

Was evolution invented by Greek philosophers?

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Despite claims of creationists and evolutionists to the contrary, a philological examination of the extant writings of the Greek philosophers Thales, Anaximander, and Empedocles shows that there is no textual-historical basis to credit the pre-Socratic philosophers with developing a theory of evolution.

With the rise of the evolutionary paradigm in Western education, tracing our present thinking about evolution back to the Greek philosophers has become a popular idea. For instance, visitors to the Museum of Palaeontology at the University of California are greeted with the statement: “Evolutionary theory begins with the Ionian philosopher Anaximander (ca 611–546 BCE).”¹ Prominent creationists approve: “Organic evolution was first taught by the Greeks at least as early as the 7th century BC.”²

This, at least, seems to be an issue that some creationists and evolutionists agree on.

Both creationists and evolutionists (though not classical scholars)³ have proposed that evolutionism goes back to ancient Greece. The philosophers who would have advocated this all belong to the period before Socrates, Plato, and Aristotle, and are therefore referred to as the “pre-Socratics” in philosophy.

From a creationist perspective Dr Bergman summarizes the arguments in the following way:

“One of the first evolutionary theories was proposed by Thales of Miletus (640–546 BC) in the province of Ionia on the coast near Greece. He was also evidently the first person to advance the idea that life first originated in water ...

“... One of Thales’ students, Anaximander (611–547 BC), developed these ideas further, concluding that humans evolved from fish or fishlike forms. These fish-men eventually cast off their scaly skin and moved to dry land where they have been ever since.

“The Greek philosopher Empedocles (493–435 BC), often called the father of evolutionary naturalism, argued that chance alone ‘was responsible for the entire process of the evolution of simple matter into modern humankind. Empedocles concluded that spontaneous generation fully explained the origin of life, and he also taught that all living organism types gradually evolved by the process of trial-and-error recombinations of animal parts. He also believed that natural selection was the primary mechanism of evolution, the fittest being

more likely to survive to pass their traits on to their offspring. In short, Empedocles’ pre-Darwin ‘survival-of-the-fittest’ theory taught that life evolved by pruning the less-fit life forms—i.e. the merciless destruction of the weaker animals and plants. Unfortunately, many early Greek manuscripts have been lost, but the texts that survive provide enough details to determine with some accuracy what the ancient Greeks believed.”⁴

Is this perception correct? More specifically in terms of a research question for this paper: *Did some of the pre-Socratic philosophers teach a form of evolution?* The thesis that this article seeks to prove is that neither Thales, nor Anaximander, nor Empedocles proposed a theory that included the vital ingredient of evolution, development of one species into the next. Arguing from the available Greek primary and secondary sources, using a philological and historical method, this paper will show that there is no evidence that Thales proposed one of the first evolutionary theories or that Anaximander taught that humans *evolved* from fish. It will also dispute the factual basis in the ancient sources to refer to Empedocles as “the father of evolutionary naturalism”. In short, this contribution disputes that there is any evidence for evolution, in the Neo-Darwinist sense or otherwise, in the extant Greek texts of these early philosophers.

Thales of Miletus

Thales (c. 620–546 BC) was credited with the view that water is the universal primary substance,⁵ and likewise with the doctrine that the world is animate (τὸν κόσμον ἔμψυχον) and full of powerful spirits or gods (δαιμόνων).⁶ This indicates that Thales’ worldview was not naturalistic but thoroughly spiritual. Aristotle confirms this (*De Anima* II/411 a7–8). For Thales possibly every object and certainly every living being had an essential spirit or god behind it, which was represented by its incidence.

Henry Osborn, one of the first to point to the Greek philosophers for evolution, was mistaken in his assertion that Thales began to teach “evolution as a natural explanation of

the higher forms of life”.⁷ There is no evidence for this, only a loose point of agreement with neo-Darwinism in that the origins of life included water,⁸ but this does not make Thales a naturalist, let alone an evolutionist. It merely articulates that modern evolutionist thinking has incorporated his idea of origin in or with water. The Greek philosopher merely saw water as a permanent principle, an element that remains while other things come and go. Thales believed that water always persists and that it is the basis from which all other things are generated.⁹ His beliefs were reinforced by his observation that all living things on this planet seemed to depend on water. He also thought of the earth as floating on water.¹⁰ According to Aristotle, Thales was evidently *not* the first person to suggest water as original principle:

