstract** Does a privileged frame of reference exist? Part of Einstein's success consisted in eliminating Bergson's objections to relativity theory, which were consonant with those of the most important scientists who had worked on the topic: Henri Poincaré, Hendrik Lorentz and Albert A. Michelson. In the early decades of the century, Bergson's fame, prestige and influence surpassed that of the physicist. Once considered as one of the most renowned intellectuals of his era and an authority on the nature of time, *The Stanford Encyclopedia of Philosophy* (2010) does not even include him under the entry of "time." How was it possible to write off from history a figure that was once so prominent? Through an analysis of behind-the-scenes of science correspondence, this article traces the ascendance of Einstein's views of time at the expense of Bergson's.

**Keywords** Einstein • Bergson • Time • Philosophy • Physics • Twin paradox • Frame of reference • Relativity • *Duration and Simultaneity*

## 4.1 Introduction

Imagine the famous twins of relativity theory talking to each other through some form of long-distance communication. Peter says to Paul: "The moment you separated from me … your time swelled, your clocks disagreed" with mine. Just imagine what "Paul would reply." That everything was normal for him (Paul) and that it was Peter's system that had gone awry. Who was right? According to Einstein, both were right. If they were as rational as scientists, they would eventually come to that conclusion.

Einstein's theory of relativity has been widely confirmed by a wide array of tests and experiments. Scientists typically refer to the "three classic tests" of general

J. Canales (✉)
University of Illinois, 810 S. Wright St, Urbana, IL 61801, USA
e-mail: jcanales@illinois.edu



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relativity as the perihelion of mercury, the red shift, and the gravitational bending of starlight. The special theory of relativity was strikingly confirmed when in 1972 scientists transported an atomic clock eastward around the world and compared it with one transported westward. The far-east traveler lost 59 ns, while the one transported westward gained 273 ns.[1] Other experiments with cosmic-ray muons (particles that enter into the Earth's atmosphere from outer space) showed that their lifespan before decaying was noticeably increased. Scientists interpreted the particles' prolonged life as due to time dilation effects arising from the relativity effects of traveling at speeds close to that of light.

Consider this additional experiment, brought up by the philosopher Henri Bergson, only a few months before Einstein was awarded the Nobel Prize. What would happen if one of the twins was so dominant, that he would not accept that his travelling sibling was seeing just the opposite he was, but who would stubbornly insist that something strange was going on in his brother's system. Everything was really normal for *him* (and only him) and it was the other twin who was going through strange dilation changes regardless of how he saw things. This dominant twin might want to force the other one to use Lorentz's equations to *correct* his perceptions and return to real life. "Here are the correction formulas that will permit you to come back to reality." Use them! he might insist. This would be a great victory for the dominant twin: "I can go on as if none of my lengths have shrunk, as if my time has not dilated, as if my clocks where working fine."[2] The less dominant twin, in contrast, would find himself in deep trouble: "I would have to completely redo the science of electromagnetism, which you have so laboriously constructed: I would have to modify [the results of] my equations, once I established them, every time I change velocities."[3] Thankfully, there was an evident solution that would prevent one of them from going through this hardship, but it would entail a compromise.

Does it matter, for science, to consider what the twins might say to each other? Would science have to take into consideration a twin so stubborn that he would not accept that the changes his other was going through as symmetrical and reciprocal? Not at all. After all, the hypothetical disagreement among the twins could be solved by recording devices that would attest that both of them were going through exactly reciprocal processes. When Paul Langevin first imagined the "voyage à boulet"—later baptized as the "twin paradox"—he imagined ways in which the two clocks could be compared while remaining at a distance from each other: "It is fun to imagine how our explorer and the planet Earth would see each other mutually live, if they could stay in constant communication by light signals or by wireless telegraphy, during separation, and thus understand how the asymmetry between two mea-

[1] J.C. Hafele and Richard E. Keating, "Around-the-World Atomic Clocks: Predicted Relativistic Gains," *Science*, no. 177 (1972).

[2] Henri Bergson, *Durée et simultanéité: á propos de la théorie d'Einstein*, ed. Élie During, 4th ed. (Paris: Quadrige/Presses Universitaires de France, 2009b). 17.

[3] Ibid., 18.

sures of time is possible."[4] These speculations made sense in light of the surge in the development of wireless technology from 1905 (the date of Einstein's paper) to 1911 (the date of Langevin's).[5]

Does it matter philosophically? The answer can be more complicated. *If only* we were just like instruments the debates pertaining to time dilation in relativity theory would be perfectly solved. Yet solving this question by reference to what instruments measure overlooks the broader question of the role of scientific instruments in the world and their relation to living consciousness. We are not just like clocks or recording instruments, argued Bergson. If we were, we would be living in a world without consciousness, where we might as well "say goodbye to the theory of relativity" in its entirety.[6]

Bergson's objections hurt Einstein enough that the Nobel Prize Committee decided not to award him the prize for relativity theory. The president of the committee explained that although "most discussion centers on his theory of relativity" it did not merit the prize. Why not? Reasons were surely varied and complex, but the culprit mentioned that evening was clear: "It will be no secret that the famous philosopher Bergson in Paris has challenged this theory." Bergson had shown that relativity "pertains to epistemology" rather than to physics—as it "has therefore been the subject of lively debate in philosophical circles."[7]

How did the debate between Einstein and Bergson unravel? How were they able to come to an agreement? As it turns out, an agreement was never reached. Bergson's objections were successfully labeled as essentially mistaken. Einstein himself led the initiative against the famous philosopher.

Might does not make right, especially not in science. "One of the strongest, if still unwritten, rules of scientific life is the prohibition of appeals to heads of state or to the populace at large in matters scientific," explained the historian and philosopher Thomas Kuhn in his *Structure of Scientific Revolutions*.[8] Science, truth and democracy, can and should go together. Our very idea of scientific knowledge as essential to modern civilization and superior to other ways of knowing relies on this notion. Of course, many scholars and scientists agree that power relations affect science, but only once they are tamed by institutions and professional codes of conduct designed to foster civil, free discourse and guarantee ethical standards. Truth and knowledge may still go hand-in-hand with power, but not in an overt or forced way. "Mob rule" has no say in science.[9]

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[4] Paul Langevin, "L'evolution de l'espace et du temps," *Scientia* 10 (1911).

