

# Review of: "Zeno and Einstein"

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## **Zeno of Elea and Einstein, i.e. methodological and substantive issues. Review of the paper *Zeno and Einstein* of Ted Dace.**

Ted Dece's paper *Zeno and Einstein* submitted for review at the scientific website *Qeios*, is very interesting and thought-provoking. I personally consider the invitation from the *Qeios* team to review this paper to be an honorable distinction. At the same time, for two important reasons, discussed below, this review ultimately took this shape. It concerns the paper available in version 2.0 of September 29, 2023 (access: <https://doi.org/10.32388/QJBGA4>).

The view of many contemporary philosophers and scientists century that it is exactly in antiquity, specifically in Greek thought and from its very beginnings, that we should look for sources or significant premises of later theories and scientific achievements – including the philosophical sources of some mathematical and logical (set-theoretic) problems – does not seem to be just a philosophical fashion. A good example of this view is an attempt to interpret four arguments about the motion of Zeno of Elea, reported in detail by Aristotle (*Physica* VI 239b) – also undertaken in the reviewed paper – in the context of the mathematical problem of infinite quantities, which I wrote about at the beginning of one of my papers<sup>[1]</sup>. For the same reasons, this view often provokes many authors to put forward (sometimes hastily) very bold and philosophically "attractive" hypotheses. However, what seems philosophically "attractive" at first may ultimately turn out to be disastrous and unworkable. It's like a mythical labyrinth built for King Minos in Crete. It's easy to enter Daedalus' labyrinth – but finding a way out and escaping the Minotaur may be completely impossible.

What exactly do I mean when I evoke the image of a mythical labyrinth? Methodological problems and substantive issues. They may concern many trials of a similar type. I see the same problems in Ted Dace's paper submitted for review. My comments concern these two aspects: 1. methodology, 2. the same important substantive issues.

### 1. The labyrinth of searching for the methodological key by *Zeno and Einstein*

*Zeno and Einstein* is certainly an attempt to interpret the problem of motion and its relativity by comparing the concepts of Zeno of Elea and Albert Einstein. Ted Dace talks about it directly, admitting at the same time that he does so in connection with the criticism of the view of another author – Wesley Salmon.

All texts in which authors attempt comparative analyses are valuable. However, I also believe that comparisons are, contrary to appearances, very difficult and methodologically quite a challenge. It seems that such attempts require great

methodological caution so as not to arouse certain associations in readers that may ultimately turn out to be misunderstandings and lead to unjustified conclusions. In order to make a proper, methodologically correct comparison, you must first thoroughly examine what is to be compared. Only then can it be concluded whether such a comparison is possible at all and on what basis. What is the criterion for this comparison? On what basis does a legitimate comparison arise at all? Without the resolution of these issues, any attempt at comparative analysis may turn out to be merely a presentation of the author's position based on their own thoughts and associations. Therefore, the point is not only to ask the question about the possibility of making such a comparison (this issue in itself is a serious task), but, above all, to ask whether such a comparison is possible at all. That is, exactly whether such a comparison is methodologically justified at all.

This remark also applies to the *Zeno and Einstein*. The issues of the position on motion in Zeno of Elea, a student and successor of Parmenides, and the issue of A. Einstein's relativistic theory seem to be so distant that attempts at comparative analysis are doomed to the difficulties presented above. This does not mean that they are completely impossible. They are a difficult task that can be undertaken only when you properly understand the problem of motion in Zeno's way of thinking and at the same time have a very good knowledge of Einstein's physical theory. Unfortunately, I do not see any attempts to look for a criterion that would allow for comparing the concepts of both characters in T. Dace's work. Therefore, in my opinion, his proposal is bold and valuable - it should be kept in mind - but at the same time too arbitrary and methodologically questionable.

Since in my scientific work I do not study Einstein's theory of relativity, and therefore I cannot consider myself as someone who knows his physical and philosophical position well enough to be able to speak on this matter, I will limit my comments only to what concerns the interpretation of the position of Zeno of Elea.

## 2. The labyrinth of searching for the proper interpretation of Zeno of Elea's arguments

Zeno's arguments are known not first-hand, but from Aristotle's account (*Physica* 239b). T. Dace rightly points out this issue himself, but no remarks are made that would indicate that he is aware of this relationship and its possible consequences. And this is an important detail. Aristotle cites Zeno's arguments as part of his own interpretation and analysis of movement (κίνησις). This means that we must take into account that Aristotle's account may be intentional, but not necessarily accurate.

