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SOIL DEGRADATION AS A MATTER OF CONCERN FOR PLATO: A FEW NOTES IN THE MARGIN OF *CRITIAS* (110–112, ED. BURNET)

Abstract: The aim of this article is to present the hypothesis that a powerful earthquake, which resulted in, among others, the destruction and engulfment by water of the bay of two cities, Helike and Bura (373/72 BC) may have been one of two significant causes for which Plato drew attention to soil degradation and erosion processes in Attica and their potentially devastating effects. The second reason was the personally experienced anthropogenic transformation of the natural environment. The philological and historical commentary on the dialogue *Critias* also showed that Plato, in his analysis, used contemporary terminology in the field of natural sciences.

Keywords: soil degradation, erosion processes, earthquake, Helike, *Critias*

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INTRODUCTION

In terms of geographical sciences, the Greeks formulated astronomy, physical geography and ethnography, both theoretically and descriptively (in the context of the dependence of culture on the natural conditions of existence). However, a similar definition of geology as a branch of science was unsuccessful. Of course, we can find in their *historiae naturales* a lot of information in the field of mineralogy, such as various λιθικά (On stones),

preserved mainly in fragments (e.g. Dionysius Periegeta, Pliny, Pseudo-Dioscorides, Poseidippus of Pella, Theophrastus of Eresos). However, they are descriptive in nature, focusing on the visible features of minerals and their usefulness for humans. No comprehensive research has been undertaken on the genesis of rocks, classification, research methods, etc. Undoubtedly, the main reason for such stagnation in relation to other branches of geographical sciences (*γεωγραφία*, lat. *geographia*; e.g. a very high level of cartography) is the scale of geological time, unimaginable for ancient people. A similar situation occurs in the case of landform changes: only events that rapidly changed the environment (volcanic eruptions, earthquakes, floods) were subject to description and interpretation. The purpose of this text is to provide an example of such an analysis of changes in soil and water conditions undertaken by Plato in relation to the environmental degradation of Attica.

THE EARTHQUAKE OF 373 BC

The Gulf of Corinth is one of the most seismically active areas in Europe; the Corinthian rift is a geologically young structure (late Pliocene), still expanding on the N-S axis, currently at a rate of 10-14 mm per year (Bell et al., 2009; Gawthorpe, 2022). There have been at least a dozen $M_w \geq 6$ earthquakes over the last 2,500 years (Console et al., 2013), the last one, with a magnitude of 6.4, occurred on June 8, 2008 (Ganas et al., 2009; Feng et al., 2010; Karakostas, 2017; situation after 2008: Mesimeri et al., 2018), raising concerns about the fate of Patras, the third city of modern Greece. While the oldest of them, already recorded in historical sources, occurred in the winter of 373 BC and was felt at least throughout central Greece. Its most spectacular effect was the sliding of two Achaean cities (northern Peloponnese), Helike (ἡ Ἑλίκη) and Bura (ἡ Βοῦρα), from the rocky slope (Strabo, 8.7.2; Diodorus, 15.48-49; Pausanias, 7.24.5-12; Mouyaris et al., 1992, contra last time Stiros, 2022).

Many researchers assume that this event may have influenced Plato when formulating the myth of Atlantis (*Timaeus* 24E-25D, *Critias* 108E ff.; Giovannini, 1985). However, leaving this issue, which has abundant literature on the subject,¹ let us pay attention to another, little-known, aspect of

¹ Beginning with Martin Th.M.'s classic treatise (1841), see esp. Mattéi, 1996; Gill, 2017; here especially earlier bibliography. Currently, mainstream research is dominated by the belief that the myth has the character of a parable (like Prodicus' famous story about

the above event. Namely, to sensitization the author of *Critias* to land-water relations, to the condition of the soil, caused both by human interference and the action of nature, which increases the scale of a possible disaster. The aversion to the sea element can be seen, for example, in the *Phaedo*, where the ending phrase towards the earth “under the sky” sounds like a gulp of air after surfacing (110A–B):