[5] Jimena Canales, "The Media of Relativity: Einstein and Communications Technologies," *Technology and Culture* (2015).

[6] "Appendix III" in Bergson, *Durée et simultanéité: á propos de la théorie d'Einstein*: 207 n. 201.

[7] Svante Arrhenius, 10 December 1922 in *Nobel Lectures in Physics (1901–1921)*. (Singapore: World Scientific, 1998), 479. Italics mine.

[8] Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 2nd ed. (Chicago: University of Chicago Press, 1970). 168.

[9] Imre Lakatos, "Falsification and the Methodology of Scientific Research Programmes," in *Criticism and the Growth of Knowledge*, ed. Imre Lakatos and Alan Musgrave, *Studies in Logic*

Over the last two decades we have learned much more about how scientific controversies are actually settled. Ethnographic, anthropological, sociological and historical studies of science increasingly reveal a large gap between the actual practice of science and normative views about what science "should be." Discussions about how controversies *ought* to be settled needs to be rethought in terms of how they *are* settled. Recent literature on controversies has focused on the role of institutions in vetting selected experts to evaluate knowledge-claims, the use of history for establishing novelty, strategies of social marginalization, public and dramatic staging, pedagogical and textbook initiatives, the role of unconscious bias, the recruitment of allies (human and non-human), and techniques for extending results obtained in laboratory conditions outwards. The contested facts in question and of the instruments and experiments connected to them are key as well. Certain facts and experiments are easier to defend and reproduce than others. Some travel easily whereas others are hard to move. In some notorious controversies, disputes do not even hinge on matters of fact, but continue even after agreement about them has been reached. Facts do not speak for themselves.

One of Einstein's most successful victories consisted in eliminating Bergson's objections to relativity theory. In the early decades of the century, Bergson's fame, prestige and influence surpassed that of the physicist—who is, in contrast, so well known today. Once considered as one of the most renowned intellectuals of his era and an authority on the nature of time, *The Stanford Encyclopedia of Philosophy* (2010) does not even include him under the entry of "time."[10]

How was it possible to write off from history a figure that was once so prominent? Einstein met Bergson for the first time during his trip to Paris on April 6, 1922. That day the philosopher advanced some arguments against Einstein's interpretation of relativity theory. He was about to publish a book on it, titled *Duration and Simultaneity*, which would appear later that year. Bergson spoke for about half an hour. "We are more einsteinian than you, Monsieur Einstein," he explained.[11] The physicist responded in less than a minute—including in his answer one damning and frequently cited sentence: "*Il n'y a donc pas un temps des philosophes*."[12]

The meeting between the two men caused such a stir in intellectual circles, that both men came to represent opposing views about time in the work of intellectuals as diverse as Martin Heidegger, Alfred N. Whitehead, George Herbert Mead, Gaston Bachelard, Maurice Merleau-Ponty and more recently Gilles Deleuze and Bruno Latour. While Einstein's notion of time would be frequently referred to as "objec-

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*and the Foundations of Mathematics* (Cambridge, UK: University Press, 1970). For the continuing fear of "mob rule" in science see Bruno Latour, " Do You Believe in Reality? News from the Trenches of the Science Wars," in *Philosophy of Technology: The Technological Condition*, ed. Robert C. Scharff and Val Dusek (Malden, MA: Blackwell Publishers, 2003).

[10] Ned Markosian, "Time," in *Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta (Winter 2010).

[11] "La Théorie de la relativité: séance du 6 avril 1922," *Bulletin de la Société française de philosophie* 22, no. 3 (1922). Re-phrased as "More einsteinian than Einstein," in Bergson, *Durée et simultanéité: á propos de la théorie d'Einstein*: 55.

[12] "La Théorie de la relativité: séance du 6 avril 1922," 364.

tive" and "physical" and the time of Bergson as "subjective" and "psychological," neither of these labels do justice to the contributions of each men.

## 4.2 Erased from Einstein's Life

Einstein's visit to Paris was covered in sensational detail by the French and German press.[13] Yet, for the most part, Einstein's biographers have ignored the role played by Bergson. The authoritative biographies of Philipp Frank, Ronald W. Clark, Albrecht Fölsing, Jürgen Neffe, Abraham Pais, Walter Isaacson, among others, either do not mention Bergson or discount his importance.[14] His absence in these retrospective accounts is especially notable compared to the importance of the episode during the period. Einstein had to go to great lengths to hide from journalists that day and to make sure that no one knew where he was staying.

For many years Bergson was portrayed as someone who did not *understand* the physics of relativity. "Bergson is mistaken," insist the physicists Alan Sokal and Jean Bricmont, adding that his "error is not a question of philosophy or interpretation, as is frequently thought; it bears on understanding the physical theory, and it enters, in the last analysis, in conflict with experience."[15] Sokal and Bricmont cited Bergson's remark that "once reentering [Earth], it [one clock] marks the same time

[13] Michel Biezunski, *Einstein à Paris: le temps n'est plus…* (Vincennes: Presses Universitaires de Vincennes, 1991).

