Dr. hab. Zbigniew Orbik, prof of SUT
Department of Applied Social Sciences, SUT

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Review of the doctoral dissertation of Anna Kuszmiruk, M.A., titled *Henri Bergson and the Theory of Relativity: Philosophical Critique of the Concept of Time in 20th-Century Physics*, supervised by Mark Sinclair, Reader in Philosophy at Queen's University Belfast, and Dr. Hab. Gniewomir Sarbicki, prof. of Nicolaus Copernicus University

1. Problem

The reviewed doctoral dissertation analyzes Henri Bergson's critique of the concept of time in physics, particularly Albert Einstein's theory of relativity. This theory, as is well known, transformed the prevailing absolute understanding of time in physics, replacing it with the concept of relative time. Two simultaneous events in one frame of reference may not be simultaneous in another frame of reference. Therefore, the concept of simultaneity plays a key role in the special theory of relativity. The relativity of simultaneity implies the relativity of the concept of temporal succession of events. Analyzing Bergson's concept of time, the doctoral student rightly emphasizes the importance of the concept of simultaneity (p. 1).

The task undertaken by the author of the dissertation is not easy, as it requires, on the one hand, tracing the development of the issue of time in Bergson's writings, and on the other hand, as stated above, in relation to a completely new approach to this problem based on the special theory of relativity.

The candidate proposes that the French philosopher's critique of Einstein's concept of time, presented in the work *Duration and Simultaneity* and in the famous debate with Einstein, which took place on April 6, 1922, in Paris, remains relevant. As is well known, the debate's outcome did not lead to a unanimous conclusion between the brilliant physicist and the eminent philosopher. Each remained steadfast in their position, questioning the validity of the other's concept of time. This is significant because some scholars consider Bergson's dispute with Einstein to be a watershed moment in establishing the relationship between physics and philosophy in the study of time. The previously existing collaboration ultimately ended. The two disciplines moved in completely different directions, determined by their methodologies and theoretical frameworks.

2. Thesis Structure and Content

The dissertation consists of an Introduction, ten chapters, a Conclusion, and a Bibliography. It is divided into four parts. Part One consists of two chapters and is titled *Bergson and Einstein: Two Monologues and the Damned Book*, contains two subsequent chapters; Part Three, *Bergson and Relativity: The Main Physical Issues Relating to Time*, consists of chapters five, six, and seven; and Part Four, titled *Bergson and Le Temps Réel: The Hypothesis of Universal Time* comprises the last three chapters, eight through ten. The work concludes with a Conclusion summarizing the analyses presented earlier. The discussion focuses primarily on *Duration and Simultaneity*, while other works by the French philosopher that discuss time are cited as necessary for the discussion.

The structure of the work was designed in such a way as to enable tracing the evolution of the development of the issue of time in Bergson's philosophy, first in his writings from the pre-relativistic period, and then after the emergence of the theory of relativity.

3. Substantive assessment of work

The reviewed doctoral dissertation, in my opinion, provides a thorough treatment of the title topic. It contributes to the research on time in Bergson's philosophy, demonstrating that it is a philosophical concept rooted in a scientific view of the world. In this way, it sheds new light on the understanding of the category of duration, central to Bergsonism. This is where its originality manifests itself. The work contains highly detailed descriptions and analyses that illuminate the very background of the development of time in Bergson's philosophy, but also its evolution in the context of fundamental changes occurring in the physical understanding of basic phenomena such as time, space, motion, and space.

The research conducted in this dissertation is based on extensive literature, both historical and current. This allows for the tracing of the development of the title topic, which is particularly important in dissertations of a historical and systematic nature. These works are written in three languages: English, Polish, and French. Their selection and use should be considered appropriate. The work of Polish philosophers who have explored Bergson's thought is also valuable. This, on the one hand, serves as a "promotion" of Polish philosophical thought, but I also believe it can motivate other young researchers to undertake research on Bergson's legacy, thus contributing to the global discourse on this thought and its philosophical and methodological implications.

The candidate demonstrates excellent philosophical and methodological training. The analyses conducted in this work reveal a fully formed researcher capable of conducting independent research. She also demonstrated extraordinary diligence; writing a work so well-

grounded in the literature required considerable intellectual effort and—in my opinion—demonstrates a genuine commitment to the practice of philosophy.

The view expressed in the dissertation that the discrepancy in Bergson's and Einstein's understanding of time stems from a fundamental difference between the philosophical and physical understandings of the nature of this phenomenon should be considered an interesting and substantively valuable contribution to the discussed issues. The author of the dissertation rightly notes, in my opinion, that Bergson's contribution lies in analyzing the hidden assumptions of relativity, often invisible to scientists. She also points out the errors Bergson made in analyzing the theory of relativity (p. 177). These errors primarily concerned analyses related to the concept of simultaneity. For example, Bergson failed to distinguish time measured locally from time measured in another frame of reference (p. 178). This demonstrates that the doctoral student presents a sound research approach to the philosopher whose views she discusses and to the field under study, in accordance with the old principle "Amicus Plato, sed magis amica veritas".

