Aristotle's Zeno. How the History of Philosophy is Intertwined with Contemporary Philosophy

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It was an immense honor for me to be able to discuss orally and in writing with Livio Rossetti. Together, we came to clarify to each other that "what the philosophers of the past really were" is one thing, and "what influence they had" is another. Unfortunately, in the hermeneutic approach, that has dominated many philosophical fields, these two aspects have often been mixed up and confused.

In these few pages, which I dedicate to Livio, a master from both a human and intellectual point of view, I try to continue reflecting on these issues.

No historian of philosophy thinks that Zeno of Elea did not exist. We all agree that he was a male person who lived in the fifth century B.C., that he had lived, that he wrote a book, that he was born in Elea, etc.

Let us stop for a moment. We are using our language as historians of philosophy to tell some indubitable things about Zeno. To get around this being trapped in our language, let us point to the flesh-and-blood Zeno, about whom we know almost nothing with

certainty after all, as "Zeno$_1$." Zeno$_1$ is the person who actually lived two thousand five hundred years ago, who causally interacted with things and people in such a way that there are many objects in my office that are part of these causal chains.[1] For example, my copy of the fifth volume of Laks-Most (2016) has many accounts and fragments about Zeno. If our philologists have worked well, each of the quotations appearing in the part of the volume on Zeno (Laks, Most 2016: 153–227) stands at the end of a causal chain with its first element in Zeno in the flesh. We can only try to establish who Zeno$_1$ is through those few hundred fragments and testimonies that we have at our disposal.

At this point, we need to digress briefly into hermeneutics. According to the ontology proposed by Heidegger and made clear by Gadamer (1960), Zeno$_1$ would not exist. Mind you, the two philosophers do not claim that it would be impossible to know it, but precisely that it is not there. In fact, Heidegger and Gadamer question the very notion of being as *Vorhandenheit*, that is, as something within our grasp. The historical sciences would not deal with what would be within our grasp, i.e., Zeno$_1$ would not exist. A hydrogen atom is within our reach, but Zeno is not. If this were the case, the expression Zeno$_1$ would lose its meaning. The ontological reason for this denial can be traced back to the fact that Zeno would be immersed in the flow of changing things in such a way as to evolve continuously since his appearance on this planet. Reading these pages of the two authors, one gets the feeling that they are confused between how things are and how things *are for us*. The thesis that Zeno$_1$ is completely unknowable makes accomplished epistemological sense; the thesis that Zeno$_1$ does not exist would like to idealistically question the notion of reality in such a radical way that we can hardly accept it. It is possible that Zeno is a part of something larger whose spiritual, creative, and constantly moving nature cannot even be thought of as Zeno$_1$, but this is a highly speculative viewpoint, which we will not consider here.

So Zeno$_1$ is there, or rather, was there. The epistemological problem now is to understand what we can know about Zeno$_1$. The situation of the sources available to us on Zeno$_1$ is specific; that is, it has peculiarities of its own, so much so that, for example, the *Stanford Encyclopedia of Philosophy* entry on Zeno edited by John Palmer (2021) presents at least three hypotheses about Zeno$_1$, namely, the Zeno$_{11}$ who responds to the Pythagoreans who would like to mathematize nature, proposed by Tannery (1885) discredited, however, by Owens (1957); the Zeno$_{12}$ who appears in Plato's Parmenides (*Prm.* 127–128) and who devises paradoxes to defend the thought of his teacher Parmenides, questioned, however, by Colli (1964), Barnes (1982) and Rossetti *et al.* (2020); the Zeno$_{13}$ master of heresy and father of sophist thought, who, however, is not the Zeno to whom Aristotle in

[1] I take for granted the notion of "causality" that I use even though I am well aware that it should be better investigated. On the subject, I tend to follow Davidson (1967) in the sense that there is causality only when there is a scientific law.

the *Physics* devotes memorable pages. $Zeno_{12}$ is the same Zeno who aroused the admiration of twentieth-century giants such as Russell (1901) and Grünbaum (1968).

The question remains open as to whether $Zeno_1$ is more similar to $Zeno_{11}$, $Zeno_{12}$, or $Zeno_{13}$. I will not comment on this because I lack the expertise.