[14] Philipp Frank focused on Einstein's physics lecture the day *before* at the Collège de France, and not the one the following day at the Société française de philosophie, when Bergson delivered his criticisms. Clark recalled how Einstein "was closely questioned" by French philosophers and does not mention Bergson in that context. In places where Fölsing deals with the relation between Einstein and contemporary philosophers, Bergson intervention is not mentioned (although he is mentioned in another context). Jürgen Neffe's biography (2005, German edition) contains no mention of Bergson. Abraham Pais mentions the meeting between Einstein and Bergson only to downplay any negative role he may have played in Einstein's life. Pais states that the special theory of relativity "caused confusion in philosophical circles, as witness, for example the little book on the subject by Henry Bergson written as late as 1922." He claims that "Einstein came to know, like, and respect Bergson. Of Bergson's philosophy he used to say, '*Gott verzeih ihm'*, God forgive him." Pais mentions Bergson again in his account of "How Einstein Got the Nobel Prize" where he explicitly discounts the role of Bergson. He points out instead to the compilation of Bergson's collected works that excluded *Duration and Simultaneity* from the collection. Le Roy explained his decision not to republish *Duration and Simultaneity* in Le Roy, Lettre-Préface, 29 September 1953 in Henri Bergson, *Écrits et paroles*, ed. Rose-Marie Mossé-Bastide, Bibliothèque de philosophie contemporaine (Paris: Presses Universitaires de France, 1957). vii–viii. Some of these references were provided to me by an anonymous reviewer for Chicago University Press. Philipp Frank, *Einstein, His Life and Times*, trans. George Rosen (New York: A.A. Knopf, 1947). 196; Ronald William Clark, *Einstein: The Life and Times* (New York: World Pub. Co., 1971); Albrecht Fölsing, *Albert Einstein: A Biography* (New York: Viking, 1997); Jürgen Neffe, *Einstein: A Biography*, 1st American ed. (New York: Farrar, Straus, and Giroux, 2007); Abraham Pais, "*Subtle is the Lord…": The Science and the Life of Albert Einstein* (Oxford: Clarendon Press, 1982). 28, 163, 510.

[15] Alan D. Sokal and J. Bricmont, *Impostures intellectuelles* (Paris: O. Jacob, 1997).

as the other" as proof of his profound misunderstanding of relativity.[16] They were only repeating what had been said many times before them, starting with Einstein. Because of this particular claim, many readers insisted that Bergson "was not sufficiently conversant with the outlook and problems of mathematics and physics."[17] "These attempts [Bergson's] … have totally failed: science, on this issue, has passed purely and simply to become the order of the day."[18] By the 1960s Bergson's fate as somebody who simply did not understand science was sealed: "The best explanation for Bergson's impressive failure as a scientific theoretician is the same as that for his failure to succeed as a metaphysician: he was not sufficiently conversant with the outlook and problems of mathematical physics."[19] Even a writer in the *Annales Bergsoniens*—an ongoing series solely dedicated to his philosophy—stated that "Bergson could not understand him [Einstein]."[20]

The chemist and Nobel Prize winner Ilya Prigogine reviewed the collection of essays that included translated portions of the transcript of the April 6, 1922 meeting for the journal *Nature*. Prigogine was extremely critical of Bergson's "pathetic" work on relativity: "Bergson's struggle with the Lorentz transformation in *Duration and Simultaneity* is as pathetic as it completely misses the point."[21]

## 4.3 Contrast Between Einstein's Journal and Letters

Let us retrace our steps and go back to the moment after the meeting. Only a few months after their encounter in Paris, Einstein was asked once again what he thought of Bergson. He had "received the Bergson book and read part of it but have not yet been able to make up my mind about it finally," he explained to Lord Haldane.[22] Later that fall, he finally found time to examine it more carefully. Einstein took Bergson's book with him on the boat that would take him to Japan. The day the ship exited the harbor he started reading, and the next morning he jotted down some

[16] Alan D. Sokal and J. Bricmont, *Fashionable Nonsense: Postmodern Intellectuals' Abuse of Science* (New York: Picador, 1998). 176. They also attribute this error to Merleau-Ponty's understanding of relativity.

[17] Thomas Hanna, "Introduction," in *The Bergsonian Heritage*, ed. Thomas Hanna (New York: Columbia University Press, 1962b), 23.

[18] André George, *Les documents de la vie intellectuelle* (January 1931): 60. Cited in André Metz, "Bergson, Einstein et les relativistes," *Archives de philosophie* 22(1959): 378.

[19] Thomas Hanna, ed. *The Bergsonian Heritage* (New York: Columbia University Press, 1962a), 23. For a later text on this topic see Andrew C. Papanicolaou and P.A.Y. Gunter, *Bergson and Modern Thought: Towards a Unified Acience*, Models of Scientific Thought (Chur, Switzerland: Harwood Academic Publishers, 1987).

[20] Hervé Barreau, "Bergson et Einstein: à propos de Durée et simultanéité," *Les Études bergsoniennes*, no. 10 (1973): 167.

[21] Ilya Prigogine, "Evolution of Physics: Review of Bergson and the Evolution of Physics, edited and translated by of P.A.Y. Gunter," *Nature* 234(1971): 159.

[22] Einstein to Richard B. Haldane, 11 September 1922, Berlin.

quick notes about it in his travel journal. He acknowledged that Bergson had fully "grasped the substance relativity theory" and considered the philosopher's contribution as one that merely "objectivized" *psychological* aspects of time: "The philosophers constantly dance around the dichotomy: the psychologically real and physically real, and differ only in evaluations in this regard."[23]

Einstein felt the damaging effects of Bergson's critique a few months later. When he was awarded the Nobel Prize (in December 1922 for the previous year), it was not given for the theory that had made the physicist famous: relativity. Instead it was given "for his discovery of the law of the photoelectric effect"—an area of science that hardly jolted the public's imagination to the degree that relativity did. The reasons behind the decision to focus on work *other* than relativity were directly traced to Bergson's intervention in Paris.