ὅσπερ τὰ ἐν τῇ θαλάττῃ ὑπὸ τῆς ἄλμης, καὶ οὔτε φύεται ἄξιον λόγου οὐδὲν ἐν τῇ θαλάττῃ, οὔτε τέλειον ὡς ἔπος εἰπεῖν οὐδὲν ἐστὶ, σήραγγες δὲ καὶ ἄμμος καὶ πηλὸς ἀμήχανος καὶ βόρβοροι εἰσιν, ὅπου ἂν καὶ [ἡ] γῆ ἦ, καὶ πρὸς τὰ παρ’ ἡμῖν κάλλη κρίνεσθαι οὐδ’ ὅπως οἶον ἄξια. ἐκεῖνα δὲ αὖ τῶν παρ’ ἡμῖν πολὺ ἂν ἔτι πλέον φανεῖται διαφέρειν· εἰ γὰρ δὴ καὶ μῦθον λέγειν καλόν, ἄξιον ἀκοῦσαι, ὃ Σιμμία, οἷα τυγχάνει τὰ ἐπὶ τῆς γῆς ὑπὸ τῷ οὐρανῷ ὄντα.

[...] and nothing of any account grows in the sea, and there is, one might say, nothing perfect there, but caverns² and sand and endless mud³ and mire,⁴ where there is earth also, and there is nothing at all worthy to be compared with the beautiful things of our world. But the things in that world above would be seen to be even more superior to those in this world of ours. If I may tell a story, Simmias, about the things on the earth that is below the heaven, and what they are like, it is well worth hearing (transl. H.N. Fowler).

The dangerous alienness of an element that can destroy cities, both on its own and through the rivers flowing from it (*Timaeus* 22e):⁵

The Choice of Hercules), although an actual event from the author’s time may have suggested the idea of a narrative frame.

² The term σήραγγα; it is a concept used in natural sciences to describe abysses, depressions in landforms or minerals (Arist., *Hist. anim.* 548a24), but also animal body cavities, cf. *Timaeus* (70C).

³ About “impassable mud” (ἄπορον πηλόν) also in 108E. Note that in both cases of using this word, Plato emphasizes through adjectives the same property of mud: heavy stagnation that restricts movement, and when a layer of mud covers something, extraction/excavation is extremely difficult. It should be emphasized that – unlike modern geology, which defines gravel, sand, silt or clay by grain size (Mocek, 2015: 133–143) – the Greek language focused, quite imprecisely, on their consistency and moisture. Therefore, one should be careful when interpreting ancient texts, because homonymous terms from literary translations do not have to correspond to modern definitions.

⁴ While the Polish renowned translator here, W. Witwicki, has used the term “βόρβορος” as a synonym for mud, and this is acceptable, there is also a subtle difference to be noted; in “βόρβορος” you don’t feel that heaviness or muddiness, it is just wet, and above all dirty, unpleasant to the touch soil, but its consistency may vary.

⁵ Seneca quotes Callisthenes, who shows how underground forms (caves, watercourses) wash away the ground, and in the case of Helike, they damaged the slope on the sea-shore, *Quaest. Nat.* 6.23.4; in a similar vein Diodorus (15.49.5–6).

παρ' ὑμῖν πόλεις εἰς τὴν θάλατταν ὑπὸ τῶν ποταμῶν φέρονται (...).

the inhabitants of your cities are swept into the sea by the rivers (...) (trans. R. Waterfield).

The above passage from the *Timaeus* is still theoretical, but in *Critias* one of the earlier floods destroys the Acropolis, which originally looked completely different than it does today (112A):

νῦν μὲν γὰρ μία γενομένη νύξ ὑγρὰ διαφερόντως γῆς αὐτὴν ψιλὴν περιτήξασα πεποίηκε (...).

since by now it has suffered from the effects of a single night of torrential rain which washed away the soil and left the Acropolis bare⁶ (...) ⁷ (trans. R. Waterfield).

The above sentences show that Plato was aware of the power of the water element and its destructive possibilities, regardless of whether they were the result of rainfall or tsunamis. However, as we will see below, in his opinion, appropriate human behavior can reduce the negative effects of a natural disaster, and inappropriate behavior can deepen or even cause it. Additionally, the Achaean earthquake did not have to be the only example of radical environmental changes visible to the philosopher.

