

Zeno of Elea

Zeno of Elea (born c. 490 BC) was credited by Aristotle with the invention of dialectic. He offered several arguments against or paradoxes concerning plurality and the possibility of motion or change and is often portrayed (e.g. in Plato's *Parmenides*) as a follower of Parmenides.

[25] Zeno was a citizen of Elea. Apollodorus in his Chronology says that he was the son of Teleutagoras by birth, but of Parmenides by adoption, while Parmenides was the son of Pyres. Of Zeno and Melissus Timon speaks thus:

Great Zeno's strength which, never known to fail, On each side urged, on each side could prevail. In marshalling arguments Melissus too, More skilled than many a one, and matched by few.

Zeno, then, was all through a pupil of Parmenides and his bosom friend. He was tall in stature, as Plato says in his *Parmenides*. The same philosopher <mentions him> in his *Sophist*, <and Phaedrus, > and calls him the Eleatic Palamedes. Aristotle says that Zeno was the inventor of dialectic, as Empedocles was of rhetoric.

[26] He was a truly noble character both as philosopher and as politician; at all events, his extant books are brimful of intellect. Again, he plotted to overthrow Nearchus the tyrant (or, according to others, Diomedon) but. was arrested: so Heraclides in his epitome of Satyrus. On that occasion he was cross-examined as to his accomplices and about the arms which he was conveying to Lipari; he denounced all the tyrant's own friends, wishing to make him destitute of supporters. Then, saying that he had something to tell him about certain people in his private ear, he laid hold of it with his teeth and did not let go until stabbed to death, meeting the same fate as Aristogeiton the tyrannicide.

[27] Demetrius in his work on Men of the Same Name says that he bit off, not the ear, but the nose. According to Antisthenes in his Successions of Philosophers, after informing against the tyrant's friends, he was asked by the tyrant whether there was anyone else in the plot; whereupon he replied, 'Yes, you, the curse of the city!'; and to the bystanders he said, 'I marvel at your cowardice, that, for fear of any of those things which I am now enduring, you should be the tyrant's slaves.' And at last he bit off his tongue and spat it at him; and his fellow-citizens were so worked upon that they forthwith stoned the tyrant to death. In this version of the story most authors nearly agree, but Hermippus says he was cast into a mortar and beaten to death.

[28] Of him also I have written as follows:

You wished, Zeno, and noble was your wish, to slay the tyrant and set Elea free from bondage. But you were crushed; for, as all know, the tyrant caught you and beat you in a mortar. But what is this that I say? It was your body that he beat, and not you.

In all other respects Zeno was a gallant man; and in particular he despised the great no less than Heraclitus. For example, his native place, the Phocaeon colony, once known as Hyele and afterwards as Elea, a city of moderate size, skilled in nothing but to rear brave men, he preferred before all the splendour of Athens, hardly paying the Athenians a visit, but living all his life at home.

[29] He was the first to propound the argument of the ‘Achilles’ which Favorinus attributes to Parmenides, and many other arguments. His views are as follows. There are worlds, but there is no empty space. The substance of all things came from hot and cold, and dry and moist, which change into one another. The generation of man proceeds from earth, and the soul is formed by a union of all the foregoing, so blended that no one element predominates. We are told that once when he was reviled he lost his temper, and, in reply to some one who blamed him for this, he said, ‘If when I am abused I pretend that I am not, then neither shall I be aware of it if I am praised.’ The fact that there were eight men of the name of Zeno we have already mentioned under Zeno of Citium. Our philosopher flourished in the 79th Olympiad [464–460 BC].

Diogenes Laertius 9.25–9, trans. R. D. Hicks

The book comes to the defence of Parmenides’ argument against those who try to make to fun of it by claiming that, if it [the all (*to pan*)] is one, many absurdities and self-contradictions result from that argument. Accordingly, my book speaks against those who assert the many and pays them back in kind with something for good measure, since it aims to make clear that their hypothesis, if it is many, would, if someone examined the matter thoroughly, suffer consequences even more absurd than those suffered by the hypothesis of its being one. In that competitive spirit, then, I wrote the book when I was a young man. Someone made an unauthorized copy, so I didn’t even have a chance to decide for myself whether or not it should see the light.

Plato *Parmenides* 128c–d = DK 29 A12, trans. M. L. Gill and P. Ryan

Then Socrates, after he had heard [Zeno reading from his book, asked Zeno to read the first hypothesis of the first argument again; and when he had read it, Socrates said, ‘Zeno, what do you mean by this: ‘if things are many, they must then be both like and unlike, but that is impossible, because unlike things can’t be like or like things unlike?’ That’s what you say, isn’t it?’

