ANAXIMANDER AND THE SCIENTIFIC REVOLUTION
IN MILETUS IN THE SIXTH CENTURY B.C.

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АНАКСИМАНДР И НАУЧНАЯ РЕВОЛЮЦИЯ В МИЛЕТЕ В VI В. ДО Н. Э.

В настоящей работе развиваются и обосновываются следующие положения:

1. Предлагается уточнение типологии ранних греческих теорий материи. Корпускулярные теории материи существовали задолго до атомистических, начиная с Анаксимандра. Следует отказаться от терминов «монизм и плюрализм» как философски несостоятельных (с. 689).

2. Ключевая роль понятия «природы» (φύσις) в научной революции в Милете в 6 веке до н. э. Критика современной «ботанической» (процессуальной) парадигмы, игнорирующей онтологическую семантику, связанную с индоевропейским глаголом 'быть' (с. 697).

3–4. Анализ ранней (4 век до н. э.) и поздней (эпохи империи) доксографической традиции о «первоначале» Анаксимандре. Только ранняя традиция основана на тексте Анаксимандра, поздняя основана на доксографии Аристотеля. Ранняя традиция однозначно приписывает Анаксимандру механистическую теорию «смеси», подобную Анааксагоровской (с. 706).

5. Реконструкция неизвестной аналогии с «промыванием» золота в анаксимандровской теории космогонического вихря (с. 722).

6. Дополнительное свидетельство Эпикура о роли вихря в теории неподвижности Земли Анаксимандре (с. 729).

7. Аналогия в «проваиванием зерна» у Ксенофана и в «Тимее» Платона (с. 736).

8. Новая интерпретация фрагмента В1 как закона сохранения материи (с. 741).

9. Незамеченные анонимные парафразы фрагмента Анаксимандра, его влияние на Гераклита (с. 750).

10. Гипотеза о социальном статусе «Милетской школы» как коллегии экспертов по физике, географии, астрономии при храме Аполлона Дидимского в Милете (с. 758).

Ключевые слова: «досократики» корпускулярные и атомистические теории материи, понятие о ‘природе’ (φύσις), научная революция в Милете в VI в. до н. э.
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Keywords: Presocratics, the distinction between ‘corpuscular’ and ‘atomistic’ theories of matter, the concept of ‘nature’ (φύσις), scientific revolution in Miletus in the 6th century B.C.

1. Preliminary remarks. Eliminating the wrong category of ‘Presocratics’, correcting the improper use of the terms ‘monists’ and ‘pluralists’, and clarifying the distinction between ‘corpuscular’ and ‘atomistic’ theories of matter.

Contrary to recent attempts of some scholars to make sense of the modern category of ‘Presocratics’ (Laks 2006), we have repeatedly argued on various occasions that it should be eliminated...
from the history of early Greek philosophy both on historical-philological and philosophical grounds. If ‘Presocratics’ are by definition Greek philosophers of the 6th and 5th centuries B.C., then Socrates should be regarded ‘Presocratic’ too. This category is unhistorical because it blurs the important distinction between two periods of Greek philosophy, the archaic (585–480 B.C.) and the early classical (480–400 B.C.). Imagine a history of Greek art which mixes the Orientalizing, Archaic and Early classical periods in one strange category of ‘pre-Phidian’ art. Apart from being unhistorical it is also philosophically meaningless and misleading, because it conflates under single category two distinct traditions, the Ionian and the Italian, based on two incompatible metaphysical paradigms. The ancient authors of ‘Successions’ (Διαδοχαί), anticipated by Plato and Aristotle, saw the truth when they applied this distinction to the general history of Greek thought, the Ionian and the Italian. The Ionian tradition starting with Thales was a secular and detached empirical science. The Italian tradition started by Pythagoras had a religious-ethical dimension and was educational in scope, it was philosophy as a way of life. These two traditions originated in totally different sociocultural contexts and were different in their goals. The term φιλοσοφία comes from the Italian tradition, the Ionian word for the new science was ἥπερι φύσεως ἱστορία, a word which in the early usage is associated with travel (including sea travel), observation and collecting information. The birth of the Ionian tradition of ἥπερι φύσεως ἱστορία was triggered by the practical/economic needs of the Milesian polis, first of all by seafaring, sea trade and colonization (Miletus was metropolis of 90 colonies according to Plinius). Navigation requires practical knowledge of astronomy, geography and meteorology, three subjects that constitute the core of any Ionian treatise Περὶ φύσεως. The Western Greek Philosophy was created by Pythagoras on fundamentally different principles as an antithesis to and negation of the Ionian naturalism; its principal aim was not specialized scientific

1 Lebedev 2010 “Getting rid of the Presocratics”; 2010 “Western Greek philosophical poems”; 2014 “The Logos of Heraclitus”; 2017 “Parmenides, ΑΝΗΡ ΠΥΘΑΓΟΡΕΙΟΣ” and especially 2019 “Idealism (mentalism) in early Greek metaphysics and Philosophical theology”.
2 Contra Moore 2020: 37 ff. who misinterprets Heraclitus fr.133Leb/B35DK. This fragment comes not from the epistemological proem in chapter 1 and has nothing to do with the criticism of polymathia. Most probably it comes from the second chapter of Heraclitus’ book (Λόγος πολιτικός) and speaks about the role of philosophers in Heraclitus’ ideal society: ‘the lovers of wisdom should be judges of the many’, i.e. philosophical elite should rule over the masses (οἱ πολλοί) who lack ‘mind and intelligence’. Both Heraclitus and Plato depend on the Pythagorean idea of philosophers-kings. See our commentary Lebedev 2014: 439–440.
research, but the construction of a religiously and morally relevant general worldview and the education of ideal citizens and fearless warriors. The representatives of these two traditions had different perceptions and even different names of their intellectual enterprise. The Ionians called it ‘inquiry into nature’ (*peri physeos historia*), while the Italians — ‘love of wisdom’ (*philosophia*). The ancient tradition about the Pythagorean origin of the term *philosophia* is generally correct. In classical Athens of the second half of 5th century B.C. the words φιλοσοφία, φιλόσοφος were known but not yet used as a term for a certain profession. The intellectual life in Athens at that time was dominated by the Ionian paradigm of ‘Anaxagoreioi’ and Ionian Sophists, like the Derveni author (Prodicus of Ceos). It was in 4th century Plato’s Academy that the shift of paradigm from Ionian to Italian tradition led to the adoption of the Pythagorean conception and designation of philosophy as both a profession and a way of life. The key term of the Ionian science were exploration (ιστορία) and ‘nature’ (φύσεις), the key terms of the Italian ‘love of wisdom’(φιλο-σοφία), were ψυχή, ἁρμονία and ἄληθεια. The cosmic harmony of the Pythagoreans was not just a law of nature (like Anaximander’s law of exact compensation in material change), but a moral and political paradigm for ascetic spiritual discipline. In all fundamental problems of philosophy these two traditions contradicted one another and defended opposing views. In metaphysics and cosmology the Ionians adhered to the strict naturalistic monism.

We avoid to apply the term ‘materialism’ to the Ionian theories, since it is potentially misleading. ‘Matter’, Aristotelian *hyle* (conceptually prefigured by Plato’s *hypodoche* in the creation story of *Timaeus* and Pythagorean passive principle to *apeiron* opposed to active *peras*), is — paradoxically — a creationist term, a misleading equivalent of the Ionian *physis* in Aristotelian doxography since Ionian *physis* is a self-moving and self-evolving substance that does not need an external *causa movens*. The concept of a passive matter-material (that implies a craftsman-*demiourgos*) was invented in the Western Greek metaphysics as a polemical creationist counterpart of the self-moving and self-evolving Ionian physis. The Ionians

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3 On the often neglected theological, ethical and practical-educational dimensions of the Pythagorean metaphysics and Eleatic doctrine of ‘being’ (including military psychology, eradication of fear etc.) see our study of idealism (mentalism) in early Greek thought: Lebedev 2017 and 2019, section 8.

4 By “naturalistic monism” we mean a position in metaphysics that recognizes only one type of reality, physical, and is opposed to metaphysical substance dualism of body and the soul, god and matter etc. See below on the confusing use of the terms ‘monism’ and ‘pluralism’.
recognized the universality of the laws of nature which abolished the notion of divinized ‘heaven’ (in Ionian cosmology the celestial bodies consist of the same elements, as earthen creatures), and, consequently, abolished the traditional mythopoetic division of the world into heavenly-divine-immortal part on the one hand, and the earthen-human-mortal part, on the other, with the exception of Heraclitus who essentially revived this traditional division in a new form, without Homeric anthropomorphism. The Ionians also believed in the infinite Universe with innumerable worlds (Anaximander, Anaxagoras, Democritus, Diogenes of Apollonia, followed by Epicureans in Hellenistic times. On the contrary, the Italians (Pythagoreans and Eleatics) recognized only one closed world, since infinite Universe is incompatible with creationism and divine providence. The Pythagorean metaphysical dualism of the corporeal and the spiritual, the sensible and the noetic, the mortal and the divine, had a direct impact on the Western conception of the cosmos, it is reflected in the division of the cosmos into a divine superlunar and a mortal sublunar parts dismissed by the Ionians science, but revived by Plato and Aristotle in the fourth century. The division of the cosmos into the divine celestial region and the mortal sublunar region was in fact a revival of the traditional mythopoetic worldview. In epistemology the Ionians favored empiricism, and the Italians radical rationalism and apriorism rejecting the “deceptive sense-perceptions”. From the point of view of the Ionian naturalistic monism psyche could only be corporeal and mortal. The Italians regarded psyche as a divine being (daimon) coming from another world and only temporarily connected with the mortal body. In ethics (to judge by the fragments of Democritus and Ionian sophists) the Ionians favored humanism (anthropocentrism) and moderate hedonism. The ethics of Pythagoreans and Eleatics had metaphysical (and religious) foundation and was strictly ascetical and antihedonistic, it laid foundation for the so-called ‘virtue ethics’ of Socrates and Plato. In politics the Ionians (except Heraclitus who anticipated Plato’s attacks on democracy) favored democracy and liberalism, at least from the fifth century (Democritus, Protagoras, we have no evidence on the political views of the Milesians), the

5 Pace Herda 2019:27 who hypothesises that in Apollonia Anaximander promoted “moderate oligarchic isonomy”. Anaximander, a ‘relative’ of Thales, descendant of ancient aristocratic genos of Thelidai, must have been of aristocratic origin himself. It remains to be proved that the Milesian aristocrats could be defenders of democracy and took part on the side of the poor in the stasis between two parties Πλουτίς and Χειρομάχα. Unfortunately, we hear nothing from the extant sources about isonomy in mid-sixth century Miletus before Aristagoras in 499 B.C. The speculations of Vernant’s (1982) sociology of knowledge about the supposed impact of a ‘democratic’ paradigm on Anaximander’s cosmology are worthless since
Italians favored aristocratic elitism; Empedocles, an ardent democrat, was a maverick in the West. The historian of philosophy who played a decisive role in creating the still persistent stereotype of ‘Presocratics’, all of whom allegedly shared the same mentality, was John Burnet with his ‘Early Greek Philosophy’ first published in 1892. Burnet tried to impose on all early Greek philosophers the same positivist mould, apparently in the context of his anti-idealist polemics against 19th century Hegelianism and German idealism. He did everything to eliminate from the texts of early Greek philosophers all traces of speculative metaphysics and to turn them all into scientific positivists. By doing this Burnet tried to undercut and refute traditional German claims concerning exclusive ties between German idealism and Greek philosophy. Suffice it to mention here that Burnet polemically renamed Parmenides ‘the father of materialism’, disbanded the Eleatic school (this stronghold of idealism) by proclaiming Xenophanes a satirical poet unrelated with Elea, dismissed the theological doctrine of divine Logos in Heraclitus as a misunderstanding of trivial phrase “this discourse of mine” etc. Paradoxically, Burnet’s monograph is hardly quoted in our days, but its heritage, the physicalist bias of the term “Presocratic”, is still alive due to its enormous influence on the 20th century Anglophone historiography of early Greek philosophy. Both Myles Burnyeat and Bernard Williams were influenced by this stereotype when they denied the existence of idealism in Greek philosophy as a whole (see our detailed refutation of their thesis in Lebedev 2019). It is also paradoxical, that Ralph Cudworth in his “The True Intellectual System of the Universe” (1678) had a more clear and historically correct understanding of who was who in the Early Greek philosophy. The remarkable engraving on the frontispiece of the first edition of his work depicts two groups of Greek philosophers opposing each other in a debate about gods at the allegorical “altar of religion.” The group of “Theists” on the left includes Aristotle, Pythagoras and Socrates; the group of “Atheists” in the right includes Strato, Epicurus and Anaximander (!). Imitating the composition of the “Athenian school” of Raphael, Pythagoras points with his finger up to heavens, Epicurus points
with his hand down to earth. Above the heads of the “Theists” hangs an intact laurel wreath with inscription “Victory”, above the heads of “Atheists” hangs a torn wreath with inscription “confusion”. The exalted face of believer Pythagoras expresses hope and gratitude to gods, the gloomy face of nonbeliever Anaximander looks down. The juxtaposition of dissenting Anaximander and Pythagoras as the originators of two perennial paradigms (mechanistic determinism vs. teleology and divine mind) is historically correct, while the grouping of Ionian naturalists together with atomists as one and the same tradition also shows perfect understanding, far superior to the modern mistaken association of the atomists with Elea. Cudworth saw the truth because he was not blinded by the modern myth of “Presocratics” which had not yet been invented in his time.

The general lines of the development of early Greek philosophy and science are often summarized in a story like this. After the first bold attempts to formulate theories of _arkhai_ of the Milesians and their followers (misnamed “material monists”), there came the epoch-making criticism of Parmenides and Zeno who demanded to explain the very possibility of motion and change. As a ‘reply’ to the Eleatic ‘challenge’ appeared the so called ‘pluralistic’ systems of Anaxagoras, Empedocles and Democritus. In our opinion this is a false story phrased in inadequate and misleading terminology which conflates metaphysical concept of ‘monism’ opposed to dualism, with the physical concept of one-element theory of matter. Democritus was in fact a naturalistic monist (in the standard philosophical sense of the word), although his theory of matter recognized infinite number of atoms or corpuscles. The origin of the physical theories of Anaxagoras and Democritus can be easily explained from the internal development of the Ionian tradition itself; there is no need to postulate any Eleatic influence at all. The theory of the cosmic Mind ( _Gnome_ ) had been formulated before Anaxagoras already by Heraclitus (fr.B41 DK with Greek text as restored in our edition, fr.140 Leb). Anaxagoras simply combined it with Anaximander’s theory of the universal mixture correctly attributed to Anaximander by Aristotle and Theophrastus. Democritus’ mechanistic determinism cannot be derived from Parmenides’ immaterialism; besides that, Democritean atoms, unlike Parmenides’ being, are not composed of pure thought. For the criticism of modern positivist interpretations of Parmenides’ ontology and the defense of the ancient mentalist interpretation of Parmenides “what is” see Lebedev 2017. If Democritus indeed ‘replied’ to Parmenides’ criticism with his recognition of the existence of ‘what is not’ (i. e. of _vacuum_), he did it ironically and as a joke. The author of the sophistic treatise _Dissoi logoi_ 6.8 has preserved a valuable evidence which demonstrates that at the end of the 5th century B.C. two dominant and opposing schools of thought
in philosophy were Anaxagoreioi and Pythagoreioi, i.e. the followers of the Ionian and the Italian traditions. It is quite possible that by Pythagoreioi he meant Eleatics as well as Pythagoreans: Strabo calls Parmenides and Zeno ἄνδρες Πυθαγόρειοι, Parmenides is included into Iamblichus’ catalogue of Pythagoreans. We have argued elsewhere in detail that the allegorical ‘gigantomachia over being’ in Plato’s Sophistes 246a4–246c3 refers not only to particular contemporary debate between Plato’s Academy and Democritus, but to the perennial theoretical conflict between the Ionian and Italian traditions, starting with Anaximander and Pythagoras in 6th century B.C. (Lebedev 2019: 689–694)

In order to understand precisely Anaximander’s theory of primordial substance (“infinite nature”) it is also necessary to eliminate from our discussion the inadequate and confusing use of terms “monism” and “pluralism” in the histories of pre-Platonic philosophy. In what follows we will use the term ‘monism’ in its traditional philosophical sense, to denote the metaphysical school of thought that recognizes only one kind of reality and is opposed to metaphysical dualism that recognizes two kinds (corporeal and incorporeal, god and matter, etc.). Metaphysical monism can be naturalistic (only physis or physical objects exists) and idealist, or mentalist (only mind or mental entities exist), also known as immaterialism. Most Ionian physikoi and Ionian Sophists were naturalistic monists; the Pythagoreans were dualists; Parmenides was an idealist monist or immaterialist. Some scholars apply the term ‘monism’ to single-element theories of matter and counterpose the proponents of such theories (dubbed ‘monists,’ e.g. Anaximenes) to multiple-elements theories of matter held by ‘pluralists’ (such as Empedocles and Anaxagoras). This unphilosophical use of the terms ‘monism’/‘pluralism’ (which probably derives from some ancient doxographical passages concerning the problem of ‘One’ and ‘Many’) is potentially misleading and can result in the confusion of the taxonomy of metaphysical theories of kinds of reality and the taxonomy of physical theories of matter or physical elements. Corpuscular theories of matter (such as those of Anaxagoras and Democritus) should not be called ‘pluralist’ and should not be contrasted with ‘monistic’ theories of a single material continuum. They should instead be called corpuscular theories and contrasted with single-substrate or single-element theories of matter. Corpuscular theories of matter may also be contrasted with single-substrate theories of matter, and discrete theories of matter may be distinguished from continualist theories. What matters in metaphysics and in the history of ancient metaphysics is the perennial conflict between naturalistic monism and metaphysical dualism of body and mind, god and matter, etc.
Histories of early Greek philosophy of nature and physical science sometimes confuse or identify the notions of corpuscular and atomistic theories of matter. As a result of this confusion the very existence of corpuscular theories of matter in Greek thought before the atomists is wrongly denied. However, every atomistic theory of matter is a corpuscular theory, but not every corpuscular theory of matter is atomistic. The truth was seen by Alexander Heidel as early as 1911 in his “Antecedents of Greek corpuscular theories”, but unfortunately his observations have been commonly neglected due to the false derivation of Democritus’ atomism from the Eleatic ontology. Corpuscular intuitions are found long before classical atomism in Greek theories of evaporation ἀναθυμίασις, medical theories of nutrition, Anaxagoras’ concepts of ‘seeds’ (σπέρματα) and ‘portions’ (μοῖραι) of various simple stuffs, Empedocles’ theory of effluences (ἀπόρροιαι) and microscopic molecules of odor by which a dog recognizes her kennel on a roof (31A20a, originally not an ‘apophthegm’). To these we should add Anaximander’s conception of primordial substance (φύσις) as panspermia (mixture of various seeds), attested both by the consensus of Aristotle and Theophrastus, as well as by Anaximander’s own gold-washing analogy in his theory of the cosmogonic vortex (on which see section 5 below). Democritus’ theory of matter was strongly influenced by Anaximander’s and Anaxagoras’ theories of invisible ‘seeds of all things’ combined with the vortex cosmogony and Infinite Universe, but it has nothing to do with the immutable divine Sphairos of the Western philosophical theology (Pythagoreans, Xenophanes and Eleatics) conceived as incorporeal light which is both intelligible (noeton) and intelligent (noeron). Democritus’ originality consists primarily in the two modifications of the original Ionian panspermia theory of matter: he made the ‘seeds of all things’ indivisible and lacking secondary qualities, distinguished only by size and shape. Both in Anaximander and Anaxagoras the ‘seeds of all things’ were divisible and qualitatively distinct, and yet it was a corpuscular theory of matter of non-atomistic type, i.e. a theory of primordial substance (physis) with molecular structure, conceived as mechanical mixture (migma) of various stuffs. Anaximander’s and Anaxagoras’ theory of matter was far ahead of the naïve popular doctrine of ‘four elements’, still cherished by Plato and Aristotle, since in their view the primordial panspermia comprised, among other ‘seeds’, all metals, i.e. a considerable part of Mendeleev’s periodical table of elements.

6 To avoid misunderstanding, it should be noted that we do not attribute to Anaximander the ‘strong’ version of the theory of universal mixture, according to which every single ‘portion’ of matter, including seemingly
2. The new concept of ‘nature’ (φύσις) and the scientific revolution in Miletus in the first half of the 6th century B.C. The emergence of the first evolutionary history of the cosmos.

Aristotle, in the book Alpha of his *Metaphysics*, placed the doctrines of the first Ionian thinkers in a completely alien metaphysical context of the academic problems of ‘first principles’ (ἀρχαί) in Athens in the 4th century BC. Aprioristic speculative metaphysics was created by the Pythagoreans and Eleatics in the late 6th and early 5th centuries BC, in the Greek West in Magna Graecia, much like a rejection of Ionian naturalism and empiricism. Due to the huge historical influence of the Aristotelian scheme on the historiography of ancient philosophy (all preceding Aristotle history of thought as a process of gradual discovery of his own four principles or causes of being) it is often repeated in secondary literature after Aristotle that most of the first philosophers recognized only ‘material’ principles, such as water of Thales, air Anaximenes and the mysterious ‘apeiron’ Anaximander. In fact, the philosophical use of the ancient word ‘beginning’ (ἀρχή) in metaphysical sense of ‘first principle’ was introduced into philosophy by the Pythagorean Philolaus in the context of Pythagorean mathematical metaphysics at the time of Socrates. For Anaximander, as for all the Milesians and all later philosophers of the Ionian tradition (Anaxagoras, Democritus, atomists, Epicurus), the fundamental and key scientific concept was “nature” (φύσις), not “arche”. It was this fundamental new concept that lies at the core of the scientific revolution in Miletus of the 6th century, since a single word *physis* replaced dozens of names of anthropomorphic gods and divine beings in the mythopoetic cosmogonies of Hesiod and other poets-theologians (as Aristotle called them). The Milesians accomplished a scientific revolution, for the first time in the intellectual history of mankind, creating an evolutionary history of the cosmos and an empirical, observational science of nature, in which there was no place for anthropomorphic mythological gods. In this new Ionian science naturalism and evolutionism were combined with analogical method and inferential proofs homogeneous stuffs, contains ‘trace elements’ of all other stuffs. The gold-washing experiment quoted by Theophrastus clearly distinguishes the ‘seeds’ of ‘gold’ and the seeds of ‘earth’, but neither in this analogy nor in any other extant source on Anaximander’ theory of matter there is a clear indication that he, like Anaxagoras, regarded every single ‘seed’ of gold as *predominantly gold* with admixtures of all other metals.

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7 Philolaus B6 DK.
8 For recent discussions of the topic of *physis* see Naddaf 2005; Hadot 2006; Macé WWW and 2017; Heinemann 2021 and collective research project ‘*Physis kai phyta*, see note 11 below.
Starting with Xenophanes of Colophon, who popularized the Milesian science of nature in his poems, the gods of popular faith were explained as poetic fiction, as personifications of natural phenomena. Heraclitus (about 500 BC) in the third chapter of his treatise ‘On Nature’ (‘Discourse on gods’) gave a systematic allegorical interpretation of the Homeric gods (later adopted by the Stoics), based on etymology. In this chapter Zeus was identified with the cosmos and the cosmic ‘ever-living fire’, Apollo with the sun, Hades with the sublunary air, etc. At the same time, Heraclitus criticized the Milesian naturalism and undertook the deconstruction of polytheistic mythology only to propose a new doctrine of pantheistic monotheism.

The term “philosopher”, “philosophy” as a designation of a certain profession and a certain way of life arose later in the school of Pythagoras in the Greek West, and in Athens became generally accepted only in the first half of the 4th century BC. thanks to Plato and the Academy. The words φιλόσοφος, φιλοσοφία as such were not unknown in the language of Athenians in the fifth century, but they denoted, like many other compounds with φιλο-, a type of character rather than a certain profession, something like intellectual curiosity and pursuit of knowledge (contra Moore 2020, cf. note 2 above). The first Ionian thinkers called their occupation not ‘love of wisdom’, but ‘enquiry into nature’ (ἡ περὶ φύσεως ἱστορία). The Greek word historia took on the special meaning of “study of the past” only by the time of Aristotle in the 4th century. In early Ionian usage it was associated not with working in the library and studying written sources, but with traveling and collecting information for cognitive or practical purposes. Democritus, the direct scientific heir of the Milesians (and not of the Eleatics, contrary to the widespread misconception), in his autobiographical fragment XIV Luria (B299 DK) retained this early usage, saying that he surpassed all his contemporaries in the number of ‘climates and lands’, which he visited during his travels, ‘conducting research’ (ἱστορέων). Thus, in contrast to Western Italian ‘love of wisdom’, which was originally life-building philosophy as a way of life, religiously and ethically based, Eastern Ionian ‘exploration of nature’ was a dispassionate objective scientific study of the natural world. Aristotle, who looked at the Ionians through the eyes of a Platonist, misrepresented them in the Alpha of Metaphysics as primitive ‘materialists’ who had not yet discovered the moving cause (that is, God), the Platonic forms or the Socratic dialectical ethics. Ionian natural history did not set itself such tasks, to reproach the Milesians

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9 The authenticity of this important autobiographical fragment has been defended by Luria who has refuted all objections of Diels. We have additional arguments in support of its authenticity in Lebedev 2021.
Anaximander and the scientific revolution in Miletus...

for this, as Aristotle and some modern researchers who operate with a false category of ‘Presocratics’ do — is like reproaching a first-class cartographer for not touching on the problems of happiness and the goal of human life in a geographical atlas. The genre of the Milesian treatise *On Nature* itself excluded anthropological or ethical issues. No one reproaches physicists for not dealing with ethical or political issues in their scientific research. Aristotle’s mistake is explained by the fact that in his excessively expanded concept of ‘philosophy’ he combined practical philosophy and natural science, Western *φιλοσοφία* and Ionian *ἱστορία*, which initially had nothing in common with each other, which arose in completely different socio-cultural contexts and posed completely different tasks: the former was concerned with human ‘soul’ (psyche), its moral education and its relation with the sphere of the divine, and the latter with detached study of the natural world within the pragmatic set of purposes posed by Milesian colonization and sea trade. The first (and only) early Ionian thinker who connected cosmology with ethics, politics and theology, and also made ‘nature’ (understood theologically and teleologically) into a moral standard, was Heraclitus, but his poetic cosmology has nothing to do with natural science: essentially it is a theory of natural law, a political parable about the ideal monarchy of Apollo the Sun, which should become a ‘paradigm’ for the creation of a federal state of Ionian city-states to withstand the power of Achaemenid empire and to liberate the Ionian Greeks from slavery (we have argued for this reconstruction in Lebedev 2014). The Ionian (Milesian) concept of a self-developing ‘nature’ was 2000 years ahead of its time, whereas the ‘moving’ and ‘formal’ causes of Plato and Aristotle were a regression into the mythopoetic past, a revival in a conceptualized form of a religious and mythological picture of the world, dismantled by the scientific revolution of the 6th century in Miletus.