“There are some who think that the men of very ancient times, long before the present era, who first speculated about the gods, also held this same opinion about the primary entity (i.e. water). For they represented Oceanus and Tethys to be the parents of creation, and the oath of the gods to be by water—Styx, as they call it. Now what is most ancient is most revered, and what is most revered is what we swear by.”¹¹

In sum, the available early sources show that Thales merely proposed that the origin of life is connected with water as a crucial element. This might well be visualized with a picture of the sea as bedrock for life, like the imagery of his pupil Anaximander advocates. The only agreement with the theory of evolution is the original connection of life-forms with water as an element or locality. However, in a similar way a connection between Thales and Genesis 1:2 could be argued: “the Spirit of God moved upon the face of the waters”. Thales’ association of the origin of life-forms with water also sits comfortably with theories that very much oppose evolution. In other words, what Thales says about water is irrelevant for the essential part of evolution, its operating process or method. There is no evidence of development from one species into another with Thales. The Greek philosopher did not provide any descriptions of the development of life that suggest this.

Anaximander of Miletus

Anaximander (c. 610–546 BC) was a disciple of Thales. He was a brilliant scholar and one of the first to envisage

the earth hanging free and unsupported in space, while planets completed circular orbits. He is also credited with the idea of a cylinder-shaped Earth, which is spherical and flat at the same time and floats unsupported as the centre of the universe.¹²

The idea that Anaximander held a proto-theory of evolution is based on his view on the origin of life in mud, which is subsequently interpreted in terms of prebiotic soup.¹³ Darwin, albeit tentatively, also sought the origin of life in a ‘warm little pond’.¹⁴

“Anaximander said that the first living creatures were born in moisture, enclosed in thorny barks and that as their age increased they came forth on to the drier part and, when the bark had broken off, they lived a different kind of life for a short time (Aetius, V, 19).”¹⁵

Although the author of this quotation, Aetius of Antioch, is used to prove this particular view of Anaximander, his work is not particularly well attested. The reference to ‘Aetius’ is irregular, as no works of his remain. The actual source is *Physical and Moral Extracts*, written by the fifth-century theologian John Stobaeus. Opinion is divided whether Aetius himself lived in the second or the first century before Christ. In any event this was hundreds of years after Anaximander whose alleged views he describes. Consequently the evidence is rather indirect: Stobaeus quoting Aetius on Anaximander, with a full millennium distance from the primary source.

A second source for Anaximander’s views is also problematic: a pseudo-graphic author who claimed to be writing as the first century philosopher Plutarch.