The Bergson problem was not going away for Einstein. *Duration of Simultaneity* was a success, albeit a controversial one. An augmented revised version appeared the following year, containing three new appendixes aimed at responding to critics. In 1936, less than a decade and a half after it first appeared, an avid reader warned prospective buyers that they "might have difficulty in finding" a copy "as the last edition is exhausted."[24]

Bergson and Einstein met in other occasions after their encounter in Paris. Bergson was the president of the CIC, a branch of the League of Nations and Einstein was a member. The CIC was founded on the idea that if intellectuals set the example for peaceful cooperation, then the world might follow. The philosopher Isaac Benrubi, amongst others, decided to attend the CIC's meeting in Geneva (25 July 1924) after learning that both Einstein and Bergson would attend.[25]

For the meeting Bergson introduced Einstein in flattering terms, but during the meeting *break* their differences once again became evident. Benrubi approached Einstein to ask him what he thought of *Duration and Simultaneity*. Einstein offered his official response, that Bergson had not understood the *physics* of relativity and that he had made a mistake. Asked if he would continue the fight against Bergson, Einstein responded: "No, I do not intend to do that, unless Bergson himself pro-

[23] Einstein, travel diary to Japan, Palestine, Spain, [6 October 1922 to 12 March 1923]. See the entry for 9 October 1922: "Yesterday I looked into Bergson's book on relativity and time. Strange that time alone is problematic to him but not space. He strikes me as having more linguistic skill than psychological depth. He is not very scrupulous about the objective treatment of psychic factors. But he does seem to grasp the substance of relativity theory and doesn't set himself in opposition to it. The philosophers constantly dance around the dichotomy: the psychologically real and physically real, and differ only in evaluations in this regard. Either the former appears as a "mere individual experience" or the second as "mere construct of thought." Bergson belongs to the latter kind but objectifies in *his* way without noticing." For an account of Einstein's impressions of Bergson from his travel diary see Armin Hermann, *Einstein: Der Weltweise und sein Jahrhundert; eine Biographie* (München: Piper, 1996). 283.

[24] Pierre Lecomte du Noüy, *Biological Time* (London: Methuen and Co. Ltd., 1936). 127.

[25] Isaac Benrubi, *Souvenirs sur Henri Bergson* (Neuchâtel: Delachaux & Niestlé, 1942).

vokes a polemic. But that would not help anybody."[26] Was Einstein willing to let bygones be bygones?

The debate nonetheless continued to explode, especially after André Metz, an alumnus of the École polytechnique and army captain stationed at the Rhine reignited the polemic by publishing damaging articles in favor of Einstein and against Bergson in the *Revue de philosophie*.[27] Einstein enthusiastically endorsed Metz's work on relativity. It "responded to a real need," "was completely exact" and contained the "refutation of the inexact assertion of other authors."[28] To observers at the time, it was clear that Metz and Einstein had a lot in common—even personally. "The personal philosophy of Einstein is similar to that of Metz," explained the Catholic philosopher Jacques Maritain.[29]

Metz was a soldier who believed that confrontations "at times violent" were "necessary conditions" for "making history." This maxim was true, he explained for "all domains"—including science: "The *triumph* of people, ideas or theories seems to be a necessary condition for *the fight*, and of a bitter struggle, sometimes violent." Metz underlined how Einstein would only prevail if he fabricated controversies, fought hard and won. In a private letter he described his intentions clearly: "The names which remain in history are those of men who have fought, and that in all areas." He considered Einstien within this category: "Einstein himself, with his simple and benevolent disposition, owes his fame to the controversies his theory raises."[30]

In a private letter to Metz, Einstein framed Bergson's mistake in terms of physics. Metz did not hesitate to publish it in the prestigious *Revue de philosophie*. "It is regrettable that Bergson should be so thoroughly mistaken, and his error *is really of a purely physical nature*, apart from any disagreement between philosophical schools," explained Einstein. He spelled-out Bergson's "mistake" in detail: "Bergson forgets that the simultaneity … of two events which affect one and the same being is something absolute, independent of the system chosen."[31] Einstein, again, used

[26] "Es wird Gras darüber wachsen, und dann wird man mit mehr Objectivität darüber urteilen." Ibid., 107–108; Angelo Genovesi, "Henri Bergson: Lettere a Einstein," *Filosofia* 49, no. 1 (1998): 8–9; Rose-Marie Mossé-Bastide, *Bergson éducateur* (Paris: Presses Universitaires de France, 1955). 126.

[27] André Metz, "Le Temps d''Einstein et la philosophie: à propos de l'ouvrage de M. Bergson, Durée et simultanéité," *Revue de philosophie* 31 (1924a); André Metz, *La Relativité: Exposé dans formules des théories d'Einstein et réfutation des erreurs contenues dans les ouvrages les plus notoires* (Paris: Etienne Chiron, 1923). On Metz see Ramiro Ledesma, "Actualidad. Filosofía, Ciencia: Andre Metz y la Geometría Euclidiana," *La Gaceta Literaria* (1929); Metz, Bergson, Einstein et les relativistes."; Eva Telkes-Klein," Meyerson dans les milieux intellectuels français dans les années 1920," *Archives de Philosophie* 70, no. 3 (2007): 370.

[28] Einstein's comments were included in the second edition.

[29] Jacques Maritain, *Réflexions sur l'intelligence et sur sa vie propre* (Paris: Nouvelle Libraire Nationale, 1926 (1924)). 225 n. 221.

[30] Archives Centre Sèvres, 408/70, folder Metz, 12 January 1925. Cited in Telkes-Klein, "Meyerson dans les milieux intellectuels français dans les années 1920," 371.

[31] Einstein to Metz, 2 July 1924. Published after his reply, André Metz, "Replique a Bergson," *Revue de philosophie*, no. 31 (1924b). Republished in P.A.Y. Gunter, ed. *Bergson and the Evolution of Physics* (Knoxville: The University of Tennessee Press, 1969), 189–190.

the word "absolute" to show that thinking about relativity in terms of the *difference* between the two travelers was essentially misguided.

Almost three years after the meeting between Einstein and Bergson took place, a scientist and popular science writer from Barcelona could still expect readers in Spain to be "aware of Bergson's objections" to Einstein, and of the particular occasion when the philosopher had let loose "all his anger" on the physicist.[32] He was emboldened to write to Einstein directly. Einstein responded, exposing the philosopher's error. The recipient decided to publish it: "In short, Bergson forgets that spacetime simultaneity has an absolute character according to the Theory of Relativity."[33] By insisting on the "absolute" nature of relativity effects, Einstein tried to convince his readers that it was not necessary to think about relativity in terms of the *difference* between the two travelers. Einstein had not forgotten about Bergson.