In the analysis of the concept of nature in early Greek philosophy and science, researchers have always been divided into two schools of thought, and this duality of approaches is to some extent determined by the etymological ambiguity of the word itself. The noun φύσις ‘nature’, on the one hand, is related to the verb φύω ‘to give birth’, φύομαι ‘to grow’. These ‘botanical’ associations have led some researchers to emphasize in the semantics of φύσις the meaning of ‘growth’, birth, development etc. However, in most Indo-European languages, the common ancient PIE root *bh₂eh₂* is attested almost exclusively in various forms of the verb ‘to be’: Slavic быти, Latin *fui*, Skt. *abhut*, Gk. ἔφυ, Eng. *be* etc. If we

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10 The collective research project and colloquia *Physis kai phyta*: Bucheri, Macè, Wash 2019.
11 Chantraine DELG: 1235; Frisk GEW: 1052; Beekes EDG (2010): 1598.
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proceed from the connection with the verb φύω, then the original etymological meaning φύσις ‘growth, birth’, if from the connection with the verb ‘to be’, then ‘being, essence’, the semantic analogue of the Gk. οὐσία, lat. essentia. It is difficult to determine which semantics is primary and which is secondary, since both are very ancient. The principle “the concrete meaning is always primary, the abstract is secondary” is doubtful, since it can be refuted by many examples of the opposite. The aorist of the verb “grow” ἔφυ is regularly used instead of ἐστίν ‘is’ metri gratia in poetry without any reference to growth, birth, etc., but rather indicates the natural, inherent properties of something, that is, the properties of its essence. In general, one should not exaggerate the importance of etymology for the interpretation of philosophical terms, since their semantics are often radically different even from the actual common use of the same word in the Greek language, let alone from the reconstructed “original” meanings that in many cases have completely faded away in the actual usage of classical times. If we look into attested actual usage of the term φύσις in scientific and philosophical texts of the 6th–5th centuries B.C., we find only one (sic!) instance of φύσις in the sense of ‘birth’ or ‘generation’ in Empedocles’ verse (fr. B8), and none in Greek philosophical prose. Aristotle in his philosophical lexicon (Metaphysics, book 5, 1014b26–35), describing the different uses of the term φύσις, in the second meaning, indicates that physicists designate by this term the first matter, the origin and the elements that make up everything. Aristotle in this underestimated evidence actually points out that the physiologists themselves did not use his own terms ‘matter’ (ὕλη) or ‘material principle’ (ἀρχή καὶ στοιχεῖον), but called this primary matter (πρῶτη ὕλη) ‘nature’ (φύσις). This use is really attested for Anaximander, who spoke of the primordial substance of the world as φύσις ἀπειρός, ἀδίδος καὶ ἀγήρως ‘infinite nature, eternal and ageless’12 and Democritus, who used the term φύσις ‘nature’ as a collective designation of all atoms, conceived as primordial substance of the Universe13. We find a somewhat different, but also ‘ontological’ rather than ‘developmental’, use of the term nature at the beginning of Philolaus’ work: “Nature in the cosmos was harmoniously constructed from limitless and limiting elements, both the whole cosmos and everything that is in it” (fr. 44 B 1). In this fragment the term ‘nature’ is applied not to the first principles (the limit and the unlimited) or primordial substance, as in Anaximander and Democritus, but to what is ‘constructed’ from the first principles by the divine mind-demiurge, i.e. the entire physical world.

12 For details see Lebedev 1978. 1988. 2016.
13 φύσις = ἄτομα: Democritus 196a, 313 Luria ταῦτα ἐκεῖνοι ‘φύσιν ἐκάλουν = A58; B168DK.
Heraclitus, when he says ‘Nature loves to hide’ (Φύσις κρύπτεσθαι φιλεῖ) probably means the invisible ‘ever-living’ fire, which ‘hides itself’, taking on the image of a visible plurality of things. In other texts of Heraclitus, ‘nature’ has a strong epistemological connotation of objective reality or an objective order of things, opposed to the poetic fiction of poets about gods and the subjective opinions (τὰ δοκέωντα) of the crowd. Logos of Heraclitus (his doctrine), according to Fr. 2 Leb / B1, “corresponds to nature” (κατὰ φύσιν), that is, objective reality, as well as the divine logos of the world, while most people are “like dreamers” and live in an illusory world of their imagination. In the archaic Pythagorean oath Tetraktys is the ‘source and root of the eternal nature (ἀενάου φύσεως)’ (58B15DK), i.e. of eternal substance of immortal soul opposed to perishable body. Physis stands here for immutable being opposed to the growth and decay of he body.

These instances of the early philosophical usage demonstrate that the genetic (‘botanical’ or relating to ‘growth’) and ‘developmental’ connotations in the lexical semantics of the term φύσις itself should not be exaggerated at the expense of its ontological connotations relating to ‘being’ and ‘essence’ of things attested in the reflexes of the root *bhu- in most Indo-European languages, unlike the rare connotations of ‘growth’. Etymological considerations are further reinforced by morphological, i.e. by the semantics of the suffix -σις. Deverbative nouns on -σις include not only nomina actionis, but also nomina actae rei which denote not processes or actions, but results of actions or objects produced by the corresponding action, as well as instruments (Chantraine 1979: 280–289). Often the same word may combine these types of meaning. Ὄψις means not only ‘sight’, but also ‘view’ (produced by seeing) and ‘eyes’ in plural, i.e. organs of seeing. Ποίησις often means written poems, not only ‘creation’. Ἑξίς (from ἔχω) means permanent feature of character (virtue in Aristotle). Γένεσις in Homer means generative principle or progenitor (of Okeanos, Ξ 246), not a process of birth. Φάτις means proverb, not act of speaking. In the very first attested instance in Homer’s ‘Odyssey’ φύσις refers to the magical power of the plant moly (κ 302), the peculiar force or ‘virtue’(capacity, not process), i.e. foreshadows the later ethical use in the sense of peculiar character or inborn talents. Given all these etymological and morphological data, given the variety of usages of the suffix -σις, as well as virtually total lack of attested instances, it would be precarious to postulate a hypothetical ‘etymological’ meaning ‘growth’. The chances are that it never existed in the noun. Scholars working on the semantical history of φύσις and filling dozens of pages with passages containing various forms of the verb φύω φύομαι, are doing a purposeless work. It is methodologically wrong to assume that the
semantics of deverbative nouns and the verbs from which they are formally derived, are the same. Deverbative nouns often have new meanings and connotations that are semantical innovations not found in the original verb.

Λόγος in Greek has an amazing variety of meanings and contextually determined special uses that are not found in the semantics of the basic verb λέγω, i.e. are exclusive semantical innovations of the deverbative noun: e.g., ‘reason’ (both as rational faculty and as a reason of doing something), ‘argument’, ‘esteem’, ‘relation’, ‘proportion’, ‘measure’ etc. The subtle semantics of φύσις should be treated delicately, with respect to its peculiar innovations that cannot be reduced to ‘growth’ and botanical realm. We have already noted the epistemological connotation of ‘objective reality’ (as opposed to doxastic imagination) in early philosophical usage: in Heraclitus to speak κατὰ φύσιν equals to speak κατ᾽ ἄλθειαν, rejecting the ἀπάτη of poets and τὰ δοκέοντα of οἱ πολλοί.\(^{14}\) Is the ‘botanical’ approach to φύσις anyhow helpful for the adequate reading of such passages? There is another philosophically important connotation of φύσις which has not attracted due attention: the axiological connotation of ‘natural’ as ‘normal’ and ‘proper’, and hence of something that imposes itself as a moral standard. This use seems to be pre-philosophical since it occurs in the colloquial expression οὐκ ἔχει φύσιν: Plato, Rep. 408b οὗ γὰρ ἔχει φύσιν … σοφοὺς ἐπὶ τὰς τῶν πλουσίων θύρας ἱέναι. “It is not natural … for the wise to go to the doors of the rich”. Here φύσις means the normal or proper way of behavior. If philosophers will go to the doors of the rich, they will break this rule and their behavior would be abnormal or improper. Heraclitus uses φύσις in such ethical meaning of proper standard twice in the extant fragment. First time in his definition of wisdom fr.100Leb (B112DK) σοφῆ ἄλθεα λέγειν καὶ ποιεῖν κατὰ φύσιν ἐπάοντας “wisdom is to speak out the truth and to act according to nature, giving ear to her”. The second instance is found in the Sun fragment as quoted in the Derveni papyrus, col. IV,7–9 [νόδος] ἡλιος [κόσμου] κατὰ φύσιν, ἀνθρωπ[ηγου] εὕρος ποδὸς [ἐών], τὸ μέτρον οὕχ ὑπερβάλλων· εἰ γὰρ τι οὐροὺς ἐ[οικότας] ὑπερβαλε]ῖ, Ἠρινδε[ς] ἐν ἐξευρήσου[σι, Δίκης ἐπίκουροι. “The Sun is the mind [or ‘ruler’, reading ἄνας] of the cosmos according to nature, being one human foot in width, and not exceeding the proper measure. For if he does exceed the proper limits, Erinyes the ministers of Justice will find him out”. The Sun is an ideal ruler of the cosmos because he rules properly, κατὰ physein.

\(^{14}\) Heraclitus fr. 20Leb/B20, we read ἐξηπάτηται οἱ ἄνθρωποι πρὸς τῶν φανερῶν ‘men have been deceived by the appearances” (with πρὸς = ὑπό) and delete τὴν γνώσιν as Hippolytus’ explanatory remark. Δοκέοντα fr.138Leb/B28a), δοκέοντα fr. 5Leb/B17.
Physis here is the standard of the cosmic justice. In fr.100Leb man attains wisdom if he follows the same cosmic standard, by listening to the logos of nature.

And yet the Ionian ‘inquiry’ (ἱστορία) about the ‘nature’ of the world and physical phenomena is always linked with the evolutionary approach: a standard Ionian treatise ‘On nature’ always begins with a cosmogony.

In a recent discussion of the ‘dualism of becoming and being’ inherent in the semantics of physis Gottfried Heinemann (2021: 24-25) comes to the conclusion that the ‘genetic’ meaning prevails in physical contexts, and the ‘dispositional’ in moral/anthropological one. The latter is true, but the former is questionable. The semantics of the noun φύσις should not be confused with or identified with the semantics of the verb φύω / φύομαι. Most of the early (6th and 5th century) instances of φύσις in physical contexts concern being rather than becoming. Φύσις in the ‘genetic’ sense is attested only once in Empedocles’ verse, a metri gratia poetic substitute for γένεσις, and even in this hapax it does not mean ‘growth’, but ‘birth’, ‘coming-into-being’ opposed to τελευτή. Aristotle notices that this is an unusual and weird usage, ‘as if the vowel υ were long’, whereas in φύσις it is always brief; therefore, φύσις is not regularly associated with the verb φύω, it is not perceived by Greek Sprachgefühl as nomen actionis from φύω ‘to give birth, generate’. So how can we reconcile the ‘ontological’ and ‘essentialist’ (relating to being or ‘true being’ rather than becoming) lexical semantics of the word with the evolutionary approach in a standard Ionian Peri physeos. The simplest answer is that by reconstructing the origin and evolution of the cosmos we can better understand its current constitution and functional characteristics, which reveal ‘how it really is’ — in Greek, ‘how it is φύσει’, ‘how it is by its own proper nature’ or ‘what kind of thing it is’? We can say that in the early Ionian philosophical and scientific usage the term φύσις holds the same central position as the term οὐσία in 4th Attic philosophical schools. It is an Ionian naturalistic counterpart of the logocentric Attic term οὐσία. The Attic ousia of a thing is grasped by the logical definition per genus et differentiam. The Ionian physis of a thing is understood after meticulous empirical research and is explained by its evolutionary history. Aristotle aptly distinguished these two epistemic paradigms as λογικός θεωρεῖν vs. φυσικός θεωρεῖν respectively. We should keep separately the ‘etymologically determined’ lexical semantics of the word and its philosophical implications imposed by the new evolutionary naturalistic paradigm. Plato in his own non-Ionian metaphysical paradigm applies the term φύσις to immobile and immutable eternal intelligible forms: τά μὲν εἴδη ταύτα ὠσπερ παραδείγματα ἐστάναι ἐν τῇ φύσει (Parm. 132d).
We employ the term ‘scientific revolution’ not as a vague rhetorical phrase like Ernest Renan’s ‘le miracle Grecque’, but as a precise term of the modern philosophy of science introduced by Kuhn in his ‘Structure of scientific revolutions’, that is in the sense of the systemic ‘shift of paradigm’. Scientific revolution is not a ‘wonder’, it is a norm in the history of scientific thought. Scholars who still believe in the myth of logos emerging from mythos engage in what we call ‘pseudo-historical evolutionism’ which ignores the concept of scientific revolution. The new naturalistic paradigm invented in 6th century Miletus was ‘revolutionary’ in the sense that it was absolutely new, unparalleled both in the Greek theogonies and Oriental mythopoetic theogonies. It makes no sense to derive Anaximander’s *apeiron* from Hesiod’s chaos or to compare the separation of elements in the Ionian vortex cosmogony with the battle of Zeus and Typhon on Hesiod’s *Theogony*. The naturalistic paradigm of the Milesians, centered on the revolutionary new concept of impersonal self-evolving physis, for the first time in the intellectual history of humanity eliminated anthropomorphic gods from the explanation of the origin and functioning of the world. Another popular and equally mistaken approach in the modern studies of the origins of Greek rational thought is the sociology of knowledge of the ‘Paris school’. J.-P. Vernant’s model of historical transition from the mythical to philosophical cosmogonies as a shift from the hierarchical ‘sovereignty’ model to the egalitarian *isonomia*: ‘while the former appear to be modeled after a social order governed by a sovereign figure, the latter are guided by a new idea of balance that...emanated directly from the experience of the emerging Greek city’ (p.48). There is something indeterminate and unclarified in the sociology of knowledge of Vernant’s school: what is precisely the mechanism of this magical ‘emanation’ or projection of ‘forms of society’ unto ‘forms of thought’? Is this process conscious or not? If it is conscious, then the Milesians were poets and myth-makers, and not philosophers or scientists. If not (even worse), they were some kind of marionettes of a quasi-Freudian collective ‘political unconscious’ that was a matrix of their picture of the world. But both assumptions are refuted by the method of Anaximander and the Milesians, which Vernant, under the influence of Kirk’s destructive hypercriticism and Kahn’s Platonizing reconstruction of Anaximander’s cosmology, simply ignored: observation, inductive-semiotic logic and rational interpretation of empirical evidence (τεκμήρια). The question arises, the projection of what ‘forms of society’ are the theory of the cosmogonic vortex of

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15 With one reservation: in this case we are dealing not with the shift from one scientific paradigm to another scientific paradigm, but with the shift from the mythopoetic paradigm to the first scientific paradigm ever.
Anaximander attested in a neglected authentic analogy between cosmoogonic process and rotational movement of a washing pan that separates gold from earth in Simpl. *Phys.* 27.2 ff. (see section 4 below) or his rational hypothesis about the origin of the biological species of man from ‘animals of another species’ (ἐξ ἄλλοειδῶν ζώων, A 10)? These are genuine scientific theories based on the autonomy of reason and the observation of nature in the Milesian sense of the word, as well as on the rational interpretation of such observations, which were some two and a half millennia ahead of their time, and not at all a projection of mysterious political archetypes hovering in the nebulous intellectual atmosphere of the era. Vernant’s own ‘image’ of Anaximander’s cosmos was heavily influenced by now outdated views current at his time, first of all by the 1960 monograph of Charles Kahn. Both Kahn and Kirk&Raven (1962), followed by Vernant, denied the authenticity of the theory of infinite Universe with innumerable ouranoi, attested by an impressive consensus of ancient sources and after Burnet (1930) defended in more recent decades by Kerschensteiner (1962), West (1971), Lebedev (1981, 2020), Conche (1991), McKirahan (2001). Once we replace the inauthentic image of a single harmonious ‘balanced’ cosmos with the grandiose picture of the infinite Universe filled with ‘infinite nature’ that like ocean produces by vortex and destroys innumerable planetary systems like ours (geocentric, not heliocentric), the ‘analogy between polis and cosmos’ collapses. Sociomorphic and political metaphors and analogies in cosmology are generally not typical for genuine physical scientists, like the Milesians or atomists, but they are typical for ethically, politically and theologically minded thinkers like Heraclitus, Pythagoreans, Plato or the Stoics. The idea of cosmic harmonia was introduced in Greek philosophy by Pythagoras, most probably, in his polemics against mechanistic determinism of the Milesians; it was adopted by Heraclitus for the same purpose. Both in Pythagoreans and Heraclitus it was used as a cosmological argument for the existence of divine cosmic mind. Nothing of the kind is attested in the fragment B1 (see below section 6) or in the doxography of Anaximander; ‘steering’ (κυβερνάν) in Aristotle *Phys.* 203b11 does not imply conscious mind or divine providence, and most probably is not even a part of the quotation from Anaximander (DK may be right reducing the quote to ἄθανατον καὶ ἀνώλεθρον in B3).
3. Aristotle’s evidence on Anaximander’s theory of primordial substance as ‘mixture’ (μῖγμα Ἀναξιμάνδρου). The term ‘intermediate’ element is Aristotle’s own conventional label for a group of theories incompatible with his own concept of ‘air’: no relation with Anaximander whatsoever. Misinterpretations of the quotation from ‘Anaximander and most of physiologoi’ in Phys. Γ 4.

The extant sources on Anaximander’s theory of primordial substance chronologically fall into two groups: the early fourth century testimonia of Aristotle and Theophrastus, on the one hand, and the later Imperial doxographical tradition starting from SP-Placita and Cicero in the 1st century B.C. By this conventional term we designate the common source of Ps.Plutarch’s De placitis philosophorum and similar extracts in Stobaeus’ Eclogae; for the detailed refutation of Diels’s Aëtius hypothesis see Lebedev 2016. These two doxographical complexes are separated by a gap of 300 years or so, i.e., by the whole Hellenistic period. Both Aristotle and Theophrastus in the 4th century B.C. unanimously attribute to Anaximander (explicitly quoted by name Ἀναξιμάνδρος) the conception of primary matter (ἀρχὴ καὶ στοιχεῖον, i.e., material principle in Aristotelian terminology) as mixture (μῖγμα) of indefinite number of various stuffs, similar to Anaxagoras’ universal mixture. In a remarkable contrast with this early evidence the late doxography of Roman times in most cases describes Anaximander material principle as “infinite” body (τὸ ἄπειρον) conceived not as mixture, but as a single element of indefinite nature, distinct from water, air and fire.

The “intermediate” element as arche in Aristotle’s doxography.

Enumerating various theories of primordial substance of the early physiologoi Aristotle on nine different occasions refers to ‘some’ (τινὲς) thinker or thinkers who posited as arche not water, fire or air, but a ‘middle’ (μέσον) or ‘distinct from’ the four elements (τὸ παρὰ τὰ στοιχεῖα) body, ‘intermediate’ (μεταξὺ) between fire and air, or between air and water, or between fire and water, more thin (λεπτότερον) than one of them and more dense (πυκνότερον) than the other. 16 Aristotle never mentions this thinker or thinkers by name, hence his identity has become a subject of endless debate since ancient times on. Alexander of Aphrodisias, followed by Simplicius and Philoponus, identified the unnamed physikos with Anaximander, while Nicolaus of Damascus, followed

16 A16 DK; Kahn 1960: 36–37; Alexander’s mistaken attribution to Anaximander was correctly rejected by Zeller-Nestle, Diels-Kranz, I,85,30 note; wrongly accepted by Kahn 1960: 44–46; KRS 111–113 and others.
by Porphyrius, attributed the theory to Diogenes of Apollonia\textsuperscript{17}. The main reason for attribution to Anaximander was the characterization of the ‘intermediate’ element by Aristotle as ἄπειρον, but this is Aristotle’s general term for ‘infinite body’ that he attributes to ‘most physiologi’, never specifically to Anaximander (see the analysis of the Phys. Γ 4 below). Anaximander should be ruled out since Aristotle explicitly contrasts his ekkrisis-type theory of material change with the alloiosis-type theory of ‘intermediate’ element and since Theophrastus did not attribute to Anaximander the theory of rarefaction/condensation implied by the terms λεπτότερον and πυκνότερον\textsuperscript{18}. Porphyrius, who wrote a history of philosophy up to Plato and must have been well informed about pre-Platonic theories of first principles\textsuperscript{19}, knew better: Diogenes of Apollonia is indeed one of the plausible candidates, although probably not alone, but as a member of a group. The plural τινές ‘some’ in Aristotle often refers to one person, however in the present case the plural may well be a collective category referring to a group of physiologoi whose notion of ‘elements’ did not correspond exactly with that of Aristotle. In Aristotle the four elements are defined by the combination of two distinctive primary qualities in the following way: fire = hot+dry, air = hot+wet, water = cold+wet, earth = cold+dry (Ger. Corr. II.3). However, in the ancient Ionian system of correlation of four world masses and four basic dynameis ‘air’ (ἄηρ) was conceived as ‘cold’ (ψυχρός). Aristotle mentions this in his exposition of the reasons for positing the ‘intermediate’ element as arche by an unnamed thinker (or thinkers) in Phys. Γ 5. 204b22 ff. Simplicius in his commentary (in Phys. 481, 28 ff.) notes the discrepancy from Aristotle’s own view of air as ‘warm’ rather than ‘cold’ element. Both in Anaximenes and in Diogenes of Apollonia ‘air’ in its original state was described as neither cold, nor hot.\textsuperscript{20}

\textsuperscript{17} On the controversy in Aristotle’s commentators se Kupreeva 2005: 122–123.

\textsuperscript{18} Theophrastus fr. 226B ap. Simplic. In phys. 149, 28 D. ἐπὶ γὰρ τοῦτο μόνον (scil. Ἀναξιμένους) Θεόφραστος ἐν τῇ Ἰστορίᾳ τῆς μάνωσιν εἴρηκεν καὶ πύκνωσιν.

\textsuperscript{19} Porphyrius’ Historia philosophos was an important doxographical source on early doxai for Neoplatonists and Christian apologists: this is a firmly established fact wrongly denied by Diels for the sake of his mistaken Aëtius hypothesis and still ignored by Mansfeld and Runia. See the place of Porphyrius in the new stemma doxographicum Lebedev 2016:619.

\textsuperscript{20} Anaximenes A7 DK = As 52 W. = Hippol. Ref. I.7.2 ὅταν μὲν ὀμαλώτατος ἢ (scil. ἄηρ), δὲν ἄδηλον, δηλοῦσθαι δὲ τοῖς ψυχροῖς καὶ τοῖς θερμῶι καὶ τοῖς νυστρῶι καὶ τοῖς κυνουμένοις κτλ. “When the air is in the most even state, it is not manifest; it manifests itself due to becoming cold and hot, wet and set in motion…” Diog.Apoll. B5DK ἦστι γὰρ πολύτροπος, καὶ θερμότερος καὶ ψυχρότερος καὶ ξηρότερος καὶ υγρότερος… καὶ ἄλλα
From Aristotle’s point of view, an elementary body that is by nature neither hot, not cold, cannot be identified with ‘air’ or ‘fire’ as defined in his theory of elements; it is rather something ‘in between’ or ‘intermediate’. This distinct from the Aristotelian ancient Ionian system of correlation of elements with the ‘powers’ (dynameis) of the hot, the cold, the wet and the dry, is probably attested for Anaximander \(^{21}\) and is certainly attested in the authentic fragments of Heraclitus \(^{22}\); from Heraclitus it was adopted by the Stoics \(^{23}\). It was also shared by Philistion of Locri \(^{24}\). Apart from this Ionian system of correlation between the four elements and primary qualities, Aristotle may have had in mind also Heraclitus’ theory of cosmic anathymiasis which in the De anima he tentatively identifies with his arche, in flat contradiction with the opinion ‘arche = pyr’ that he attributes to Heraclitus in Metaphysics and Physics. Heraclitus’ anathymiasis from the sea rising to the region of the sun corresponds exactly to the body ‘intermediate between water and fire’ mentioned in Aristotle.

The μεταξύ (μέσον) formula “between fire and air” or “between water and air” in any case is Aristotle’s own, since if a certain physikos used it himself explicitly in his text, Aristotle would not hesitate between possibilities both of which are his own conjectures. We may conclude that a particular physikos who explicitly described his material principle as “intermediate” between two empirical

\[\text{πολλαί ἐτεροϊῶσεις ἐνεισι κτλ.} \] 

“The air takes many forms: it becomes more hot and more cold, more dry and more wet... and it is subject to many other alterations as well...” Here again ἀἷρ is originally in a neutral state ‘between’ basic perceptible qualities. From Aristotle’s point of view an element ‘between hot and cold’ would be something ‘intermediate between air and water’, while something ‘between dry and wet’ would be something ‘intermediate between fire and air’ in Aristotelian sense of the word, because in Aristotle’ physics ‘air’ is a combination of ‘hot and wet’.

\(^{21}\) Simplicius, in Phys. 150.22–25 (commenting on Arist. Phys.187a20) ἐνούσας γάρ τὰς ἑντυπτήτας ἐν τῷ ὑποκειμένῳ... ἐκκρίνεσθαι φησίν Ἀναξίμανδρος... ἑντυπτήτας δὲ εἰσὶ θερμὸν ψυχρὸν ἐξηρὸν υγρὸν κτλ. The four primary qualities correspond to four elements (maxima membra mundi) the concentric spheres of which Anaximander probably called κόσμοι (Kerschensteiner 1962: 41–59), archaic usage of the term attested in [Hippocr.] De hebdomadibus, 1–2.

\(^{22}\) We argue that in Heraclitus the four world-masses (maxima membra mundi, not Empedoclean elements) Πῦρ, Πρηστήρ (Stormwind = cold winter air), Θάλασσα and Γῆ of fr. 44–45 Leb (B31DK) correspond to the interchanging θερμή, ψυχρά, υγρά, καρφαλέα in fr.46Leb(B 126): the successive domination of four world masses in the cosmic battle of Megas Eniautos is mirrored by the change of seasons in astronomical year (Lebedev 2014: 337–350).

