

EDITOR'S PREFACE

This is a new publication of Bertrand Russell's book *Our Knowledge of the External World as a Field for Scientific Method in Philosophy*.¹ It includes eight lectures delivered as Lowell Lectures in Boston, in March and April 1914.

As such a rich treatise, containing deep analyses of the most outstanding questions about the external world and our knowledge of it, generates a lot of thoughts, I would only add two complementing comments² to two of the subjects analyzed by Russell:

- Zeno's paradox (rather *απορία*) the *Dichotomy* (the complementing comment deals with Aristotle's discussion of this *απορία*)
- How spacetime physics posed the greatest challenge to the (often taken for granted) feeling that we possess free will.

1. *How Aristotle virtually arrived at a logical refutation of the seemingly self-evident flow of time by analyzing Zeno's paradox the Dichotomy.*

As the Eleatic view of the world,³ so openly contradicted people's perceptual experience that it had been mostly

¹B. Russell, *Our Knowledge of the External World as a Field for Scientific Method in Philosophy* (Open Court Publishing Company, Chicago and London 1915).

²I am including them here, not as footnotes in the relevant places in the book, because they too long.

³Presented in Parmenides' poem (generally known as *On Nature* because the original title is unknown) whose content "has been revealed

ridiculed since the time of the Eleatics. This attitude had prompted Zeno⁴ to demonstrate to those who regarded motion and change as self-evident that it is their view, which naively reflects what comes from our senses, that leads to contradictions. Zeno formulated a number of paradoxes for this purpose such as the *Dichotomy* – if an object travels from a point A to a distant point B, it has to travel first half of the distance AB, then half of the remaining half, and so on; as the object has to travel an infinite number of such distances (since every distance can be divided into two) and as each of these travels needs some time, the object would need an infinite amount of time to travel the infinite number of distances and would *never* reach B.

Aristotle showed that Zeno had arrived at the paradox, because he explicitly presupposed that space was divisible to infinity, but implicitly assumed that time was not infinitely divisible (if both space and time are infinitely divisible, there is no paradox – if, for example, a distance of one meter is traveled by an object for one second, the object will travel half a meter for half a second and so on, and will not need an infinite amount of time to reach the end point B).

In Book VI of his *Physics* Aristotle wrote about Zeno's implicit assumption that time is not infinitely divisible:⁵:

This is false; for time is not composed of indivisible nows any more than any other magnitude is composed of indivisibles.

However, when Aristotle discussed the nature of time itself in Book IV of *Physics* – that of all times (past, present, and

by a goddess, who tells him what really *is*. Reality, she says, is uncreated, indestructible, unchanging, indivisible” (Chapter VI, p. 130). See also: “The great conception of a reality behind the passing illusions of sense, a reality one, indivisible, and unchanging, was thus introduced into Western philosophy by Parmenides, not, it would seem, for mystical or religious reasons, but on the basis of a logical argument as to the impossibility of not-being” p. 131.

⁴See Chapter VI, p. 132

⁵J. Barnes, (Ed.), *Complete Works of Aristotle*, Vol. 1, (Princeton University Press, Princeton 1984), §9

future) only the present time (the moment ‘now’) is real – his logical analysis inescapably led him to the opposite conclusion – that the only real moment of time is “the indivisible present ‘now’ ”.⁶ Aristotle knew that the duration of ‘now’ could not be zero, because then time would not exist at all. He realized that he had no choice but to assume that the moment ‘now’ is indivisible in order to avoid a contradiction in terms – if the moment ‘now,’ which by definition is wholly present, were divisible, it would contain past, present, and future moments:⁷

All time has been shown to be divisible. Thus on this assumption the now is divisible. But if the now is divisible... there will be a part of the now that is past and a part that is future... It is clear, then, from what has been said that time contains something indivisible, and this is what we call the now.