## 4.4 The "Mistake" According to Bergson

One claim in Bergson's book is frequently cited as mistaken: that time is not altered according to the velocity of a system. He categorically stated that if a clock traveling close to the speed of light is later compared to a stationary clock, it "does not present a delay when it finds the real [stationary] clock, upon its return."[34] This claim, taken at first blush and in isolation, was completely at odds with the account of *time dilation* given by Einstein. In the foreword to his second edition, Bergson explained that the book's central message was to "explicitly prove that there is no difference, in what concerns Time, between a system in motion and a system in uniform translation."[35] "This sentence," noted the Bergson scholar and philosopher Élie During, "if taken literally, is evidently inacceptable for a physicist."[36] Yet Bergson's capitalization of Time signaled to readers that he was confronting a different concept from that of the physicists.[37]

Bergson, however, explained—on numerous occasions—that he did not understand by Time—and that is why he capitalized the term in the foreword—exactly the same thing as relativity physicists. In cases where one dealt exclusively with

[32] Miguel Masriera Rubio, "La verdad sobre Einstein," *La Vanguardia* (15 January 1925).

[33] Einstein to Masriera Rubio: "Kurz: Bergson vergass, dass raumzeitlische Koinzidenz auch nach der Relativitätstheorie absoluten Character hat." p. 1 of 2. Einstein to Masriera Rubio, 7 October 1925, Berlin. Scientific Correspondence, Folders M-Misc,1, Box 6, Einstein Archives.

[34] Appendix III in expanded second 1923 edition. Bergson, *Durée et simultanéité: á propos de la théorie d'Einstein*: 208.

[35] Foreword to the second expanded 1923 edition. Ibid., ix.

[36] Élie During, "Dossier critique: I. Notes," in *Durée et simultanéité: á propos de la théorie d'Einstein*, ed. Élie During (Paris: Quadrige/Presses Universitaires de France, 2009a), 253.

[37] For Bergson's strategic use of capital letters see Élie During, "Introduction au dossier critique," in *Durée et simultanéité: á propos de la théorie d'Einstein*, ed. Élie During (Paris: Quadrige/Presses Universitaires de France, 2009b), 237.

*their* notion of time, as in the case when only clocks were considered, or when dealing exclusively with physics and mathematics, or in the case when acceleration was involved, he fully accepted the conclusions of relativity scientists: "The truth is that the group of transformations discovered by Lorentz assures, in a general manner, the invariance of the equations of electromagnetism."[38]

Bergson allied his point of view on relativity with Henri Poincaré and Hendrik Lorentz, who never accepted essential aspects of Einstein's interpretation of relativity, and who, alongside Bergson, would be remembered for not having understood the theory or not being able to "let go" of old conceptions. "Poincaré never understood the basis of special relativity," explained Abraham Pais, Einstein's colleague and biographer.[39] Since then, others have echoed this familiar line. Walter Isaacson contends that "for his part, Poincaré seems never to have fully understood Einstein's breakthrough."[40] Dennis Overbye notes that "when he [Poincaré] finally addressed the issue of relativity squarely, in 1912, it was clear that he didn't understand it."[41]

Evidence shows that Poincaré accepted some of the most revolutionary implications of relativity, which he nonetheless attributed to Lorentz—not to Einstein. In a report on Lorentz's work, he repeated some of the same claims he had made earlier, when he had nominated Lorentz for the Nobel Prize. Poincaré explained how in the case of traveling, differing clocks, Lorentz had shown that it was impossible to claim one as correct and the other one as delayed. He explained how it was "impossible to detect anything other than relative velocities of bodies with regard to one another, and we should also renounce the knowledge of their relative velocities with regard to the ether as much as their absolute velocities." He concluded clearly: "This principle must be regarded as rigorous and not only as approximate."[42] That same year (1910) in a lecture in Gottingen, he framed the choice between Einstein's and Lorentz's interpretation of the theory as mainly a matter of taste. In his last significant statement on relativity, Poincaré did not even mention Einstein.[43] Instead, he chose to open his talk with an explanation of Bergson's philosophy.

Lorentz was in constant communication with Bergson. One day, when walking along the Seine, he brought up certain "objections" to Bergson's work. Bergson considered them carefully, and explained to Lorentz that his claim about the "two clocks" should not be taken literally. "It is just a manner of explaining oneself," so

[38] Bergson, *Durée et simultanéité: á propos de la théorie d'Einstein*: 24 n. 21.

[39] Pais, "*Subtle is the Lord…*"*: The Science and the Life of Albert Einstein*. 21.

[40] Walter Isaacson, *Einstein: His Life and Universe* (New York Simon and Schuster, 2007). 135.

[41] Dennis Overbye, *Einstein in Love* (New York: Penguin, 2000). 145.

[42] Henri Poincaré, "Rapport sur les travaux de H.A. Lorentz, ca. 31 January 1910," in *La Correspondance entre Henri Poincaré et les physiciens, chimistes et ingénieurs* (Basel: Birkhäuser, 2007), 438.