\(^{23}\) D. L.VII. 137 ὁ ἄφρ τὸ ψυχρὸν.

\(^{24}\) ap. Aanon. Lond. XX.25.
elements, never existed. This is Aristotle’s own formulation and conventional label for various theories that describe the primary element (e.g., ἀήρ in non-Aristotelian sense of the term) as originally neutral: neither cold, nor cold. According to Aristotle such element cannot exist because all existing elements are either hot or cold ‘by nature’ and should possess these qualities in their original state. Once we dismiss the Aristotelian passages concerning the ‘intermediate’ element as historically worthless and irrelevant for the reconstruction of Anaximander’ physics, the number of his genuine testimonia on Anaximander’s theory of primordial substance is reduced to three only. Let us have a closer look at them.

(1) *Physica* 1.4, 187a12–23 (ed. Ross)

ως δ’ οι φυσικοί λέγουσι, δύο τρόποι εἰσίν. οἱ μὲν γὰρ ἐν ποιησάντες τὸ [ἡν] σῶμα τὸ ύποκείμενον, ἢ τὸν τριῶν τι ἢ ἄλλο ὁ ἐστὶ πυρὸς μὲν πυκνότερον ἄερος δὲ λεπτότερον, τάλλα γεννώσι πυκνότητι καὶ μανότητι πολλὰ ποιούντες (ταῦτα δ’ ἐστὶν ἐναντία...)· οἱ δ’ ἐκ τοῦ ἐνὸς ἐνούσας τίς ἐναντιότητας ἔκκρίνεσθαι, ὅσπερ Ἀναξιμανδρός φησι, καὶ ὅσιο δ’ ἐν καὶ πολλὰ φασιν εἶναι, ὅσπερ Ἐμπεδοκλῆς καὶ Ἀναξαγόρας· ἐκ τοῦ μίγματος γὰρ καὶ οὕτωι ἐκκρίνουσι τάλλα.

‘But [scil. in contrast with what the Eleatics say] as the regards the theories of the *physikoi* [scil. about matter and material change], there are two ways in which they argue. Some of them, admitting one body as underlying substrate, either one of the three or that which is denser than fire, but thinner than air, generate other bodies by means of density and rarity thus producing many, which are opposites, whereas others state that opposites are excreted from the one, as Anaximander says, and as say those who posit one-and-many, like Empedocles and Anaxagoras: for these *physikoi* also [scil. like Anaximander] excrete [in their theories] other bodies from mixture.’

In contrast to the formal dichotomous taxonomy of theories of principles originally in *Phys.* I.2 according to three parameters (one or many, finite/infinite, moving/immobile), which can be misleading (because it conflates physics with metaphysics and theories of elements with models of reality), the distinction between the two groups of theories of matter and material change in the 4th chapter, is based on accurate and correct observations, and has not lost its scientific value to this day. The theory of the original homogeneous substrate (usually one of the three elements) in combination with its subsequent qualitative transformation into other bodies that form pairs of opposites, on the one hand, and the opposing theory of the original "mixture" with the subsequent ‘separation’ or ‘excretion’ of opposites, on the other. Felix Cleve [1966] aptly named these two groups ‘transformists and agenesis’, and the debate between them
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is analogous to the debate of ‘epigenetists and preformists’ in 19th century biology. Aristotle’s taxonomy is generally confirmed by the surviving texts (and relative doxography) of the early physikoi. The only minor inaccuracy is the assignment of ‘condensation and rarefaction’ to all supporters of the theory of a single substrate. The physicists of the first group describe the change in the primordial substance as ἀλλοϊώσις, ἀλλοιοῦσθαι (which corresponds to Aristotle’s own ἀλλοίωσις ‘qualitative change’), the physicists of the second group speak of the ‘separation’ or ‘excretion’ of pre-existing elements (opposites) from the mixture. It is clear that Aristotle refers Anaximander to the second group. All attempts to separate Anaximander from the second group, allowing some ‘other’ meaning of ἐκκρίσις in his case, are absolutely untenable and dictated solely by the myth of the mysterious ‘Anaximander’s apeiron’, which in turn is based on the erroneous attribution to Anaximander of the anonymous theory of the ‘intermediate element’ with which we have dealt above. The mechanistic terminology of ἀποκρίνεσθαι, διακρίνεσθαι, συγκρίνεσθαι etc. well known from the fragments of Anaxagoras and the atomists, is inextricably linked with the concept of ‘mixture’ (μίγμα) of elements, each of them necessarily implies the other; Aristotle explicitly attributes both of them to Anaximander, and the terminology of ‘separation’ (ἀποκρίνεσθαι) is independently attested in the best extant doxography of Anaximander.

(2) Metaphysica 12.2, 1069b18–24 (ed. Ross)

[…] ὥστε οὐ μόνον κατὰ συμβεβηκός ἑνδέχεται γίγνεσθαι ἐκ μὴ ὄντος, ἀλλὰ καὶ ἐξ ὄντος γίγνεται πάντα, δυνάμει μέντοι ὄντος, ἐκ μὴ ὄντος δὲ ἐνεργεία. καὶ τοῦτ᾽ ἔστι τὸ Ἀναξαγόρου ἐν’ βέλτιον γάρ ἢ “ὄμοιο πάντα” — καὶ Ἐπεδοκλέους τὸ μίγμα καὶ Ἀναξιμάνδρου, καὶ ὡς Δημόκριτος φησιν — ἢν ὄμοιο πάντα δυνάμει, ἐνεργείᾳ δ’ ὀο’ ὥστε τῆς ὕλης ἄν εἶν ἡμένοι.

“…and so, it is possible not only to come into being accidentally from what-is-not, but everything also comes into being from what-is, namely from what-is-potentially, and not from what-is-actually. And that is exactly Anaxagoras’ ‘one’, for it is better than ‘all things together’— as well as [it is better than] ‘mixture’ of both Empedocles and Anaximander, and of how Democritus puts it — [it is better to say] ‘all things were together in potentiality, but not in actuality’, so they were touching on [our concept] matter.”

In this passage Anaximander is included in the same group of physikoi, as in Physics A4, as one who holds a ‘mixture’ theory of matter, similar to that of Anaxagoras and Empedocles; Aristotle again explicitly describes Anaximander’s primordial matter as
‘mixture’ (μίγμα ...Ἀναξιμάνδρου). One should be really blinded by the modern myth of ‘Anaximander’s aperion’ to assume that Aristotle for some reason is right with regard of Anaxagoras and Empedocles, but wrong with regard of Anaximander, given that: 1) these two passages are the only two testimonia of Aristotle on the nature of Anaximander’s primordial matter with explicit mention of his name; 2) these two testimonia do not only agree with one another, but are also in perfect agreement with the independent evidence of Theophrastus on Anaximander’s theory of matter and material change, on which see section (4) below. 3) the consensus of these three 4th century B.C. pieces of external evidence, provided by source-authors who certainly had access to Anaximander’s original text, is further reinforced and corroborated by the authentic Ionian (i.e. non-Aristotelian and non-doxographical) term ἀποκρίνεσθαι attested in the two best expositions of Anaximander’s cosmogony in Hippolytus and Ps.Plutarch’s Stromateis. This term is inextricably linked with the mechanistic concept of matter as ‘mixture’ of various ‘seeds’ and ‘excretion’ theory of material change, alternative to the qualitative change of a single substrate (ἀλλοιώσεις).

The words “ἣν ὁμοῦ πάντα δυνάμει, ἐνεργείᾳ δ’ οὖ” are conceived as a single thesis which is grammatically the subject of the predicative syntagma βέλτιον γάρ (scil. ἐστίν) ἢ “ὁμοῦ πάντα”. Aristotle claims that the physikoi who posited original ‘mixture’ rather than single first element, came closer to his theory of materia prima as potentiality, once we admit a ‘better’ (i.e., more precise conceptually) conception of their ‘mixture’ as ‘one’, and a ‘better’ reformulation of Anaxagoras’ ὁμοῦ πάντα as ὁμοῦ πάντα δυνάμει. It remains unclear whether Aristotle proposes an interpretation or a ‘development’ and corrected version of his own. As interpretation it would be wrong, since both in Anaximander and Anaxagoras the primordial mixture was conceived as a panspermia of different ‘seeds’ (σπέρματα), while in Empedocles the four ‘roots’ (B6) are eternal and inalterable.

In book 3 (Γ) of his Physics, after expounding his theory of process (kinesis) as actualization (energeia) in chapters 1-3, Aristotle turns in the following chapters 4-8 to the problem of infinite, τὸ ἀπειρὸν. Τὸ ἀπειρὸν is Aristotle’s own general term for infinity and infinite magnitude in various fields including intelligible realm and mathematics, but in the present chapters he narrows the subject of discussion to the physical realm, since physical science is concerned with magnitudes, process and time, all of which can be finite or infinite (202b 30–33). That the problem of infinite properly belongs to the competence of physical science is evidenced by the fact that all (πάντες!) noteworthy philosophers have touched on the infinite in their discourse (λόγον πεποίηνται) and all of them posit the infinite as a certain principle of being, καὶ πάντες ὡς ἄρχην τινα
περιέχειν ὅπου ἀπειρόν, 203a5), whereas 'all students of nature always posit a substrate of the infinite some other nature, one of the so-called elements like water, air or the intermediate between them' (ὁι δὲ περὶ φύσεως πάντες ἀεὶ ὑποτίθεασιν ἑτέραν τινά φύσιν τῶν ἀπειρῶν τῶν λεγομένων στοιχείων, ὅπων ὃδωρ ἢ ἀέρα ἢ τὸ μεταξὺ τούτων, 20316-18). This group of physiologoi apparently refers to the Milesians and their followers who posited a single-stuff or continuous primordial substance, it is distinguished from the adherents of the ‘mixture’ theory of matter, i. e., corpuscular theories of Anaxagoras and Democritus who admit the existence not of a continuous infinite body, but ‘infinite by contact’, i. e., the integral mass of all particles separated by void (τὴν ἄφθινον συνεχῆ τὸ ἀπειρὸν, 203a22). The primary aim of Aristotle’s following polemics is to demonstrate that the existence of an infinite body or bulk of matter ‘surrounding’ our cosmos, admitted in most Ionian theories of the infinite Universe, is impossible, and thus to prove once again what he demonstrates with more detail in the De Caelo: that our cosmos is unique, finite (πεπερασμένος, not ἀπειροῖ) and eternal. It is in this polemical context that Aristotle mentions the ‘encompassing’ (περιέχον) ‘infinite’ body admitted by Anaximander and ‘most of physiologoi’ in their theories of the infinite Universe:

Physica 203b4–12.

“It is also with good reason that all [philosophers of nature] posit it [= the infinite] as a principle [arche], for it cannot be purposeless, nor can it mean something different from a principle (‘beginning’),
Anaximander and the scientific revolution in Miletus...

for otherwise it would be finite ... for this reason, as we state, there is no beginning/principle of it, but rather the infinite itself is acknowledged to be the beginning/principle of all other things, and to contain within itself and to govern everything else, as assert those who do not posit other causes than the infinite, like intellect or love, and this is, according to them, the divine being, for it is deathless and imperishable, as asserts Anaximander and the majority of the physiologoi.’

If we approach this passage cited in innumerable modern studies as alleged evidence on the specific arche of Anaximander’s termed τὸ ἀπειρον, as integral part of Aristotle’s context, it seems obvious and undeniable that Aristotle does not speak here of Anaximander in particular and does not quote the term τὸ ἀπειρον as the name of Anaximander’s specific primordial substance, distinct from the water of Thales or the air of Anaximenes, as Imperial doxographers do. The words ‘with good reason all posit it as archе’ (203b4) repeat verbatim the initial statement in the beginning of chapter 4 πάντες ὥς ἀρχήν τινα τιθέασι τῶν ὄντων (τὸ ἀπειρον 203a3) with addition of only one word ‘with good reason’ (εὐλόγως). After a general typology of views about the ‘infinite’ of all previous philosophers Aristotle turns now to their reasons or arguments (logoi) for positing to apeiron as archе. There is no indication in the text that Aristotle in our passage stops employing his own term for infinite magnitude or infinite body (τὸ ἀπειρον) which he employs throughout the chapters 4-8 of the book 3, and starts citing an authentic term of Anaximander. But there are clear indications that such assumption is wrong. As we have pointed out, the abstract substantive τὸ ἀπειρον is actually not attested before Pythagoreans and Plato who follows them. In all authentic pre-Platonic fragments ἀπειρος is used exclusively as adjective, i.e., as a property (συμβεβηκός) of ‘another substance.’ The repetition of the initial general statement πάντες ὥς ἀρχήν τιθέασι signals that the following diaeretic doxography of reasons follows the same division as the preceding exposition of the of the doctrines concerning apeiron as such: the first two arguments marked in our quotation above as [I] correspond to the apeiron = ousia view, and the passage with the mention of Anaximander marked as [II] explicitly refers to the ‘most of physiologi’, the adherents of the apeiron = symbebekos view. The first diairesis concerns the possibility of existence and reality of infinite magnitude, the second diairesis concerns the reasons for positing apeiron as archе. In the first diairesis Aristotle subdivided the followers of the type [II] into those who posit one continuous infinite body, like water, air or the ‘intermediate’ element (203a18), and those who admit ‘infinite by contact’ (ἄφη), i.e. integral mass of particles in mixture, like the homoiomere of Anaxagoras and atoms of Democritus (203a20). Let us distinguish these groups ad
hoc as types II.1 and II.2 In the second diairesis under discussion Aristotle does not take into account this distinction between subtype II.1 and II.2, presumably, because he has pointed out above that both theories essentially agree in positing an infinite body, while the composition of this infinite body (integral mass of particles or single continuous body) is inessential, since the supporters of the type II.2 ‘assert, that the infinite is continuous by contact’ (τῆς ἄρῃ συνεχὲς τὸ ἄπειρον εἶναι φασίν (203a22). But at the same time there is no indication in the passage under discussion that Aristotle classes Anaximander with the group II.1 (single continuous element). The opposite view of some ancient commentators (Alexander, Simplicius) followed by many modern scholars, is based in the wrong attribution to Anaximander of the ‘intermediate’ element mentioned in 203a18. On the contrary the parallelism of diairesis I and II makes it clear that Aristotle places Anaximander in one and the same group with Anaxagoras and Democritus, i. e., supporters of the corpuscular theory of mater, exactly as he does in the two passages on the ‘migma of Anaximander’ discussed above. In the exposition of the reasons for positing apeiron as arche and even as a divine being Aristotle introduces another division absent from diairesis I: he divides the physikoi into those who posit as arche to apeiron only, and those who posit ‘apart from (or besides) to apeiron’ (παρὰ τὸ ἄπειρον) also ‘other causes, like mind of love’ (ἄλλας αἰτίας, οἷον νοῦν ἢ φιλίαν), in other words into ‘materialists’ and dualists who combine the material cause with a causa movens like Anaxagoras’s Nous and Empedocles’ Philia. The mention of Empedocles here is unexpected since Empedocles did not share the Ionian paradigm of the infinite Universe, but recognized, like all Italikoi and Aristotle’s himself, one finite cosmos with no periechon body outside the heavens. According to one possible explanation Aristotle’s usage here is influenced by the Platonic concept of to apeiron as equivalent to his term hyle. But it is also conceivable that this inaccuracy is due to Aristotle’s firm association of Anaximander’s theory of mater as ‘mixture’ with the theories of Anaxagoras and Empedocles (see passages 1–2 discussed above). Below Aristotle refers to Anaxagoras’ primordial matter (conceived as ‘mixture’ of various ‘seeds’) as τὸ ἄπειρον in his criticism of the

25 Cf. the phrase κοινὸν σῶμα 203a34.
26 Phys. 207b34 ἐπεὶ δὲ τὰ αἴτια διήμηται τετραχῶς, φανερὸν ὃτι ως ὕλη τὸ ἄπειρον αἰτίον ἐστι ... φαίνονται δὲ πάντες καὶ οἱ ἄλλοι ως ὕλη χρώμενοι τὸ ἄπειρον· διό καὶ άτοπον τὸ περιέχον ποιεῖν αὐτὸ ἄλλα μὴ περιεχόμενον. “Since the causes have been divided into four classes, it is obvious that the infinite is a cause as matter... it is apparent that all others also employ it as matter. That is why it absurd to make it ‘encompassing’ rather than something encompassed”.

initial stage of Anaxagoras cosmogony: 205b1 Ἀναξαγόρας δ᾿ ἀτόπως λέγει περὶ τῆς τοῦ ἀπείρου μονῆς κτλ. “Anaxagoras absurdly speaks about the immobility of the infinite…” (scil. before the Mind set it in motion). Simplicius has preserved two verbatim fragments of Anaxagoras’ text with the description of this stage which make it clear that Anaxagoras did not use the substantive τὸ ἀπείρον (fr. B1–2). Anaxagoras speaks about the ‘encompassing’ bulk of matter (τὸ περιέχον), and uses ἀπείρον only as adjective describing the infinite extension of the primordial mixture. There is no reason why Anaximander should be an exception to the rule, especially given that his theory of matter, according to unanimous consensus of Aristotle and Theophrastus, is similar to that of Anaxagoras.

The parallelism of two diaireseis of various opinions on τὸ ἀπείρον in Phys. Γ 4 makes it clear that the group [I] refers to Plato and Pythagoreans, not to physikoi in proper sense, therefore Anaximander is ruled out. The typically Platonic dialectical argument, according to which the concept of apeiron as such entails its status of arche, recalls Plato’s elaboration on ἀρχή in Phaedrus 245d 1–627. Anaximander, as one might expect, is included only in the group [II] together with physikoi who regard the ‘infinite’ not as a ‘separate’ substance, but as an attribute (συμβεβηκός) of some primordial corporeal substance which may be identical either with a single element or with migma like that of Anaximander, Anaxagoras and Empedocles: any of these falls under Aristotle’s own general category of τὸ ἀπείρον, ‘infinite magnitude’ or ‘infinite body’ encompassing our cosmos from outside. Anaximander is quoted by Aristotle at this point as a classical or typical representative of those who posit only infinite matter without causa movens. The physikoi of this group ignore or deny the dualism of god and matter (metaphysical dualism like that of Plato and Pythagoreans or physical dualism of double causation like that of Anaxagoras and Empedocles) and therefore tend towards naturalistic pantheism: they regard as ‘divine being’ (τὸ θεῖον) the infinite substance itself and characterize it by divine epithets like ‘immortal and imperishable’ (ἀθάνατον καὶ ἀνώλεθρον). Note that the quotation from Anaximander in our passage is restricted to these two words only.28 Aristotle quotes from memory, he renders the general meaning of Anaximander’s words correctly, but the quotation is imprecise: the authentic original is preserved in Hippolytus’ Ref. I,6,1 ταύτην (scil. φύσιν τοῦ ἀπείρου) ἄξιον εἶναι καὶ ἄγηρω. These two variants

27 Simplicius, In Phys. 463,3 speaks of ‘paralogism.’
28 So rightly Diels-Kranz in 12A15; but they wrongly regard as a verbatim quotation Aristotle’s paraphrase in 2B3.
should not be treated as independent quotations (contra Diels-Kranz) and should not be combined, they are alternative. Hippolytus’ variant is a præferenda lectio for several reasons: 1) Hippolytus does not quote from memory, he cites a written source, a doxographical compendium of highest quality with many traces of original wording (calling it ‘Theophrastus’ with Diels is a worthless conjecture unsupported by evidence). 2) Hippolytus preserves not only the two epithets, but also the noun φύσις to which they were attached in Anaximander’s text. Φύσις ἀπειρος, ἀidental καὶ ἀγήρος is smooth regular Greek, τὸ ἀϊδιον καὶ ἀγηρον ἀπειρον is a stylistic and grammatical nightmare, while τὸ ἀπειρον, ἀϊδιον καὶ ἀγηρον would be perceived as three epithets of some uncertain entity, but certainly not of some mysterious apeiron. 3) The words ὀλεθρος ‘destruction, ruin’ and θανατος ‘death’ are virtually synonymous, therefore Aristotle’s variant is tautological: ‘indestructible’ does not enrich the meaning of ‘immortal’. But the word ἀγήρος in Hippolytus’ version is pregnant with much more subtle and differentiated philosophical meanings: ‘eternal’ (ἀϊδιος) corresponds to Aristotle’s ‘ungenerated and indestructible’, something that has always existed, exists and will always exist, while ‘un-aging’ or ‘ever-young’ describes another important physical quality: it does not deteriorate over time, does not rust or rot, but notwithstanding endless mechanical processes of ‘excretion, separation, coalescence, dialysis etc.’ remains ‘new’, ready to be reused for the construction of new worlds. ‘Unaging’ contains an echo of the fragment B1 as interpreted below in section (8).

4. The origin of the arche-formula (τὸ ἀπειρον = ἄρχη) attributed to Anaximander in the Imperial doxography

In textbooks, encyclopedias and scholarly literature about Anaximander it is often stated that he took for the beginning (arche) some element of an indefinite nature, different from the water of Thales and the air of Anaximenes, called “infinite” (apeiron). Anaximander of Miletus could neither say nor write anything of the kind, since this is a late, 4th century BC, Peripatetic terminology, which the late doxography of the Roman time uncritically attributed to Anaximander (Lebedev 1978). In the original, Anaximander wondered not about the “beginning” (ἄρχη), but about the “nature” of the world (φύσις). Arche is a term of Aristotelian metaphysics and physics, and in the Alpha of Metaphysics and in the first book of Physics, Aristotle examines all the doctrines of earlier philosophers through the prism of his doctrine of four “principles” or “causes” of being: matter, form, final cause and moving cause. Aristotle classed all three Milesians with “materialists” who ‘conceived the material principles as the only principles of all things’. The Aristotelian
formula of the material or elementary principle, ἀρχὴ καὶ στοιχεῖον, was also attributed by later doxographers to Anaximander, although the term ἀρχὴ in the sense of a metaphysical principle does not occur in the pre-Platonic philosophical texts before Philolaus, while the word στοιχεῖον (originally meaning letter of alphabet) has become an abstract term for ‘element’ in Plato and Aristotle only. The term τὸ ἄπειρον “infinite” or “infinity” also belongs to Aristotle, not to Anaximander, it does not occur in pre-Platonic philosophical texts. In the early texts, only the adjective ἄπειρος “infinite” was used, but not the substantive adjective τὸ ἄπειρον. Anaximander’s authentic term “infinite nature” (φύσις ἄπειρος) is preserved in the best doxography of Hippolytus and Simplicius, as well as in Theophrastus.

The first book of the treatise “On the physical opinions of philosophers” Placit. 1.3.3 (second half of the 1st century BC), in which for the first time, 500 years after the death of Anaximander, a specific doctrine of the “principle” (arche) is attributed to him as “infinite” (τὸ ἄπειρον), is based not on Theophrastus, but directly on Aristotle (Lebedev 2016) and Aristotelian criticism of “materialism”, which does not recognize the “moving cause”. It is clear that the compiler of the first book of Placita no longer had access to the original text of Anaximander and uncritically reproduced the formulations of Aristotle. If we turn from later sources to the earliest, that is, to the 4th century B.C. texts of Aristotle himself and Theophrastus, both of whom undoubtedly had the original of Anaximander in their hands, we see that Anaximander is credited here with the doctrine of primary matter as a “mixture” of all kinds of simple substances, similar to the theory of the universal mixture of Anaxagoras, but without the Anaxagorean doctrine of the cosmic Mind, which sets the material mixture in motion in the beginning of the cosmogonical process: the ‘infinite nature’ of Anaximander is characterized by the “perpetual motion” (ἄνδιος κίνησις, the correct formulation of Aristotle). The term ἄπειρος only in the Pythagorean-Platonic tradition (and through it in Aristotle) acquired the connotation of “indefinite” (ἀόριστος), that is, an unformed principle opposite to the principle of “limit” as matter to form. In Ionian physics, this word could have only quantitative meaning: infinite in extension or in number. This is how the term is invariably used in authentic fragments of Anaxagoras, the Ionian dialect and the mechanistic terminology of which (“separation – coalescence – dissolution” etc.) follows Anaximander. When Anaximander spoke about “infinite nature”, he meant exclusively its infinite extention in space. When he used this term in his theory of the plurality of worlds and spoke of “the infinite ouranoi (= celestial vaults) and the orderings inside them” (ἄπειροι οὐρανοί καὶ οἱ ἐν αὐτοῖς κόσμοι), he meant the numerical
infinity of ‘innumerable worlds’ in the infinite universe. According to its composition, ‘infinite nature’ is a ‘mixture’ of all kinds of simple substances (including metals and all elements), mixed in the form of the smallest corpuscles or ‘seeds’, but outwardly it is a gaseous mixture similar to air. In the same way, in the pre-cosmogonic state, the material ‘mixture’ of Anaxagoras is described by him as “aer and aither, both being infinite (in extension)” (Anaxag. 59B1 πάντα γὰρ ἀγρὶ τε καὶ αἴθηρ κατείχεν, ἀμφότερα ἄπειρα ἐόντα).

All extant doxographical reports on Anaximander’s theory of primordial substance can be divided into two general classes (A) and class (B). These can be further subdivided into the following sub-types. Reports of class (A) either attribute to Anaximander explicitly the concept of universal ‘mixture’ μιγμα similar to that of Anaxagoras (let us designate this as type A^1), or speak of plurality of ἄρχαι (initia) or about ‘seeds’ (seminaliter, sua propria principia) (type A^2), or describe the cosmogonical process in ‘agenetist’ terms ἄποκρίνεσθαι — συγκρίνεσθαι — διακρίνεσθαι which necessarily imply the concept of original ‘mixture’ and corpuscular theory of matter (panspermia), even without the explicit mention of μιγμα (type A^3). Type A^1 is represented by two testimonia of Aristotle, type A^2 by the testimonia of Irenaeus and Augustinus, type A^3 by the doxography of Hippolytus and Plutarchus’ Stromateis. The class (B) includes two sub-types. B^1 includes doxographical reports that attribute to Anaximander a single-element theory of primordial substance, conceived ether as ‘intermediate’ element (τὸ μεταξό) or ‘something different’ or ‘set apart from’ (or ‘distinct from’) the four elements (ἄλλο τι or τὸ παρὰ τὰ στοιχεῖα), something ‘indefinite’ (ἀόριστον). Testimonia of the sub-type B^2 do not specify the precise nature and internal structure of the primordial substance since they describe it in quantitative terms of infinite extension only, just ‘infinite body’ or ‘infinite magnitude’ τὸ ἄπειρον (scil. μέγεθος or σῶμα), usually in the formula ἄρχη = τὸ ἄπειρον. The earliest extant testimonium of the type B^2 after Aristotle (Phys. Π 4) is Cicero in Academica whose source was probably Academic doxography of Philo of Larissa (tradition of Clitomachus). The definition of Anaximander’s principle in Placita philosophorum I.3.3 formally belongs to type B^2, but in subsequent criticism it is characterized as indefinite, i. e. as type B^1 (though not as ‘intermediate’).