A valuable comment included in the reviewed dissertation, which makes a significant contribution to the discussion on Bergson's concept of time, is the clarification of the confusion, noticeable in the literature on the subject, between two concepts that are key to the philosophy of the author of Matter and Memory: real time and real duration. One can read: “Duration, as Bergson conceived it, denotes a lived, qualitative experience of time that resists spatialisation and escapes mathematical formalisation (…). Real time, by contrast, refers to a form of temporality that, while still rooted in experience, lends itself to measurement and scientific articulation (p. 181-182).

While this comment is not the candidate's own, its inclusion in philosophical discourse (especially if the dissertation were published as a monograph) could contribute, on the one hand, to the development of research on the philosophical concept of time, and, on the other, to the elimination of certain entrenched but untrue views. This observation also demonstrates the evolution of the concept of time-duration in Bergson's thought. The direction of this evolution was determined, according to the considerations presented in the thesis, by progress in science (primarily physics). Therefore, and this is also valuable, contrary to some earlier interpretations, the thesis sheds new light on Bergson's concept of time, showing it to be consistent with results achieved both in the theory of relativity, but also in contemporary quantum physics, or more broadly, science as such.

4. Suggestion

The candidate is right when she writes in the summary to part four that: “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 revolutionized scientific thought, Bergson argued that his worldview remained embedded in prerelativistic 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” (p. 220). The evidence confirming these words appears to be Einstein's criticism of quantum mechanics. Bergson's criticism of the concept of time in the theory of relativity, in turn, led to a correction of his original understanding of time as duration and the formulation of the hypothesis of universal time.

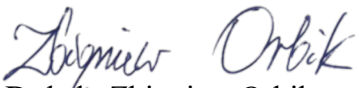
It seems worthwhile to draw attention to another important aspect of this discussion: the relationship between metaphysical concepts and scientific theories. While this issue exceeds the scope of the work under review, it nevertheless touches on a key issue in assessing Bergson's critique of the concept of time in the theory of relativity and his own concept of universal time. The key question is: is metaphysical criticism of results obtained in scientific knowledge even justified? Metaphysical theories are, as is well known, not falsifiable. In my opinion, it is worth drawing attention to a fundamental issue in this discussion: the structure of physical theories. They can be distinguished by three basic elements: (1) mathematical formalism; (2) the representation of reality given by measurement results; and (3) bridging rules connecting (1) and (2)[1]. Interpretations offered by philosophers typically focus on the mathematical structure of physical theories or on bridging rules that assign mathematical formalism to experimental data. Philosophical interpretations can take various forms: from consistency with the mathematical structure of the theory, through a neutral stance toward the mathematical apparatus of a given theory, to its negation. This situation seems to be present in the Bergson-Einstein debate, and it would perhaps be worthwhile to highlight this in the Conclusions. Without resolving the validity of the philosopher's criticisms of the theory of relativity, it should be remembered that the concept of absolute time, which underpinned Newtonian physics, was also essentially metaphysical.

[1] See. M. Heller, *O filozofujących fizykach i fizykujących filozofach czyli o filozoficznych interpretacjach fizycznych teorii* [*About philosophizing physicists and physicizing philosophers, or about philosophical interpretations of physical theories*], „Zagadnienia filozoficzne w nauce”, XIII / 1991, p. 90–93.

At the end of these few remarks, it is worth quoting the words of the outstanding physicist Arthur Eddington, who wrote: “According to the principle of relativity in its most extended sense, the space and time of physics are merely a mental scaffolding in which for our own convenience we locate the observable phenomena of Nature. Phenomena are conditioned by other phenomena according to certain laws, but not by the space-time scaffolding, which does not exist outside our brains”[2]. It seems, therefore, that in the case of scientific theories describing the most fundamental phenomena of the real world, it is impossible to completely avoid their metaphysical interpretations.

5. Conclusions

In my opinion, Anna Kuszmiruk's thesis meets the requirements for doctoral dissertations. It is a work of high merit, demonstrating that the candidate not only understands the analyzed problems but also formulates compelling proposals for resolving many specific issues. I request that she be admitted to the next stages of her doctoral program and suggest publishing the dissertation as a monograph, which would constitute a valuable link in research on Bergson's philosophy and, more broadly, on the philosophical and scientific issues of time.



Dr hab. Zbigniew Orbik

[2] A. S. Eddington, Gravitation and the Principle of Relativity. Nature 98,(1916), p. 328.