ECOLOGICAL DISASTER IN ATTICA AND ITS CAUSES

Critias is the middle part of the planned trilogy, preceded by *Timaeus* and crowned by *Hermocrates*, never written (Eberz, 1910; Rosenmeyer, 1956). The trilogy was to be devoted to natural issues, in particular human's place in the natural world. It should be assumed that *Critias* was being written from 357, and the lack of completion can be explained by the death

⁶ The adjective "ψιλός" is commonly used in geography, cf. "great and naked [i.e. open]" plain in Herodotus (1.80); "treeless and bare peaks of the Alps" in Polybius (3.55.9) and zoology, when, for example, Aristotle writes that man is the most naked of all animals (*De gen. anim.* "ἄνθρωπος ψιλότατον τε κατὰ τὸ σῶμα τῶν ζῴων πάντων ἐστὶ").

⁷ A similar thought about the destructive power of storms can be found in the pseudo-Platonic *Kingfisher*: "καὶ ἐνθυμηθέντι γὰρ τῷ δέος ἐπέλθοι τὰς ἀστραπὰς ἐκεῖνας καὶ βροντὰς ἀνέμων τε ἐξαισία μεγέθη ὑπέλαβεν ἂν τις τὴν οἰκουμένην ἅπασαν καὶ δὴ συμπεσεῖσθαι" (*Halcyon* 3. "Even at the thought of those flashes of lightning, peals of thunder and enormous winds fear could well assail a man; one would have supposed that the whole earth was on the very point of collapsing in ruins", transl. M.D. MacLeod).

of Plato (348/7). A thinly veiled criticism of the state of the soil and a description of its erosion is found at the beginning of the description of the ancient size of Athens, when Attica covered an area larger than today and the land was more fertile (110E–111A). Meanwhile later (111A–D):

πολλῶν οὖν γεγονότων καὶ μεγάλων κατακλυσμῶν ἐν τοῖς ἐνακισχιλίοις ἔτεσι—τοσαῦτα γὰρ πρὸς τὸν νῦν ἀπ’ ἐκείνου τοῦ χρόνου γέγονεν ἔτη—τὸ τῆς γῆς ἐν τούτοις τοῖς χρόνοις καὶ πάθουσιν ἐκ τῶν ὑψηλῶν ἀπορρέον οὔτε χῶμα, ὡς ἐν ἄλλοις τόποις, προχοῖ λόγου ἄξιον ἀεὶ τε κύκλω περιρρέον εἰς βάθος ἀφανίζεται· λέλειπται δὴ, καθάπερ ἐν ταῖς μικραῖς νήσοις, πρὸς τὰ τότε τὰ νῦν οἶον νοσήσαντος σώματος ὅσῳ, περιερρυηκυίας τῆς γῆς ὄση πείρα καὶ μαλακή, τοῦ λεπτοῦ σώματος τῆς χώρας μόνου λειφθέντος. τότε δὲ ἀκέραιος οὔσα τὰ τε ὄρη γηλόφους ὑψηλοὺς εἶχε, καὶ τὰ φελλέως νῦν ὀνομασθέντα πεδία πλήρη γῆς πείρας ἐκέκτητο, καὶ πολλὴν ἐν τοῖς ὄρεσιν ὕλην εἶχεν, ἧς καὶ νῦν ἔτι φανερὰ τεκμήρια· τῶν γὰρ ὀρῶν ἔστιν ἃ νῦν μὲν ἔχει μελίτταις μόναις τροφήν, χρόνος δ’ οὐ πάμπολυς ὅτε δένδρων ἴσχυρόθεν εἰς οἰκοδομήσεις τὰς μεγίστας ἐρεψίμων τμηθέντων στεγάσματ’ ἔστιν ἔτι σα. πολλὰ δ’ ἦν ἄλλ’ ἡμερα ὑψηλὰ δένδρα, νομὴν δὲ βοσκήμασιν ἀμήχανον ἔφερον. καὶ δὴ καὶ τὸ κατ’ ἐνιαυτὸν ὕδωρ ἐκαρποῦτ’ ἐκ Διός, οὐχ ὡς νῦν ἀπολλῦσα ῥέον ἀπὸ ψιλῆς τῆς γῆς εἰς θάλατταν, ἀλλὰ πολλὴν ἔχουσα καὶ εἰς αὐτὴν καταδεχομένη, τῇ κεραμίδι στεγούση γῆ διαταμιευομένη, τὸ καταποθὲν ἐκ τῶν ὑψηλῶν ὕδωρ εἰς τὰ κοῖλα ἀφιεῖσα κατὰ πάντας τοὺς τόπους παρείχετο ἀφθονα κρηνῶν καὶ ποταμῶν νάματα,⁸ ὧν καὶ νῦν ἔτι ἐπὶ ταῖς πηγαῖς πρότερον οὔσαις ἱερὰ λελειμμένα ἔστιν σημεῖα ὅτι περὶ αὐτῆς ἀληθῆ λέγεται τὰ νῦν.