Figure 1. *School of Athens* by Rafael

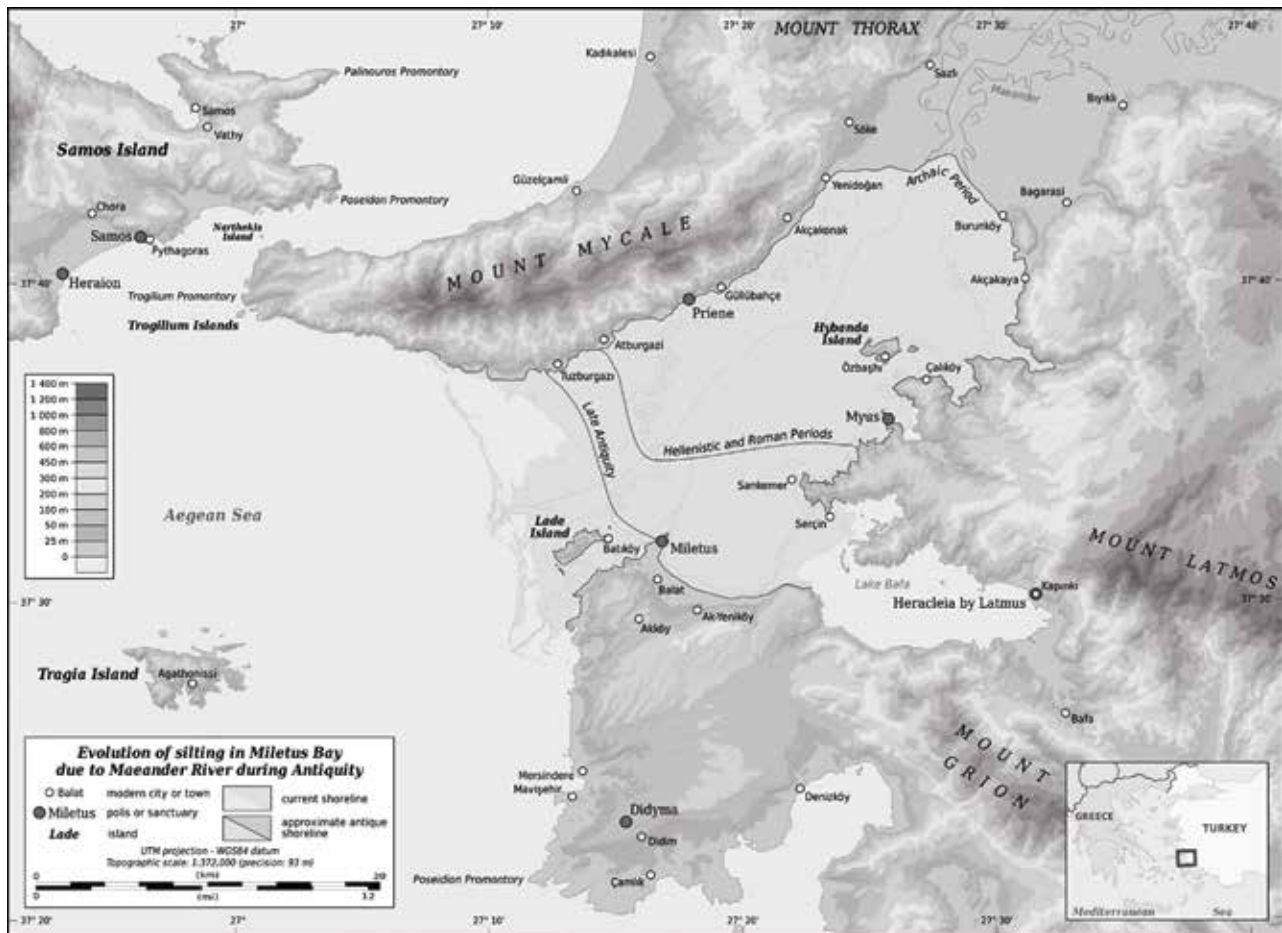


Figure 2. Miletus in ancient Greece (by Eric Gaba)

“Further he [Anaximander] says that in the beginning man was born from creatures of a different kind; because other creatures are soon self-supporting, but man alone needs prolonged nursing. For this reason he would not have survived if this had been his original form.”¹⁶

A complicating factor, which invites some scepticism, is the fact that there are important parallel passages in Stobaeus and Pseudo-Plutarch.¹⁷ Possibly Pseudo-Plutarch is a reasonably accurate source still, because he drew from books that were known at the time and wished to be regarded as genuine Plutarch. Otherwise he does not contradict material found in the real Plutarch, and some of his statements are also found in Aristotle and Hippolytus of Rome (AD 170–235). For example, the idea that (unlike his master Thales) Anaximander thought of *air* as the first principle of all things living. Pseudo-Plutarch adds that he personally considers mere air unlikely as first principle, because of the perceived lack of an operating cause. Just like the mere presence of silver is insufficient for a cup to emerge, but that it also needs a creative force, a silversmith. According to Pseudo-Plutarch

the same would be true for any other material like wood or brass.¹⁸ While Pseudo-Plutarch adds his own thoughts, his description of Anaximander’s view of water as first principle is undisputed and is also found in Aristotle and the church father Hippolytus.¹⁹

If Anaximander was true to the teachings of his master Thales in other respects, the demons or gods that filled the cosmos²⁰ should be taken as an operating cause in Anaximander’s thinking. If so, his worldviews were not secular and there is no need to explain his religious language and imagery as a mere vehicle of expression of his times.

Pseudo-Plutarch indicated that air is an important principle in Anaximander’s thinking. He was probably the first person in Greek thinking to whom the pneumatic theory of the soul can be attributed. Earlier authors, like Homer, considered that the essence of the soul was in the blood, but Anaximander thought that the soul was spiritual, or airy in nature.²¹ Late evidence for this comes from (the genuine) Plutarch’s *Table Talk*,²² which is part of his *Moralia* collection. On the basis of one of its discussions, Anaximander is credited with humanity’s evolutionary

development from fishes. Plutarch relates the following (*Quaest. Conv.* 8.8):