Only the doxography of class (A) is ‘primary’, i. e. based on the original text of Anaximander’s ‘On nature’, all doxography of classes (B) is ‘secondary’ and derivative, it depends either on the Aristotelian anonymous passages about ‘intermediate’ element and/or on Aristotle’s discussion of infinite in Physics 3.4 (τὸ ἄπειρον). The testimonia of class (A) have absolute priority over class (B) since only these preserve for us the authentic thought and
occasionally authentic terms and phrases of Anaximander, whereas the testimonia of class (B) are phrased in 4th century Aristotelian terminology.

According to Diels’s ill-founded hypothesis, virtually all physical doxography of pre-Platonic philosophers of the Imperial times derives from the ‘Physical Opinions’ (Φυσικὰ δόξατ) of Theophrastus. We have criticized what we call Diels’s Pan-Theophrasteanism elsewhere (Lebedev 2016). In his ‘Doxographi Graeci’ 133–144 Diels has printed in five parallel columns excerpts from Hippolytus, Plutarchus’ *Stromateis*, Diogenes Laërtius, ‘Aëtius’ (i.e. *Placita philosophorum*) and the supposed fragments of Theophrastus (with few exceptions, not verbatim quotations from Theophrastus, but summaries written by Simplicius, mixed with Simplicius’ own remarks and/or additions from other uncertain sources). The occasional convergence of these excerpts Diels explained by postulating Theophrastus as a common source of all five ‘columns’. But Simplicius quotes Theophrastus on certain occasions as only one of his sources alongside with Eudemus, Alexander and other authors, he apparently combines various sources. The compiler of ‘Placita’ quotes Theophrastus’ ‘Physics’ (not ‘Physical opinions!’) as a source only twice on particular topics in II.20.3 and II.29.7, both times as a different view, i.e., as a subsidiary, not as his main source. It did not occur to Diels that in each case the ‘common source’ may have been the original work of a pre-Platonic *physikos*. Diels was misguided by his mistaken assumption that after Theophrastus’ ‘Opiniones’ no one allegedly read the original works of pre-Platonic philosophers. The case of Simplicius reading and quoting from pre-Platonic books (Parmenides, Zeno, Melissus, Empedocles, Diogenes, Anaxagoras) in the 6th century A.D. is alone sufficient to refute Diels. It seems obvious that, e.g., the doxographical summaries of Anaximander’s doctrines in Plutarch’s *Stromateis* and in Hippolytus’ *Refutatio I* were written by two independent readers of Anaximander’s text since they preserve complementary authentic words and phrases. The first book of *SP-Placita* Περὶ ἀρχῶν, in turn, significantly differs both from Plutarch and Hippolytus in that it is deeply influenced by the text of Aristotelian *Physics* and Metaphysics, especially by Aristotle’s polemics against ‘materialists’ in *Metaphysics* A. Anyone who accepts Diels’ filiation of doxographical sources, would have to postulate some epitome of Theophrastus ‘Opiniones’ (like mythical *Vetusta Placita*, another invention of Diels) as an intermediate source between the *SP-Placita* and Aristotle’s *Physics* and *Metaphysics*. But this is not the case. In favor of the direct

29 On Simplicius’ sources for early philosophers see the helpful discussion in Sider 2005: 37–42.
dependence of *Placita* Book 1 on Aristotle rather than on Theophrastus or *epitome* of Theophrastus speak the following facts. (1) Contradictions between certain lemmata in *SP-Placita* and corresponding doxography attested with Theophrastus’ name elsewhere. Theophrastus’ view of Anaximander’s original substance as ‘mixture’ (discussed below in section 5) contradicts *SP-Placita* 1.3.3 discussed below. (2) Some direct quotations from Aristotle’s works in *SP-Placita* can be established with certainty (for details see Lebedev 2016: 594–599). (3) Last, but not least, our attribution of *SP-Placita* to Arius Didymus provides further support to the thesis that the compiler of this work relied directly on Aristotle’s works in his arrangement of chapters on the basis of Aristotelian categories, starting with ‘substance’ of something followed by συμβεβηκότα: e. g. Περὶ οὐσίας ἡλίου (2.20), Περὶ μεγέθους ἡλίου (2.21), Περὶ σχήματος ἡλίου (2.22) etc. The last philosopher mentioned in *SP-Placita* is the Peripatetic Xenarchus of Seleucia, a friend of Arius Didymus. Arius knew the philosophical encyclopedia of Eudorus (διαίρεσις τοῦ κατὰ φιλοσοφικὰν λόγου) who wrote a commentary on Aristotle’s Categories. Arius’ detailed and extensive doxographical summaries of Aristotle physical and ethical doctrines quoted by Stobaeus testify to his profound knowledge of the Corpus Aristotelicum. We have argued elsewhere that these excerpts derive from Arius’ attested opus magnum ‘On philosophical schools’ (Περὶ αἱρέσεων, also quoted as ἐπιτομαῖ τῶν ἄρεσκόντων), comprising all schools including pre-Platonic, rather than from hypothesized by Diels’ compendium on Plato, Aristotle and Stoics with impossible title *Epitome* (Lebedev 2016: 616–620). ‘Abridgement’ (epitome) as a full title of a literary work is as weird as a full title ‘Book’.

With these considerations in mind let us have a fresh look at the passage on Anaximander’s arche as τὸ ἀπειρον in *SP-Placita*.

*SP-Placita* (Plut. Stob.) 1.3.3 (for variants and parallels see M.-R. V,1, p. 201 ff.).

[a] Ἀναξίμανδρος δ’ ὁ Μιλήσιος φησι τῶν ὄντων τὴν ἀρχήν εἶναι τὸ ἀπειρον. [b] ἐκ γὰρ τοῦτον πάντα γίνεσθαι καὶ εἰς τοῦτο πάντα φθείρεσθαι: [c] διὸ καὶ γεννᾶσθαι ἀπείρους κόσμους, καὶ πάλιν φθείρεσθαι εἰς τὸ ἔξ ὅου γίνονται. [d] Λέγει γοῦν διὰ τὶ ἀπειρον ἐστὶν· ινα μηδὲν ἔλειπτη ἢ γένεσις ἢ ψφισταιμένη. [e] ἀμαρτάνει δ’ οὗτος μὴ λέγων τι ἐστὶ τὸ ἀπειρον, πότερον ἢρ ἐστὶν ἢ υδάρ ἢ γῆ ἢ ἄλλα τινά σώματα. [f] ἀμαρτάνει οὖν τὴν μὲν ἅλην ἀποφαίνουμενος τὸ δὲ ποιοῦν αἴτην ἄναιριν· τὸ γὰρ ἀπειρον οὐδὲν ἄλλο ἢ ἅλη ἐστὶν· οὐ δύναται δ’ ἢ ἅλη εἶναι ἐνεργεία, ἢν μὴ τὸ ποιοῦν ὑπόκειται.

‘[a] Anaximander of Miletus says that the principle of existing things is the infinite, [b] for it is from the infinite that all things come into being and into which they perish again. [c] It is for this
reason that the innumerable worlds (*kosmoi*) are [also] generated and perish again into the same [stuff] as the one out of which they come into being. [d] Indeed, he explains why it is infinite: in order that the existing generation might never come to an end. [e] He errs not saying what is exactly the infinite, whether it is air, water or earth or some other bodies. [f] He errs by stating the material cause, but eliminating the creative cause. For infinite is nothing more than matter, and matter cannot exist in actuality if a creative cause is not laid down.’

Commentary. [a] The *arche* formula formally corresponds to what in our taxonomy of doxographical reports on Anaximander’ primordial substance we have designated as type B², i. e., the *arche* is described as just ‘infinite’ without further clarifications. On the other hand, the criticism in [e] implies the οὐ διορίζων (‘without specifying whether…’) formula which is just a variant of άδύνατον (indefinite) or ‘intermediate’, i. e., our type B¹. The chances are, that the type B² originated from the type B¹, which, in turn, is based on the false attribution of the anonymous theory of ‘intermediate’ element to Anaximander. [b] is a garbled variant of Anaximander’s ‘fragment’ in Simplicius and Hippolytus versions, rephrased in colorless Aristotelian terminology of generation and destruction and adjusted to Aristotle’s definition of material cause in *Met.* 983b8–9 ἐξ οὐ γίνεται πρῶτον (ἀπαντά τά ὄντα) καὶ εἰς ὁ φθείρεται τελευταίον. [c] Contains some traces of original wording and partly authentic terminology from Anaximander’s doctrine of innumerable worlds, but substitutes for the archaic οὐρανοῦς the standard later term κόσμους (which is semantically correct). [d] is based on Aristotle’s *Phys.* 203b18–20, i. e., on Aristotle’s context of the reference to Anaximander’s infinite body thirty. [e] This criticism of the theory of ‘intermediate’ element is based on Aristotle’s *Phys.* 204b29–35 (αδύνατον … φαίνεται δ’ οὐδέν). If so, it appears that the compiler of the extant version of *SP-Placita* I already admitted (invented?) the identity of anonymous *physikos* with Anaximander. Another contemporary Aristotelian scholar of the second half of 1st century B.C., Nicolaus of Damascus, disagreed with him by identifying the anonymous *physikos* in Aristotle with Diogenes of Apollonia. [f] The concluding criticism of ‘materialists’ is based primarily on Aristotle *Met.* 988b22 ff.

To sum up: the first clear attestation of the type B *arche* formula attributed to Anaximander occurs in a context which, although preserves some echoes of the superior summary like that of Simplicius and Hippolytus, is heavily influenced by Aristotelian passages (formulations, terminology) from *Physics* relating to the possibility of existence of infinite body as well as by Aristotle’s

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30 In this case Diels (Dox.180) correctly recognized borrowing from Aristotle rather than Theophrastus (contra Kahn 1960: 38).
criticism of ‘materialists’ in *Metaphysics* A. At the same time, it differs from Aristotle in one important respect: Aristotle never attributes to Anaximander a specific ‘arche = apeiron’ formula distinct, e.g., from Thales’ ‘doctrine arche = hydor’ or Anaximenes’ doctrine ‘arche = air’, i.e. type B^I formula. Aristotle discovers the view of ‘infinite’ as principle of being in all preceding philosophers (including the metaphysics of Plato and Pythagoreans). Aristotle attributes in *Phys.* Γ 4 the doctrine of infinite body, inextricably linked with the Ionian theory of the infinite Universe, to ‘all physiologi’ including Anaximander, but he does not touch on the nature and composition of Anaximander’s infinite body because this is irrelevant for the problem of possibility of infinite body as such. When he does so in two other passages, he both times explicitly attributes to Anaximander the view of primordial substance as ‘mixture’ similar to that of Empedocles and Anaxagoras. It is in the late 1st century B.C. doxography that we for the first time encounter the attribution to Anaximander of a peculiar ‘simple’ element distinguished from other elements by the term τὸ ἀπειρον, i.e. type B^I formula. The source of this aberration is most probably Aristotle’s passage *Phys.* 203b4–15, in which, however, τὸ ἀπειρον is Aristotle’s own general term for the infinite body (magnitude). In all likelihood this aberration occurred after the edition of Aristotle’s works by Andronicus in the mid-first century B.C. Anaximander’s book was very rare, so compilers of the collections of placita (ἀρέσκοντα), who were unable to consult the original, turned to the writings of Aristotle as a newly discovered ‘ancient source’ on early theories by ‘great Aristotle’ who had access to the lost or inaccessible works of early philosophers. The compiler of *SP-Placita* I may have ‘reconstructed’ Anaximander’s view of primordial substance from *Phys.* Γ 4 by combining it with Aristotle’s criticism of the anonymous theory of ‘indefinite’ (‘intermediate’) element in the following context 204b 29 ff. In a similar vein he (or rather his Epicurean source) ‘discovered’ in Aristotle’s *De Caelo* a ‘neglected’ doctrine of ‘minima’ (ἐλάχιστα) in Heraclitus (Placit. I.13.2): for details see Lebedev 1979, Lebedev 2014: 202-203 and commentary to Heraclitus fr.116 Leb.

5. The evidence of Theophrastus. The analogy of gold-washing and theory of vortex (δίνη) in Anaximander’s cosmogony

**Simplicius, In Phys.** 27, 2 = Theophrastus fr. 228A = Anaximander Ar.164 W. = Anaxag. A41 DK.

Ἀναξαγόρας,... πρῶτος μετέστησε τὰς περὶ τῶν ἀρχῶν δόξας καὶ τὴν ἐλλειπούσαν αἰτίαν ἄνεπλήρωσε, τὰς μὲν σωματικὰς ἀπείρους ποιήσας· πάντα γὰρ τὰ ἰμοομορφή, οὔν ὅδωρ ἢ πῦρ ἢ χρῡσὸν, ἄγένητα μὲν εἶναι καὶ ἀφθαρτα, φαίνεσθαι δὲ γινόμενα καὶ
Anaximander and the scientific revolution in Miletus...

“Anaxagoras... was the first to change the opinions about the first principles, firstly, by making the corporeal principles infinite, for he admitted that all homogeneous stuffs like water, fire or gold are unborn and indestructible, but only seem to be generated and destructed due to conjunction and disjunction, since all stuffs are present in all other stuffs, but each is characterized by the prevailing stuff: a stuff, in which there is a lot of gold, appears to be gold, although it contains all other stuffs as well. Indeed, Anaxagoras says “in everything there is a portion of everything” and “which thing contains most parts of a certain kind, with those parts it was and it is identical”. And these tenets of Anaxagoras, according to Theophrastus, are similar to what Anaximander states. For he [=Anaximander] says that in the separation of the infinite homogeneous particles agglomerate together, and what was gold in the Universe, becomes gold, while what was earth in the Universe, becomes earth, and in the same way all other things as well, on the assumption that they are not generated [in this process], but preexist before. However (δὲ !), Anaxagoras [scil. “unlike ἐκείνος”, i.e. unlike Anaximander] posited above [the material principle] as a cause of motion and generation the Mind. “And if we take it in this way, it seems that Anaxagoras admits infinite number of material causes and only one cause of motion and generation, the Mind, under whose action [the material causes] produced the worlds and the nature of all other things. But if we conceive the universal mixture as a single nature indefinite both by its form and by magnitude, it follows that Anaxagoras admits two causes, the nature of the infinite and the Mind, and so it appears that he treats the corporeal elements similarly to Anaximander.”

Since the 19th century scholarly opinion has been divided between those who took the word ἐκείνος with reference to the
preceding name of Anaxagoras, and those who understood it as “the former”, i. e., with reference to Anaximander. Although the first opinion seems to be still prevailing (partly due to the ‘magic of great names’ like Diels and the authority of DK as “standard edition” in the last century) it is certainly wrong and should be discarded in favor of the second, primarily because it destroys the clear logical nexus of Simplicius’ text and results in at least two incongruities of which neither Theophrastus nor Simplicius can be held guilty. Theophrastus compares the theories of the “first principles” (in Aristotelian sense) of Anaxagoras and Anaximander, he finds a striking similarity (παραπλησίως λέγειν) in their conception of material cause as a universal mixture of innumerable preexistent homogeneous stuffs (ὁμοομερῆ in Aristotle’s own terminology, σπέρματα in Anaxagoras), which in the process of mechanical “separation” produces all seemingly homogeneous stuffs as agglomerates of particles according to the simila similibus principle. It is both natural and logical that after quoting in paraphrase the theory of Anaxagoras Theophrastus (and Simplicus) quotes for comparison the “similar” diakrisis doctrine of Anaximander. Now, according to Zeller’s and Diels’s view, Theophrastus ‘compares’ Anaxagoras with Anaxagoras which is absurd. After pointing to “similarity” of Anaxagoras and Anaximander’s “treatment” of “material causes” Theophrastus also points to an important difference in their general theory of first principle, which is introduced by a contrasting particle δέ ‘however’. Their theory of matter is similar, ‘however’ Anaxagoras, unlike Anaximander, ‘posited above’ matter a causa movens, the cosmic Mind. There is a clear contrast in Theophrastus/Simplicius text between the preceding words ‘he says that in the separation of the infinite etc.’ that stress the “similarity”, and the following reservation “however Anaxagoras etc.” which contrasts the views of Anaximander and Anaxagoras on the cause of motion. This contrast is clear only on the assumption that ἐκείνος refers to Anaximander. The equation of ἐκείνος with Anaxagoras again results in logical incongruity, because in this case the doctrine of Anaxagoras is contrasted with Anaxagoras himself which is absurd.

It is important to note that Theophrastus ascribes to Anaximander as textually attested in his work only the doctrine of universal mixture and ‘excretion’ or ‘separation’. He makes it clear that the interpretation of the universal mixture as ‘one single nature indefinite both in form and magnitude” (μία φύσις ἄοριστος) is his own interpretation (οὕτω λαμβανόντων “if we take it in this way”), which is not found in Anaximander’s original text. This interpretation is apparently influenced by the Platonic/Pythagorean use of τὸ ἀπειρον as indefinite material principle contrasted with πέρας as formal cause. Such usage is alien to Ionian scientific prose.
It is therefore remarkable that some scholars (e.g., Cornford and Kirk) have rejected the authentic ancient Ionian doctrine quoted by Theophrastus from Anaximander’s book, and instead ascribed to him the Platonizing/Peripatetic interpretation of this doctrine taking τὸ ἀπείρον in the sense of ἀόριστον as ‘without internal distinctions or ‘indefinite’\textsuperscript{31}. If we turn to the best extant examples of early Ionian cosmological prose, the fragments of Anaxagoras, we can make sure that in Ionian tradition ἀπείρος is used only in quantitative sense of either “infinite” in extension or “infinite” by number. Both Anaximander and Anaxagoras spoke about the ‘Infinite surrounding body’ (τὸ ἀπείρον περιέχον) and ‘innumerable worlds.’

Theophrastus’ exposition of both Anaximander’s and Anaxagoras’ theories of original universal mixture and of the process of “separation” in cosmogony is a paraphrase that preserves some original wording and contains one concrete example of separation of “gold from earth”. It is conceivable that when Theophrastus marks the ‘similarity’ of two doctrines he especially points to the verbal coincidences and especially the use of the same example. The value and meaning of this example have been commonly misunderstood and underestimated. The choice of ‘gold and earth’ is not accidental, the two stuffs are not adduced ‘exempli gratia’, they form a fixed pair. The reference is to the real ‘separation of gold from earth’ in the technological operation which was known under the technical term of διάκρισις, the same as used by Anaximander and Anaxagoras\textsuperscript{32}. There are at least two other instances of the use of metallurgical analogies in Anaximander’s cosmology and meteorology: he compared the ‘exhaust’ of fire from the circular hole on sun’s ‘wheel’ with the ‘tube of smith’s bellows’ (πρηστῆρος αὐλός A21, B4DK) and he explained the nature of wind as a ‘flow of air when the most thin and wet particles of it are set in motion or melted by the sun’ (τηκομένων A24DK). The ‘smith’s bellows’ of the sun and the ‘melting’ of air caused by it, may have been parts of the same metallurgical analogy comparing the cosmos

\textsuperscript{31}This mistake is also committed by Dührsen 2013: 274. Gregory’s ‘unlimited, but finite’ (2016: 91) is a plain absurdity based on the hypercritical denial of the theory of innumerable worlds and Infinite Universe which is attested with the same degree of certainty as Anaximander’s Milesian origin.

\textsuperscript{32}Pollux, Onomasticon 7.97 describes the stages as follows: χρυσούργοι… χρυσὸν ὄρυτοντες, τὴν χρυσίτιν γῆν μεταλλεύοντες, διασιθήνοντες, διηθοῦντες, διακρίνοντες, ἔμοντες, καθαίροντες πυρή βασανίζοντες. Demetr. Cydon. Apol. line 235 ὀσπερ ἄν ἐν τῇ τῆν χρυσίτιν (scil. γῆν) σκάπτων τὸν μὲν πόνον ψύστατο, τὰ ψήγματα ἐν τῷ πηλῷ διακρίνειν οὐδ’ ὀλως ἔπιστατο.
with a melting furnace. Gold was either mined from mountains or collected from gold sand of rivers. The initial stage of this process is described by Heraclitus in fr. 26Leb/B22 χρυσίον οι διζήμενοι γην πολλην όρύσουσι και ευρίσκουσι όλιγον “those who seek for gold dig out a lot of earth and find very little’. In the ‘technological’ section of the second chapter of his work (Logos politikos) in which Heraclitus enumerated various τέχναι in order to demonstrate that all of them ‘imitate nature’ and the ‘divine law’ of the cosmos by joining the opposites into harmonious whole, he also compared the cosmogonical process with ‘melting gold’ and producing various figures from the same recycled amorphous stuff by the cosmic god (fr. 116Leb = Arist. De caelo 304a9). The chances are that Heraclitus, as in many other cases, borrowed some technological analogies of the Milesians and — by means of the polemical device peritrope — gave them a new teleological meaning, thus ‘turning them around’ against Milesian naturalism.

The most difficult and laborious was the subsequent process of gold washing in χρυσοπλύσια. According to Pollux (see note 32 above) the ‘separation of gold from earth’ (διακρίνω) is a process preceded by διασήθω (= διασείω) ‘shake violently’, by διηθέω ‘strain through, filter’ (cf. διήθημα ‘riddled earth’) and followed by ἕψω ‘smelting, refining’. ‘Shaking’ was performed, according to some sources, on a wooden tray (σανίς) or washing pan. This ‘shaking’ may have included rotary motion, as in modern artisanal gold-washing using ‘turbo pan’. It is reasonable to conclude that Theophrastus paraphrases Anaximander’s analogy between the cosmogonical vortex and the separation of gold from earth in khrysoplysia. This is more than analogy, this is a striking example of a kind of scientific experiment intended to prove that rotary motion can ‘separate’ similar constituents of a mixture, the mechanical law

33 This analogy should be distinguished from the image of pnigeus in Aristophanes Nub.96 = Hippon A2 DK. This image is similar to the comparison of men (ἀνθρωποι) with embers (ἀνθρακες) attributed by Sextus to Heraclitus, which we regard authentic (fr. 75A Leb) and connect with Heraclitus fr. 75Leb (B26 DK) on man’ ‘kindling up’ in the morning and ‘going out’ in the evening.

34 Agatharchid. De mare eryrthr. 27; Strabo 3.2.8; 4.6.7.

35 Diod. Sic. 3.14.2 ἐπὶ γὰρ πλατείας σανίδος μικρὸν ἐγκεκλιμένης τρίβουσι τὴν κατειργασμένην μάρμαρον ὄδωρ ἐπιχεοντες· εἰτε τὸ μὲν γεώδες αὑτῆς ἐκτηκόμενον διὰ τῶν ὑγρῶν καταρρεῖ κατὰ τὴν τῆς σανίδος ἐξκλίσιν, τὸ δὲ χρυσίον ἔχον ἐπι τοῦ ἐξολο παραμένει διὰ τὸ βάρος.

36 See e.g. https://www.youtube.com/watch?v=Y5-I2SiR7D0 or search youtube for similar videos labelled ‘turbo pan, gold-washing’. Unfortunately, extant ancient evidence is scanty.
of motion of *simila similibus* type. In our study of the conceptual metaphor in Heraclitus (Lebedev 2020) we proposed to distinguish this type of analogies from metaphorical analogies and to term it ‘natural analogy’, since it is based on the comparison of one natural phenomenon with another. Unlike metaphorical analogies which are poetic rather than scientific, natural analogies were the product of the scientific revolution on 6th century Miletus. They are inextricably linked with the new empirical method of τεκμαίρεσθαι, τεκμήρια also known as ὁς ἄθηλον τὰ φανόμενα ascribed to Anaxagoras (B21a). Democritus in his acoustic theory used two similar analogies explaining that in the production of sound air is broken into groups of atoms of similar size: the violent motion of waves on the sea shore brings together pebbles of similar size and form; the rotational motion of the sieve (δίνον) separates and brings together barley grains, lentils and wheat grains. Plato’s ‘winnowing sieve’ in the *Timaeus* (52ē6) that separates the heavy bodies from the light, depends on these analogies of Democritus, who in turn continues the ancient Ionian tradition that goes back to Anaxagoras and Anaximander.

Alexander Heidel saw the truth in his 1906 paper in which he argued that the ‘eternal motion’ of the primordial matter ascribed by Aristotle to the Milesians must have been conceived by Anaximander and Anaximenes as vortex (δῑνη). Heidel’s hypothesis was accepted by John Burnet (1920: 62), but rejected by Kirk KR 128–129 on insufficient grounds and omitted without notice in Kahn’s influential monograph (1960), presumably because it did not fit his Platonizing reconstruction of Anaximander’s cosmology (denial of innumerable worlds etc., wrong interpretation of fr. B 1). Heidel did not take into consideration the decisive evidence of Theophrastus discussed above, but he made some interesting points: e.g., he plausibly explained the circular shape of the ‘drum’ of earth as produced by the original vortex in which heavy bodies tend to agglomerate at the center. The origin of other celestial ‘wheels’ of the sun and the moon in Anaximander’s model can be also adequately explained by the action of cosmogonical vortex. That Anaximander held the doctrine of original vortex cannot be doubted

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37 Verbatim quotation in Sextus VII.117 = Democrit. Fr. 316 Luria = B164 DK.: καθάπερ ὁ ρῆν πάρεστιν ἐπὶ τέ τον κοσκίνουμένων σπερμάτων καὶ ἐπὶ τῶν παρὰ ταῖς κυματωγαῖς ψηφίδων· ὅπου μὲν γὰρ κατὰ τὸν τοῦ κοσκίνου δῖνον διακριτικὸς φακὸ μετὰ φακῶν τάσσονται καὶ κριθαὶ μετὰ κριθῶν καὶ πυρὸν μετὰ πυρῶν, ὅπου δὲ κατὰ τὴν τοῦ κύματος κίνησιν αἱ μὲν ἐπιμήκεις ψηφίδες εἰς τὸν αὐτὸν τόπον τὰς ἐπιμήκεις ὁδοῦνται, αἱ δὲ περιμερεῖς ταῖς περιμερέσι. Paraphrase in: *Placit.* IV.19.3 = Democrit. 491 Luria, cf. Democrit. A 128DK.

38 On the relation of Plato’ *Timaeus* to Democritus see, e.g., Nikolau 1998; Gorey 2018.
since it is attested virtually by Anaximander’s own words precisely paraphrased by Theophrastus — genuine Theophrastus, quoted by name, and not the hypothetical ‘Theophrastus’ of Diels.

