

# ***IT WAS ABOUT TIME***

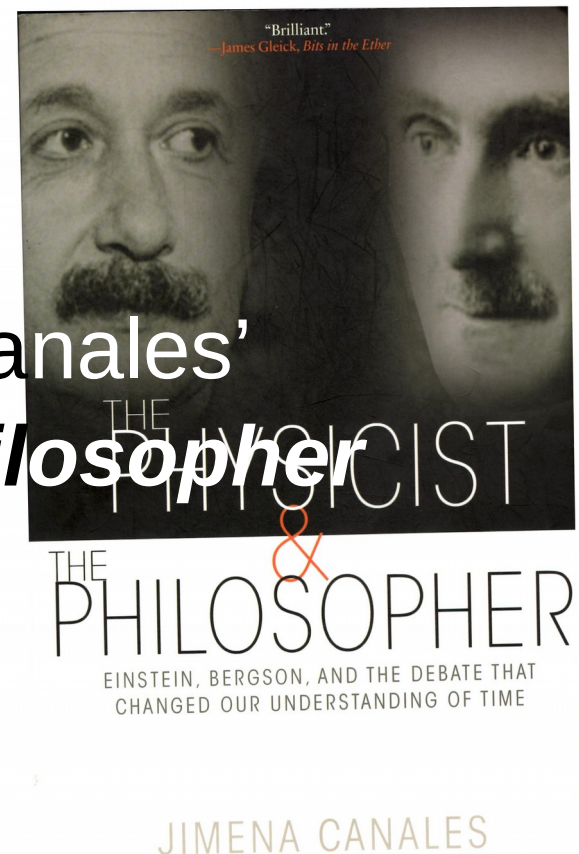
~~A review of~~  
~~An overview of~~  
~~An introduction to~~  
~~Comments on~~

A book report of Jimena Canales'

***The Physicist & the Philosopher***

*Leo Michelotti*

*November 9, 2018*



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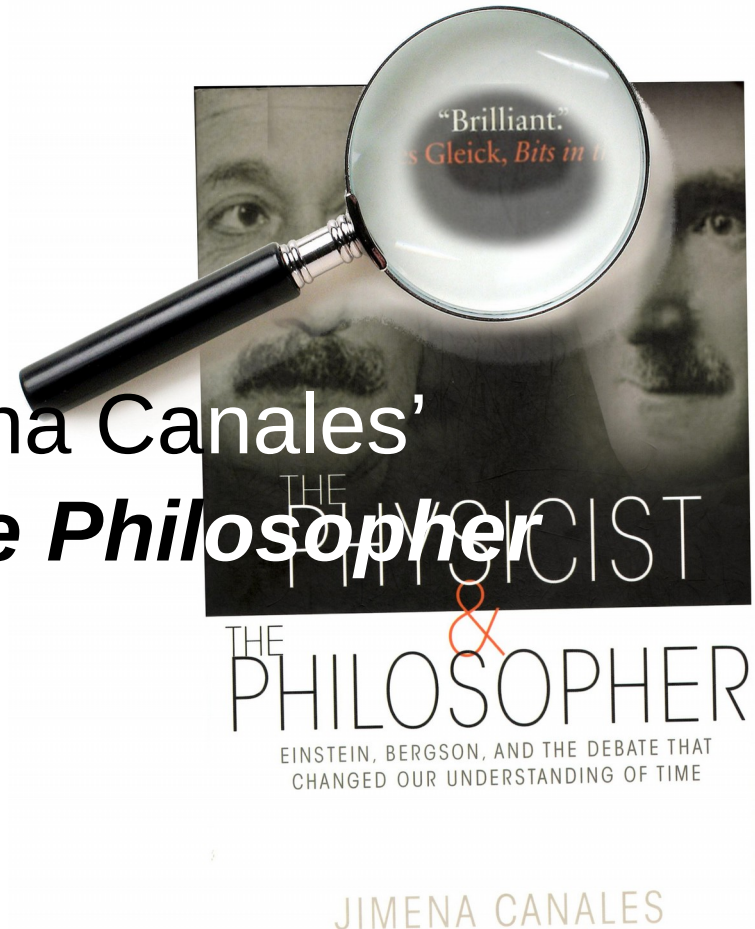
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A book report of Jimena Canales'