Let us return to the subject of Hermeneutics. Gadamer, drawing on a tradition from Schleiermacher to Heidegger, strongly emphasizes that we always do so through biases when we approach sources. Resuming our example, it is impossible to read the pages of Laks-Most devoted to Zeno without knowing the ancient Greek language, without being familiar with the entire Platonic and Aristotelian corpus, etc. In other words, we study historical reality through a sort of *pre-comprehension*. According to hermeneutics, it is impossible to research completely without presuppositions, as would happen in the natural sciences. It is evident that Heidegger and Gadamer's unfamiliarity prevents them from knowing that the same thing happens in the so-called natural sciences (see, for instance, Fano, Tarozzi 1997). Of course, research without presuppositions does not exist. All scientific inquiry is a human endeavor and, therefore, is accomplished from our point of view. Having said that, however, there is an interesting methodological difference between the historical and non-historical sciences. The water on which Thales reflected is exactly the same water on which our chemists work today. The Zeno doxographed by Diogenes Laertius in his *Lives of the Philosophers* (D.L. IX 5) is not the same Zeno we work on. To explain this point, alongside $Zeno_1$ and the three hypotheses $Zeno_{11}$, $Zeno_{12,}$ and $Zeno_{13}$, we must introduce $Zeno_N$, the evolution of sources over time that distances the Zeno scholar from $Zeno_1$. In other words, countless causal chains start from $Zeno_1$, which we try to trace by investigating our available sources. We note that often, especially for ancient authors, many causal chains soon after their death become "anonymised," that is, although they continue down to us, they no longer have anything that allows us to trace them back to $Zeno_1$. If we were omniscient and could follow the motion of the molecules backward to the molecules of which the famous book written by $Zeno_1$ was composed, assuming that such causal chains had preserved the information, that is, that it had not been dispersed in essentially superdeterministic processes, we could know much more than $Zeno_1$. However, this, for now, is impossible.

On the other hand, since, thanks to Bayle (1740), Zeno has reentered European philosophical debate, $Zeno_N$ has developed, so much so that today's $Zeno_N$ allows the formulation of much more justified hypotheses about $Zeno_1$ than was the case with Bayle. As Gadamer rightly notes, $Zeno_N$ enjoys the work of time that enables us to understand $Zeno_1$ better and better.

At this point, however, we must return to the question of $Zeno_1$'s existence. Heidegger and Gadamer do not believe that $Zeno_1$ exists, so the passage of time makes the synthesis between Zeno, who lived in the fifth century B.C., and our work as historians of Zeno better and better structured. For us, on the other hand, who believe in the existence of $Zeno_1$, time can help us understand $Zeno_1$ better, but it can also worsen our epistemological situation. For example, in the sixth century A.D., in all likelihood, the $Zeno_N$ of

Simplicius was much better epistemologically than the $Zeno_N$ of today because Simplicius had at his disposal so many sources that have been lost to us.

Gadamer calls what happens to $Zeno_1$ to come down to us "the history of the effects" (*Wirkungsgeschichte*) of Zeno. Of course, Gadamer speaks in general, while I apply his historiographical categories to the specific case of Zeno. We look at $Zeno_1$ through his history of effects. Such a history of effects is an important part for the historian of philosophy since, for Gadamer, it does not obliterate $Zeno_1$ – which for him does not exist – but always better renders the historical reality of Zeno. As we have seen, from our perspective instead, the history of effects is a double-edged sword in that, on the one hand, it can help us understand $Zeno_1$ better and better, but it can also obliterate him, as Barnes, Colli, and Rossetti think Aristotle did.

The *Wirkungsgeschichte* is important not only in the history of philosophy but also in philosophy. Let us see how.

Passmore (1965) and Kristeller (1964) emphasized an aspect of philosophy, also taken up by Cottingham (2005) and Williams (2015), that I would summarize as follows:

> The problems philosophers pose are too complex for us to neglect their history.

