

# Review of: "Zeno and Einstein"

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Potential competing interests: No potential competing interests to declare.

Thank you very much, Ted Dace, for this article, which presents a problem for the meaning of space, time and continuum that has not yet been fully clarified! I am not very familiar with Einstein and Quantum Mechanics, but I would like to make the following additional comments about Zeno.

The problem posed by Zeno is not limited to the case of single motion; it concerns space, time and motion insofar as the concepts of the continuum and the infinite are included in it. The problem inevitably arises where these concepts play a role and, as a result, has a more general significance than that usually accorded to it. You examine this problem, which has presented itself again and again in history, under the question of whether theoretical considerations and concepts born of reflection on experience say anything at all about reality. He rightly points to the vivid evidence, the "immediately given", as the basis that opposes abstract reflection in the aporias, refuting their results. However, if one appeals to the evidence of experience, one limits the performance of comprehension from the outset, because one would then also have to say that experience cannot be comprehended or can be understood much better without comprehension. Cauchy, the French mathematician, said: "There is nothing more astonishing than that which is evident", to express his distrust of the obvious. The usual argument that one only needs to observe does not apply either, because it is precisely observation that is based on the opposites of rest and movement, but there is neither absolute rest nor absolute movement; both can only be perceived relative to each other. To regard experience as the incomprehensible, which only makes possible abstract comprehension that strays into speculative aberrations, is contradicted by the scientific-technical progress alone, through which we make ourselves comfortable in experience.

The critique of Zenonian aporias usually goes so far as to say that Zenon's reflections are refuted by reality: after all, one can always see Achilles overtaking the tortoise. This will not have escaped Zenon himself, and yet he set the statement of the reflection that movement has no limit against the perception that movement comes to an end. Why? He apparently wanted to show that all perceived movement is a concept that we do not know exactly what it means. Movement is a concept, in perception this concept is always already present, we make it clear to ourselves through geometric operations by means of line, point and boundary and the notion of time (speed). At no moment in the perception of a moving body is the movement as a whole directly before our eyes. Therefore, the perception of the moving object, including the perception of our own body, always requires reflection, which connects the present with the past by means of a concept. In all perception of reality, this work of reflection is permanent, to use Kant's term, what makes possible and founds the concept of movement, but also the concepts of becoming, of the stream of existence, etc.

Zeno's arguments are ambiguous and I am far from believing that I grasp the only possible meaning of these paradoxes. I would merely like to make a supplementary reference to the context of the four arguments cited by Aristotle (Physics VI, 9,

239b, 10 - 240a, 18), which present themselves in the form of the dilemma.

In Zeno, reflection opposes experience or perception as follows:

1. Dichotomy: Perception shows the runner running from A to B. The perceived movement with starting and ending point is taken as the real. Reflection on this concept, permanent in perception, opposes this with the demand of the concept that apperception must begin anew at every point of movement reached. The reflection then asserts: the runner reaches  $\frac{1}{2}$ ,  $\frac{3}{4}$ ,  $\frac{6}{8}$  etc. of the distance without reaching the goal, so the movement cannot stop, it is boundless.
2. 2) Achilles and the tortoise: We see that A overtakes the tortoise, despite its head start. The reflection says: If the tortoise starts running in A, Achilles must first run as far as A, in this time the tortoise runs as far as B. Now Achilles must run to B, in this time the tortoise runs to C and so on. There is no end to this race. For: if the movement is real, then if the time is the same for both runners, with an identical number of time points, the tortoise must have already left each point of its run when Achilles arrives, for otherwise it would not be in motion.
- 3) The flying arrow: Perception shows us its movement from A to B. If this arrow is in motion, then there must be an unlimited number of points between each two points of its flight. For movement means going from one point to another. But no movement can take place between two adjacent points, because the point has no extension. Therefore, as long as we have not completed the synthesis of the infinity of isolated points, there is no traversed distance. From this Zeno concludes that the arrow is not moving at all, but is at rest.
1. The stadium: The speed of the car in relation to the columns of the stadium is 1, the same speed, measured on the same columns, is double for the oncoming driver, so that the statement  $1=2$  results for one identical fact.

So, according to these four arguments of Zeno's, one must either suspend logic or, if one does not want to do so, assert that perception is false. Zeno's implication was probably not to claim that one or the other is false. But rather that perception and reflection, each taken separately, imperfectly state reality. Reality can be understood neither by perceiving alone nor by thinking alone, but both must be able to be understood from One, even though Zeno gives no indication of this. The One that Parmenides meant cannot therefore be achieved according to the principle of identity, which is a mere logical principle and goes to the determination of objects under the form of extension. For Zeno extension itself is problematic, but unlike Parmenides, it was clear to him that the One can only be attainable in the knowledge of extension, cannot be a mere abstract principle. The fact that every object, and in particular the universe, the world or the universe as a whole, always "gives" itself to us only in the contradictory opposition of rest and movement, that we thus always have only the changeable where we mean identity, testifies to the unresolved actuality that is invariably inherent in Zeno's aporetic thought.