So although there have been many devastating floods in the course of the 9,000-year interval between then and now, the soil washed down from the highlands in all these years and during these disasters has not formed any considerable pile of sediment, as it does elsewhere, but is constantly rolled down into the depths,⁹ where it vanishes. Just as on the small islands, what remains now is, compared with those days, like a skeleton of a body wasted by disease: the soil, or at any rate as much of it as is rich¹⁰ and soft,¹¹ has rolled away, and only the spare body of the land remains. In those days,

⁸ Ulrich von Wilamowitz-Moellendorff (1919: 395) already pointed out how, thanks to the structure of participles, Plato reflects the dynamism of fast-flowing water not only in semantics, but also in syntax; the Polish/English translation, although adequate, does not reflect this beauty.

⁹ Used here in the original the word “βάθος” is also “abyss”, cf. the ominous: “Ταρτάρου βάθη” (Aeschylus, *Prometheus vinc-tus* 1029, although Plato also uses it in the interesting, metaphorical sense of “depth of understanding” (*Theaetetus* 184A): “καὶ μοι ἐφάν ἡ βάθος”.

¹⁰ An old word, dating back to the PIE tradition, used in this extremely positive sense both for the earth/soil (Arist., *Athen. Pol.* 12.3; Theophrastus, *Hist. plant.* 8.6.2; Theocritus. *Id.* 18.29), as well as animals (Arist., *Hist. anim.* 600a23).

¹¹ A very general term, with positive connotations, to describe any soft, pleasant to the touch thing. Earlier, in the *Timaeus* (60B–E), we find a description of the influence of water on the properties of soil.

however, the land was intact, our mountains were just high mounds, what we now call the Stony Plains were filled with rich soil, and the highlands were covered with dense forests (of which there are traces even now). Nowadays some of our mountains sustain only bees, but not long ago trees from there were cut as roof-timbers for very substantial buildings, and the roofs are still sound. Cultivated trees grew tall and plentiful, and the soil bore limitless fodder for our flocks and herds. Moreover, the ground benefited from the rain sent each year by Zeus and didn't lose it, as it does nowadays with the water flowing off the bare ground and into the sea. Instead, because the ground had plenty of soil to absorb moisture, it stored the rain on a layer of impermeable clay, let the water flow down from the high ground into the low ground of every district, and so provided abundant springs to feed streams and rivers. Even now there are still shrines, left over from the old days, at the sites of former springs, as tokens of the truth of this account of the land¹² (transl. R. Waterfield).

This ends with a conclusion, which is not particularly favorable for contemporary comparisons, about the ancient moral perfection of the Athenians, which was expressed, among other things, in proper (i.e. moderate: γεωργῶν μὲν ἀληθινῶν) farming, and thanks to this the climate was also moderate (111E). Excessive cutting down of forests, lack of appropriate scale of new plantings and lack of care for the landscape led to soil erosion due to the inability to absorb water, the runoff of which accelerated the degradation process. Even if, as some researchers would like (e.g. Trampedach, 1994: 153, 261), the above criticism refers to democratic authorities, which may be indicated by the choice of Critias, an extremist oligarch, as the title of the dialogue, it does not have any importance in understanding the erosion process and how to prevent it. Hence, it is no coincidence that when describing the ideal beauty of the Atlantean home, he mentions planting trees near the water (117 B-C). In the near future, Plato will develop (*Leges*, 844A) the issue of irrigation principles and guaranteeing universal access to springs and streams (Klingenberg, 1976: 66–67). His postulate is not innovative, as we find contemporary examples of rational forest management (Theophrastus, *Hist. plant.* 5.8.1). It should be emphasized, however, that even a forest, which was a human creation, belonged to the sphere of nature, not civilization,¹³ as can be seen, for exam-

¹² A very interesting sentence, indicating that Plato was aware of changes in river conditions, e.g. certain streams drying. The mentioned shrines (literally “sacred signs”), regardless of their ‘archaeological’ meaning, symbolize in Plato that ancient harmony when human activity did not have a destructive impact on nature. On the sacralization of natural space in Greek culture, see Schimpf (2018).