***The Physicist & the Philosopher***

*Leo Michelotti*

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# Subject of the book

- Scientists (mostly physicists) and philosophers engaged in discussions, debates and arguments about the nature of time.
  - People, ideas, and the historical framework that influenced them.
- Uses as focal point: a formal debate in Paris on April 6, 1922 between Albert Einstein, Henri Bergson and others, along with preceding and subsequent “discussions.”
- The theory of relativity sparked confrontations that enlarged fractures between physics and philosophy and within philosophy itself. ..++
  - “Einstein was defended by scientists and philosophers of a particular bent, whereas Bergson was backed by a very different set of scientists and philosophers. Alliances and antagonisms ... were subtle and complex. Many philosophers ended by siding with Einstein; many physicists, with Bergson.”

# Subject of the book

- Scientists (mostly physicists) and philosophers engaged in

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Perhaps the separation began in the 19th century, when a new word was invented to distinguish a specific subset of philosophers from the rest.

*“The poet Samuel Coleridge...complained that the term 'philosopher' was 'too wide and too lofty' for contemporary students of natural knowledge....*

*The mathematician William Whewell responded by proposing the term 'scientist' [ in 1833 ]. ...*

*Whewell...also coined the term 'physicist' to describe studies [sic] of 'force, matter, and the properties of matter.' ”*

# Style and/or genre

- Scholarly historical book written in a popular style.
- Asynchronous, non-sequential narrative.
  - Reading it is a little like watching LOST! or Dunkirk.
    - For example, one chapter ends in 1939, at the start of World War II; the next begins back in 1922; one paragraph recalls events from 1951; the next is back in 1941.
- Numbers: 29 chapters (346 pages);  
28 page bibliography;  
29 page index;  
average 46.14 endnotes per chapter (60 pages),  
not including 42 for a ten page postface;  
even acknowledgments extend to four pages.

# Structure and content

- Part One: The Debate (three chapters)
  - Starts from the 1922 meeting featuring Einstein and Bergson and proceeds to preliminary introductions of material to follow.
- Part Two: The Men (sixteen chapters)
  - Most of the major players in the subsequent discussions, with their repercussions for science and philosophy.
- Part Three: The Things (eight chapters)
  - Inventions, discoveries, and technologies that influenced the arguments: e.g. clocks, telecommunication, movies, recordings, trains, planes and automobiles, and atoms.
- Part Four: The Words (two chapters)
  - A few final (recorded) thoughts of Einstein and Bergson about each other and the argument they initiated.

# Opening lines

- Chapter 1: Untimely

“On April 6, 1922, Einstein met a man he would never forget. He was one of the most celebrated philosophers of the century, widely known for espousing a theory of time that explained what clocks did not: memories, premonitions, expectations and anticipations. Thanks to him, we now know that to act on the future one needs to start by changing the past.”

“Why does one thing not always lead to the next? The meeting had been planned as a cordial and scholarly event. It was anything but that. ...”

# (Personal) reading challenges and other minor quibbles

- Bias from education, training and biography
  - Relativist from youth: formally indoctrinated from ages 15-25
- Would have liked:
  - localized “comprehensive” exposition of Bergson’s positions
  - timeline
  - glossary of philosophies: nominalism, positivism, pragmatism, conventionalism, phenomenology, operationalism, and so forth
- Author uses questions as writing device ...++
  - Sometimes useful; sometimes provoking; sometimes annoying
- Possible errors? Editorial glitches? ...++
- Among the missing ...++



# (Personal) reading challenges and other minor quibbles

- B “What drew Bergson's students to call him an enchanter? What motivated socialites to send servants ahead of time to reserve seats for his lectures? Why was he meticulously read by presidents and prime ministers? Why did his enemies want to murder him? ... ..”
- W
- A “Should intellectuals embrace mass media? ... Should scientists take advantage of its persuasive powers for reaching consensus and assent?”
  - Einstein: yes. Bergson: not as much.
- P
- A “Has time ever advanced clockwise?” (Great sentence)