[43] Throughout, I use the term "relativity theory" and "theory of relativity" broadly to include the contributions of Lorentz and Poincaré. When referring to Einstein's particular contribution and to highlight his work from that of others, I use the phrase "Einstein's theory."

that he could get to "the depth of the matter."[44] Bergson explained why his philosophy was being received with such animosity on the part of physicists. He speculated that Einstein, along with numerous other physicists, simply did not understand him. To Lorentz, he offered a very negative view of Einstein:

> In general, relativity physicists have misunderstood me. They, by the way, frequently do not know my views except than through hearsay, by inexact and even completely false accounts. This is perhaps the case of Einstein himself, if what they say about him is true.[45]

Bergson later confided to another friend that Einstein could not comprehend him because "he is not that familiar with philosophy and especially with the French language."[46] He concluded that Einstein had probably not even "read my book" relying on second-hand accounts of "this or that French physicist who did not understand me, and who, not having the philosophical background needed to understand me, would remain impervious to my explanations."[47]

In the end, Bergson simply gave up trying to convince Einstein or his defenders. Their mutual misunderstanding was simply insurmountable. Referring to the accounts by Metz, he simply concluded: "The meaning of my thoughts, as that of my book, has completely escaped him. There is nothing I can do."[48]

## 4.5 Between Physics and Philosophy

What was Bergson's main point? Bergson had confronted the problem of time from many angles, most famously in *Matter and Memory* (1889) and later in *Creative Evolution* (1907). He agreed that clocks helped note simultaneities, but he did not think that our understanding of time could be based on them. He had already thought about this option, back in 1889, and had quickly discounted it: "When our eyes follow on the face of a clock, the movement of the needle that corresponds to the oscillations of the pendulum, I do not measure duration, as one would think; I simply count simultaneities, which is quite different."[49] In *Duration of Simultaneity* he came to the problem of time from a yet more sophisticated angle. He fully accepted the usefulness of clock time, but wanted to ask additional questions about it. He insisted that time was important for humans because of how it related to events that

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[44] Bergson to Lorentz, 9 November 1924, Paris, in Henri Bergson, *Correspondances* (Paris: Presses Universitaires de France, 2002). 1119–1122 on p. 1122. Republished and annotated in Henri Bergson, *Écrits philosophiques*, ed. Arnaud Bouaniche, et al., Quadrige (Paris: Quadrige/Presses Universitaires de France, 2011). 556–559.

[45] Bergson to Lorentz, 9 November 1924, Paris, in Bergson, *Correspondances*: 1119–1122 on p. 1122. Republished and annotated in Bergson, *Écrits philosophiques*: 556–559.

[46] Jacques Chevalier, *Entretiens avec Bergson* (Paris: Plon, 1959). 69.

[47] Ibid.

[48] Henri Bergson, "Bergson à E. Peillaube," *Revue de philosophie* 24(July 1924a): 440.

[49] Henri Bergson, Essai sur les données immédiates de la conscience, ed. Arnaud Bouaniche, 9 ed. (Quadrige/Presses Universitaires de France, 2011). 80.

were relevant for them. One could not define time exclusively by reference to clocks, because clocks were made by humans *to time events that mattered to them and thus attracted their attention*.

Bergson argued that Einstein's theory of relativity was undergirded by a more basic sense of simultaneity, one which was not based on comparing events against clocks, but which would explain why clocks were invented and used in the first place. If this, much more basic, conception of simultaneity did not exist, then "clocks would not serve any purpose." "Nobody would fabricate them, or at least nobody would buy them," he argued. Yes, clocks were bought "to know what time it is," admitted Bergson. But "knowing what time it is" presupposed that the correspondence between the clock and an "event that is happening" was sufficiently *meaningful* for the person involved leading them to pay *attention* to it. That certain correspondences between events could be significant for us, while most others were not, explained our basic sense of simultaneity and the widespread use of clocks. Clocks, by themselves, could not explain either simultaneity or time, he argued.

If a sense of time more basic than that revealed by matching an event against a clock-hand did not exist, clocks would serve no purpose: "They would be bits of machinery with which we would amuse ourselves by comparing them with one another." Something different, something novel, something important, something outside of the clock itself needed to be included in our understanding of time. Only *that* could explain why we attributed to clocks such power: why we bought them, why we used them, and why we invented them in the first place. As the debate between the physicist and the philosopher unraveled in decades to come, the disagreement between their different conceptions of time appeared so inescapable that it was even traced back to the ancients, where Einstein's view was associated with Parmenides', and Bergson's with Heraclitus'.

Einstein tried to neutralize the philosopher by claiming that he did not deal with real things. According to Einstein, philosophy had been used to explain the relation between psychology and physics. "The time of the philosopher, I believe, is a psychological and physical time at the same time," he explained in Paris.[50] But relativity theory, by focusing on very fast phenomena, had shown just how off-the-mark psychological perceptions of time really were. Psychological conceptions of time, Einstein insisted, were not only simply in error, they just did not have an independent existence in reality. "These are nothing more than mental constructs, logical entities."[51] Because of the enormous speed of light, humans had "instinctively" generalized their conception of simultaneity and mistakenly applied it to the rest of the universe. Einstein's theory *corrected* this mistaken generalization. Instead of believing in an overlapping area between psychological and physical conceptions of time (where both were important although one was admittedly less accurate than the other), he argued that they were really two distinct concepts: a mental assessment (the psychological one) that was inadequate when compared to the only one "objective" concept: physical time.

[50] "La Théorie de la relativité: séance du 6 avril 1922," 363.

[51] Ibid., 364.

If Einstein could show that psychological assessments of time were essentially mistaken "mental constructs," then the task for philosophers was greatly reduced if not completely null. Bergson did not want to accept the role for philosophy that Einstein was giving to him. He was clear that his comments were not about physics, but that did not mean that they were about things that "did not exist" as Einstein seemed to imply in his phrase "*il n'y a donc pas un temps des philosophes*."[52]

Bergson also did not accept that their disagreement was a technical matter in physics. None of *his* claims were meant to bear on physics: "The theory was studied with the aim of responding to a question posed by a philosopher, and no longer by a physicist." "Physics," he added, "was not responsible for answering that question."[53]

## 4.6 On the Relation Between the Special and General Theory

While the Michelson-Morley experiment played an important role in the *special* theory of relativity, three other experimental results were essential for the *general* theory (an explanation for the perihelion of Mercury, the bending of light rays by the sun, and the red-shift effect).[54] In the eyes of Einstein's supporters, these results proved the numerous virtues of Einstein's general theory. Were they (the "three classical tests" as they came to be known) not enough to blow Bergson's objections out of the water? In the decades that followed, the general theory received increasing support. A group of scientists working from new American large-scale observatories became "Einstein's jury" ruling in favor of the physicist.[55] A new way of understanding time in physics and astronomy gained prominence for the rest of the century.