No one of these authors explicitly says that, but their reflections on the history of philosophy head in this direction. Passmore identifies what he calls a "history of problematic philosophy," which is neither merely antiquarian and doxographic nor polemical or retrospective. It is based on the hypothesis that there are *problems of philosophy* at least partly independently of the authors; according to this perspective, Plato and Frege, for instance, though in their historical specificity, can converse with each other. Kristeller points out that in the philosophers of the past, truth and error are inextricably mixed. The history of philosophy is not all true, as Hegel thought, nor the saga of falsehoods, as the neo-positivists believed, but a mixture of truth and falsehood. According to Williams, one can study either the history of philosophy or the history of ideas. The latter looks not only at the work of philosophers but also at the historical context in which they are embedded, while the former is concerned primarily with the philosophers' reasoning. The former also has a strong impact on contemporary philosophy because it can make strange what seems obvious, or vice versa; we have to be careful not to regard the great authors of the past as our contemporaries, which analytic philosophers have often done, precisely because their theoretical interest lies in their temporal distance from us, which makes them disorienting and challenging. As Cottingham rightly points out, it often happens within Anglo-Saxon philosophy to read essays that unwittingly repropose theses that have been formulated and debated for two thousand years! Not only that, but many essays in analytic philosophy would also like to disregard authority often by substituting Aristotle for Quine. This is why it is important for philosophers to study the history of philosophy well. In order to have that sense of foreignness that past philosophers arouse, it is not enough to read them while keeping in mind their temporal distance; it is also necessary to understand them in the light of their predecessors. If she disregards this

historical work, the contemporary philosopher risks convincing herself of arguments that implicitly assume theses already enucleated and discussed in the past.

All the scholars mentioned above are historians of philosophy. Therefore, their main worry is to make the history of philosophy relevant to the philosopher. Looking at the problem from the other side, one will see that it is very difficult, even impossible, to understand the philosophical problems in their complexity, the possible solutions, and the relevant arguments without reading classical texts.

I propose an example to explain the point better. Many theoretical physicists say that with twenty-century physics, we should abandon our sensible intuition, which, on the contrary, was respected by classical physics.[2] Indeed, this statement is a mistake. Psychologists have shown that our perception is closer to Aristotle's physics than Newtonian physics (Bozzi 2018). Historians of physics showed that the process of geometrization of space, peculiar to classical physics, was long and difficult (Koyré 1968). Moreover, Aristotelian physics is, in many aspects, more similar to contemporary physics. For instance, according to Aristotle, it is obvious that space and time change because of motion and matter's quality, as happens in relativity theory. Furthermore, discontinuity, fuzziness, and indeterminism, which are typical of quantum mechanics, are largely discussed and investigated by Aristotle. Therefore, Aristotle's physics is closer to experience than classical physics, and contemporary physics is closer to Aristotelian than classical. In other words, after a historical investigation, one discovers that the relationship between experience and theoretical physics is exactly inverse to the common opinion. The received view depends on the kind of education we receive at school, which is based, above all, on classical physics. This example shows how an attentive learning of Aristotle's physics sheds new light on contemporary debates. The problem of the relation between our best theories and our perceptions is too difficult to attempt to solve it without historical scholarship.

Having said that, however, I would like to talk about another issue related to the relationship between philosophy and the history of philosophy. The history of the effects of ancient philosophers significantly impacts how we do philosophy today. Whitehead (1978: 39) said that the history of European philosophy is a series of footnotes to Plato; to me, it should be said that it is instead a variation of the themes proposed by Aristotle. In Zeno's arguments, regardless of why the Eleate formulated them, Aristotle saw deep issues concerning motion and the continuous. From Bayle to Grünbaum, Zeno_{12} has dominated Zeno_{1}'s history of effects because of the Aristotelian presentation. And so much good philosophy has been produced in this history of effects, especially in the twentieth century.

Let us look at some examples. Aristotle introduces important distinctions in Physics to address Zeno's arguments. For example, infinity can be according to quantity or according to division (Arist. *Ph*. 233a21–30). Indeed, a segment of finite length but infinitely divisible is different from a line of infinite length. According to Aristotle, one can

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[2] On the abandonment of the notion of *Anschaulichkeit* see Beller (1983).

say that a segment is composed of infinite points only in the sense of divisibility[3]. This should solve Zeno's argument against the possibility that a segment is composed of infinite points. The Stagirite would later return to this problem in *Ph*. 263a4–b9 outlining what in contemporary philosophy has become the problem of *supertasks*: the possibility or impossibility of accomplishing infinite actions in a finite amount of time. In discussing these questions, Aristotle reiterates the fundamental topological feature of the continuum, according to which every cut has only one edge, which will later be the basis of the modern topological notion of connectedness (White 1988).