# (Personal) reading challenges and other minor quibbles

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- “Einstein's work showed that a different logic applied to a light signal than to a solid body.... Relativity was not necessary for understanding the latter.”*
- “Was the quest to find what differentiated the past from the future as misguided as those attempts to find a difference between left and right...? 'There can be no doubt that all natural laws are invariant with respect to an interchange of left and right,' explained [Hermann] Weyl. Why should time be any different?”*
- “Thanks to [Bergson], we now know that to act on the future one needs to start by changing the past.”*

(P)

- Bias from
  - Relativis
- Would ha
  - localized
  - timeline
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The theory of relativity is often criticized for giving, without justification, a central theoretical role to the propagation of light, in that it founds the concept of time upon the law of propagation of light. The situation, however, is somewhat as follows. In order to give a physical significance to the concept of time, processes of some kind are required which enable relations to be established between different places. It is immaterial what kind of processes one chooses for such a definition of time. It is advantageous, however, for the theory, to choose only those processes concerning which we know something certain. This holds for the propagation of light *in vacuo* in a higher degree than for any other process which could be considered.<sup>82</sup>

Speaking to a throng of eager listeners, he was forthright about his theory's weakness. If the "central theoretical role" given to the propagation of light in his understanding of "the concept of time" appeared "without justification," why adopt his theory? He proceeded to justify himself: "The situation, however, is somewhat as follows." He felt entitled to treat light in such a special way "in order to give a physical significance to the concept of time." Since a material reference for time had to be chosen, it was "advantageous . . . to choose only those processes concerning which we know something certain." Light, at the moment, was the best available solution because "this holds for the propagation of light *in vacuo* in a higher degree than for any other process which could be considered."<sup>83</sup>

After his debate with Bergson, Einstein developed a bolder response. He worked much harder to prove why clocks based on light defined as a constant were "ideal" for more than these practical "advantageous" reasons—they were also ideal for foundational ones.

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# (Personal) reading challenges and other minor quibbles

- Bias from education, training and biography

- Relativist since teens: formally indoctrinated from ages 15-25

- *No mention of:*

- *train in tunnel paradox,*

- *Eotvos experiment,*

- *George Le Maitre's big bang theory,*

- *the role of consciousness in early quantum theory,*

- *Teilhard de Chardin,*

- *Michael Polanyi, ...*

- *...*

- Possible errors? Editorial glitches? ...

- Among the missing ...

# Bergson's position

- Time is not space; it is ontologically different from space.
  - “[Bergson] associated [time] with *elan vital*, a concept translated worldwide as 'vital impulse.' This impulse...was interwoven throughout the universe giving life an unstoppable...surge....”
  - “ 'Time is...the necessary condition of action: What am I saying? It is action itself.' ”
- Time exists in ***duration***; there is no time "point."
  - “ 'The pure present is an ungraspable advance of the past devouring the future. In truth, all sensation is already memory.' ”
- Einstein's time is static, reversible; Bergson's Time is dynamic and irreversible. Einstein destroyed the “flow” of time.
  - *Time is not homogeneous!*
  - “*Any physical measurement of time, [Bergson] argued, contained an irreducible psychological [ i.e. human ] element.*”
- Physical time of clocks is real but not complete. Philosopher's Time exists too.
  - Deeper questions: What is a measurement? Why make clocks?
- Logical inconsistency in definition of simultaneity between near and far.
  - In the end, Einstein accepted this criticism.
- (Later) claimed that quantum mechanics proved him right.

# Einstein's position

- Synchronization at large distances should be done with light.
- Speed of light is the same in all inertial frames.
  - Eliminate "ether" as explanation of Lorentz contraction
- Simultaneity of distantly separated events was not an absolute predicate, and the temporal order of events outside each other's light cones was ambiguous.
- There is no preferred reference frame for any physical effect.
  - All physics to be invariant under Lorentz transformations.
  - This was a true revolution. (man in a box thought experiments)
- Time is what you measure with a clock! ...++
- Fitzgerald-Lorentz-Minkowski transformations are not just mathematics but express something real about the true nature of space-time.