An important parallel to Anaximander’s gold simile reconstructed above, or rather a direct reflex of it, is found in Diogenes’ summary exposition of Anaxagoras’ cosmogony: D. L. II, 8 (p. 154, 29–31 Dorandi) καθάπερ γὰρ ἐκ τῶν ψηγμάτων λεγομένων τὸν χρυσὸν συνεστάναι, οὐτὸς ἐκ τῶν ὁμοιομορφὸν μικρῶν σωμάτων τὸ πᾶν συγκεκρίσθαι. ‘Just as from the gold crumbs, as they are called, gold is formed-by-consolidation, so the whole Universe has been compounded by concretion from tiny homogeneous bodies’. Kahn (1960: 40), misled by the wrong identification of ἐκείνος with Anaxagoras and by the myth of ‘Anaximander’s apeiron’, has seriously underestimated the value of this paraphrase dismissing it as a garbled variant of Theophrastus’ passage quoted by Simplicius. The Diogenes version of the gold simile cannot depend on Theophrastus since it contains authentic Ionian word ψήγματα for gold sand (the addition of λεγομένων ‘so called’ points to the peculiar usage departing from standard koine) and authentic term συγκεκρίσθαι not found in Theophrastus version. Theophrastus quotes Anaximander’s version, Diogenes quotes Anaxagoras’ version borrowed from Anaximander. Theophrastus noticed the striking similarity (or rather identity) of the gold simile in Anaximander and Anaxagoras, that is why he quotes the simile with a preceding remark ‘Anaxagoras says this similarly to Anaximander’ (ταῦτα παραπλησίως τῶι Ἀναξιμάνδρῳ λέγειν τὸν Ἀναξάγοραν). Diogenes’ paraphrase contains only slight admixture of Peripatetic terminology substituting ‘homeomorphic bodies’ for Anaxagoras’ authentic term ‘seeds of all things.’ Because of its highly abbreviated form it omits the reference to ‘earth’, but there can be little doubt that it refers to the same simile of ‘separation’ and consequent ‘accretion’ of gold particles in khrysoplysia caused by the rotary motion or washing pan analogous to the cosmic vortex.

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39 Arist. De caelo 304a 20–21 = Heraclit. Fr. 116 Lebedev ἐκ τοῦτο (scil. πυρὸς) συντίθεμένου φασὶ γίγνεσθαι τάλλα καθάπερ ἂν εἰ συμφυσωμένου ψήγματος. Imitated in Hippocr. De diaeta I.20 χρυσίον ἐργάζονται κόπτουσι, πλύνουσι, τήκουσι πυρὶ μαλακῶι, ἵσχυοι δὲ οὕς συνίσταται. Arist. De Caelo 275b32 = Democrit. Fr.261 Luria τὴν δὲ φύσιν εἶναι φασὶν αὐτῶν μίαν, ὅσπερ ἂν εἰ χρυσὸς ἐκαστὸν εἰη κεχωρισμένον.
6. Additional evidence on the cosmogonical vortex in Anaximander and Anaximenes provided by Epicurus in the book XI of his Περὶ φύσεως

CPh 32, 1–9. 16 (P. Herc.1042, col. 8.I):

ἐπὶ[γ]η[σ]ιν ἐπὶ[τ]η[θ]ε[υ]όμενα, ἀ[λ]λ’ ὡς προε[ιπον οἰονεὶ σκέ[π]ανόν] τινα τούτοις παρά[σ][κε][υ]αζ[ό][ν][υ]το[ν τὸν ὁρόν καὶ [τ]ῶν τε[χ]ω[μά]τον ἄθ[η]κτον τῆς [δ]ίνης τι[ν]ήτης…το[μ]πάνου…

“providing the resting [of earth] upon [the air], but as I said before, they admit that a kind of covering for these [celestial bodies] is provided by mountains and walls that are not touched by this vortex…[shape of] cylinder.

Ibid. col.8.II, 1–8:

[διατηρικοὶ ιναι τοῦ υμῶν τοίχους ἐν κύκλῳ ποιήσαντες ἢνα φράξωσιν ἡμᾶς πρὸς τήν δίνην, ὡς ἐξοθὴν αὐτῆς περιφερομένης, πά[σ]ιν [υ][π][έ][ρ κε][φαλῆς τα] ἀ[ύ]της της δίνης, ὡς [ἐξωθεν αὐτῆς περιφερομένης, π]αρα[σκευαστικόν· τὴν γῆν διατηροῦσαν ὡς πρὸς τῆς μονῆς αἰτίον καὶ τοι[α[υ]τῆς στορχο[ν] πανταχο[ν]θε[ν][ου] ώρα[σ]ια] χρο[νο]ν καὶ τὴ[ν δίνην]—ὁμοίως αἴτιον—τοῦτο [ἄρα] τὸ τῆς μονῆς αἰτίον | καὶ αὐτὸ τοῦ τούτο παρασκευαστικού. [τήν] ὡς ν’ ἔφη τις τῶν δίων, τὸ δὴ παρασκευασάς ἐν [μ[έ]σῳ] τοῦ τρ[οχου] πανταχο[νθε[ν] ὁμ[οι]ω[ς] στ[έ][λ][λ][ο][μέ]νην μέν[ειν ἐν τῶι] [κόσμωι κ]ατ[ά]…

“…it will have [no] need. For, if [the earth] is equidistant from every direction, it will not be able to have weight in any of them: the earth is endowed with this quality by the nature of air, while the
capacity to sustain the equal distance from the periphery is due to the equal air-pressure from all sides — it is by something like this condition that he explains the position of the earth in [the center of] the cosmos, and this explanation is not impossible, either — and, consequently, this is the cause of the earth’s stability, and not its prerequisite [?], for the equality [=equidistance] is provided by the similar air-pressure from all sides, as one of the divine minds said, while that which caused [the earth] to remain in the middle of the cosmos being similarly pressured [by air] from all sides…”

Despite some remaining uncertainties one thing is certain: Epicurus is discussing and contrasting two solutions of the classical Greek cosmological problem of the ‘immobility’ or ‘resting in place’ (μονή) of the Earth: (1) the explanation by equidistance from all points of the periphery of the cosmos (ἰσότης) and (2) the explanation by the equilibrium of the force of air pressure ‘from all sides’ of the Earth itself. A necessary preliminary question is whether Epicurus presents these as two alternative explanations proposed by two different predecessors, or as two interpretations of one and the same theory proposed by a single person. The second possibility is favored by the singularis ‘as one divine man said (ἔφη τις), but this does not prove that the two possibilities are incompatible, so we have to tackle both with theories of various physikoi and various interpretations of what one of those physikoi meant. In the whole extant physical/astronomical doxography the ‘equidistance’ theory of Earth’s immobility (μονή) is attributed to two philosophers only: Anaximander and Plato. The original (and originating, as we will argue) source of this doxographical tradition on Anaximander is Aristotle’s De caelo.40 The form of argument attributed by Aristotle to Anaximander in this passage immediately calls for suspicion. Firstly, this is an example of what Aristotle himself used to call λογικῶς θεωρεῖν ‘to consider something from the logical point of view’ as opposed to φυσικῶς θεωρεῖν ‘to consider something from the physical point of view’, a distinction which neatly describes the essential difference between the Ionian and Italian (Eleatic) styles of thought. All that we know about Anaximander’s (and Ionians’ generally) method and explanatory technique firmly puts him in the latter, not in the former class. And secondly, the argument attributed by Aristotle to Anaximander in this particular form requires a spherical earth, not a disc, ‘all parts of

40 De caelo 2.13, 295b11–16 (ed. Moraux) εἰσὶ δὲ τινες οἳ διὰ τὴν ὁμοιότητα φασιν αυτὴν μένειν, ὡσπερ τῶν ἄρχων Ἀναξίμανδρος· μᾶλλον μὲν γὰρ οὕθεν ἄνω ἢ κάτω ἢ εἰς τὰ πλάγια φέρεσθαι προσήκει τὸ ἐπὶ τοῦ μέσου ἓρμιμένον καὶ ὁμοίως πρὸς τὰ ἔσχατα ἔχον· ἀμα δ’ ἄδυνατον εἰς τὸ ἐναντίον ποιεῖσθαι τὴν κίνησιν· ὅστ’ ἐξ ἀνάγκης μένειν. τούτῳ δὲ λέγεται κομψῶς μὲν, οὐκ ἀληθῶς δὲ…
which’ are not ‘equidistant’ from the spherical periphery of the cosmos. On the other hand, there are no reasons to doubt that Aristotle quotes the term ὁμοιότης ‘similarity’ as a catch-word of Anaximander’s theory which contrasts him with all preceding physicoi who postulated a kind of cushion (water, air etc.) on which the Earth rests. We possess a unique testimony of Eudemus that in ancient Milesian mathematical terminology ὁμοιός was used in the sense of the later standard term ἴσος, i.e. as meaning ‘equal’ rather than ‘similar’. Note that Aristotle quotes Anaximander as a member of a group distinct from the preceding theories of ‘support’, he is quoted as only ‘one of the ancient’ (εἷς τῶν ἀρχαίων) supporters of this theory, a formulation which alludes that there are also more recent supporters of this or similar theory. There can be no doubt that the main target of Aristotle’s subsequent criticism of the homoioites theory is Plato in the Phaedo and that the mention of ‘one of the ancients’ is just a polite ‘diplomatic’ language used to avoid a direct attack against his teacher. The truth was seen by Simplicius, In De caelo 321, 32 ff. = Ar 189 W. Ταύτης μὲν οὖν τής δόξης καὶ Πλάτων ἔστιν, ἐν οἷς ἐν Φαίδωνι λέγει (p. 532) “ἰσόρροπον γὰρ πράγμα ὁμοιόν τινὸς ἐν μέσῳ τεθέν οὐχ ἔξει μᾶλλον οὐδὲ ἤτον οὐδαμόσει κλιθήναι.” ἄλλ᾽ ὁ γε Αριστοτέλης εὑρὼν προελημμένην αὐτήν ύπὸ Ἀναξιμάνδρου ἐμμελέστερον οὐέται τὸ τούτον ἐλέγχειν τοῦ ἄντιλέγειν πρὸς Πλάτωνα ... ‘This opinion is also shared by Plato in the passage of Phaedo in which he says ... “an object in a state of equilibrium in the middle etc.’ But Aristotle who has found this opinion anticipated by Anaximander, thinks that it is more appropriate to refute him rather than to argue against Plato...’

The later Imperial doxography took this diplomatically ‘more appropriate’ (ἐμμελέστερον), but imprecise and potentially misleading reference of Aristotle to Anaximander at face value and essentially attributed to Anaximander the Platonic formulation/version of the theory which polemically eliminated factors of physical necessity (ἀνάγκη), like pressure of surrounding air, admitted by most early physicoi, including Anaximander! It is worth noticing that Aristotle’ report is virtually unparalleled in extant

41 Procl. In Eucl. 250,20 = Thales 11A20 DK, cf. Eudem. Fr.134-135 W. Wehrli wrongly omits the remark on Thales’ ‘archaic’ usage: the oratio obliqua λέγεται ... εἰρήκεναι proves that Proclus quotes it from Eudemus.
42 This was clearly seen both by Alexander and Simplicius, in De caelo, 532,7-9. ὁ δὲ Ἀλέξανδρος, διὰ τοῦ εἰπεῖν, φησίν, δόσπερ τῶν ἀρχαίων Ἀναξιμάνδρος ἐδήλωσεν ὡς καὶ ἄλλων ὄντων οὐκ ἄρχαίων ταύτης τῆς δόξης. ‘Alexander notes that by saying ‘like Anaximander among the ancients’ Aristotle made it clear that there are other supporters of this opinion, as well, who are not ancient’.
doxography with a single exception in Hippolytus Ref. I,6,3, a passage which may have been influenced by Aristotle. Nevertheless, the attribution to Anaximander of the Platonizing (dialectical rather than physical) version of the *homoioites* theory, has become a dogma in the modern scholarship with only few exceptions: Heidel 1906:281, Robinson 1971 and especially the illuminating analysis of the problem in Furley 1989: 16–22. Continuing his commentary on the Aristotelian passage Simplicius, 532 even corrects Aristotle by pointing that Anaximander combined the explanation by equidistance with the supporting force of air: Ἀναξιμάνδρῳ δὲ ἔδόκει καὶ διὰ τὸν ἀέρα τὸν ἀνέχοντα μένειν ἢ γῆ καὶ διὰ τὴν ἰσορροπίαν καὶ ὁμοιότητα (in De Caelo 532, 13–14). The importance of this corrective remark of Simplicius has been underestimated. It is not very often that he makes a factual correction of Aristotle’s inaccurate statements. He must have relied on some ancient authoritative doxographical source on Anaximander. Just before this he quotes Alexander who had access to some first-class exclusive doxography of Theophrastus on the cosmic evolution in Anaximander (Ar 84 W. = 12A27 DK).

Contrary to the Diels’s myth of Theophrastus as the single most important source of all subsequent physical doxography of pre-Platonic philosophers up to the Imperial times and the *Pacita* tradition we have argued in extenso for a polycentric model (Lebedev 2016): the extant *SP-Placita* (‘Aëtius’ in Diels’s mistaken terminology based on a misreading of a confusing passage in Theodoretus) are the result of convergence of several independent Hellenistic (Academic, Stoic, partly Epicurean) and post-Hellenistic traditions (‘return to ancients’ Plato, Aristotle and Pythagoras), a synthesis most probably achieved by Arius Didymus, the teacher of Augustus. Contrary to Diels’s implausible hypothesis that after Theophrastus ‘Physical opinions’ no one read any more the original texts of the early *physikoi* 44, all Hellenistic schools had their own doxography independent of Aristotle and Theophrastus. Epicurus provides a striking case at point. There is no doubt that he studied the original works of Democritus, we are informed that he enjoyed reading and discussing with extreme subtlety the texts of ancient *physiologoi*, Anaxagoras, Archelaus, Empedocles; much of the meteorological doxography in the *Letter to Pythocles* must be based

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43 Rossetti 2013:28 quotes only the words ἰσορροπίαν καὶ ὁμοιότητα and omits the word διὰ τὸν ἀέρα τὸν ἀνέχοντα. Diels-Kranz should have added this testimony as alternative to Aristotle under 12A26. This has been done only in Wöhrle, Ar 189.

44 The only ‘proof’ of this fantastic thesis is a wishful parallel in Dox.Gr. 119: Cicero on Aristotle’s one ‘elegant’ Ἐπιτομὴ ρητόρων which made superfluous many earlier handbooks of rhetoric.
on his own Lesefrüchte rather than on pre-existing collections. It is therefore very likely that in the passage of *De Natura XI* on the theories about Earth’s immobility and vortex he relies, *inter alia*, on the original texts of Anaximander and Anaximenes. We propose the following source analysis and interpretation of the relative placita in the context of Epicurus treatise, followed by the subsequent interpretation of the recovered new fragment in the original context of Anaximander’s Περὶ φύσεως.

‘One of the divine, i. e., illustrious, men’ (τις τῶν δίων) is Anaximander, therefore the following words are adduced by Epicurus as a quotation from Anaximander’s book: την γὰρ ισότητα ή το[υ] ἀέρ[ους] στολ[ῆ] πανταχό[θε]ν // ὡμοία οὐσα, παρεσκε[υ]κεν ‘it is the pressure of air — which is similar (ὡμοία) from all sides — that has caused the equality (ισότητα)’, i. e., equidistance. We would venture to guess that in this passage Epicurus engages in polemics against Aristotle’s Platonizing reformulation of Anaximander’s thesis in *De Caelo*; he refutes Aristotle, i. e. the thesis that immobility of Earth in Anaximander results from its equidistance from all points of the periphery of the cosmos, by quoting Anaximander’s own words (τοιαύτην λέγει ἐν μέσῳ 43,11–12 and ἔφη τις 43,23) which explain the immobility of Earth’s position in the center by the physical force of the air-pressure, caused by the continuous vortex. Παρασκευάζω ‘provide’ or ‘cause something’ is Epicurus’ own regular term, but the words ἡ τοῦ ἀέρος στολὴ πανταχόθεν ὡμοία may preserve traces of the original wording of Anaximander’s text, in the Ionian dialect στολὴ πανταχόθεν ὡμοία. Note the verbal coincidence of ὡμοία with ὡμοιότητα in Aristotle’s paraphrase. Traces of the original wording can also be detected in the lines 43,6-10 τὸ δῆ πανταχόθεν ὡμοί[ως] στελλομένην ἴσον [ἀπε]έχει[ν] ἀπὸ τοῦ τρ[οχ]οῦ πανταχόθεν ‘[the earth] being similarly pressured from all sides is equidistant from the wheel from all sides’ and lines 43, 24–28 ἐγ[ι] [με] [σω] τοῦ τρ[οχ]οῦ πανταχόθεν ὡμοί[οι]ς στ]έλλο[με]νην μέν[ειν] ἐν τῶι [κόσμῳ κατ][ά]υ ‘being similarly pressured from all side in the middle of the wheel, stays immobile in the cosmos’.

The use of τροχοί ‘wheels’ as astronomical term in contexts where in standard later texts is used the term “spheres” (σφάραι), is attested exclusively for Anaximander and nobody else. In the line quoted above τροχοί seems to be used in the sense of whirlwind,
i.e., synonymous with δίνη 'vortex'. It should be noted however that the ‘wheels’ (τροχοί) of celestial bodies, like the Sun and the Moon, in Anaximander’s cosmology are composed of ὕβρ, the opaque air, and therefore are also quasi-vortices, i.e., circular streams of aer. Not only the words ἐν μέσῳ τοῦ τροχοῦ, but also the words ὁμοίως στελλομένη (scil. ἦ γῆ), ἰσον ὀπέχειν πανταχόθεν may also be quoted verbatim from Anaximander. The use of the verb στέλλω (συστέλλω) and deverbative noun στολή, in ‘pneumatic’ contexts with reference to ‘compression’ of air etc. is not Epicurus’ innovation: it is attested already in Democritus’ theory of eidola ‘impressed’ in the air, and may well be a part of common Ionian lexical heritage going back to Anaximander. Already in Homer στέλλω is used as a nautical term ‘make compact’ (of sails), furl (LSJ, s.v. IV.1).

In our opinion the common ‘admiration’ for the argument of immobility of Earth in the form attributed to Anaximander by Aristotle, perceived by many as a great scientific achievement, is a serious delusion. It is a just-so-story, a dialectical joke with no scientific meaning. The misapplied principle of sufficient reason hides its implicit mythical anthropomorphism: the Earth is conceived like someone who cannot decide where to go because of too many equal choices and so stays where she is. Jean Buridan captured these implications and brilliantly visualized the situation in the image of a donkey not knowing which bundle of hay to choose: indeed, there is no sufficient reason to choose one rather than another, given that the donkey is ‘equidistant’ from both bundles.

It is the authentic Ionian form of Anaximander’s argument, preserved by Epicurus, that makes him a scientific giant and the father of physical mechanics. We have already noted that ‘equidistance’ from all points of spherical periphery is a condition which applies to spherical body only; consequently, it does not apply to Anaximander’s drum-shape Earth. Once we replace the sphere and geometrical ‘equality’ (ἰσότης) of the Platonic version with Anaximander’s flat Earth and ‘equality’ of opposite physical forces, only two ‘sides’ really matter: the upper and down horizontal flat discs that are exposed to the ‘pushing’ or ‘pressure’ of the circular air vortex. The vertical narrow side of the disc is a quantité neglectable since it runs parallel to the direction of air stream: the vortex virtually does not exert any pressure on it. Most probably Anaximander argued that the vortex constantly and simultaneously exerts equal pressure on the two flat horizontal surfaces (ἐπίπεδα in doxography) with which it collides: the subterranean upstream part of vortex pushes (στέλλει) the disc of Earth upwards, while at the very same moment the overhead downstream part of the same circular vortex pushes the disc with equal force (ὁμοίως) in the opposite direction downwards, the result of this interaction of two
equal opposite forces is that Earth rests in place immobile (μένειν). There is a possible reflex of the original argument of Anaximander in Aristotle’s explicative paraphrase: *De Caelo*, 295b12 μᾶλλον μὲν γὰρ οὐθὲν ἄνω ἢ κάτω ἢ εἰς τὰ πλάνα φέρεσθαι προσήκει τὸ ἐπὶ τοῦ μέσου ἰδρυμένον καὶ ὁμοίος πρὸς τὰ ἐσχάτα ἔχον· ἀμα δ’ ὀδύνατον εἰς τὸ ἐναντίον ποιεῖσθαι τὴν κίνησιν· ὃστ’ εξ ἀνάγκης μένειν.

In the *SP-Placita* (P only), chapter ‘On earthquakes’, the Aristotelian (Platonizing) version of the ὁμοιότης argument is attributed also to Parmenides and Democritus both as a cause of immobility of earth and of earthquakes.⁴⁶ For Parmenides this is conceivable since all Western Greek cosmologies were teleological and rejected the Ionian cosmogonical vortex⁴⁷, replacing it with a divine demiourgos conceived as Noos or anima mundi (Aphrodite, Harmonia etc.). But for Democritus this should be ruled out: the authentic Ionian formulation has been preserved in Diogenes Laërtius IX.30 τὴν γὴν ὁχεῖσθαι περὶ τὸ μέσον δινομένην· σχῆμα τ’ αὐτῆς τυμπανόδες εἶναι ‘the Earth is kept afloat in the center supported by the vortex, and it has a drum-like shape’. The colorless language of the *Placita* version looks like a verbal reproduction of the Aristotelian passage in *De Caelo*, while the high-quality paraphrase of *Megas Diakosmos* in Diogenes quotes at least three authentic words verbatim⁴⁸.

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⁴⁶ *SP-Placita* III,15,7 D.
⁴⁷ The only exception seems to be Empedocles B35, but vortex in Empedocles is not a spontaneous mechanical process, as in Ionians; it is caused and controlled by Strife, the evil force of separation and destruction opposite to the demiurgical force of Love. This looks like Empedocles’ polemical message to his colleagues in the Eastern quarters who, according to Aristophanes’ smart joke, substituted Dinos for Zeus on the cosmic throne (Nubes, 38-82). Aristophanes puts into Socrates’ mouth the equation of Zeus with δίνη in PDerv, XVIII, 1-3 (i. e., Prodicus’ *Epochs*), as reconstructed in [Lebedev 2019: 513 ff.].
⁴⁸ For ‘Leucippus’, a name of an ‘ancient sage’ of times immemorial (an Ionian alternative to the Italian ‘Orpheus’ which, according to Ion of Chios was used as pseudonym by Pythagoras), as Democritus’ pseudonym in the Athenian copies of his *Megas Diakosmos* see [Lebedev 2020: 141-143]: this was a precaution Democritus took against the psephisma of Diopeithes (c.430 B.C.) at the time of his visit to Athens. Epicurus knew that this was just a literary device: he ‘encountered’ his rolls of Democritus’ works in Ionia (τοῖς Δημοκρίτου βιβλίοις D. L.X.2-3), where the psephisma of Diopeithes was not valid, and where the works of Democritus circulated under his real name.
7. The ‘winnowing of seeds’ analogy in Xenophanes’ neglected fragment and its parallel in Plato’s Timaeus. Its relation to Anaximander

A striking parallel to the ‘gold washing’ analogy in Anaximander’s cosmogony is provided by an equally neglected analogy of ‘winnowing’ that Theophrastus attributes to Xenophanes, or rather quotes verbatim from Xenophanes’ Περὶ φύσεως.

Stobaeus, Anthol. I, 25, 1b = DoxGr II, 20, 3 = Placit. II, 20, §5 M-R = Theophrastus, Physical doxography, fr. 232 FHSG = Xenophanes, Χενοφάνης ἢκ νεφῶν πεπυρωμένων εἶναι τὸν ἡλιον. Ἀθανάσιος <δὲ> ἐν τοῖς Φυσικοῖς γέγραφεν, ἢκ πυριδίων μὲν τῶν συναθροιζόμενων <ἐκ> τῆς υγρᾶς ἀναθυμίασεως, συναθροιζόντων δὲ τὸν ἡλιον. ‘Xenophanes holds that the sun consists of ignited clouds. However, Theophrastus in Physics writes that [according to him], the sun consists of pyridia which are agglomerated from the wet evaporation [from the sea], and by their agglomeration form the sun’.

In ps.Plutarchus’ version of SP-Placita Theophrastus is not mentioned, both δοξαι (ἐκ πυριδίων and ἢκ νεφῶν) are ascribed to Xenophanes as alternatives (ἦ). All other testimonia of this chapter of SP-Placita do not mention Theophrastus, either. In the transmitted text of Stobaeus’ version, the second doxa looks like a separate lemma with a placitum ascribed to Theophrastus himself. This should be explained as a confusion in the transmission of Placita, since no Peripatetic could ever hold that a new sun is born every morning from sparks contained in the exhalation from the sea or is ‘fed’ by the sea: for Aristotle and Peripatetics all superlunar celestial bodies consist of divine aither and cannot be ‘fed’ from inferior sublunar elements. The addition of ὡς in M-R does not solve the problem. We would rather read in Θεόφραστος <δὲ> ἐν τοῖς Φυσικοῖς… First is reported the standard view (Xenophanes holds that the sun consists of ignited clouds), then follows the alternative view of Theophrastus, introduced by slightly contrasting or distinguishing particle δὲ (‘however, Theophrastus writes…’): Xenophanes holds that the sun is formed by the aggregation of pyridia contained in the cosmic exhalation from the sea.