Tannery (1885) guesses that Zeno's thinking has to do with Cantor, although he does not quite understand why. It will then be Grünbaum who will show how using Cantor's theory of infinite sets, one can try to solve the problem posed by Zeno of how a segment can consist of infinite points, which has tormented the Pythagoreans, Democritus, Galileo, and Bolzano (Fano, Graziani 2018). Roughly speaking, the problem is that if a segment were composed of an infinite number of unextended points, its length would result in zero since a sum of zero length points, even if infinite, is null. Indeed, Lebesgue's notion of the measure of a set of real numbers is only infinitely denumerable additive. This means that the measure of the sum of a non-denumerable interval of reals cannot be determined by the sum of the zero measure of its elements. On the other hand, Grünbaum's analysis is not a complete solution to the paradox because it is possible to define ultra-additive notions of measure. And the debate goes on. Finally, the Arrow paradox forces Aristotle to formulate a physics without instants (*Ph*. 239b7), which will be overcome only by Newton's calculus of fluxions, which, however, proved to be the victim of a contradiction similar to Zeno's, identified by Berkeley in his *Analyst* (1734). According to Zeno, the moving arrow always stays in a certain region of space, but staying in a region of space means being motionless. Therefore, the moving arrow is always still. Because of this paradox, Aristotle does not introduce the notion of instantaneous velocity. Newton's derivative with respect to time allows us to speak of instantaneous velocity, but the notion of limit was not rigorous. As emphasized by Berkeley, either something is 0, and then it cannot be a denominator, or it is bigger than 0, and then it is not a limit. Certainly, a quantity could not be both 0 and non-0. This contradiction would only be resolved by the great German mathematician Weierstrass in the 1850s with the well-known epsilon/delta expedient. Not surprisingly, Russell (1901) associates Zeno precisely with Weierstrass. However, the solution to the Arrow problem of the Newton-Weierstrass type is not entirely satisfactory, as Russell himself realized. Indeed, Weierstrass' notion of a limit is a relation between two growing sets of numbers: the difference between the function and the limit and the possible small ε's chosen whatsoever. This

[3] Today, we speak of bounded or unbounded intervals of real numbers.

means that the rigorous definition of instantaneous velocity through the calculus is not really instantaneous. The debate continues to this day (Calosi, Fano 2014).

So, the history of Zeno's effects has been fruitful with interesting results. To conclude, alongside the history of philosophy as broadening our perspective and the history of philosophy as an intellectual exercise, we should not forget the *antiquarian* value of philosophy, which was wittily defended by Garber (2003). The latter, as well as Cottingham, observes that it is precisely the antiquarian way of doing philosophy that allows us to see unexpected aspects of the arguments of past authors. Indeed, if we reread philosophers with our own categories, we risk losing the very value that the history of philosophy has in freeing us from the tyranny of the present.

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Hermeneutical scholars doubt whether many past authors really existed. They are only a sort of construction built with the passing of time. Indeed, Zeno of Elea, for instance, was real, and historians attempted to establish what he wrote and intended to say. Our most important source for Zeno is Aristotle. Zeno's paradoxes deeply influenced the latter's *Physics*. Is Aristotle's physics relevant to us? Yes, because philosophical problems are too complex not to be considered in their historical development as well. In reading Zeno and Aristotle, we can see physical problems from a completely different perspective and learn a lot. In other terms, the historical Zeno is disorienting for us. On the other hand, Zeno's historical legacy is extremely interesting for us. Indeed, we will see how Zeno's and Aristotle's reflections on continuum, extension, and movement could contribute to a better understanding of these notions in the contemporary debate.

KEYWORDS Zeno of Elea, Aristotle, history of philosophy, paradoxes