# Einstein's position

- S *“[During] those years, [Einstein] believed that time was*
- S *either what clocks measured or it was nothing at all. ...”*
- 
- S *Bruno Latour: “ 'Bergson had carefully studied Einstein's*  
p *theory of relativity and wrote a thick book about it, but*  
li *Einstein had only a few dismissive comments about*
- T *Bergson's argument. After Bergson spoke for thirty*  
– *minutes, Einstein made a terse two-minute remark, ending*  
– *with this damning sentence: "Hence there is no*  
– *philosopher's time; there is only a psychological time*  
*different from the time of the physicist." ' ”*
- T
- F *"Einstein's reply [ during the 1922 debate ] – stating that the*  
m *time of the philosophers did not exist – was incendiary."*  
S

# Twin paradox

- Originally called “Langevin’s paradox,” Paul Langevin introduced the twin paradox in 1911, in a speech about the revolutionary meaning of relativity. ..++
- Acceleration *unnecessarily* used to explain non-reciprocity of the twins.
  - Einstein already motivated/working to “generalize his theory.”
- *"[Bergson] insisted that even if the twins' clocks differed, his major point still held - that philosophy had a right to study these differences. So what if one of the twins' clocks showed a different time than the other's, asked Bergson. This discrepancy did not necessarily mean that time itself became dilated and should be understood in the way that Einstein proposed."*
- What Einstein proposed:
  - no preferred frame of reference (Lorentz transformations valid) **for any physical phenomena**
  - time is nothing more or less than what is measured by clocks



# Twin paradox

- Originally called "Langevin's paradox." Paul Langevin introduced the
- "When did Bergson first learn of Einstein's work? In the spring of 1911 ... scientists and philosophers ... met in Bologna during the Fourth International Congress of Philosophy.... Paul Langevin asked members of the audience if 'anyone among us' would want to 'dedicate two years of his life to find out what Earth would look like in two hundred years.' ... Langevin delivered this question not as a peddler of dreams and fantasies, but rather as a pure and honest physicist. ... Bergson, we are told, was seething in the audience, already getting ready for a fight. ... Langevin's presentation stole the show. ... [ It ] was simply brilliant. ... Einstein [though absent] was thrilled."

# Twin paradox

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“Langevin was one of the first scientists in France to espouse Einstein's theory. After learning about it, he quickly became ‘the apostle of the new gospel.’ His involvement with relativity theory was so thorough that Einstein, at the time of Langevin's death (1946), even claimed that his friend would have in all likelihood [sic] developed it himself had others, including Einstein himself, not done it: ‘It seems to me certain that he would have developed the special theory of relativity if that had not been done elsewhere, for he had clearly recognized the essential points,’ he explained.”

no preferred frame of reference (Lorentz transformations valid) for any  
***physical phenomena***

- time is nothing more or less than what is measured by clocks

# Twin paradox

- O “The philosopher Brunschvicg ... reminded the attendees  
th [ of yet another conference, this time in Paris ] that for  
m Langevin's hypothesis to be correct, scientists still need
- A to prove that biological processes underwent the same  
tw temporal transformations as physical ones [i.e. clocks] ...  
– [Others criticized] how Langevin described clocks as  
‘aging’ and ‘growing old.’ ... The physicist Jean Perrin ...
- “/ added with irony: ‘When physicists say “aging,” that is  
p one word I especially like’ ”  
d  
ti
- W “[ Edouard Le Roy suggested: ] Why not simply use  
u different terms...? Why not use ‘hour’ for the time of  
physics and ‘time’ for that of philosophy? In this way,  
– Le Roy aimed to set boundaries.... After listening  
– attentively ... Langevin retreated. ... [He] admitted that he  
– did ‘not have the pretension of speaking from the point of  
view of a philosopher.’ ”

# Part Two: The Men

- Principals: Albert Einstein and Henri Bergson
- Seconds: Paul Langevin, Paul Painlevé and Edouard Le Roy
- Others: Hendrick Lorentz, Albert Michelson, Henri Poincaré, Alfred North Whitehead, Bertrand Russell, Arthur Eddington, Martin Heidegger, Hermann Minkowski, Ernst Mach, Edmund Husserl, Hermann Weyl, Norbert Wiener, (Parmenides), (Heraclitus), ...
- Not in the book: Ludwig Wittgenstein, Georges Lemaître, Michael Polanyi, (Teilhard de Chardin), ...

# TO BE CONTINUED (and don't blink)



“People assume that time is a strict progression of cause to effect, but actually, from a nonlinear, non-subjective viewpoint, it's more like a big ball of wibbly-wobbly, timey-wimey stuff.”

– Doctor Who