“To this Nestor subjoining said: But, sir, of my citizens, as of the Megarians in the proverb, you make no account; although you have often heard me say that our priests of Neptune (whom we call Hieromnemons) never eat fish. For Neptune himself is called the Generator. And the race of Hellen sacrificed to Neptune as the first father, imagining, as likewise the Syrians did, that man rose from a liquid substance. And therefore they worship a fish as of the same production and breeding with themselves, in this matter being more happy in their philosophy than Anaximander; for he says that fish and men were not produced in the same substances, but that men were first produced in fishes, and, when they were grown up and able to help themselves, were thrown out, and so lived upon the land. Therefore, as the fire devours its parents, that is, the matter out of which it was first kindled, so Anaximander, asserting that fish were our common parents, condemneth our feeding on them. [LCL424]”²³

Writing a century later, Hippolytus confirms that this idea was ascribed to Anaximander. The church father gives a summary in his *Refutation of all Heresies*:

“And [Anaximander declared] that animals are produced (in moisture) by evaporation from the sun. And that man was, originally, similar to a different animal, that is, a fish.”²⁴

Importantly, Anaximander did not see water or moisture as the first eternal element, but air. In this passage it is the hot air overcoming water by means of evaporation (ἐξατμιζομένου) that produces animals.²⁵ The words about the animals rising from moisture or mud (ἐξ ὑγροῦ) have their background in the Greek theory of abiogenesis, or spontaneous generation of life from an organic matter. For instance, from ancient observation it seemed that fleas originated from dust and maggots from cadavers. Aristotle was one of the first to teach this theory,²⁶ which prevailed until 1859 when Louis Pasteur disproved it.²⁷

Even if the pertinent issue of abiogenesis is set aside, the question remains whether these passages actually teach that humans evolved from fish or fishlike forms. They probably do not. Even Hippolytus (who disagreed with Anaximander 700 years later) does not accuse him of promoting the view that

men *were* initially fish, only that they ‘nearly resembled’ (παρὰπλήσιον) fish. In other words, mankind was in a different state, but not a different species. Plutarch, who wrote earlier, makes a clear distinction between the fish and the humans they contain. As Hippolytus writes later and only summarizes, he should be read in the light of Plutarch. Consequently, from a philological and literary-historical point of view, Anaximander’s idea of fish as our common parents²⁸ points to hosts rather than to a form of evolution.

At best, the text teaches development or adaptation *within* a species. Perhaps the comparison with the development of a butterfly applies. The fish only serve as cocoons or eggs to protect and nourish the humans until they are ready to tackle the next stage of life. To claim that Anaximander taught a form of Darwinian evolution is not warranted by the text. Even Kočandrle and Kleisner, who otherwise have the Greek philosophers ‘foreshadow’ Darwinism, as they call it, acknowledge that a literal interpretation of the text does not point to evolution:

“If this is more than just a reference to the origin of life in a moist environment, the entire concept may be most clearly described in Plutarch. He places the birth of humans quite unequivocally into fish, in particular the viviparous sharks (though here, the manuscript was emended). People are then almost in a position of the biblical Jonah [figure 3]. If we were to read Plutarch literally, man grew in fish until reaching a level of independence. The story would thus deal not with the development of humans from other creatures but with a description of the growth of the first individual from a species that cannot take care of itself after birth.”²⁹



Figure 3. *Jonas en de walvis* by Pieter Lastman, 1621

Kočandrles' and Kleisner acknowledge that Anaximander does not teach that humans evolved from fish or fishlike forms. With him they are humans to begin with. Their reference to Jonah is also helpful, as the big fish served as a safe environment where the prophet was protected against the tempest and sea (Jonah 1:17). In the stories about Anaximander's teachings, the humans leave the fish once they are ready, similar to a baby leaving the amniotic fluid of the placenta behind once it is ready to live in this world independently.

In no uncertain terms, Kočandrle and Kleisner conclude that Anaximander did not teach evolution and that he did not believe in a common descent of all species:

"The idea of evolution by natural selection was certainly completely foreign to Anaximander. One can suppose that Anaximander's interest stemmed from a desire to explain arrival of first living creatures or, in particular, of the first individuals of each species. Even so, one can claim that his theory was, in principle, open to evolutionary ideas."³⁰

Gregory agrees: "There is nothing in Anaximander to suggest survival of the fittest or adaptation to the environment."³¹ Another important matter is that while Anaximander was a naturalist,³² he firmly believed that all of the cosmos was governed by moral law and not by chance.³³ World systems come into being and perish again into the infinite as a matter of penalty and retribution to make up for injustice.³⁴ Human life is governed by similar principles.³⁵ Anaximander believed that just as a well-ordered government sees that theft is punished, so the order of nature is such that no considerable imbalance can last indefinitely.³⁶ Whilst Anaximander teaches a secular, linear, and progressive conception of history, it is through mankind's observance of morality that the world advances.