Another issue, which is worth bearing in mind from the very beginning, is that, contrary to what is commonly said, these are not four arguments against motion, but - as it is precisely written in Aristotle - *four arguments concerning motion* (τέτταρες οἱ λόγοι περὶ κινήσεως). If so, then the view that Zeno, following Parmenides, denies and abolishes all physical motion by some fancy dialectical argument, is probably incorrect. Already in ancient times, this view was highly controversial and was considered absurd. There is an episode known from the account of Diogenes Laertius (VI 39): when the kynik Diogenes of Sinope, the successor of Antisthenes in *Cynosarges*, heard that there was no such thing as movement, he did not provide any argument against it, but only started walking.

It seems that the source of the quite common view of the strangeness of the Eleatics' philosophy is the erroneous belief that in their case we are dealing with some radical ontology without any physics. This ignores the fact that Parmenides is known to have devoted a large part of his poem to physical issues. Some fragments are also known to us today. Therefore, if Zeno is a faithful continuator of Parmenides' way of thinking, he should not be denied a philosophical interest in physics. Aristotle's notation: τέτταρες οἱ λόγοι περὶ κινήσεως, seems to be very valuable information in this situation. In this context, also the analyzes of Zeno, who describes the consequences that arise from the results of Parmenides' path of inquiry, can be understood not only as a description of being (τὸ ὄν) as each separate (τὸ ἕκαστον), but also - in a sense - as the basic conditions arising from there and the possibilities of physics as such. Zeno's terms such as: size (μέγεθος), weight, strength / thickness / stoutness (πάχος), having (holding) before / in front of oneself (προέχειν), keep off or away from / pushing away (ἀπέχειν) do not appear there accidentally and without justification.

The actual paradoxical nature of Zeno's four arguments is well expressed and summarized by a sentence that some authors, including H. D. P. Lee, consider a putative "fifth argument". He quotes Diogenes Laertios (IX 72; =DK 29B 4) and it reads: τὸ κινούμενον οὔτ' ἐν ᾧ ἔστι τόπω κινεῖται οὔτ' ἐν ᾧ μὴ ἔστι (transl: *moving, moves neither in the place where it is nor in place where it is not*). It seems, therefore, that the registration of what we call motion does not describe motion as such, but only the particular states associated with it. The implicit matrix of standard physical conditions in each of the four arguments - especially in the argument about *moving equal masses in the stadium from the opposite side* (περὶ τῶν ἐν σταδίῳ κινουμένων ἐξ ἐναντίας ἴσων ὄγκων) - allows us to see the problem of relativity. However, the key to their correct explanation may lie in a good reading of Parmenides' intentions and Zeno's motives for defending Parmenides. Why?

All four arguments are a physical model for showing the consequences of the thesis, which is the actual thesis of Parmenides and Zeno: considering in the scope of thinking /perceive by the mind, apprehend (νοεῖν) what is its own "object", i.e. only itself is (ἔστιν), and therefore being (τὸ ὄν), any movement for him should be excluded. So it is unmoved (ἀκίνητον). What *is* (ἔστιν) cannot undergo movement in this respect, and therefore cannot be (μὴ εἶναι). Parmenides and Zeno categorically exclude this possibility. And that is why we can say that Achilles will certainly catch up with the turtle at a precisely defined time  $t_1$  and at a precisely defined point  $x_1$ , and overtake it at time  $t_2$  and at  $x_2$ . However, Achilles - as I think Zeno's relevant argument also shows - will at no time and in any place reach the point that is the tortoise itself, just as the tortoise will never reach the point that is Achilles. Achilles and the tortoise are "points" that have no other reference points than themselves, and therefore cannot be considered spatiotemporally in a data system such as:  $t_1x_1$ ;  $t_2x_2$  or others.

### 3. Possible way out like the way of solution

I think that for any attempt at a comparative analysis of Zeno's arguments and Einstein's theory of relativity, the above suggestions should be taken into account - especially since, in the light of the concepts of both, the issue of relativity may actually turn out to be something very interesting and philosophically stimulating for further reflection and research. I mean not only T. Dace, but also myself. For this reason, T. Dace's effort - with the reservations mentioned above - should not

be discredited. This is required by the attitude of intellectual and scientific honesty and kindness expected in the scientific community.

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## References

1. <sup>^</sup>K. D. Rycyk, *Krytyka Platona przyjmowania uczestniczenia (τὸ μετέχειν) rzeczy w postaciach (εἶδη) jako przyczynek do dyskusji na temat źródeł antynomii w podstawach matematyki*, „*Semina Scientiarum*” 17 (2018), s. 20–54 (DOI: <http://dx.doi.org/10.15633/ss.3514>).