LSJ distinguishes two homonymous words: πυρίδιον, a diminutive of πῦρ, ‘spark’, citing only one example, the fragment of Theophrastus in SP-Placita quoted above; and a diminutive of πυρός ‘wheat’, citing Aristophanes, Lys. 1206 and a 3rd century B.C. papyrus. The first word has a short υ, the second has a long υ. Commentators of Theophrastus’ fragment and of Xenophanes’ theory on the nature of the sun have commonly taken πυρίδιον as

49 δὲ addidi.
small particles of fire, as sparks. *Prima facie*, this seems logical, since on the referential level of meaning the *physical theory* of Xenophanes certainly involved something like this. But there is a problem on the lexical level, a problem concerning how Xenophanes and Theophrastus *expressed* this concept. Πυρίδιον, the supposed diminutive of πῦρ is virtually unattested elsewhere. This is understandable: there was a standard and commonly used Greek word for ‘spark’ σπινθήρ. So why, instead of saying ‘spark’, one would use a cumbersome and unheard of diminutive ‘little fire’ with a suffix which seldom (if ever) is combined with words denoting stuffs, raw materials or elements? We do not find in Greek language words like γηΐδιον ‘little earth’, ἀερίδιον ‘little air’, θαλασσίδιον ‘little sea’ etc., therefore the alleged πυρίδιον ‘little fire’ comes out as something unexpected. Πυρίδιον, the diminutive of πῦρ, in the sense a tiny grain, on the contrary, looks quite natural, it is better attested from the 5th century in Aristophanes; it was occasionally used of other seeds, i.e. ‘tiny particles’, e.g. of linen. There is another reason to doubt that πυρίδια in Xenophanes original poetic text could mean ‘little fires’: a word with three (or even four in nominative!) consecutive short syllables is hard to insert into dactylic verse. On the contrary, if we admit that in Xenophanes’ poem πυριδίων meant ‘wheat grains’, we immediately get a perfect part of hexameter πυριδίων συναθροιζομένων... This is a neglected verse quotation from Xenophanes that should be added to his *verbatim* fragments. A conjecture lies at hand that in Xenophanes’ poem these words were a part of a poetic simile and analogy with winnowing: the formation of a new sun from the cosmic exhalation, the separation of the particles of fire from the exhalation with their subsequent agglomeration in the area of the sun were assimilated to the winnowing of wheat, the separation of the wheat grains from chaff (bran) with their subsequent agglomeration on the threshing-floor (ἡ ἅλως) which had a *circular form* similar to the disc of the

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50 A whole corpus TLG search yields only one instance of πυρίδιον, diminutive of πῦρ, Alciphron’s letters of *hetairai* IV.13. But the word here does not mean ‘spark’: it refers to a ‘little flame’ on altar for burning incense. The use of diminutive in this passage conveys the charming atmosphere of a cozy place is described.

51 There is a rare word ὑδάτιον, but not ὑδατίδιον! And it never means ‘drop’ (σταγών): it is used of a rivulet, of little rain or a little drink prescribed by a doctor.

52 In the iambic *Praecepta salubria* of Asclepiades of Bithynia (?), v.55 Πυρίδιον πλήσασα λινοῦν ἐν ξύλωι the phrase πυρίδιον λινοῦν corresponds to the standard λίνου σπέρμα in Hippocrates’ prose. The Didot text has meaningless ἔξολοι which I emend to ἐν ξύλωι, taking ξύλον as wooden vessel.
sun. The analogy does not end here: both in the cosmos and in a threshing-floor the shaking motion that causes separation, is produced by the stream of air/wind/exhalation. The confusion of the imagery (the terms that pertain to the iconic level) with what is illustrated by them (the terms of the referential level), should be attributed not to Theophrastus, who quoted Xenophanes from the original poetic text and therefore knew their context, but to the subsequent doxographers who worked with secondary prose summaries without original context and who also wrongly ascribed to Theophrastus himself the πυρίδια theory of Xenophanes.

The analogy of winnowing used to illustrate the mechanism of ‘separation’ of an original mixture of elements occurs also in Plato’s *Timaeus* 52e-53a:

> τά δὲ κινούμενα ἄλλα ἄλλοσε ἀεί φέρεσθαι διακρινόμενα, ὡςπερ τά ύπο τῶν πλοκάνων τε καὶ ὀργάνων τῶν περὶ τὴν τοῦ σίτου κάθαρσιν σειόμενα καὶ ἀναλικνόμενα τὰ μὲν πυκνά καὶ βαρέα ἄλλη, τὰ δὲ μανά καὶ κούφα εἰς ἑτέραν ἤκει φερόμενα ἔδραν· τότε οὖτο τά τέταρτα γένη σειόμενα ὑπὸ τῆς δεξαμενῆς, κινουμένης αὐτῆς οἰόν ὀργάμου σεισμόν παρέχοντος κτλ.

“And as they are moved, they drift continually, some in one direction and others in others, separating from one another. They are winnowed out, as it were, like grain that is sifted by winnowing sieves or other such implements. They are carried off and settle down, the dense and heavy ones in one direction, and the rare and light ones to another place” (tr. D.Zeyl).

The text of Plato’s *Timaeus* abandons in images and analogies borrowed from the texts of early Greek philosophers. Plato borrowed the analogy between the letters of alphabet and elements of the cosmos from Heraclitus and Democritus (Lebedev 2017: 251–53), he adapted the acropolis/kephale analogy (and, possibly, the image of man as ‘celestial plant’, οὐράνιον φύτον) from Alcmaeon of Croton (Lebedev 2017: 23ff.), he also borrowed the comparison of casting and recasting by Physis (personified Nature) of new beings from the same material with the ‘gold-casting art’ (χρυσοχοϊκή τέχνη) from Heraclitus (Lebedev 2014: 202). As David Graham (2015) has pointed out, Plato in the *Timaeus* 49 heavily relies on Anaximenes’ theory of the transformation of matter and borrows from Anaximenes’ the analogy between the condensation of air and the felting of wool. Now we see how he borrows the

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53 Did Xenophanes also intend a word pun on ἄλως (Doric form of ἕλως) — ἄλως ‘threshing floor’? The assimilation of the disc of the sun to round threshing-floor is rooted in Greek folklore and may predate Xenophanes. The fact that ἄλως in the sense of halo of the sun is first attested in Aristotle (*Meteor.* 344b2), proves nothing, since all earlier astronomical and meteorological texts are lost.
analogy of winnowing from the pre-Platonic physikoi. In most cases
Plato does not borrow mechanically, but reworks and adapts the
borrowed material to his purpose and his own context, as in the
present case. For Plato the Sun was a divine immortal being, in the
Republic he ridicules Heraclitus’ doctrine (probably influenced by
Xenophanes and the Milesians) that the sun is new every day. It is
significant that Plato makes the originating cause of this ‘chaotic’
motion not the divine Nous-demiourgos (inspired by Pythagorean
philosophy), but to the blind Ionian physis-wetnurse (πιθήνη). Still,
he tacitly acknowledges that nature can contribute something to the
origin of the world, but only on the low and primitive level. In a
sense, Plato entrusts her with ‘dirty job’ in order to alleviate the
work of the divine Mind. Unlike the great geometer Nous-
Demiourgos, Nature the wetnurse has not studied geometry (she is
ἀγεωμέτρητος, so to speak), so all she can do is to separate the
heavy from the light in the threshing-floor, a job done by peasants
and slaves, unworthy of the Master. The analogy of winnowing is an
exact parallel to the analogy of gold-washing that we have found
above in Anaximander. The parallelism of these analogies provides
a vivid example of what we call ‘metaphorical synonymy’ (on this
see Lebedev 202054). The iconic and referential levels of these
analogies are symmetrical and strictly parallel, only the arts from
which the imagery is taken are different. Both primarily illustrate the
separation (diakrisis) of the original mixture of heterogeneous
elements and the principle similia similibus. Particles of gold in the
first analogy correspond to the wheat grains in the second, earth
(slag) to the chaff, both include, inter alia, the implements that
produce the separating motion, a sieve or a similar tool. It is
conceivable that the analogy of winnowing may have been used not
only by Xenophanes, but also by other early philosophers who
conceived matter as a mixture of various ‘seeds’. It is more
economical to assume that Xenophanes and Plato have a common

54 Exactly, as in the case of gold-washing, we find the verb διακρίνεσθαι in
the technical descriptions of threshing and winnowing. Διακρίνω with
πυρούς (wheat grains): Jo. Chrysost. Quod nemo laeditur, 13 διακρίνει
tους πυρούς τῶν ἁχύρων. Theodoret. De provid. v.83, 740, 2 κἂν ἀναμίζει
θελήσης κέγχρον καὶ φακόν, καὶ πυροὺς καὶ κριθάς, πάλιν αὐτὰ διακρίνεις.
Διακρίνω with σίτον, σπέρματα: Clem.Alex. Eclog.Proph. 25,2 <ὡς> ὁ
σίτος ἀπὸ τοῦ ἄχυρου διακρίνεται (τούτης ἀπὸ τοῦ ὅλικου ἐνδύματος)
dia pneúmatos kai to ãkhron χωρίζεται dia to pneúmatos λικμώμενον,
οὗτος τὸ πνεύμα διαχωριστικὴν ἔχει δύναμιν. Basil. Caes. In Mamant.
Mart. v. 31, p. 41, 40 τὸ πτύον διακρίνει μὲν τὸ ἁχύρον ἀπὸ τοῦ σίτου· καὶ
tὸ μὲν κούφον καὶ ἀστατὸν ὑποσχίζεται τοῦ τροφίμου, τὸ δὲ πρὸς τροφήν
πνευματικήν ἐπιτήδειον παραμένει. Greg. Nyss. In Cant.cant., v.6, p.12, 1.8
tὸ λικμητὸ διακρίνας ἐκ τῶν ἁχύρων τὰ σπέρματα. Many more examples
can be quoted from the Church Fathers.
A. V. Lebedev

source, Anaximander, than to admit a more complicated possibility: first Xenophanes borrows the analogy from Anaximander (and changes the cosmogonic context to meteorological), and then Plato in *Timaeus* borrows it from Xenophanes, surprisingly restoring the original cosmogonic context. Other possibilities are also conceivable: Plato combines the two versions of Anaximander and Xenophanes, or he relies on yet another pre-Platonic *physikos*, e. g., Democritus, who made use of similar analogies, illustrating the separation (*diakrisis*) and subsequent agglomeration of atoms of similar shape (the *similia similibus* principle). Xenophanes denied the cosmogony as such and recognized (following the Pythagoreans) the eternity of the world created by divine mind: this is explicitly stated in the ignored neglected fragment Xenophanes on the eternity of the world, quoted by Philo, and in the corresponding doxographical passage in *MXG* [Lebedev 2000]. Therefore, it is easy to understand why he replaced the initial cosmogonical application of the analogy by the meteorological one. If the analogy of ‘winnowing’ (alongside the analogy of ‘washing’) was also used by Anaximander, it must have been applied not to the everyday formation of a new sun, but to the cosmogonic separation of ‘seeds’ in the primordial ‘mixture’ of the Infinite nature, i. e., as another example from *tekhnai* illustrating the mechanics of *dine*. This cannot be proved with certainty at present without additional evidence, and yet it remains a plausible possibility: Xenophanes’ Περὶ φύσεως was for the most part not original, but a popularizing exposition of Milesian stuff. Traces of Anaximander’s original concept of ‘seeds of all things’ (adopted from him by Anaxagoras): have been preserved in the underestimated passage of Augustinus’ *De civitate Dei* VIII 2 (12 A17DK = Ar 128 W.) non enim ex una re sicut Thales ex umore, sed ex suis propriis principiis quasque res nasci putavit. Quae rerum principia singularum esse creditit infinita, et innumerabiles mundos gignere et quaecumque in eis oriuntur; eosque mundos modo dissolvi modo iterum gigni existimavit, quanta quisque aetate sua manere potuerit…

Augustinus relies on an excellent doxographical source very similar to Hippolytus and Simplicius, since it contains a paraphrase of fr. B1 DK: ex suis propriis principiis quasque res nasci = ἐξ ὧν δὲ ἡ γένεσις ἐστί τοῖς οὖσι; et innumerabiles mundos gignere et quaecumque in eis oriuntur = ἐξ ἦς γίνεσθαι τοὺς (scil. ἀπείρους) οὐρανοὺς καὶ τοὺς ἐν αὐτοῖς κόσμους; quanta quisque aetate sua manere potuerit = κατὰ τὴν τοῦ χρόνου τάξιν. Note that in the doxographic source of Augustinus, exactly as in Hippolytus and Simplicius’, the report on ‘principle’ is immediately followed by the reference to ‘innumerable worlds’and the quotation or paraphrase of the fragment B1. The phrase ‘sua propria principia’ equals ‘semina rerum’ and presupposes Anaximander’s original phrase σπέρματα
πάντων χρημάτων. The parallel from Irenaeus of Lyon (whose source is probably the same doxographical compendium as the one quoted by Augustinus) also contains traces of Anaximander’s original wording: *Adv. haereses* 2.14.2 (ed. Brox) = Anaxim. Ar 52 W. “Anaximander autem hoc quod immensum est (τὸ ἀπειρον) omnium initium subiecit (ὕπεθετο πάντων ἀρχήν), *seminaliter* habens in semeti pso omnium genesim”. A conjecture lies at hand that that the later standard use of the term ‘seeds’ (σπέρματα, semina rerum) for corpuscles in mechanistic theories of matter conceived as *panspermia* in Anaxagoras, Democritus, Epicurean tradition and Lucretius goes back to Anaximander.55

8. The true meaning of the fragment B1DK: Anaximander’s discovery of the fundamental law of Greek physics ἐκ μηδένας μηδὲν γίνεσθαι (‘ex nihilo nihil fit’).

The first meaningful and theoretically important text of Greek philosophy and science has been preserved in the most authentic version by Simplicius (henceforward S version), as well as in a number of inferior quality paraphrases and reminiscences in doxography (below distinguished by initial letter of the name of the quoting author: H = Hippolytus, P = Plutarch etc.). The (S) version is further subdivided for analysis into sections marked by [a], [b] etc. in bold.

(S) Simplicius, *Comm. in Phys*. 24,13 D. (= A9 + B1 DK; Ar 163 W.):

[a] τῶν δὲ ἐν καὶ κινούμενον καὶ ἀπειρον λεγόντων Α. … [b] ἀρχήν τε καὶ στοιχείαν εἰρήκε τῶν ὄντων τὸ ἀπειρον, πρῶτος τούτου τούνομα κομίσας τῆς ἀρχῆς. [c] λέγει δ’ αὐτὴν μήτε ὕδωρ μήτε ἄλλο τι τῶν καλομεμένων εἴναι στοιχείων, ἄλλ’ ἐτέραν τινά φύσιν

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55 Anaxagoras B 4 σπέρματα πάντων χρημάτων and σπερμάτων ἀπειρον πλήθος. According to Democritus 275 Luria (67A15DK), the traditional four elements differ only in the size of corpuscles, while ‘their nature is a mixture of all kind of seeds’ αὐτὸν τὴν φύσιν οίον πανσπερμίαν πάντων τῶν στοιχείων. Fr. 140a Luria (68A28 DK) τὴν πανσπερμίαν (scil. ἀπειρον σχημάτων καὶ ἀτόμων) στοιχεία λέγει τῆς ὀλῆς φύσεως ‘the mixture of all kind of seeds (scil. of shapes and atoms) D. posits as elements of the whole nature’. Fr.145 Luria (=Arist. *Phys*. 203a19) ἐκ πανσπερμίας τῶν σχημάτων (ἀπειρον πουὶ στοιχεία) ‘Democritus posits infinite number of elements contained in a mixture of all kind of shapes’. In the original Ionian text Democritus no doubt wrote πανσπερμία τῶν ρυσμῶν, since elsewhere Aristotle translates Democritus term ρυσμός into Attic idiom as σχῆμα. On the ground of the verbal coincidences between these Aristotelian paraphrases we may conclude that Democritus characterized as ‘panspermia’ the ‘whole nature’, and this provides valuable additional evidence on the early use of φύσις in the sense of ‘substance.’
“[a] Of those who posit one, moving and infinite [element], Anaximander … [b] stated that the principle and element is the infinite, having for the first time introduced this name of principle. [c] he says that it is neither water, nor any other of the so-called elements, but a certain another infinite nature, out of which are generated the heavens and the arrangements (kosmoi) inside of them. [d] “Out of which [elements] takes place the generation of existing things, into the same their destruction happens as well, according to the fatal indebtedness. For they [= elements and things generated from them] pay between themselves the just recompense for the damage (adikia) according to the appointment of time [= according to appointed or due time],” [e] as he puts it in somewhat poetic words. [f] It is clear that, having observed the change of the four elements into each other, he did not consider any of them worthy of being made the substrate [of all], but something else, distinct from them. [g] However, he explains generation not by the qualitative change of the element, but by excretion of the opposites caused by the eternal motion. That is why Aristotle classed him in one group with the followers of Anaxagoras.

(H) Hippolytus, Ref. 1.6.1 (= Ar 74 W.):

οὗτος ἀρχὴν ἔφη τῶν ὄντων φύσιν τινα τοῦ ἄπειρον, ἐξ ἤς γίνεσθαι τοὺς οὐρανούς καὶ τὸν ἐν αὐτοῖς κόσμον...λέγει δὲ χρόνον <τεταγμένον> ὡς ὀρισμένης τῆς γενέσεως [[καὶ]] τοῖς οὐσίς καὶ τῆς φθορᾶς. “He said that the principle of existing things is some nature of infinite, out of which are generated the heavens and the arrangement inside of them... He speaks about appointed time meaning that the generation and destruction of existing thins are determined.”

(P) ps.Plutarchus, Strom.2 (= Ar 68 W.) A.

...τὸ ἄπειρον φάναι τὴν πάσαν αἰτίαν ἔχειν τῆς τοῦ παντὸς γενέσεως τε καὶ φθορᾶς, ἐξ οὗ δὴ φησὶ τοὺς τε οὐρανοὺς ἀποκεκρίσθαι καὶ καθόλου τοὺς ἀπαντὰς ἄπειρους ὄντας κόσμους.

56 <τεταγμένον> addidi.
57 τοῖς οὖσι with deleted καὶ Marcovich : καὶ τῆς οὐσίας codd.
Anaximander and the scientific revolution in Miletus...

ἀπεφήνατο δὲ τὴν φθορὰν γίνεσθαι καὶ πολὺ πρῶτον τὴν γένεσιν ἐξ ἀπείρου αἰώνος ἀνακυκλουμένων πάντων αὐτῶν.

“Anaximander... said that the infinite is the comprehensive cause of the generation and destruction of the Universe. It is from the infinite, he says, have been excreted the heavens and in general all innumerable worlds. He asserted that the destruction happens and much earlier the generation, and that all this comes around in circle from the infinite eternity.”

(DL) Diogenes Laertius II,1 (= Ar 92 W.)

οὗτος ἐφασκεν ἀρχὴν καὶ στοιχεῖον τὸ ἀπειρον ... καὶ τὰ μὲν μέρη μεταβάλλειν, τὸ δὲ πάν ἀμετάβλητον εἶναι.

“He said that the principle and element is the infinite... the parts undergo change, but the whole (or the Universe) remains unchanged.”

(A) Augustinus C.D. VIII,2 (= Ar 128 W.)

...et innumerabiles mundos gignere et quaecumque in eis oriuntur; eosque mundos modo dissolvi modo iterum gigni existimavit, quanta quisque aetate sua manere potuerit.

“...and innumerable worlds are generated and whatever is formed in them. In his opinion, these worlds now are dissolved, now born again, depending on how long period of life each of them can persist”.

(C) Cicero, De nat. deorum I,10,25(= Ar 29 W.)

Anaximandri autem opinio est nativos esse deos longis intervallis orientis occidentisque, eosque innumerabiles esse mundos.

“According to Anaximander’s opinion, gods are born and in long intervals of time they are born and perish, and they are the innumerable worlds”

Simplicius’ source of the quotation from Anaximander. In numerous modern discussions of Anaximander’s fragment B1 DK it is taken for granted that the source of Simplicius is the lost work of Theophrastus ‘Physical opinions.’ But Simplicius does not mention Theophrastus as his source in (S). We have criticized elsewhere in detail Diels’s ‘single-source’ doxographical theory as a relic of the speculative XIX-th century Quellenforschung (Lebedev 2016). (S) contains heterogeneous material. Strictly speaking, Simplicius’ source for the quotation [d] cannot be established with certainty, but even if by any chance the source of section [d] is Theophrastus ‘Physics’ (not ‘Physical opinions’ never quoted by Simplicius!), the preceding and following context (sections [c] and [e]) cannot derive from Theophrastus. Theophrastus cannot be Simplicius’ source
since the cyclical interchange of opposites/elements (implying a single substrate like Aristotle’s materia prima) he reads into the fragment flatly contradicts the mechanistic panspermia theory of matter which the real and attested by name Theophrastus explicitly attributes to Anaximander in the passage discussed above in section (5). Simplicius’ misinterpretation of the fragment results from his mistaken identification of the anonymous author of the theory of ‘intermediate’ element with Anaximander which is not attested before Alexander. On the origin of this ancient confusion see sections (3–4) above. Simplicius was a man of great erudition, he may have used a variety of sources on early philosophers. Alexander of Aphrodisias, Porphyrius’ Philosophos historia, which relied on the great work of Arios Didymus Περὶ αἰρέσεων, come into consideration, inter alia, as possible sources of the quotation [d]58. Since Simplicius’ interpretation of the fragment as cyclical interchange of elements/opposites is borrowed from Alexander, not from Theophrastus, it is conceivable that he borrowed the fragment together with its interpretation from Alexander as well, although the exposition is his own.

The limits and extension of the verbatim quotation. There are two extreme opposite views on this problem. Some scholars believe that every single word is authentic (Diels-Kranz, Kahn 1960: 168 ff.), their opponents reject the first part of the fragment as inauthentic, because they find in it the Aristotelian formula of material cause and the Aristotelian terminology of ‘generation and destruction’ (γένεσις καὶ φθορά — Kirk, Raven, Schofield: 118–119). Both these approaches are incorrect: the former is uncritical, the second hypercritical. The neglected paraphrases of the fragment B1 cited below in section (9), prove that the first part of the fragment (preceding the words διδόναι γάρ) in Simplicius’ version renders the general sense of Anaximander’s text more or less correctly, but at the same time replaces the authentic mechanistic terminology of ‘excretion — dissolution’ (ἀποκρίνεσθαι — διακρίνεσθαι etc.) with standard Aristotelian terms γένεσις καὶ φθορά, unattested as a pair of opposites before the 4th century B.C.

The metaphorical language and philosophic meaning of the fragment B 1. In the XIX-th century scholars like Nietzsche and Rohde found in Anaximander’s text a religious ‘Orphic’ idea of ‘injustice’ of individual existence punished by the ‘just retribution’ imposed by the so-called apeiron on all individual beings. It is hard to imagine how Anaximander’s inanimate ‘infinite nature’ conceived as a panspermia of various stuffs, like earth and gold,

58 Porphyrius’ Philosophos historia as important doxographical source of Christian apologists and Neoplatonists, neglected both by Diels and by Mansfeld-Runia see Lebedev 2016: 619-621.
could be concerned with the moral standing of innumerable worlds, stones, plants, animals etc. produced by its own spontaneous vortices. Besides that, ‘ancient Orphism’ is a Neoplatonic myth. The Orphic mysteries were instituted by Onomacritus in Athens several decades later than the publication date of Anaximander’s *Peri physeos* (c. 546 B.C.). A turning point in the history of interpretations of B1 was John Burnet’s ‘Early Greek Philosophy’ (1892) and the restoration of the word ἀλλήλοις in Diels’s edition of Simplicius’ Commentary on ‘Physics’ in ÇaG (1895). Burnet dismissed the ‘Orphic’ interpretation as ‘fanciful’ and, emphasizing the importance of the word ‘to each other,’ connected the reciprocal encroachment and retribution with the ‘strife of opposites’, like the hot and the cold, i.e. with meteorological phenomena like the change of seasons (Burnet 1920: 54, note 1).

We will argue that, although the rejection of the ‘Orphic’ interpretation was justified, taking ἀλλήλοις with a reference to opposites and meteorological phenomena was a fatal mistake that has misguided generations of scholars. The ‘Orphic’ reading of the fragment is not intrinsically liked with and is not implied by the traditional (pre-Burnet) interpretation of γένεσις as generation of all individual things (τὰ ὄντα) from some primordial substance (ἀρχὴ καὶ στοιχεῖον according in Simplicius’ doxographical language), and ‘destruction’ as return of all individual entities into the original source if generation according to some necessity or fate.

Although all other paraphrases and reminiscences of Anaximander’s dictum, cited above, are inferior to (S), they possess underestimated informative value. Contrary to Diels’s ‘Pantheophrasteanism’ in doxography, these testimonia cannot be reduced to a single common source. Common source is conceivable in the case of (S) and (H), but even this is far from certain. Certain similarity must be due to Anaximander’s original text itself, but phrasing is very different in ps.Plutarch, Diogenes, Cicero, Augustinus. We are dealing with independent ancient readers of Anaximander all of whom without exception connect the dictum with processes of cosmic scale, primarily with the generation and destruction of innumerable worlds, and not with trivial ‘meterological’ phenomena like the change of seasons.

On the mistaken interpretation of Burnet was built an even more fanciful and absolutely misleading interpretation of Jaeger who added to the ‘strife of opposites’ a personified Chronos as a presiding ‘judge.’ In his ‘Paideia’ (1946: 159 ff.) and ‘Theology of Early Greek Philosophers’ (cited below) Werner Jaeger proposed a new interpretation of the imagery of Anaximander’s fragment which

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59 On the origin and date of the Orphic theogony see Lebedev 2022.
has become surprisingly influential and is still accepted by many.\textsuperscript{60} It is based on several questionable assumptions that (1) ἀλλήλοις implies contest between conflicting parties and reciprocity of offence and retribution; 2) χρόνους is allegedly genetivus subjectivus rather than objectivus; 3) τάξις is used here in a certain ‘ancient juridical’ sense of ‘ordinance’ or ‘decree’. We have seen above that (1) is wrong: the quotation from Anaximander does not mention ‘opposites’ which appear only in the mistaken commentary of Simplicius. In support of (2) Jaeger cites the poetic ethical topos of the ‘judgement of time’ (ἐν δίκῃ χρόνου Solon, fr.36.3 W. etc.) which has nothing whatsoever to do with physical laws and material change. Χρόνου τάξις is a set phrase, a TLG proximity search for the combination χρόνος + τάξις yields dozens of instances none of which supports Jaeger’s interpretation. The ‘order of time’ or ‘time-order’ (χρόνου τάξις) in attested Greek usage always refers either to a recurrent period of time, or to fixed moment (set date), or (often in later sources) the order of events in time (syn. ἀκολουθία, of sequence, e.g. the chronological order of composition of author’s works), never to a fanciful “scene in a courtroom” imagined by Jaeger: a personified Time as a judge passing ‘verdicts’ to a couple of scandalous litigants who, for some reason, in turn assault each other and then pay atonement for their misdeeds (Jaeger, Theology, 35). The evidence for τάξις ‘ordinance’ or ‘decree’ is very thin: a couple of passages from Attic fourth century prose (cited below), never in early Ionian prose (Herodotus, Hippocrates). To amend the lack of evidence for the noun Jaeger tries to derive this exceptionally rare use from the meaning of the verb τάττω ‘ordain’ in phrases like τάττει δίκην, τάττει τιμωρίαν used of judge (δικαστής) who passes judgement or ‘orders’ or ‘appoints punishment’ (Jaeger, Theology, p. 207, note 59). This is based on the tacit assumption that the usage of the verb and the noun are absolutely identical, but that is not the case: even in the only two passages from Plato cited in LSJ, s.v. τάξις II,3 ‘ordinance’\textsuperscript{61} the term τάξις is associated not with ‘judge’ or court, but with νόμος or νομοθέτης, i.e. with the ‘ordinance’ or prescription of a written law. This is only natural since the standard Greek word for ‘judgment’ by judge or court is κρίσις, and nor τάξις (a proximity search for δικαστ- + κρισ- gives many instances). A whole-corpus proximity search in TLG for the combination of δικαστ- and ταξι- within 5 words fails to provide a single instance of τάξις in the sense of ‘ordinance’ or verdict pronounced by a judge or court (postulated by Jaeger), it yields only some instances of τάξις in

\textsuperscript{60} DK I,89 nach der Zeit Anordnung; Kahn 1960: 166 ordinance of time; Guthrie HGPh. I, 76 ordinance of time; KRS, 110 assessment of Time; etc.