Perhaps Bergson was mistaken because he focused only on the special theory? Bergson knew fully well that this approach had its limitations, but in his appendices and later publications he confronted claims that his book was irrelevant in the face of the success of the general theory. "In the special theory there is something that

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[52] Ibid.

[53] Henri Bergson, "Les Temps fictifs et le temps réel," in *Durée et simultanéité: á propos de la théorie d'Einstein*, ed. Élie During (Paris: Quadrige/Presses Universitaires de France, 2009a), 425–426.

[54] Along with the Michelson-Morley experiment and the red-shift effect, historians and scientists alike often claim that the 1919 expedition was "one of the three 'classic' relativistic effects predicted by Einstein," Matthew Stanley, "An Expedition to Heal the Wounds of War: 1919 Eclipse and Eddington as Quaker Adventurer," *Isis* 94 (2003): 70. The red-shift effect was described by Einstein as a "crucial test" of the theory in 1916. To this day the bending of light rays by the sun is seen as a paradigmatic example of a crucial experiment. Albert Einstein, "The Foundation of the General Theory of Relativity," *CPAE* 6: 198. See entry "crucial experiment" in Nicholas Bunnin and Jiyuan Yu, *The Blackwell Dictionary of Western Philosophy* (Malden, MA: Blackwell, 2004).

[55] Jeffrey Crelinsten, *Einstein's Jury: The Race to Test Relativity* (Princeton: Princeton University Press, 2006).

demands the general theory," so by getting at the first theory he would touch on the second.[56] When readers were asked to consider clocks not only traveling away from each other, but meeting once again, how should they understand time? Should they use the algebraic equations of the special theory or the differential equations of the general one?[57]

If acceleration was taken into consideration, then the most astounding ways of describing Einstein's work broke down. To Bergson, the inclusion of acceleration proved that the two times were not equal in every sense: "So, if one wants to deal with real Times then acceleration should not create a dissymmetry, and if one wants for the acceleration of one of these two systems to effectively create a dissymmetry between them, then we are no longer dealing with real Times."[58] Acceleration was an inescapable mark of a difference in the clocks' travel itineraries. Since a difference existed, one that accompanied a difference in times, then their times were not equal in *every* sense.[59] After all, one would have the extraordinary experience of having done something different, being propelled to outer space and jolted back to return to Earth, while the other one comfortably remained at home. These differences were extraordinary, he argued, and physicists had no right to brush them aside and consider both observers as dealing with the same precious and contested entity, time.

If the dissymmetry due to acceleration was ignored, then Bergson was ready to concede to Einstein: "one could naturally say that [clocks traveling at different speeds] cannot run in synchronicity." In these cases "in effect Time slows down when speed increases." But for Bergson the introduction of acceleration proved that the times described by Einstein were not all equally real. "But what is this Time that slows down? What are these clocks that are not in synchronicity?"[60] These clocks were not equal in every way because one had gone through something that the other had not.

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[56] Bergson, *Durée et simultanéité: á propos de la théorie d'Einstein*: 33.

[57] For a clear exposition of the twin paradox using only the special theory of relativity see Tim Maudlin, *Philosophy of Physics: Space and Time*, Princeton Foundations of Contemporary Philosophy (Princeton: Princeton University Press, 2012).

[58] Henri Bergson, "Les Temps fictifs et le temps réel," *Revue de philosophie* 24, no. 3 (1924b). Cited in Henri Bergson, "Les Temps fictifs et le temps réel," in *Mélanges* (Paris: Presses Universitaires de France, 1972 (1924)), 1443–1444.

[59] On the question of the symmetry/asymmetry of the relativity clocks see Jimena Canales, "Of Twins and Time: Scientists, Intellectual Cooperation, and the League of Nations," in *Neutrality in Twentieth-Century Europe: Intersections of Science, Culture, and Politics after the First World War*, ed. Rebecka Lettevall, Geert Somsen, and Sven Widmalm (New York: Routledge, 2012).

[60] "Appendix III" in Bergson, *Durée et simultanéité: á propos de la théorie d'Einstein*: 210.

## 4.7 Talking Past Each Other

How did Bergson deal with experimental results? In the opening sentence in *Duration and Simultaneity*, Bergson was very careful not to go against any facts of observation: "we take the formulas … term by term, and we find out to which concrete reality, to what thing perceived or perceptible, each term corresponds."[61] Bergson, in fact, wanted *more* not *less* weight placed on experiment and mathematics. He wanted to return to the results of the Michelson-Morley experiment—an experiment which was central in discussions of relativity theory.[62]

When describing the Michelson-Morley experiment, he again considered the connection between two clocks in terms of the exchange of electromagnetic signals. "How do we synchronize two clocks located at different places?" Two operators in charge of setting the clocks "communicate" with each other about the time by means of "optical signals, or more generally electromagnetic ones," "where a person in O sends a person in A a ray of light destined to be returned back." This procedure was equivalent to that of the Michelson-Morley experiment "with the difference, however, that mirrors have been replaced by people."[63] Both of these scenarios (one based on two individuals communicating with each other at a distance and the other one on the Michelson-Morley's experiment), according to Bergson, did not lead to Einstein's conclusions.

Bergson carefully considered the connection between the stationary observer and the traveling one in terms of electromagnetic communications. He imagined what the dialog between "Peter" and "Paul" could be as they separated. Bergson wrote it down, as if it were a script for a play. Peter, in Bergson's account of the story, says to Paul: "The moment you separated from me … your time swelled, your clocks disagreed." It was "obvious," according to Bergson what "Paul would reply." That everything was normal for him (Paul) and that it was Peter's system that had gone awry.