Plato *Parmenides* 127d–e = DK 29 A11, trans. M. L. Gill and P. Ryan

He [i.e. Aristotle] himself, having refuted Parmenides’ argument both as adopting false premises (the premise was that being is spoken of in one way only – either ‘There is nothing other than what is’ or ‘What is not is nothing’ – for these are equivalent) and as putting them together in a non-syllogistic way (for the conclusion asserted does not follow) he says that some yield to both arguments, both the argument stated by Parmenides and that stated by Zeno (who wanted to help the argument of Parmenides against those who tried to mock him on the grounds that if one is many he will be saying things both laughable to reason and self-contradictory). Zeno shows that their hypothesis, which says that there are many things, involves still more laughable things than the one [which says] that there is [only] one, if anyone were to attack it properly. For Zeno himself, in Plato’s *Parmenides*, seems to be a witness to this account.

Simplicius *In Phys.* 133.32–134.9 =DK 29 A23, trans. P. Huby and C. Taylor

Arguments concerning Plurality

Zeno put forward numerous arguments denying the existence of plurality. Some of the more important reports are as follows:

[DK 29B2] In his book, however, which has many attempts at argument, he shows in detail that the man who says there are many things finds that he is making opposing utterances. Of these arguments, there is one in which he shows that if there are many things, they are both large and small, large so as to be unlimited in size, and small in such a way as to have no magnitude. In this he shows that what has neither magnitude nor thickness nor bulk would not even exist. He says:

For if it were attached to another existing thing, it would make it no bigger; for when there is no magnitude, and it is attached, it is not possible to add anything to magnitude. And so at once what is attached would be nothing. And if when it was removed what remains is not less, nor again when it is attached that will not increase, it is clear that neither what was attached nor what was removed was anything.

And Zeno says this, not destroying the One, but [saying] that each of the many has magnitude and is without limits, because before it is taken away there is always something, through the slicing to infinity; and that he proves, having earlier proved that nothing has magnitude from the fact that each of the many is the same as itself, and one.

Simplicius *In Phys.* 139.5–19 = DK 29 B2, trans. Huby and Taylor adapted

[DK 29 B3] For again, showing that if there are many, the same things will be limited and unlimited, Zeno writes thus verbatim:

If there are many, necessarily they are as many as they are, and neither more of them nor fewer. But if they are as many as they are, they would be limited. If they are many, existing things will be unlimited. For there are always other things in between existing things, and again other things in between them. And in this way existing things will be unlimited.

And in this way he demonstrated the unlimited in quantity from the dichotomy.

[DK 29 B1] However, [the unlimited] in magnitude he [demonstrated] earlier by the same argument. For having shown first that 'If Being did not have size it would also not exist', he adds: 'but if it exists, it is necessary for each thing to have some size and thickness and be apart from it the one from the other. And about that which projects there is the same argument. For that also will have size and part of it will [again] project. It is the same to utter this once and to say it always. For nothing of it like this will be last, nor will there not be another related to another. In this way if they are many it is necessary for them to be small and large, small so as not to have magnitude, and large so as to be unlimited.'

Simplicius *In Phys.* 140.28–141.8 (140.27–34 = DK 29 B3; 140.34–141.8 = DK 29 B1), trans. Huby and Taylor adapted

Arguments concerning Motion

Zeno's paradoxes concerning motion are nowadays well known and continue to attract interest from philosophers, mathematicians, and others.

The Dichotomy Paradox

There are four arguments about motion by Zeno which present difficulties to those trying to solve them. The first argument concerns what does not move because what moves must arrive at the halfway point before it arrives at the end. We resolved this in the prior discussions.

Aristotle *Physics* 6.9, 239b9–14 = DK 29 A25; cf. *Physics* 233a21–31

There are four arguments by Zeno which do away with motion and present difficulties for those who try to resolve them. The first is like this. If there is motion, then what moves must first fully traverse half of the [relevant] distance, but there are unlimited halves (for one can always pick out halves of the distance which has been picked out). However, it is one cannot traverse unlimited halves in a limited time, and thus it is impossible to move.

Themistius *In Phys.* 199.12–17

The Runner or The Achilles

The second [argument] is the so-called 'Achilles'. It is that the slowest runner in a race will never be overtaken by the fastest; for the pursuer must first get to the point from which the person running away from him started, the result being that the slower must always be somewhat ahead. This is the same argument as the Dichotomy, but it differs in that the additional magnitude taken is not divided into halves. It follows from this argument that the slower is not overtaken, but it occurs in the same way as by the Dichotomy (for in both cases the division of a magnitude in a certain way has as its consequence that the limit is not reached; however, it [the Achilles] goes further in that even the fastest legendary runner will fail in pursuing the slowest); the result of this is that the solution [of the difficulty] must be the same.

Aristotle *Physics* 239b14–26 = DK 29 A26; cf. Themistius *In Phys.* 199.23–9

The Arrow

The third [argument], which was stated just now, is that an arrow in motion movement is [in fact] still. This is the consequence of assuming that time is composed of nows for if this is not granted, then there will be no deduction.