\textsuperscript{61} Plato, Leg. 925b κατὰ τὴν τάξιν τοῦ νόμου; Polit.302c παρὰ τὴν τοῦ νομοθέτου τάξιν.
the sense of body of judges in the phrase δικαστῶν τάξις. In other words, there is no textual evidence at all for the ‘scene in a courtroom’ with a dikastes assigning penalties now to one, now to another party, ‘reconstructed’ by Jaeger on the ground of the allegedly ‘ancient juridical’ usage of the single word τάξις. Such usage of the noun does not exist. Apart from these formal linguistic objections to Jaeger’s reading of the fragment there are also considerations relating to its philosophic and scientific meaning that make Jaeger’s reading utterly unlikely. Anaximander was a scientific genius of planetary scale who created the geocentric model of the cosmos in astronomy that lasted in for some 2000 years until Copernicus, and who wrote the first naturalistic and evolutionary history of the cosmos without any reference to traditional Greek gods. There is no trace of myth in any doctrine or etiological explanations of natural phenomena attributed to Anaximander in extant sources. All his theories and etiological explanations are rationalistic and based on natural analogies and empirical ‘proofs’ (tekmeria), like the washing pan analogy supporting the theory of vortex. Personified abstractions conceived as divine powers, like the time god Χρόνος are typical in the mythopoetic tradition (the Orphic theogony of the seer Ὄνομακρίτος) or in the mystical allegorism of Pherecydes, both of whom belong wholly to the pre-scientific age. They are alien to scientific Ionian prose, the best example of which for us are the fragments of Ἀναξαγόρας since they employ Anaximander’s terminology and develop a similar theory of matter. Anaximander had no reason to recur to the scientifically futile assimilation of the time to judge etc. This assimilation explains nothing and is scientifically purposeless. Unlike the Western Greek philosophers who regarded time as a real divine power, the Ionian thinkers (except Heraclitus) and the Sophists had a more technical (time as metron) or even subjectivist view of time. There can be no doubt that Anaximander explained the alternation of day and night by his ‘revolving wheels’ of the Sun and the Moon. As regards the change of seasons, he must have explained it not by vague poetic metaphors like ‘decree of time’, but by the yearly travel of the sun between the summer and winter solstices, τροπαί.

The terminology of the analogy in fr. B1 is not ethical-religious, but legal-economic: the cosmos as a household maintaining a balance of expense and income. It is used exclusively to convey the notion of ‘exact compensation’, i.e., of preservation in the transformations of indestructible matter and does not contain any ethically or politically relevant connotations or allusions. The ‘repayment of debt’ legal-economic metaphorical code, invented by

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62 Antiphon B 9DK νόμιμα ἢ μέτρον τῶν χρόνων, οὐχ υπόστασιν. Democritus 287 L. ἠμεροειδῆς καὶ νυκτοειδῆς φάντασα.
Anaximander, is used in the first attested formulation of the law of conservation of matter: “Out of which /elements/ all things originate, into the same they perish according to the fatal indebtedness: they [the things that arose, one the one hand, and the original elements, on the other] pay a just recompence among themselves at the appointed time”. This is a universal law that applies to all things (animals, men, worlds, etc.), and not to “opposites” in spite of the widespread erroneous interpretation that goes back to Burnet. Neither the text of Anaximander quotation in (S), nor any of the paraphrases quoted above mentions or implies “opposites”. Anaximander is not talking about any “reciprocity” or cyclical change. The word ἀλλήλοις does not imply any reciprocity, it is not important philosophically and may have been added by Simplicius to clarify that compensation is paid between two groups of eternal elements on the one hand, and generated things, on the other, and not between generated things themselves. The Greek word for cannibalism, ἀλληλοφαγία, does not imply that a man A eats a man B and is in his turn eaten by B, it just refers to the fact that one member of a group eats another member of the same group, not that they eat each other in turn. Things derive from elements and depend on elements, but elements do not derive from generated things and do not depend on things. These two groups are unequal. Things correspond to “debtors”, the elements to “creditors”, the generation of things out of elements is compared with a loan (borrowing of stuff) secured by one’s own body. The lifespan of any being is determined by the “set” debt repayment term (χρόνοι τάξεως = προθεσμία). After the expiration of the loan term (χρόνοι τάξεως), every being repays its debt (χρέος is alluded to in τὸ χρεών) to creditors-elements. It repays (τίσις) the just amount (δίκην), i.e. equal to inflicted damage (ἀδίκα is a legal term for damage with no moral or religious connotations). The innumerable worlds after expiration of loan term are dissolved in the “boundless nature” (φύσις ἄπειρος, ἀόιδος καὶ ἀγήρως) which according to Theophrastus and Aristotle is a mixture of different “seeds” like that of Anaxagoras (hence the plural ἔξων). It is conceivable that in the context of fr. B1 Anaximander mentioned the ‘seeds of all things’ (σπέρματα πάντων χρημάτων), and that σπερμάτων is implied in the phrase ἔξων. In a sense, it was an archaic Ionian equivalent of the fourth century Attic στοιχεῖα ‘elements’. Not a single gram of matter is lost in these transactions of nature. In the cosmic household, all expenses are covered by equal recompenses, not a bit

63 See the passage on ‘seeds’ from Epicur. Epist. Herod. 79 cited below, p.62. On the origin of the philosophical term στοιχεῖα ‘elements’ from the alphabet analogy in Heraclitus and Democritus see Lebedev 2017: 251-253.
of “eternal nature” disappears, only individual beings are born and die due to mechanical resheluffle of particles of matter. Anaximander formulated the law of nature, which later became known as the law of conservation: ἐκ μηδὲν μὴ δὲν γίνεσθαι (ex nihilo nihil fit). Aristotle refers to it right after the mention of Anaximander, Empedocles and Anaxagoras and characterizes it as a common opinion unanimously agreed by all physikoi: περὶ γὰρ ταύτης ὁμογνωμονούσι τῆς δόξης ἄπαντες οἱ περὶ φύσεως (Phys. 187a34). It is a myth that the principle ex nihilo nihil could not be formulated before Parmenides; as we see, it was discovered by Anaximander. The Pythagoreans and Eleatics, who denied the reality of corporeal matter, may have polemically reapplied the ex nihilo principle to the divine and immortal soul in what Plato called ‘gigantomachia over being’.

It seems that Aristotle understood properly Anaximander’s metaphorical language in fr. B 1. The third of the five arguments for belief in the infinite summarized in ‘Physics’ Γ 4 and attributed to Anaximander, runs: 203b18-20 ἐτι τῶι οὐτως ἐν μόνως ἂν ὑπολείπειν γένεσιν καὶ φθοράν, εἰ ἀπειρον εἰ ὅθεν ἀφαρεῖται τὸ γεννόμενον. “Further, from the fact that generation and destruction would not fail only if the source, from which is taken away that which-is-coming-into-existence, is infinite”. The primordial matter is conceived here as kind of wealth of supplies, a reservoir, which will fail unless it is infinite. Simplicius 466,28 and Aristotle himself in 208a8 read ἐπιλείπειν, a verb which is often used with reference to ‘wealth’ (πλούτος), ‘supplies’ (τὰ ἐπιτήδεια) etc. Prima facie, it might seem that the law of conservation (which prohibits any, let alone total loss of matter) makes this argument invalid. But this is true only with regard of the single-world cosmological model: the cyclical cosmogony of Heraclitus, Empedocles and the Stoics admits endless recycle of the same indestructible matter. However, the generation of innumerable οὐρανοί in Anaximander infinite Universe requires an infinite ocean of readily available matter.

The corollary of the law of conservation of matter is the principle that Universe as a whole remains unchanged. This corollary is explicitly ascribed to Anaximander in what seems to be a brief doxographical paraphrase of the fragment B1 in Diogenes Laertius Π.1: καὶ τὰ μὲν μέρη μεταβάλλειν, τὸ δὲ πᾶν ἀμετάβλητον εἶναι ‘the parts undergo change, but the whole (or the Universe) remains unchanged.’ In the Letter to Herodotus, 38–39 Epicurus quotes both these principles as fundamental in the study of nature: Πρῶτον μὲν ὃτι οὐδὲν γίνεται ἐκ τοῦ μὴ ὄντος· πᾶν γὰρ ἐκ παντὸς ἐγίνετ’ ἀν σπερμάτων γε οὐθὲν προσδόθηκεν. καὶ εἰ ἐρθείτο δὲ τὸ ἀφανιζόμενον εἰς τὸ μὴ ὅν, πάντα ἀν ἀπωλεῖται τὰ πράγματα, ὥσκ ὄντων τῶν εἰς ἄ διελύετο. Καὶ μὴ καὶ τὸ πᾶν ἀεὶ τοιούτον ἢν οἶον νόν ἐστι, καὶ άεὶ τοιούτον ἔσται. οὐθὲν γὰρ ἔστιν εἰς δ μεταβαλέι.
Although in atomistic Universe ‘seeds’ refers to atoms, the function of Epicurus’ σπέρματα is similar to that of semina rerum (τὰ ἐξ ὅν) in Anaximander’s fragment: Epicur. *ibid.* 79 τὰ τοιαῦτα σπέρματα ἐξ ὧν ζῷα τε καὶ φυτὰ καὶ τὰ λοιπὰ πάντα <τὰ> θεωρούμενα συνίσταται, “such seeds, out of which are formed by concretion animals, plants and all other observable beings”.

9. Neglected anonymous quotations and reminiscences of Anaximander B 1. Three fragments of Heraclitus adapt Anaximander’s analogy to his own theory of the cosmic cycles and ‘fated changes’

Plato. *Timaeus* 42e-43a

οἱ παῖδες … μιμούμενοι τὸν σφέτερον δημιουργόν…πυρὸς καὶ γῆς ὑδάτως τε καὶ ἀέρος ἀπὸ τοῦ κόσμου δανειζόμενοι μόρια ὡς ἀποδοθησόμενα πάλιν, εἰς ταύταν τὰ λαμβανόμενα συνεκόλλον… ἐν ἐξ ἀπάντων ἀπεργαζόμενοι σῶμα ἐκαστὸν.

“The junior gods… imitating their creator…borrowing (as a loan) from the cosmos portions of fire, earth, water and air — so that to return them back to the same owner — glued them together, in this way producing from all parts one body in each case.”

Heraclit. *Quaest. Hom.* 22.10

Πᾶν γὰρ τὸ φυόμενον ἐκ τινων εἰς ταύτα ἀναλύεται διαφθειρόμενον, ὥσπερει τῆς φύσεως ὁ δεδάνεικεν ἐν ἄρχῃ χρέα κομιζομένης ἐπὶ τέλει.

“Every single thing that originates from some constituents, disintegrates into the same constituents when it is destroyed, as if nature was collecting in the end the debts that it lent in the beginning”.

Philo Alex., *De posteritate Caini*, 5

πάντα γὰρ ὄν γένεσις ἐστὶν οὐρανοῦ κύκλος περισφίγξας ἐντὸς ἑαυτοῦ κατέχει. καὶ γὰρ αἱ τῶν τετελευτηκότων ἀναστοχειούμεναι μοῖραι πάλιν εἰς τὰς παντὸς δυνάμεις ἐξ ὧν συνεστησαν ἀποκρίνονται, τοῦ δανεισθέντος ἐκάστῳ δανεισμάτος κατὰ προθεσμίας ἀνίσους ἀποδιδομένου τῇ συμβαλούσῃ φύσει, ὡσπέρ βουληθεὶ τὰ ἑαυτῆς χρέα κομίζεσθαι.

“Everything that has a birth, is embraced by the circle of heaven. For during the disintegration of corpses, the dissolving shares again are separated into (or ‘excreted’) those powers of the Universe, from which they were formed, since the loan lent to everyone after the expiration of unequal debt periods again is returned to the creditor nature when she wants to collect the debts owed to her.”
The source of Philo is unknown, but it is an excellent source of exceptional value, because it preserves the authentic, pre-Peripatetic, terminology of Anaximander (ἀποκρίνονται). Note that πάντα ὄν γένεσις ἐστιν echoes εἴ ὄν δὲ ἡ γένεσις ἐστι in Simplicius’ version.

Hippocrat. De natura hominis, 3.

Καὶ πάλιν γε ἀνάγκη ἀποχωρείν εἰς τὴν ἐσωτερικὴν φύσιν ἐκαστον, τελευτάντος τοῦ σώματος τοῦ ἀνθρώπου, τὸ τε ὕψος τὸ ὑψόν καὶ τὸ ἔξω καὶ τὸ ἑξω καὶ τὸ θερμὸν καὶ τὸ ψυχρόν πρὸς τὸ ψυχρόν. Τοιαύτη δὲ καὶ τῶν ζώων ἢ γένεσις, καὶ τῶν ἄλλων πάντων. γίνεται τε ὁμοίως πάντα καὶ τελευτά ὁμοίως πάντα.

“And when the human body dies, every constituent part of it should necessarily return to its own nature [NB: physis = original substance], the wet to the wet, the dry to the dry, the hot to the hot, and the cold to the cold. Of such kind is also the nature of animals and of all other beings. All beings are generated and perish in the same way”.

Heraclit. Fr.3Leb (B80DK):

εἰδέναι χρή τὸν πόλεμον ἐόντα ξυνόν καὶ δίκην ξυνόν καὶ γινόμενον κατέριν καὶ χρεώμενα.

‘One must know that war is really common [or ‘mutual’], that strife is the right order [‘justice’] of things and that all things are generated by strife and by borrowing [scil. from their opposites]’.

Heraclit. fr. 42Leb (B90DK) Plutarchus, De E apud Delphos 8; p. 388E:

...τὴν τὰ ὅλα διάκοσμον ἄργην...ὡς γὰρ ἐκείνην ὑπαλλάττουσαν ἐκ μὲν ἐσωτερικὴς τῶν κόσμων, ἐκ δὲ τοῦ κόσμου πάλιν ἐσωτηθῇ ἀποτελείν πυρὸς τε ἀνταμείβεται πάντα, φησὶν ο Ἡράκλειτος, καὶ πῦρ ἀπάντων δικωσπέρ χρυσοῦ ἐρῆμα καὶ χρήματον χρύσον, οὗτος κτλ.

“... The arkhe that sets in order the Universe... just as she by loan and pledge now produces from herself the cosmos, now from the cosmos again herself, and gets in exchange for fire all things – says Heraclitus – and fire in exchange for all things, as if property [= ‘pledge’] in exchange for gold [= ‘money’] and gold in exchange for property, so etc.”

Diels’s conjecture ἀνταμιβή for the attested in all MSS of Plutarch verb ἀνταμείβεται should be rejected for many reasons as wrong and impossible (see our commentary to fr.42L, Lebedev 2014: 321-326]. Once we accept the MSS reading ἀνταμείβεται, it

64 χρεώμενα A, acc. Kahn, Conche: χρεών Diels, alii.
becomes obvious that this verb is not passive, but medial and that its subject is not πάντα, but ἡ τὰ ὀλα διακοσμοῦσα ἀρχή from the preceding context. This preceding context is not a verbatim quotation (set on bold), but Plutarch’s paraphrase (underlined); however, it should not be dismissed, since besides Plutarch’s explicative interpretation in standard koine of the verbatim quoted fragment, it also contains something which is omitted in the verbatim quotation. I have argued in the commentary to my edition of Heraclitus’ fragments that Plutarch’s ἡ τὰ ὀλα διακοσμοῦσα ἀρχή ‘The principle that sets in order all things (or he Universe)’ is a paraphrase in standard koine of some original name of the cosmic god in Heraclitus’ archaic Ionian prose, conceivably Aion or Physis. The problem is that Heraclitus used several metaphorical names for his new philosophical cosmic god whom he counterposes to the traditional anthropomorphic gods of Homer and Hesiod: Τὸ Σοφόν (The Wise Being), Mind or Intelligence (Γνώμη), Αἰών, Πόλεμος, Κεραυνός, and whom he identifies with personified ‘Nature’ (Φύσις).

In order to understand properly the meaning of this imagery one should take into consideration the semantical association of ‘to be’ and ‘to have’ in various languages: e.g. German ‘es gibt’, French il y a, Russian имется (passive from active иметь ‘to have’), all three expressions in the sense of ‘there is’. In Greek the relevant example is provided by the word οὐσία which in the original pre-philosophical usage meant ‘property, possession’ (i.e. ‘what one has’), and in philosophical usage became ‘being, substance, essence’. ‘What I have’ is ‘what is present and available’; what I do not have, is absent. This association explains the origin of the economic metaphorical model ‘the world as a household’ and the ‘loan/pay back’ analogy for the description of cosmic processes in Greek philosophy of nature. Unlike most modern interpreters Plutarch, a penetrating reader of Heraclitus, perfectly understood the meaning of the simile. Property (pledge) and its gold equivalent (money) never come into the same hands: to get one of them you have to give away the other, they can only exist alternatingly, never simultaneously. Heraclitus probably alluded to this paradox in fr. 25 Leb (B123 DK) ‘Nature loves to hide’.

Heraclit. Fr. 45Leb (B31 DK) θάλασσα διαχέεται καὶ μετρέται εἰς τὸν αὐτὸν λόγον, ὁκοῖς πρόσθεν ἦν ἣ γενέσθαι γῆ. 65 “The Sea is dispersed and replenishes herself exactly to the same measure as was before it became Earth”. This fragment has been commonly
misinterpreted as a ‘chemical’ cosmogony starting with Diogenes Laertius IX. 8–9 and Clement’s source. Together with the preceding fragment on the ‘reversals of Fire’ it comes from the ‘calendar of Great Year’, conceived as a grandiose battle (Polemos) of four cosmic masses, their alternating advance (increase) and retreat (decrease) within the ‘turning points’ or ‘limits’ (τροπαί, τέρματα, οὐροί) set by the ‘Wise Being’ and Fate (Εἰμαρμένη). Heraclitus in his typical manner combines military metaphorical code with the legal-economic. The verb διαχέεται here has nothing to do with ‘pouring’ water etc., it is used here in the Homeric sense of ‘dispersing’, dissipating enemy’s army and connotes diminution, waning (also used for waning moon). The opposite process of recompense or replenishment is described as ‘to have measured out to oneself, in buying or borrowing’ (LSJ, s.v. μετρέω IV.3), as in Hesiod, Op. 349 ἤ μετρέσθαι παρὰ γείτονος ‘get good measure from one’s neighbour’. Note that Thalassa and Ge are ‘neighbours’ in the cosmos, so they regularly lend and borrow from each by equal measure (εἰς τὸν αὐτὸν λόγον).

Let us now compare the use of the loan/repayment analogy in Anaximander and Heraclitus and note similarities and differences (if any). Only after this we can try to assess the relationship between the two. It is obvious that we are dealing with one and the same analogy or metaphorical model on the iconic level (the ‘source domain’ in Lakoff — Johnson terminology). In both cases this analogy is employed in the description/explanation of the cosmic processes, in both cases ‘creditors’ are the elements, cosmic masses or ‘powers’ (dynameis), and what is especially striking, in both cases the analogy does not end with the relationship between ‘productive’ forces and things produced, but is extended further by the inclusion of the third element: the ‘prefixed’ time of the repayment of loan (iconic level of meaning) which corresponds to the predetermined time of the destruction of a thing produced (referential level of meaning). But there is also a difference on the referential level of meaning. In Anaximander’s B1, if we interpret it as a general and universal law (i. e., not restricted to the generation of innumerable worlds from the ‘Infinite nature’ only), ‘debtors’ are all composite bodies, i. e. not only worlds, but also animals, human bodies etc. Their relation is that of inequality and power: ‘debtors’ depend on ‘creditors’, i. e. stuffs from which they ‘borrow’ their components at birth, but not vice versa. On the contrary, ‘creditors’ exercise absolute power over ‘debtors’ and mercilessly destroy them at the appointed time to extract by force the ‘repayment’ of debt or what is due (τὸ χρεών). If Anaximander ever used in this context the verb κυβερνάω (as applied to the supreme creditor of all being), he must have used it not in the teleological sense (intelligent design or divine providence), but as a synonym of κρατεῖν, to have in one’s power.
Every act of dissolution of a composite body in Anaximander’s Universe is a single-time irreversible event. Now, in all three fragments of Heraclitus that employ the loan/repayment analogy, the ‘borrowing’ and ‘repayment’ occur between opposite cosmic dynameis, i.e. between equals, and is reversible, i.e. is a recurrent regular event of an endless cycle.

A striking parallel is provided by Theodoretus, De providentia I, v. 83, p. 565, 18 ff. Migne:

Βλέπε τοιγαροῦ κάνταυθα τοῦ Θεοῦ τὴν πρόνοιαν, ἐφεστόσαν ἥλιον καὶ σελήνη καὶ τοῖς ἄλλοις φωστήρισι... (45) Καὶ ἐστὶν ἰδεῖν οἶνον τινας ἀδελφὰς, τὴν ἡμέραν φημί καὶ τὴν νύκτα, παρ’ ἀλλήλων δανειζομένας εἰς χρέιαν τῶν ἀνθρώπων τὸν χρόνον, καὶ πάλιν εὐγνωμόνως ἀποδιόδοσας. Τοῦ μὲν γὰρ χειμώνος λήγοντος, καὶ τοῦ ἐαρος ὑπολάμποντος...τινικάτα δανείζεται παρὰ τῆς νύκτος ἡ ἡμέρα, αὖξουσα τοῖς ἀνθρώποις τὸν τῆς ἐργασίας καιρόν...Τοῦ δὲ θέρους ἥδη μεσοῦντος, παῦεται μὲν δανειζόμενη, παρατύπτα δὲ τῆς ἐκτίσεως ἀπέτεια, οὐδὲ μίαν ἡμέραν ἀναβαλλομένη τὴν ἐκτίσιν. Κατὰ βραχὺ δὲ ὄμως, καθάπερ ἔλαβεν, ἀποδίδοσιν ὠπέ ἔλαβεν.

“You can also see the providence of God in this, presiding over the Sun and the Moon, and the luminaries... (45) And you can see that day and night are like two sisters, who borrow from each other time for the use of men, and return it with gratitude ... As soon as winter ends, with the first glimpses of spring the day immediately begins to borrow from the night, increasing the working hours for men ... and when it reaches the middle of summer, it stops borrowing and immediately begins paying off the debt, without delaying payments for a day. However, soon it returns exactly what it took.”

Theodoretus probably got this simile from a Stoic source based on Heraclitus and mediated by a Neoplatonic source. The words χρόνον ... ἐκτίσιν ... ἀποδίδοσι sound like echoes of Anaximander’s διδόναι ... τᾶς ... χρόνου in fr. B 1.

The standard Greek word for prefixed (appointed) time of payment of debt in Attic prose and in the koine was προθεσμία (still used in Modern Greek). It derives from ‘set’ (τίθημι) ‘before’ or ‘in advance’ (πρό), and seems to be a substantivated form of the original adjective in the phrase προθεσμία ἡμέρα ‘a pre-appointed day,’ cf. ὑπερημερία ‘overdue’, literally ‘beyond the set day’. We do not find it in the 5th century Ionian prose (Herodotus, Hippocratic corpus), it seems to be of Attic origin; in Attic law there was a προθεσμίας νόμος. This explains why both Anaximander and Heraclitus ignore this word speaking of preset date of return. Anaximander uses the phrase χρόνου τάξις ‘appointment of time’, Heraclitus speaks of οὐροτ (= ὄροτ) ‘limits’ or ‘terms’, as well as agonistic metaphor τέρματα ‘turning posts’ (in a stadium) and military metaphor τροπαί ‘reversals’ (= ‘defeats’ in battlefield). In
Herodotus, apart from the meaning ‘boundary’ and ‘boundary stone’, the word οὖρος is also used in temporal sense of ‘limit’ or prefixed ‘term’ (with verbs προτιθέναι, προκεῖσθαι); Thales predicted the solar eclipse by ‘setting in advance’ as a fixed point that very year in which it did occur’ (οὖρον προθέμενος ἕνιαυτόν τοῦτον… I,74, cf. Powell, Lex. Herod. s.v., 3). Note that προθέμενος echoes προθεσμία. The verbatim quotation from Heraclitus in the Deveni papyrus, col.IV has proved beyond any doubt that the correct reading in Heraclitus’ sun fragment fr. 56Leb (B94 DK) is οὖρος, not μέτρα. Heraclitus does not mean the size of the sun (this is doxographical misinterpretation), he applies the word ‘limits’ or ‘terms’ to the solstices mentioned in the same column below (line 13). This fact alone is sufficient to refute the ‘materialist’ interpretation of μέτρα in the cosmic fragment 37 Leb/B30 DK in spatial sense with reference to the ‘aggregate bulk of matter’ (first proposed by Burnet (1920: 150) and followed by Marcovich (1967: 275) and many others. Μέτρα is attested only once in Heraclitus fr. 37Leb./B30 DK, in this text the word is used in a strong temporal sense with reference to the ‘measured periods of time’, i. e., to diurnal, yearly and ‘megas eniautos’ regular cosmic cycles. The Sun god will never ‘overstep’ the fixed points of summer and winter τροπαί, because he cares for the human race and is an ideal ruler and embodiment of justice. In Heraclitus the ‘fixed points’ of all cosmic cycles are ‘preset’ by the ‘Wise Being’ that ‘governs the Universe’, and by his providential ‘intelligence’ (Γνώμη). There is no room for such agents in Anaximander’s naturalistic Universe. From the excellent (and underestimated) doxographical compendium used by Augustinus we learn that the lifespan (aetas) of innumerable ουρανοί, i. e. world-formations similar to ours, is unequal: it depends on how long such world-formation ‘can last.’ The source of Augustinus is not just a paraphrase of the Simplicius’ report, on this point it preserves more, the detail on the lifespan of ουρανοί and traces of the original wording not found in Simplicius: aetas renders Greek αἰών, cf. also ἔξι ἄπειρου αἰῶνος in Ps.Plutarch’s Stromateis. We do not find in our sources an explicit answer to the question what determines the lifespan of an ουρανός in Anaximander’s cosmology. One may guess that the mechanistic cosmogony provided a mechanistic explanation: a bigger ουρανός ‘lasts longer’ (manere potuit) and has a longer lifespan (aetas =

66 Cf. Xenophon, Memorabilia, IV.3; Lebedev 2019: 532–544; 597–599.
67 De civitate Dei, 8.2 = Anaxim. Fr.128 W. et innumerabilia mundos gignere et quaecumque in eis oriantur; eosque mundos modo dissolvi, modo iterum gigni existimavit, quanta quisque aetate sua manere potuerit; nec ipse aliquid divinae menti in his rerum operibus tribuenis.
68 Ps.Plut. Strom, 2 = Anaxim. Fr. 69 W. = Thales 260.
μακραίων and δολιχαίων (Emped. B21,12) are poetic epithets of gods. Incidentally, the hypothesis that Anaximander described the innumerable worlds by the poetic epithet of gods, explains the origin of the doxographicum according to which he identified innumerable ouranoi with gods. The smaller is an ouranos the shorter is his lifespan (βραχύβιοι vs. μακραίονες). Democritus’ theory of endless generation and destruction of innumerable worlds in the infinite Universe, which has roots in Anaximander and the Ionian tradition, admits the possibility of collapse of two worlds, as a result of which the smaller is destroyed (‘defeated’) by the bigger one: Δ. φθείρεσθαι τὸν κόσμον τοῦ μικρότερον νικῶντος (Placit. II, 4,9 = A84 DK = 12; 353 Luria). We cannot attribute this particular theory of collapse to Anaximander due to the lack of evidence, but we can plausibly assume that Democritus and Anaximander shared the same principle: the lifespan of a world-formation depends on its size. In his cosmogony Anaximander employed embryological analogies: the birth of an ouranos starts with a separation from the Infinite nature of kind of embryo, containing the opposites of hot and cold (γόνιμον θερμοῦ καὶ ψυχροῦ); the embryo formation was followed by growth compared with the growth of a tree: both the new-born ouranos and the first living beings were covered by ‘bark’ (φλοιός περιεχόμεναι), in the case of ouranos it was a ‘sphere of fire’ that broke into the rings of stars. This conception of the world as a gigantic living organism fits well with the term αἰών ‘lifespan’ which, unlike the abstract χρόνος, characterizes living beings.