"Anaximander was the first to believe that if there is a 'golden age', this age is not forever lost in some distant past as it was in mythical accounts, but perfectly achievable in the future, that is, on condition that man realizes that social order like natural order must be based on an equilibrium of rights and obligations, that mutually hostile opposites are nonetheless equals."³⁷

These are not completely new observations. As early as 1954, Professor Loenen cautioned that post-Darwinian suppositions should not be imported into the work of ancient authors. After a detailed study of all the concepts involved, he summarizes his findings on Anaximander's alleged evolutionism as follows:

"(1) The central idea of modern evolutionism is the conception that the higher species developed from the lower ones. With Anaximander an evolution of species is out of the question. (2) Modern evolutionism explains evolution by natural selection and (or) adaptation to environment. With Anaximander there

is no indication for the idea of natural selection, whereas the adaptation to environment which he, in a sense, probably accepted, had no consequences as to the biological structure of the animals, but only as to their habits of living. (3) Evolutionism finds its arguments in the field of biology and palaeontology. Anaximander, on the contrary, based his strange theory on the idea that all organic life originated in the sea. (4) The idea of abiogenesis which was undoubtedly basic for Anaximander, is not an evolutionist theory, at least as far as modern evolutionism keeps within the bounds of biological science. We may safely³⁸ state that no biologist is convinced that abiogenesis has been proved by purely scientific arguments. Those biologists who take an abiogenesis for granted know very well that this is a logical postulate, i.e. a philosophical conception. On account of the principle *omne vivum a vivo*, which has been established scientifically, one would be even more justified in stating the contrary. So even on this point Anaximander is not a precursor of modern evolutionism."³⁹

Summarized, there is no evidence in Anaximander for the central concept of evolution that, at a biological level, higher species developed from lower ones. Even biological adaptation seems absent from his thinking.

Empedocles of Acragas

The third ancient candidate whom Bergman and others put forward as teaching evolutionary theory is the Greek philosopher Empedocles (c. 493–435 BC). He lived on the isle of Sicily and is known for adding earth as a fourth primary element to air, water, and fire.⁴⁰

But is Empedocles the 'father of evolutionary naturalism'? This thesis implies that Empedocles not only taught evolution, but also as an unguided process. If one considers the latter first, it immediately becomes clear that this runs against all the available evidence about his worldview. Empedocles was not a secularist at all. He was a vegetarian for religious reasons who also believed in some form of reincarnation. Not only did he accept the transmigration of souls as true, but he also regarded himself as a god who was banished to Earth for 'three times countless years' for committing the sin of eating meat. His self-image included the conviction that he had achieved the most perfect of human states. To the public Empedocles wished to confirm the rumour that he had already become a god.⁴¹ Otherwise the philosopher was known as a diviner and an oracular medium on behalf of the gods. He was also a magician and claimed to be able, possibly with the use of pharmacy, to fully control the weather (wind and rain) and also to have returned a dead man from Hades.⁴² He allegedly

kept the body of a woman in a trance for 30 days without breathing or pulsation for the duration. Empedocles in his own words:

“I go about among you an immortal god, no more a mortal, so honoured of all, as is meet, crowned with fillets and flowery garlands. Straightaway as soon as I enter with these, men and women, into flourishing towns, I am revered and tens of thousands follow, to learn where is the path which leads to welfare, some desirous of oracles, others suffering from all kinds of diseases, desiring to hear a message of healing.”⁴³

Empedocles confirmed his (poly) theistic worldview with his teachings: “Blessed is the man who has gained the riches of divine wisdom; wretched he who has a dim opinion of the gods in his heart.”⁴⁴ The philosopher was principally a proponent of intelligent design by the gods. He even warned his readers that they should not be deceived by naturalism, but that there are divine painters who are responsible for the material reality of this world. If Burnett’s interpretation is correct, Empedocles even argues that this should be believed on the basis of divine revelation (θεοῦ πάρα μῦθον ἀκούσας)!