The very fact that Aristotle, one of the greatest thinkers of our civilization who single-handedly created the science of logic, was led by the common-sense view (that only ‘now’ is real) to the inescapable contradiction – the present moment is both divisible and indivisible – implies that that view is wrong. Aristotle seems to have tried to identify the cause of this contradiction. In Book IV of his *Physics* he appears to have considered the possibility that the contradiction was caused by the seemingly self-evident assumption that the division of time into past, present and future reflected an objective fact in the world and wondered whether that division and the very idea of time might exist only in the mind (or the soul):⁸

Whether if soul did not exist time would exist or not, is a question that may fairly be asked.

⁶ *op. cit.*, §13.

⁷ *op. cit.*, §3.

⁸ *op. cit.*, §14.

Sixteen centuries ago Augustine also investigated the nature of time and like Aristotle faced the same paradoxical situation about the duration of ‘now,’ but, unlike him, he explicitly concluded that the division of time into past, present and future did not reflect an objective feature of the world (which according to Augustine is an eternal present identical to the Eleatic’s eternal being, which is constantly present) and therefore this division was caused by the mind:⁹

What is by now evident and clear is that neither future nor past exists, and it is inexact language to speak of three times – past, present, and future... In the soul there are these three aspects of time, and I do not see them anywhere else.

2. *Whether or not free will exists crucially depends on whether the concept of spacetime represents a real four-dimensional world or is nothing more than an abstract mathematical construction.*

The most probable reaction to this statement is, I guess, to ask sarcastically “What does spacetime physics have to do with free will?” As often happens such “questions” tell more about the persons who ask than about what is asked.

Our physical bodies obey the laws of the physical world (reflected in our physical theories) in the first place, not what is happening in our brains. As this is a general statement, let me state explicitly the present situation with free will – it is spacetime physics, particularly the nature of spacetime (whether spacetime represents a real four-dimensional world or is merely a mathematical space), that has posed the greatest intellectual challenge that humankind has ever faced:

If spacetime is real, we do not have free will because our physical bodies are forever given (four-dimensional timelike) worldtubes, which contain at once (*en bloc*) our entire lives

⁹Saint Augustine, *The Confessions*. In: *Great Books of the Western World*, Vol. 16, ed. by M. J. Adler (Encyclopedia Britannica, Chicago 1993), Book XI.

(like a filmstrip¹⁰ which contains at once the entire story of a movie). No matter what is going on in our brains, that is irrelevant for the reality of our physical worldtubes and spacetime because, obviously, it is the experimental physical evidence that determines their reality. So, it is spacetime physics that decides whether or not we have free will – if the world is four-dimensional free will does not exist; if reality is something else – a three-dimensional world (which is ruled out by experiment) or a growing (or evolving) block universe – free will may or may not exist.

I think it is exceedingly clear that the only way to eliminate this challenge is to refute the existing arguments for the reality of spacetime, starting with Hermann Minkowski’s own arguments, which are firmly based on experimental physics, summarized in his 1908 worldview-changing lecture “Space and Time.”¹¹ Inexplicably, these arguments of unprecedented strength (because *experiments would be impossible if spacetime were not real*) have been ignored although it seems self-evident that such incomprehensible attitude is closer to the irrational “This cannot be because it cannot be” than to science...

That is why, any discussion of free will that does not address those arguments is nothing more than an insignificant unscientific chat.

¹⁰Think of the following situation: Watching the main character in a movie confidently declare “I do not care about spacetime physics. I *know* I have free will!” we can only smile because we know that past, present and future (in the movie) are given at once on the filmstrip; so the main character’s “actions” are predetermined since they are all given on the filmstrip. The filmstrip seems to be the best visualization of how the whole history of the perceived by us three-dimensional world is given *en bloc* in spacetime.

¹¹H. Minkowski, “Space and Time.” In: Hermann Minkowski, *Spacetime: Minkowski’s Papers on Spacetime Physics* (Minkowski Institute Press, Montreal 2020)

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Vesselin Petkov
Minkowski Institute
Montreal