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Anaximander and the Architects

Robert Hahn
Southern Illinois University Carbondale, hahnr@siu.edu

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ANAXIMANDER AND THE ARCHITECTS

A study of the philosophical mentality of Anaximander of Miletus (c. 610 - 546 B.C.) is by its very nature a study in the origins of western rationality; this short study is part of a much wider project that invites a review of that tradition. The origins of Greek philosophy/science, traceable to the Milesians on Aristotle's account, form the foundation of a tradition that identifies the exercise of human reason as the highest virtue. Familiar studies envisaged western rationality as the triumph of reason over the senses; the mind, not the body, holds the key to a deep understanding about nature. Indeed, it is by transcending the senses and the bodily dimensions of experience that reason can grasp what truly is, Being as opposed to Becoming. Reason's reflection on its own operations was supposed to be sufficient to generate an understanding of the way things are. A consequence of this position was to self-consciously define the boundaries of appropriate investigations into rationality: since the success of rationality depended upon the conscious rejection of the bodily and sensorial aspects of experience, a knowledge of the historical, social, political, religious, economic, and technological context was routinely excluded from further examination. The broad thesis I am pursuing is that traditional attempts to understand reason and rationality trans-temporally and hence trans-contextually, disengaged from the body and its situatedness in an historico-socio-political order, have proved inadequate to account for the nature and origins of western philosophy/science. And thus, philosophy cannot understand itself, its purposes and tasks, independent of that embeddedness and our reflection upon it.

Why is this review and reassessment necessary? The recent and important work of Jonathan Barnes, in his two volume study of the Pre-Socratics, makes it impossible to undertake the kind of investigation pursued here. Barnes represents the traditional view that denies that an understanding of rationality depends in any way upon the historical context in which reason operates.

"...I have little concern with history. It is a platitude that a thinker can be understood only against a historical background; but that, like all platiitudes is at best a half-truth, and I do not believe that a detailed knowledge of Greek history greatly enhances our comprehension of Greek philosophy. Philosophy lives a supracelestial life, beyond the confines of space and time; and if philosophers are, perforce, small spatio-temporal creatures, a minute attention to their small spatio-temporal concerns will more often obfuscate than illumine their philosophies. History, however, is intrinsically entertaining. A few external facts and figures may serve to relieve the reader from the purely abstract narrative: I hope that my occasional historical paragraphs may be of use to that end, and may do something to placate the historically-minded reader."1 (my italics)

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1Barnes, 1979, vol. I, p. x. Cf. also his response to the criticism his work generated on just this point, 1982, p. xvi. Barnes modifies his rhetoric as a result of the criticism but his position is substantively unchanged: "Some critics, indeed, have accused me of being anti-historical, and their accusation has some point: I made one or two naughty remarks about history, and I occasionally flirted with anachronistic interpretations of Presocratic views. For all that, the book is a sort of history: it recounts past thoughts, and its heroes are long dead. In speaking slightlyingly of history I had two specific things in mind - studies of the 'background' (economic, social, political) against which the Presocratics wrote, and studies of the network of 'influences' within which they carried out their researches. For I doubt the pertinence of such background to our understanding of early Greek thought...." (my italics)
Barnes represents a dominant point of view in certain philosophical circles. Those who subscribe to this perspective tend to rule out of hand the possibility that the innovation of philosophy and science owed a significant debt to the architects engaged in monumental temple building contemporaneous with the flourishing of Anaximander. Indeed the supracelestial view makes it impossible to take such an investigation seriously. The short article now being presented, part of this larger project of tracing out the origins of the earliest philosophers within their cultural context — and in this way re-appraising the very idea of western rationality — offers a challenge to Barnes' point of view.

This essay is divided into several sections. In (B) I set out the problem of making a diagram or model of Anaximander's cosmos, then in (C) I outline the relevant fragments and testimony -- for Anaximander's picture of the cosmos and its formation -- from which a diagram or model might be constructed. Next, in (D) I invite the reader to reflect on the differences between plan and elevation perspectives: two ways of imagining. In (D.1), evidence for plan and elevation perspectives in ancient Egyptian architecture is examined, and the contributing influence is considered; in (D.2) evidence for plan and elevation perspectives in archaic Greek architecture, focusing on the Ionian evidence, is then taken up. In (E), possible plan and elevation renderings of Anaximander's cosmos are displayed. And then, in (F), some reflections on the consequences of this project are briefly considered.

The Problem of Imagining Anaximander's Cosmos

More than thirty years ago, in important work by both Kahn and Sambursky, the opinion was expressed that Anaximander's cosmology permitted representation in a diagram. Kahn made the point that while it would be hopeless to draw a diagram of the poetic descriptions of the cosmos by Homer and Hesiod, "the characteristic view of [Anaximander's] earth [is] that it lends itself directly to geometric representation." And Kahn continues, "We can scarcely doubt that the Milesians were in fact accustomed to discuss such matters with the aid of diagrams or simple models." Sambursky put forth the same sentiment when he declared that, "In the cosmology of Anaximander use was made for the first time of the scientific model as a means of description or as a method of explaining phenomena." Although both scholars identify Anaximander as the first in a line of cosmologists whose geometrically-conceived models of the cosmos can be represented in a picture, neither offered us a possible rendition.