“As painters, men well taught by wisdom in the practice of their art, decorate temple offerings when they take in their hands pigments of various colours, and after fitting them in close combination—more of some and less of others—they produce from them shapes resembling all things, creating trees and men and women, animals and birds and water-nourished fish, and long-lived gods too, highest in honour; so let not error convince you in your mind that there is any other source for the countless perishables that are seen, but know this clearly, since the account you have heard is divinely revealed.”⁴⁵

By now it should be evident that Empedocles wasn’t a naturalist, so evolutionary naturalism should be ruled out, if only for that reason. However, as a polytheist, did he teach evolution? Empedocles proposed that the universe was governed by a continued interplay of the forces Love and Strife, which may be interpreted as attraction and repulsion.⁴⁶ These worked upon the primary elements and continue to do so even in organisms like the human body. This seems to point into the direction of change through adaptation and survival of the fittest. While Love and Strife may well function as a Hegelian principle, this is probably where the comparison with evolution ends, because with Empedocles these forces are moral in character. He calls Love ‘soft’, ‘immortal’, and ‘blameless’.

The first appearance of creatures in this world is because they have lost their immortality because of their exposure to love in the vortex of worlds and circumstances. Unlike their previous abode, Earth is mortal in character. It is important to note that Empedocles does not describe creation, but manifestation. It is not that these creatures did not exist before, but that they had been immortal in a different reality where they had the misfortune to be touched by a soft and constant stream of immortal love.⁴⁷ Empedocles describes a fall and change in status. This is rather a Greek equivalent of the fall of mankind in Genesis 3, not of the creation story of Genesis 1. For Empedocles the major challenge is to achieve the original immortality again after the shattering experience of the fall.

Empedocles does not describe the results of evolution when he speaks about creatures with countless hands, oxen with human faces, etc.⁴⁸ For him this was the limited aftermath of the fall into mortality, a phase of, sometimes literally, picking up the pieces after the great literal mix-up. It was this great mix-up and not a creation process that caused solitary limbs to wander seeking for union.⁴⁹ In the best of circumstances not a concept readily associated with natural selection in the Darwinian sense, but for Empedocles this is a restorative and not a creative process. Furthermore, he insisted that this reassembly into ‘proper’ species was essentially a divine and not a mere natural process: “But, as divinity was mingled still further with divinity, these things joined together as each might chance, and many other things besides them continually arose.”⁵⁰

It is against this background that Aristotle’s (*Physics II*) insight on Empedocles should be read:

“And so with all other organs that seem to embody a purpose. In cases where a coincidence brought about such a combination as might have been arranged on

Table 1. A visual summary of the views of the pre-Socratics

	Evolution			
	Naturalistic	Darwinian	Super-Naturalistic	Theistic
Thales	none	none	none	none
Anaximander	none	none	none	none
Empedocles	none	none	none	none
	Biological adaption		Worldview	
Thales	none		super-naturalistic	
Anaximander	none or inconclusive		super-naturalistic	
Empedocles	none		super-naturalistic	

purpose, the creatures, it is urged, having been suitably formed by the operation of chance, survived; otherwise they perished, and still perish.”⁵¹

This merely describes the adaptation of a species to changing circumstances. Indeed, this is also an important element in Darwin’s theory, but hardly exclusively so. Adaptation of species may be noticed by any keen observer and Empedocles should be credited for this; but this does not make him a proto-Darwinian. Adaptation of species is not unique to Darwinism, but shared by scholars of any persuasion.

For Empedocles the ‘trial-and-error recombinations’ belong to the initial phase of chaos after the fall into mortality, but when everything is sorted and recovered things continued as ‘normal’. This should not be confused with ‘natural selection’ in the Darwinian sense.⁵² This phase of alleged ‘evolution’ was not evolutionary in character, but the pieces of a puzzle coming back together again. For Empedocles this was not a random creation of life, but a divinely⁵³ guided recovery process from a fall into mortality.

In sum, there is no evolution in Empedocles, naturalistic or theistic. He merely proposed a temporal phase of discontinuity in the cosmos, to which mankind fell victim, but has since recovered from sufficiently to be in reach of immortality and divinity again.

In retrospect

This journey through the philosophies of Thales, Anaximander, and Empedocles shows that they did not propose any theory of evolution, naturalistic or otherwise. The available evidence even argues against the idea that the pre-Socratic philosophers advocated biological adaptation within a species. While it can be argued that their philosophies contain building blocks⁵⁴ that, as such, are also used in modern evolutionary concepts,⁵⁵ these ‘blocks’ are not unique to evolutionary concepts. Classical authors should be carefully considered in their textual, philosophical, and historical context.