¹³ Let us remember that although “ecology” is not an ancient term, it was created from the Greek οἶκος, per analogiam to *oikonomia*, already known in antiquity: the management of an *oikos*, i.e. a household, a farm, but also a small homeland. However, the inclusion of

ple, in the anonymous Hellenistic treatise *De mundo* (392b) (included in the *Corpus Aristotelicum*):

Πεποίκιλται δὲ καὶ χλόαις μυρίαῖς ὄρεσι τε ὑψηλοῖς καὶ βαθυζύλοις δρυμοῖς καὶ πόλεσιν, ἅς τὸ σοφὸν ζῷον, ὁ ἄνθρωπος, ἰδρύσατο, νήσοις τε ἐναλίοις καὶ ἠπείροις.

This region is adorned with innumerable green plants, high mountains, deep-shaded woodland, and cities established by the wise creature, man; and with islands in the sea, and continents (transl. D.J. Furley).

Is Plato's story about the former greatness of Attica merely a fictional moral parable intended to highlight the scale of contemporary natural degradation? It seems not. Recent geological studies of Attica have proven that in the 3rd–2nd millennium BC the southern coast in the Saronic Gulf looked completely different than in the 4th century BC (Pavlopoulos et al., 2020; Vandarakis et al., 2020): Piraeus was an island separated from the mainland by a shallow lagoon, and the connected rivers Ilissos and Kefisos had a different bed (Goiran et al., 2011; Di Nicuolo, 2020). It seems that despite the lack of direct evidence, especially written evidence, Plato could deduce the above state of affairs from three sources:

- a) in the 6th–5th centuries BC most of the area of the former lagoon was still covered by swamps (Xenophon, *Oec.* 19.6.), which were just beginning to be drained on a massive scale;
- b) in the 5th–4th century BC the greatest anthropogenic transformation to date is taking place in all of Attica, of which the philosopher was an eyewitness and which he submits to the above-mentioned criticism; from the oral tradition of the last few generations he could become aware of a previously unexperienced acceleration of qualitative and quantitative changes;
- c) visible remains from the Bronze Age, indicating previously different settlement conditions: here, an extremely convincing proof of the realism of Plato's account is the fact that the spring he described on the Acropolis, from which water was taken in Mycenaean times, and which, in his opinion, stopped functioning as a result of an earthquake earth (112D), was found by Oscar Broneer during an archaeological research (Broneer, 1939; recently, research has been

the natural world into the *oikos* in the late modern era is something new, unknown to the ancient tradition, which sharply demarcates the world of civilization from it.

undertaken again at this site, enriching the findings of Broneer, Van Damme, 2023).

From the above perspective, the Achaean earthquake has only an auxiliary function, proving the possibility of a sudden and radical change in the generally dynamic nature of human-nature relations.

CONCLUSIONS

Based on the above, we can conclude that Plato certainly had ecological awareness: seeing the degradation of nature, he recognized its causes and indicated, correctly also from our perspective, remedial measures, using scientific natural terminology; he also linked the well-being of nature with the quality of life of human as a social being. However, it should also be strongly emphasized that, like almost every ancient thinker, he saw the primary sources of the crisis in individual morality, and not in systemic changes. Hence the epithets about “real” farmers and religious shrines. We can also hypothesize that the power of the water element, one of manifestations of which was soil erosion, aroused deep reluctance in Plato due to the shock caused by the destruction of the Achaean cities. It also played an additional role in realizing the dynamism of natural changes. It is obvious that Plato’s attitude is in no way representative and each Greek community and its attitude to its own settlement structures must be examined separately.

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