Aristotle *Physics* 239b30–3 = DK 29 A27

However, Zeno argues fallaciously. For he says that if everything always rests or in motion when it is corresponding to what is equal (*kata to ison*), and what is in motion is always in the now (*en to nun*), then an arrow that is in motion is unmoving. However, this is false; for time is not composed of indivisible nows just as no other magnitude is composed of indivisibles.

Aristotle *Physics* 239b5–9 = DK 29 A27

Zeno destroys motion, saying ‘what is moving does not move either in the place in which it is nor in that which it is not’.

Diogenes Laertius 9.72 = DK 29 B4

The flying missile is at rest in its motion, since everything must be either moving or resting, but what moves is always corresponding to what is equal to itself; but what is always corresponding to what is equal to itself is not moving. Thus it is at rest.

Simplicius *In Phys.* 1016.29–31

Zeno reasons fallaciously in this way. He says: ‘If everything is at rest when it is an extension corresponding to what is equal to itself, but what moves is always at an extension corresponding to what is equal to itself, then an arrow which moves must be unmoving. However, this is false. For it is not the case that what moves is always at an extension corresponding to what is equal [to itself]; instead it is not in time at all but is only in the now, as was stated earlier, and time is not composed of nows, nor do the nows obtain in actuality, nor is the now a part at all just as neither is anything else a partless and indivisible part of what is continuous.

Themistius *In Phys.* 199.4–12

The Moving Rows

The fourth argument is that concerning equal bodies which move alongside equal bodies in the stadium from opposite directions—the ones from the end of the stadium, the others from the middle—at equal speeds, in which he thinks it follows that half the time is equal to its double. The fallacy consists in requiring that a body travelling at an equal speed travels for an equal time past a moving body and a body of the same size at rest. That is false. E.g. let the stationary equal bodies be AA; let BB be those starting from the middle of the A’s (equal in number and in magnitude to them); and let CC be those starting from the end (equal in number and magnitude to them, and equal in speed to the B’s). Now it follows that the first B and the first C are at the end at the same time, as they are moving past one another. And it follows that the C has passed all the A’s and the B half; so that the time is half, for each of the two is alongside each for an equal time. And at the same time it follows that the first B has passed all the C’s. For at the same time the first B and the first C will be at opposite ends, being an equal time alongside each of the B’s as alongside each of the A’s, as he says, because both are an equal time alongside the A’s.

Aristotle *Physics* 6.9, 239b33–240a17 = DK 29 A28, trans. R.P. Hardie and R. K. Gaye

The following translation of the relevant part of *Physics* 6.9, by R. P. Hardie and R. K. Gaye, is from J. Barnes (ed.), *The Complete Works of Aristotle*.

Zeno's arguments about motion, which cause so much trouble to those who try to answer them, are four in number.

The first asserts the non-existence of motion on the ground that that which is in locomotion must arrive at the half-way stage before it arrives at the goal. This we have discussed previously.

The second is the so-called Achilles, and it amounts to this, that in a race the quickest runner can never overtake the slowest, since the pursuer must first reach the point whence the pursued started, so that the slower must always hold a lead. This argument is the same in principle as that which depends on bisection, though it differs from it in that the spaces with which we have successively to deal are not divided into halves. The result of the argument is that the slower is not overtaken; but it proceeds along the same lines as the bisection argument (for in both a division of the space in a certain way leads to the result that the goal is not reached, though the Achilles goes further in that it affirms that even the runner most famed for his speed must fail in his pursuit of the slowest), so that the solution too must be the same. And the claim that that which holds a lead is never overtaken is false: it is not overtaken while it holds a lead; but it is overtaken nevertheless if it is granted that it traverses the finite distance. These then are two of his arguments.

The third is that already given above, to the effect that the flying arrow is at rest, which result follows from the assumption that time is composed of moments: if this assumption is not granted, the conclusion will not follow.

The fourth argument is that concerning equal bodies which move alongside equal bodies in the stadium from opposite directions—the ones from the end of the stadium, the others from the middle—at equal speeds, in which he thinks it follows that half the time is equal to its double. The fallacy consists in requiring that a body travelling at an equal speed travels for an equal time past a moving body and a body of the same size at rest. That is false. E.g. let the stationary equal bodies be AA; let BB be those starting from the middle of the A's (equal in number and in magnitude to them); and let CC be those starting from the end (equal in number and magnitude to them, and equal in speed to the B's). Now it follows that the first B and the first C are at the end at the same time, as they are moving past one another. And it follows that the C has passed all the A's and the B half; so that the time is half, for each of the two is alongside each for an equal time. And at the same time it follows that the first B has passed all the C's. For at the same time the first B and the first C will be at opposite ends, being an equal time alongside each of the B's as alongside each of the A's, as he says, because both are an equal time alongside the A's.

Aristotle *Physics* 6.9, 239b9–240a17 (= DK 29 A25, 26, 27, 28)