The conversation between the two observers, as narrated by Bergson, led nowhere. It consisted in back-and-forth repetition between the travelers. It was characterized by misunderstanding and mistrust. The conversation between Einstein and Bergson led to similar results.

Bergson considered a case where the travelers could be seen by "a supreme consciousness" capable of "communicating telepathically with both." That "consciousness" would indeed see the effects of time dilation. But "from the point of view of physics, that argument does not count."[64]

Throughout the rest of his book, Bergson explained how the laws of electromagnetism did not necessarily lead directly to Einstein's conclusions. When scientists turned to them as evidence for the theory of relativity, they assumed a concept of

[61] "Préface" in ibid., vi.

[62] Ibid., 1.

[63] Ibid., 9–10.

[64] Ibid., 91, 108.

communication so narrow that he could not possibly imagine how it would unambiguously compel scientists, or the famous travelers in the twin paradox, to agree with each other. Paul and Peter would go on disagreeing forever, never agreeing on the "paradoxes" of relativity theory. To fully investigate the topics of his interest—of how science passed from the abstract to the concrete, and from the conventional and the symbolic to the real—Bergson stressed aspects of the twin paradox that could *not* be explained simply be recourse to new forms of electromagnetic transmission and communication. He made it patently evident that Einstein, in his theory, made certain assumptions about the nature of communication.

## 4.8 Conclusion

Scientists' rhetorical, argumentative and persuasive practices are often held up as ideal examples of "reasonable discourse." The work of the philosopher Jürgen Habermas is often invoked to show how the road of "objective scientific truth" emerges from an " 'ideal speech situation,' the counterfactual ideal of a domination-free communication community."[65] In this view, bad science emerges when norms guaranteeing reasonable discourse are broken. The "freak of a [German] natural physics" and "Soviet Marxist genetics," explained Habermas, arose in cases of overt interference with the processes of consensual scientific deliberation.[66] The philosopher Helen Longino has drawn out a list to guard against the manipulation of science: "(1) there must be recognized avenues for the criticism of evidence, of methods, and of assumptions and reasoning; (2) there must exist shared standards that critics can invoke; (3) the community as a whole must be responsive to such criticism; (4) intellectual authority must be shared equally among qualified practitioners"[67] These parameters can give us hope that scientific controversies can be settled solely "on the basis of evidence." Philip Kitcher, author of *Science, Truth, and Democracy*, maintains that "neither the fact that major scientific controversies are protracted nor our inability to delineate a precise account of scientific evidence should undermine our confidence that the resolution of scientific debate on the basis of evidence is possible."[68]

Does the "ideal speech situation" described by Habermas actually lead to scientific consensus and to good science? Not everyone is an optimist. Being a scientist, according to the philosopher Mary Hesse, involves "the decision to enter a certain

[65] Gordon R. Mitchell, "Did Habermas Cede Nature to the Positivists?," *Philosophy and Rhetoric* 36, no. 1 (2003): 7.

[66] Jürgen Habermas, *Knowledge and Human Interests* (Cambridge: Polity, 1987). 315.

[67] Helen E. Longino, *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry* (Princeton, N.J.: Princeton University Press, 1990). 76.

[68] Philip Kitcher, *Science, Truth, and Democracy*, Oxford Studies in Philosophy of Science (Oxford: Oxford University Press, 2001). 41.

form of life, that is, the scientific community of rational discourse."[69] But this ideal is rarely fulfilled. Hesse noted that "the conception of the ideal speech situation is certainly very strongly counterfactual. What then is its status? It is not something that is empirically realized in history, and perhaps is never realizable."[70] Habermas, agreeing with criticisms of this nature, nonetheless decided to hold on to this "fiction" for reasons that appear to be sentimental: "on this unavoidable fiction rests the humanity of intercourse among men who are still men."[71] The sociologist Milena Wazeck, in her study of Einstein's opponents, found that communication did not lead to scientific consensus. "The possibility of overcoming disagreement by communication and learning," she explains, in nothing other than an "optimistic view."[72]

Since the time of Galileo, science is replete with "rhetorical strategies of nondialog" as effective means for silencing opponents.[73] Working as a scientist involves working within a community of scientists that listen to "persuasive arguments" in favor or against of certain theories. But what happens when "unreasonable men" refuse to be or cannot be swayed by to the evidence that is presented to them? "The man who continues to resist after his whole profession has been converted has *ipso facto* ceased to be a scientist," explained Thomas S. Kuhn.[74]

When scientists communicate, they cannot help but communicate about communicating. What happens if we complement our studies of communication in science and our normative ideals of science with investigations into the actual non-communication strategies that actually *do* lead to consensus? This type of consensus comes at a steep price, excluding from our knowledge practices notions of communication connected to classical hermeneutics and exegesis that include investigations into meaning, understanding, intentionality, intertextuality, and affectivity and that have been relegated to a secondary status and circumscribed as part of the humanities. When talking about the time of the universe, it is about time to talk about who is doing the talking.

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[69] Mary Hesse, "Habermas' Consensus Theory of Truth," *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association* 1978 (1978): 382.

[70] Ibid., 381.

[71] Cited in T. McCarthy, "A Theory of Communicative Competence," *Philosophy of the Social Sciences* 3 (1973): 140; Hesse, "Habermas' Consensus Theory of Truth," 381.

[72] Milena Wazeck, "Marginalization Processes in Science: The Controversy about the Theory of Relativity in the 1920s," *Social Studies of Science* 43, no. 2 (2013): 185.

[73] Mario Biagioli, *Galileo, Courtier: The Practice of Science in the Culture of Absolutism* (Chicago: University of Chicago Press, 1993). 218. For communication breakdown in the case involving Herbert Dingle's objections to relativity, see Hasok Chang, "A Misunderstood Rebellion: The Twin-Paradox Controversy and Herbert Dingle's Vision of Science," *Studies in the History and Philosophy of Science* 24 (1994).

[74] Kuhn, *The Structure of Scientific Revolutions*: 159.

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