References

1. www.ucmp.berkeley.edu/history/ancient.html
2. Bergman, J., Evolutionary naturalism: an ancient idea, *J. Creation* 15(2):77–80, August 2001; p. 70.
3. The publications that are often relied on to establish a link between evolutionary theory and Greek philosophy were not written by classical scholars, but by doctors of science. This is particularly true for the foundational publication in this regard by Dr H.F. Osborn, *From the Greeks to Darwin*, MacMillan, London, 1908. Osborn’s field was paleontology and anatomy. Interestingly, he was not a Darwinist and held the view that mutations and natural selection play no creative role in evolution and became a proponent of organic selection. In creationist circles the debate has been carried by natural scientists as well, and not by classicists or philosophers, e.g. Dr Bert Thompson’s *History of Evolutionary Thought*, Star Bible & Tract Corp, Fort Worth 1982. (See also Bergman, ref. 2.)

4. answersingenesis.org/theory-of-evolution/evolutionary-naturalism-an-ancient-idea/
5. Aristotle, *Metaphysics* 1.983b.
6. Diogenes Laërtius, *Bíoi kai gnōmai* 1.27: Ἀρχὴν δὲ τῶν πάντων ὕδωρ ὑπεστήσατο, καὶ τὸν κόσμον ἐμψυχον καὶ δαιμόνον πλήρη.
7. Osborn, H.F., *From the Greeks to Darwin*, Macmillan, New York, p. 6, 1908.
8. Xenophanes (c. 576–480 bc) would later recognize fossils as remains of sea life, taking this as proof that the seas formerly covered the earth, and that water was the element from which the earth emerged. See Richard D. McKirahan, *Philosophy before Socrates: An introduction with texts and commentary*, 2nd edn, Hackett Publishing, Indianapolis, p.65, 2010. See also Hippolytus, *Refutation of All Heresies* 1.14.4–6.
9. Aristotle, *Met.* 983: αἰεὶ γὰρ εἶναι τινα φύσιν ἢ μίαν ἢ πλείους μᾶς ἐξ ὧν γίγνεται ἄλλα σωζομένης ἐκείνης.
10. See Aristotle, *On the Heavens* 294a28, *Metaphysics* 983b20.
11. Aristotle, *Met.*, 983b: εἰσι δὲ τινες οἱ καὶ τοὺς παμπάλαιους καὶ πολλὰ πρὸ τῆς νῦν γενέσεως καὶ πρώτους θεολογήσαντας οὕτως οἰοῦνται περὶ τῆς φύσεως ὑπολαβεῖν: Ὠκεανὸν τε γὰρ καὶ Τηθὺν ἐποίησαν τῆς γενέσεως πατέρας, καὶ τὸν ὄρκον τῶν θεῶν ὕδωρ, τὴν καλουμένην ὑπ’ αὐτῶν Στύγα τὴν ποιητῶν: τιμιώτατον μὲν γὰρ τὸ πρεσβύτατον, ὄρκος δὲ τὸ τιμιώτατόν ἐστιν.
12. Couprie, D.L. and Pott, H.J., Imagining the Universe, *Apeiron: A Journal for Ancient Philosophy and Science* 35(1):47–59, 2002; pp. 50–51. See also Couprie, D.L., *Heaven and earth in ancient Greek cosmology: from Thales to Heraclides Ponticus*, Springer, New York, 2011; p. 105: “In two texts it is said that the earth is like a column of stone, and in the third it is said that the earth is cylindrical-shaped, its height being one-third of its diameter.”