Theophrastus in his Metaphysics quotes with approval Heraclitus’ refutation of some ‘materialists’ who posit only ‘material principles’ in the beginning which cannot explain the beauty, harmony and regularity of the actual cosmos produced by them:

    ἀλογὸν κάκεινον δόξειν ἄν εἰ ὁ μὲν ὀλός οὐρανὸς καὶ ἔκαστα τῶν μερῶν ἀπαντ’ ἐν τάξιν καὶ λόγῳ καὶ μορφαῖς καὶ δυνάμεις καὶ περιόδοις, ἐν δὲ ταῖς ἁρχαῖς μηθὲν τοιούτον, ᾧ ἥδεις σαμμὸς εἰκῆ κεχυμένον ὁ κάλλιστος, φησίν Ηράκλειτος, κόσμος.

“It would also seem absurd if the whole Universe and all its parts, everything is arranged in certain order, ratio, forms, powers and periods, whereas in the first principles there is nothing of the kind, but, in Heraclitus words, «the most beautiful cosmos /would be/ like a heap of rubbish dispersed at random»” 69.

Most probably Heraclitus engages here in polemics with the Milesians, and his main target is Anaximander’s vortex cosmogony. If this were so, he argues sarcastically, we would see now not the

69 Fr. 38 Leb./B124 DK = Theophr, Metaph. 15 We emend σάρξ as σαμμός.
‘most beautiful’ cosmos, but a heap of garbage like those debris that are produced by devastating whirlwinds. This is a remarkable anticipation of Lovelock’s ‘junkyard tornado’ argument, only with κάλλιστος κόσμος instead of Boeing. The harmony of the cosmos, according to Heraclitus, should be attributed not to the blind force of vortex, but to the divine cosmic mind (Γνώμη).

We therefore may conclude that Heraclitus borrowed from Anaximander the loan/repayment cosmological imagery, but changed its application, by applying it not to the composition-decomposition of compounds, but to all temporal cycles of regular interchange of opposites, the increase and diminution of cosmic powers, the diurnal (Day and Night), the year cycle of Horai-Seasons, and finally the ‘Great Year’, the lifespan of the cosmic god. However, in Heraclitus fr.42 Leb/B90 DK the analogy of loan/repayment, exactly as in Anaximander’s B1, illuminates the causal relation between the primordial substance as a sponsor of all being (creditor) and all separate things as debtors who are bound to return the borrowed portion of eve-living fire at the prefixed date, the summer tropai of Megas Eniautos (ekpyrosis in Stoic terminology).

The philosophic meaning of the simile has dramatically changed. What was physical science in Anaximander, has become metaphysics and natural theology with ethical-political message in Heraclitus. The mechanical necessity of τὸ χρεών gave way to the predetermination of the providential mind (Γνώμη) of the ‘Wise being’ (τὸ Σοφόν) which ‘alone governs the whole Universe’ (ἠ τε οἶο ἐκοβέρνησε πάντα διὰ πάντων, fr.140 Leb./B 41 DK). Anaximander’s idea of preservation of substance in change is kept, but it is one and the same ‘common’ substance of all beings permeated with the energy of life, not a mixture of various ‘seeds’.

The political message encoded in the simile may be read like this: if you have a system composed of conflicting powers and you want to have it running smoothly, transforming conflict into harmony, you will need to place a third controlling element above the two competing, a moderator who will set the common rules of competition for both parties, and will oversee that neither of them ‘oversteps the limits.’ Otherwise, one party will destroy the other and the whole system will collapse (οἰχήσεθαι πάντα). The polis of Zeus (aka ‘ever-living fire’), the kallistos kosmos, ruled by his son Apollo the Sun, who oversees the changes of day and night, winter

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70 The diverging doxographical figures 10800 or 18000 years, as well as 30-years duration of human genea may have been ‘reconstructed’ by later exegetes of the image of Aion playing pessoi, see Lebedev 2014 : 91–95.
and summer, is the ideal paradigm of such organization. Pace J.-P. Vernant, nothing of the kind should be read into the text of Anaximander’s B1 which is just a formulation of the physical law of material change and preservation of matter without any political or moral hyponoia. The legal terms of ‘damage’ and ‘compensation’ are used here metaphorically only to convey the idea that not a single gram of the ‘eternal nature’ is ever lost in any process of mechanical recombination of particles. Anaximander’s fragment B1 and Heraclitus’ fragment on the Sun and Erinyes, the minister of Dike, have often been compared and grouped under the heading of ‘cosmic justice’. This category of ‘cosmic justice’ is potentially misleading since it confuses the concepts of ‘laws of nature’ and ‘natural law’ which should be clearly distinguished. ‘Laws of nature’ are studied by physical scientists, theories of ‘natural law’ pertain to the domain of political philosophy and philosophy of law. Anaximander was a physical scientist, Heraclitus was a moral, political and theological thinker whose book contained the first systematic study of natural law. Aristotle committed a serious mistake by putting Heraclitus’ work in one group with standard Ionian Peri physeos which never touched on moral or political matters, not because their authors have ‘not yet reached’ that level, but because this was not their subject. The only exception was Archelaus who supplemented the history of the natural world with the origins of social institutions. In a sense Heraclitus’ remake of Anaximander’s loan/repayment analogy was a kind of peritrope, a polemical device the purpose of which was to ‘turn over’ opponent’s arguments or ideas against himself by modifying or ‘recharging’ them with polemical content. Heraclitus achieved this relying on his ‘triadic stricture’ (2+1), by reinterpreting the mechanical damage/recompense of Anaximander as a ‘law’ sensu proprio, established by the divine legislator, the cosmic god who ‘presides over’ the conflicting elements.

10. A hypothesis concerning the social status of the so-called ‘Milesian school’: a collegium or thiasos of physikoi, experts on matters of astronomy, geography, meteorology etc. under the patronage of Apollo Didymeus, serving the practical needs of the Milesian colonization, sea trade and founding new poleis.

“Milesian school” is a conventional and not very adequate modern term. There is no indication in the sources that it was an educational institution similar to the Athenian philosophical schools of the 4th century or the Pythagorean school in Italy, just as there is no indication that the Milesian thinkers acted as paid private tutors like the sophists in Athens. On the other hand, they were not separate individuals, either: the doxographic sources emphasize that
this was the tradition of thinkers connected with each other by the relationship of teacher and student. We get an impression that this group of thinkers in some respects may be rather compared with the early scientific societies of Modern Europe. A historically more accurate description of this group of Ionian naturalists would be “a scientific society of Miletus for the advancement of the natural sciences”, including astronomy, geography, meteorology. Aristotle painted an anti-historical picture, presenting the first Ionian naturalists (and other early thinkers) in the Alpha of Metaphysics as well-to-do gentlemen, who thanks to their leisure, indulged in idle contemplation of the amazing wonders of nature and competed proposing immature theories of the ‘first principles’ of being, at the same time approaching step by step the great final synthesis of Aristotle himself. Intellectual curiosity may have been one the psychological factors, but the whole complex of the mathematical-astronomical-geographical-meteorological sciences advanced by the Milesians, was of great practical importance for the navigation, sea trade and founding new poleis. Therefore, the Milesian ‘enquiry into nature’ was a demanded professional enterprise, a negotium, and not an idle entertainment, an otium. The school, created by Pythagoras in the West, set itself completely different primary tasks, but these tasks were also practical rather than idle speculation: the education of the ideal citizens and warriors.

What exactly was the social status of the ‘Milesian school’, whether it was a professional or a (formally) religious thiasos, whether it had a certain legal status or had no one, one can only guess in view of the extreme scarcity of sources. The most plausible hypothesis is that the Milesian physikoi were a group of experts (σοφοί) in astronomy, mathematics, geography and meteorology associated with the temple of Apollo Didymeus, the patron of the Milesian colonization. Miletus was the metropolis of 90 colonies, scattered over a vast area from southern France to Colchis and Olbia. The founding of each of these cities required the blessing oracle of Apollo. The bone plate with an oracular response of Apollo Didymeus (which we date soon after 494 B.C.) found in the Eastern temenos of Olbia and published by A. S. Rusjaeva in 1986, can be interpreted as a refoundation oracle of Olbia with a new name Ολβίη instead of the original Βορυσθένης. Speaking in the first person, Apollo Didymeus announces ‘peace to the Olbian (‘Blessed’) city’ (εἰρήνη Ολβίηι πόλει) in what seems to be a reconciliation of two parties in the conflict (stasis) between the oligarchical and democratic parties in Olbia, the supporters of the old cult of Apollo Ietros (whose archaic temple was located in the Western temenos) and of the new cult of Apollo Delphinios whose classical temple was erected in the Eastern temenos. According to the new information provided by Anna
Rusjaeva, this oracular plate was found not in the island of Berezan’, contrary to the incorrect original reports, but in the Eastern temenos of Olbia (Rusjaeva 2010: 41).

Like his Delphic brother, the Milesian Apollo performed a planetary civilizational function, he controlled the spread of civilization and the urbanization of rural areas, as well as the creation of new trade routes (both Greek and international) and nets of poleis, both economic and political. It can be assumed that the priests of Apollo Didymeus Branchidai had to deal not only with the sacred (founding sanctuaries, selecting priests), but also the practical side of the matter, such as, for example, choosing the best place for a new city, appointing archegets of expedition, taking into account water supply, wind rose, minerals, relations with the neighboring barbarians etc. Aristotle in *Politics*, in his advice on childbirth, recommends listening to what “doctors and physicists (physikoi)” say: doctors are authorities on the state of the body, and ‘physicists’ are experts on the state of the environment, they know, e. g., that the north winds are healthier, than the southern ones. Apparently, Anaximander was appointed an archeget of the *apoikia* (or rather *epoikia*, as suggested by Herda 2019: 25) of the Milesian colony to Apollonia Pontica (Sozopol in Bulgaria) precisely as such an environmental specialist, most competent in choosing the best place for the city (Aelian *V.H*. 8.3). This is is the first and most important evidence of the connection between the Milesian *physikoi*, colonization and the temple of Apollo Didymeus. The second evidence is the iambics of Callimachus describing the Milesian version of the legend of the Seven Wise Men. The Arcadian Bathycles, who brought the cup to Thales, found him in the temple of Apollo Didymeus, where he was drawing on the ground “a figure invented by the Phrygian Euphorbus”. This is a local-patriotic version of the legend, reflecting the rivalry between the oracles of Apollo in Miletus and in Delphi: instead of the Delphic tripod of the standard version, the Milesian version has goblet, which Thales dedicates to the temple of Apollo Didymeus as ‘the wisest’, and not to Delphi, as in the standard version. At the same time, the version of Callimachus contains an allusion to the superiority of the

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71 On Apollo Didymeus and Delphinios as gods of colonizastion see Herda 2011.

72 Arist. *Pol*. 1335a39 δεὶ δὲ καὶ αὐτῶς ἢδη θεωρεῖν πρὸς τὴν τεκνοποιίαν τὰ τε παρὰ τῶν ἱατρῶν λεγόμενα καὶ τὰ παρὰ τῶν φυσικῶν· οἱ τε γὰρ ἱατροί τοὺς καιροὺς τῶν σωμάτων ἰκανῶς λέγουσι, καὶ περὶ τῶν πνευμάτων οἱ φυσικοὶ, τὰ βόρεια τῶν νοτίων ἐπαινοῦντες μᾶλλον.

73 Callim. Fr. 191. 58–62 Pfeiffer. Hahn (2017) 136. The allusion in ‘that very figure’ or diagram (σχῆμα) to Pythagoras’ theorem is obvious, and was noticed by Burkert (1971: 420 n. 106), Pfeiffer and others.
Milesian mathematicians and sages and, possibly, to the plagiarism of Pythagoras: the teachings of Pythagoras about reincarnation (vegetarianism) and his geometrical discoveries are attributed here to the first incarnation of Pythagoras — the Phrygian (that is, a native of Asia Minor and compatriot of the Milesians!) Euphorbus: the geometrical figure drawn by Thales on the sand at the moment when Bathycles arrives in Callimachus’ story, is most probably the demonstration of Pythagoras’ theorem. The allusion (hyponoia) is that the Milesian Thales long before Pythagoras knew the theorem which the latter claimed as his own discovery. Expounding the Milesian version of the legend, Callimachus could weave into it historical data from the biographical tradition of Thales, which linked his studies of mathematics with the temple of Apollo Didymeus. The highest wisdom of Pythagoras in the circle of his admirers was emphasized by his connection with the oracle of Apollo of Delphi (as well as with Delos). The highest wisdom of Thales in the Milesian version of the legend is emphasized by his connection with Apollo of Didyma: here we see the rivalry of oracles at work. Finally, the third evidence, possibly reflecting the tradition of the connection between the Milesian physikoi and Didymeion, we find in the legendary correspondence between Thales and Anaximenes, quoted by Diogenes Laertius.

In a letter to Pherecydes Thales writes that he wishes to come to Syros and “become his interlocutor in what he writes about” (D. L. I, 42; 1.58 Dorandi ἐθέλω γενέσθαι λεσχηνώτης περὶ ὅτεων γράφεις). In the plural, the same Ionian word meaning ‘disciples’ (literally ‘interlocutors”) is also found in the letters of Anaximenes. In a letter to Pythagoras, Anaximenes informs him that Thales died after falling off a cliff, “and we, his disciples, remember him ourselves, as well as our children and disciples” (DL II, 4; 1.18–21 Dorandi ἡμέες δὲ λεσχηνώται αὐτοὶ τε μεμνώμεθα τοῦ ἀνδρός, οἱ τε ἡμέων παῖδες τε καὶ λεσχηνώται). Here the word λεσχηνώται refers to the entire “Milesian school” after Thales. In a letter to Pythagoras, his disciples from Sicily are named so: DL II, 5; 1.34 Dorandi φοιτέουσι δὲ τοι λεσχηνώται καὶ ἐκ Σικελίης. The fictional letters of Greek philosophers are not reliable historical sources and should not be taken at face value. On the other hand, they should not be dismissed without ado as absolutely worthless. Like historical novels they may contain here and there quotes, typical expressions or certain facts from the historical tradition, the purpose of which is to give them credibility. For example, the letters of Pseudo-Heraclitus contain many reminiscences from the book of Heraclitus and genuine philosophical doctrines and attitudes found in his

74 On the religious rivalry and competition between oracles see Eidinow 2014.
authentic fragments for example, criticism of the Greek folk religion, monotheism, pantheism, ‘cosmic medicine’, etc. The rarest word λεσχηνώτης, except for these passages, is not found anywhere else. In ancient biographies of philosophers, the usual words for ‘disciples’ are μαθητής, ἀκουστής, ἑταῖρος, γνώριμος, but not λεσχηνευτής. The chances are that the author of the letters took this Ionian word from the biographical tradition of the Milesians, to give credibility to his compositions. Let’s pay attention to the fact that the word λεσχηνώται is applied to the students of Thales, that is, to the Milesian school. Exedrae have been linked with gatherings and “mobile situations” in Greek sanctuaries, e. g. in the Asklepieion in Epidauros; they were suitable for gathering of small social groups (Kristensen 2018). Λεσχηνώτης (λεσχηνευτής) derives from the verb λεσχηνεύομαι ‘to talk, to converse with’, which is attested in Heraclitus fr. 144Leb/B5DK and in early Ionian prose: Democritus, Herodotus in compounds, περί, Hippocr. Prorrh. 2.4 connected with μαθηταί. The best recent discussion of the history and cultural aspects of Greek λέσχη is chapter 9 in J. Bremmer’s “Greek religion and culture…” (2008: 153–168). As regards, the etymology, Beekes tries to defend the hypothesis of the Anatolian common source (unattested!) with the word in Hebrew, but his semantical objection to the derivation from λέχομαι (“λέσχη was not necessarily a room for lying down”, EDG 850) is invalid. In the first attestation of the word λέσχη in Odyssey 18.329 it refers to a warm place where a stranger can spend a night (εὐδείαν). And λέχομαι can mean ‘to repose’ with reference to dinner, so the original meaning of λέσχη may have been ‘dining room’ as in Boeotia: Etym. Magnum s.v. λέσχη· λέσχαι παρὰ Βοιοτοῖς τὰ κοινὰ δειπνητήρια ‘Lounges (leskhai) among Boiotians are the common dining rooms’. Chantraine DELG 632 persuasively reconstructs the original form *λέχ-σκα, from the verb λέχομαι ‘to repose, to recline’. An example of a similar semantic development is provided by the English lounge, from French s’allonger ‘to stretch out’.

The use and functions of Greek λέσχη in various places and periods were multifarious. One should distinguish at least five. 1) Public lounges open to everyone where simple people used to gather and talk. They were associated with σχολή, doing nothing and gossip (ἀδολεχία, φλυαρία)75. These demotic λέσχαι may be com-

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75 Harpocrton, Lex. in decem oratores, Lambda, lemma 9 Λέσχαι· Ἀντιφών ἐν τῷ Πρὸς Νικοκλέα λέσχας ἔλεγεν δημοσίως τινὸς τόπους, ἐν οἷς σχολὴν ἄγοντες ἐκαθέζοντο πολλοὶ. Ὅμηρος: οὐδὲ θέλεις εὐθέως χαλκήιον ἐς δόμον ἐλθὼν ἰὲ που ἐς λέσχην. “Лесхи. — Антифон в речи Против Никокла: лесхами называли публичные места, в которых сидел народ, проводя досуг. У Гомера: А ты не хочешь спать, приди в медный дом или в лесху”.

pared with traditional καφενεία in modern Greek villages where old men sit and talk for hours, rather than with modern Greek λέσχη ‘club’ which is often reserved for the elect members. Anthropologists compared them with ‘primitive’ men’s houses. They probably could serve as a free hostel at night, as in the passage of Odyssey quoted above. 2) Dining rooms, as in Boiotia. The precise meaning of ‘common dining-rooms’ uncertain: a kind of taverna, a thermopolion, or a public lounge that could be rented or used for a dinner by relatives, friends or a social group. 3) In political sphere, a permanent place of gathering of a collegium or committee. In Sparta Λέσχη was a building in which presided the elders (πρεσβύτατοι) who decided whether a newborn should live or disposed. 4) Λέσχαι attached to sanctuaries. The most celebrated was the Lesche of Cnidians in Delphi painted by Polygnotus. Some leschai were dedicated to Apollo Leschenorius, in Thessaly and the Greek West, not in Ionia, according to Bremmer. 5) Of special interest for our purpose is the association of λέσχαι with performance of poetry, recounting of myths, as well as with philosophy and philosophical conversations. The similarity of λέσχαι with ἐξέδραι mentioned in Harpocration’s Onomasticon, probably refers to their similar function as public places of gatherings rather than to architectural form: unlike exedrae of the Hellenistic and Roman times archaic and classical Greek λέσχη was a closed lounge or hall (οίκημα). The word λέσχη could also mean talk, conversation or political debate.

76 Photius, Lex. s.v. λέσχαι: Κλεάνθης δὲ φησιν ἀπονεμήσθαι τῷ Ἀπόλλωνι τὰς λέσχας, ἐξέδραις δὲ ὀμίασι γίνεσθαι, καὶ αὐτὸν δὲ τὸν Ἀπόλλων παρ᾽ ἐνίοις Λεσχηνόριον ἐπικαλείσθα = Cleanthes, SVF 543. “Cleanthes says that leskhai are dedicated to Apollo, they happen to be similar to exedrae, and Apollo himself in some places is called [or has the cult epiklesis] Leschenorius.” Harpocration, s.v. λέσχαι adds the precise source: Κλεάνθης ἐν τῷ Περὶ θεών. Explanation of the epiklesis in Cornutus, 32: καὶ λεσχηνόριον δ’ αὐτὸν (Ἀπόλλωνα) προσήγορεσαν διὰ τὸ τὰς ἡμέρας ταῖς λέσχαις καὶ τῷ ὀμίλειν ἄλληλοις συνέχεσθαι τοὺς ἀνθρώπους, τὰς δὲ νύκταις καθ’ ἑαυτούς ἀναπαύεσθαι. “They called Apollo Leschenorius because at the daytime men are kept together by conversations and communication, whereas at night time they take a rest in private.”

77 Hendrikson, The invention of Greek library, 372 “A corollary to the traditional narrative of the history of libraries is a history of their architectural form: a “Greek library” was a small room or rooms off a colonnade (as it had been in gymnasia like the Lyceum), whereas a “Roman library” involved a large reading room that held both books and book-related activities etc.”. Strabo describes the grounds of the Museum in Alexandria as follows: τὸν δὲ βασιλείων μέρος ἐστὶ καὶ τὸ Μουσείου, ἔχον περίπατον καὶ ἐξέδραν καὶ οίκον μέγαν ἐν ὑδὸ καὶ συσσίτιον τῶν μετεχόντων τοῦ Μουσείου φιλολόγων ἁνδρῶν (17.1.18). The Museum is also a part of the royal grounds, and it has a walkway, an exedra, and a
The title of the lost work of Heraclides Ponticus Λέσχαι probably means philosophical conversation, a synonym of the later term Διατριβαι. The leskhe of the Milesian physikoi may have been attached to the temple of Apollo in Didyma. This hypothesis is favored by some indications in the biographical tradition noticed above, although the Delphinion of Miletus cannot be ruled out, either. It provided place for the meetings and conversations of the first scientific society not only in Greece, but in the history of mankind. It may have also provided housing for their library, various scientific hypomnemata, the celestial globe and map of Anaximander, natural mirabilia etc. It must have been destroyed by the Persians together with Didymaion either in 494 or in 479, depending on which date is correct. We will never know whether the library collection of the Milesians was saved or destroyed together with the sanctuary during the suppression of Ionian revolt in 494 (according to alternative possibility, by retreating Xerxes in 479). Fortunately, copies of Anaximander’s and Anaximenes’ books existed in fourth century in the library of Aristotle and later Peripatos, and very likely, in the libraries of Anaxagoras and Democritus in the fifth.

In biographical sources Anaximander is called a fellow citizen, student and successor (as the head of the Miletus school), as well as a relative (according to the lexicon of the Court) of Thales of Miletus. The names beginning with Anax- (‘lord’) are typical of the aristocratic environment, which is in agreement with the indication of Suda that Anaximander was a relative of Thales, who belonged to the noble family of Neleidai. The dates of A.’s life are established on the basis of the unusually accurate testimony of the chronologist Apollodorus of Athens (Diogenes Laertius 2.2): in the second year of the 58th Olympiad (547/6 BC) Anaximander was 64 years old and soon after that he died. Therefore, Anaximander was born in 610/9 BC. and died in the mid 40s of the 6th century BC. The 546th year was the year of the conquest of Ionia by Cyrus of Persia, later it served the Ionian Greeks “epochal” for informal chronology (“the year when the Medes came”). Diogenes Laertius cites the dating of Apollodorus along with an indication that Anaximander “made a brief exposition of his views”, which “fell into the hands of Apollodorus”: meaning that Anaximander's book was very rare and Apollodorus was lucky. Obviously, the information about the ‘find’ of Apollodorus Diogenes borrowed from the context of his Chronicle; on the basis of this, it can be concluded that Apollodorus found such accurate information about the age of Anaximander (instead of the usual approximate dating by ‘acme’) in “the large hall in which there is the dining room for the scholars who are fellows of the Museum (Hendrikson ibid.: 374).
exposition of his views”. Likewise, Xenophanes says in an elegy that in “the year that the Mede came” (546), he was 25 years old. Democritus, in the preface to Mikros Diakosmos, indicated that his treatise was written in the 730th year after the capture of Troy. We do not know whether Anaximander’s death “soon after” the Persian conquest of Ionia was somehow related with this event. It may be unrelated. However, if the date of composition was recorded by Anaximander himself in the preface to his work, a question arises why did he decide to publish his discoveries at this particular moment. One possible explanation might be that Anaximander was aware of the historical importance of the new picture of the world he created and, with the outbreak of war, he hurried to write down and preserve his discoveries, e.g. by dedicating a copy of his work to the Didymeion, just as Heraclitus dedicated his work to the Artemision in Ephesus. But this remains just a possibility that needs further confirmation.

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