13. See Gregory, A. Anaximander’s Zoogony; in: Rossetto, M., Tsiarikas, M., Couvalis, G., and Palaktoglou, M. (Eds.), *Greek Research in Australia: Proceedings of the Eighth Biennial International Conference of Greek Studies, Flinders University June 2009*, Flinders University Department of Languages—Modern Greek, Adelaide, pp. 44–53, 2009.
14. Darwin also suggested the requirement of a large diversity of ammonia and phosphoric salts, and considered the presence of light, heat, and electricity a prerequisite. See Peretó, J., Bada, J.L., and Lazzano, A., Charles Darwin and the Origin of Life, *Origins of Life and Evolution of Biospheres* 39(5):395–406, 2009.
15. Aetius v. 9.4: Ἀναξίμανδρος ἐν ὑγρῷ γεννησθῆναι τὰ πρῶτα ζῷα φλοῖσις περιεχόμενα ἀκανθώδεσι, προβαίνουσι δὲ τῆς ἡλικίας ἀποβαίνειν ἐπὶ τὸ ζηρότερον καὶ περιρρηγνυμένου τοῦ φλοῖου ἐπ’ ὀλίγον χρόνον μεταβίβωνα.
16. Pseudo-Plutarch, *Stromateis* 2. See Campbell, G. L., *The Oxford Handbook of Animals in Classical Thought and Life*, Oxford University Press, Oxford, p. 240, 2014.
17. See Gregory, A., *Anaximander: A re-assessment*, Bloomsbury Academic, Sydney, p. 52, 2016.
18. Ps. Plut. *Plac.* 1.3: ἀλλὰ καὶ τὸ ποιοῦν αἴτιον χρὴ ὑποτιθέσθαι οἷον ἄργυρος οὐκ ἄρκει πρὸς τὸ ἐκποῶμα γενέσθαι, ἂν μὴ καὶ τὸ ποιοῦν ἦ, τουτέστιν ὁ ἀργυροκόπος ὁμοίως καὶ ἐπὶ τοῦ χαλκοῦ καὶ τοῦ ζύλου καὶ τῆς ἄλλης ὕλης.
19. Cf. Hippolytus, *Refutatio Omnium Haeresium* 1.6.
20. Diogenes Laërtius, *Bíoi kai gnōmai* 1.27: τὸν κόσμον ἐμψυχον καὶ δαιμόνον πλήρη.
21. Bosworth Burch, G., Anaximander, the first metaphysician, *The Review of Metaphysics* 3(2):137–160, 1949; p. 157–158.
22. Συμπροσιακά—*Quaestiones convivales*.
23. Plut. *Quaes. Conv.* 8.8.4: ὑπολαβὼν δ’ ὁ Νέστωρ ‘τῶν δ’ ἐμῶν’ ἔφη ‘πολιτῶν ὡσπερ Μεγαρέων 32 οὐδεὶς λόγος: καίτοι πολλάκις ἀκήκοας ἐμοῦ λέγοντος, ὅτι αἰεὶ οἱ 33 τοῦ Ποσειδῶνος ἱερεῖς, οὓς ἱερομνήμονας καλοῦμεν, ἰχθύς οὐκ ἐσθίουσιν ὁ γὰρ θεὸς λέγεται φυτάλιμος. οἱ δ’ ἄφ’ Ἑλλήνων τοῦ παλαιοῦ καὶ πατρογενεῖο 34 Ποσειδῶνι θύουσιν, ἐκ τῆς ὑγρᾶς τὸν ἀνθρώπων οὐσίας φθίνα δοξάζοντες 35, ὡς καὶ Σῦρος: διὸ καὶ σέβονται τὸν ἰχθύν, ὡς ὁμογενεῖ καὶ σύντροφον, ἐπεικέστερον Ἀναξίμανδρου 36 φιλοσοφούντες: οὐ γὰρ ἐν τοῖς αὐτοῖς ἐκείνους ἰχθύς καὶ ἀνθρώπος, ἀλλ’ ἐν ἰχθύσιν ἐγγενέσθαι τὸ πρῶτον ἀνθρώπου ἀποφαίνεται, καὶ τραφέντας ὡσπερ οἱ γαλεοὶ 37 καὶ γενομένους ἰκανοὺς ἑαυτοῖς βοηθεῖν ἐκβῆναι τηγκαῦτα καὶ γῆς λαβέσθαι. καθάπερ οὖν τὸ πῦρ τὴν ὕλην, ἐξ ἧς ἀνήφθη, μητέρα καὶ πατέρ’ οὖσαν, ἦσθιεν, ὡς ὁ τὸν Κήρυκος 38 γάμον εἰς τὰ 39 Ησιόδου παρεμβάλων εἶρηκεν οὕτως ὁ Ἀναξίμανδρος τὸν ἀνθρώπων πατέρα καὶ μητέρα κοινὸν ἀποφίνας τὸν ἰχθύν διέβαλεν πρὸς τὴν βρωδίν.
24. *Refutatio Omnium Haeresium* I.6.7: Τα δὲ ζῷα γίνεσθαι <ἐξ ὑγροῦ>, ἐξαμυζόμενον ὑπὸ τοῦ ἡλίου, τὸν δὲ ἀνθρώπον ἑτέρωφ ζῷω γεγονέναι—τουτέστιν ἰχθύι—παραπλήσιον κατ’ ἀρχάς. See Marcovich, M. (ed.), *Refutatio Omnium Haeresium*, Walter de Gruyter, Berlin, p. 65, 1986.