The problem of drawing a picture or making a model creates difficulties. When Anaximander imagined the cosmos, from what perspective or perspectives did he do so? Is it likely — and on what grounds — that some other part of his 6th century community inspired his imagination? Who else was engaged contemporaneously in drawing diagrams or model-making? Is there any light to be thrown on possible variations in perspective-representations with which Anaximander may have been familiar?

Presocratic studies, by the very fragmentary nature of the evidence, must be speculative. In attempting to offer visual models, I am painfully aware of the degree to which guesswork enters into the formulation. Nevertheless, what I shall try to do is to sketch a plausible case that Anaximander may likely have imagined the cosmos from more than one perspective or model, and that the community of architects/engineers working contemporaneously on monumental

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2Kahn, 1960, p. 82.


4There are those, like Dicks, 1970, p. 43-45, and 1966, pp. 26-40, for instance, who believe the tertiary evidence is so unreliable that nothing can be reasonably concluded. Cf. the rebuttal by Kahn, 1970, pp. 99-116.

5There is no technical term in Greek for "engineer". Herodotus (3.60, cf. also 4. 87) uses the term architektōn when referring to Eupalinos of Megara who supervised the construction of the tunnel/water-channel in Samos.
stone temples to Hera in Samos, to Artemis in Ephesus, and to Apollo in Didyma, directly or indirectly stimulated his cosmic imagination.

If the case seems compelling, the next step would be to sketch out a picture of the socio-political context in which the architects/engineers were brought to center stage and so could affect Anaximander’s philosophical conceptions. Such a study would focus upon the origins of western philosophy/science as a cultural practice. That is, the western tradition of rationality traced back to the Milesians such as Anaximander must be grasped as embedded within the framework of relations that motivated temple building. Broadly conceived, archaic temple building, among its several purposes, was an expression of the struggle for power and the control of land in an age of apparent fluidity and unpredictable settlement.

C

Prose Fragments and Testimony on Anaximander's Cosmic Structure and its Formation

In the surviving prose fragments and testimonia, what claims can we reasonably accept about the image and formation of Anaximander's cosmos?

a) The shape of the earth is curved, round, like the drum of a column (kionos lihdi parapësion); the earth is cylindrical in shape, its depth is one-third of its width (= 3 x 1).

around 530 B.C. For a discussion of the architect, cf. Coulton, 1977, ch. 1. For the distinction between architect and engineer, cf. the thoughtful essay by Holloway, 1969, p. 286ff. Some person or persons were chiefly concerned with the overall design of the building and its detailed parts; this person(s) may be called the "architect": some person or persons were responsible for executing the construction -- quarrying, transporting, placing, and dressing the stone; this person(s) may be called the "engineer". It may be that the architektön was responsible for all aspects of the construction and the various tasks were shared by teams of architects.

I want to be clear from the start that I am not arguing Farrington's thesis, 1949/61, that technology proved to be a sufficient condition in accounting for the rise of Greek philosophy. Lloyd, 1979, p. 235, correctly criticized Farrington's thesis. If technology were sufficient then Egypt and Mesopotamia should have witnessed the birth of philosophy for they excelled over the Greeks in technological mastery. My thesis only entails the view that certain contributing aspects of technology have not been fully appreciated. However, if we make a list of the achievements, real or imagined, attributed to Thales, Anaximander, Rhoikos/Theodorus and Chersiphron/Metagenes, and place them side by side, the kinship is striking. Thales is credited with predicting some sort of stellar anomaly, generally spoken of as the prediction of a solar eclipse, the measurement of the height of a pyramid, the measurement of the distance of a ship at sea, diverting the river Halys for Croesus' army, among other things. Anaximander is credited with the first geometrical-model of the cosmos, the first Greek map of the inhabited earth, and the first seasonal sundial. Theodorus is credited with inventing or introducing into Greece the set-square, the level, the rule, the key, the lathe, diverting the river Imbrasus in order to set the platform for the Heraion, and a new technique for casting life-size bronze statues. Chersiphron is credited with inventing a device for moving huge monoliths, and his son Metagenes gained esteem for developing that technique for the delivery of monolithic architraves. The broad family resemblance of these achievements is a kind of applied geometry with technological innovation; the kinship suggests a community of common interests. Cf. also Snodgrass, 1980, pp. 142ff.

If we emend guros for hugron, the word "curved" must be interpreted to mean "concave" rather than "convex." (Cf. also Burnet, 1945, p. 65 n.1) The familiar Ionian doctrine is that men live in a hollow of the earth, that is, the Mediterranean basin. As Kahn noted, this is also the teaching of Anaxagoras, Archelaus, and Democritus.

Diels-Kranz [DK], 12B5. Hippolytus, Ref. 1,6,3. On the reliability of Hippolytus on Anaximander, cf. Kahn, 1960, p. 15: "All of the information which this author [Hippolytus] gives us concerning Anaximander (with the exception of his date...) comes from Theophrastus and from no other source. He is drawing on an epitome in which information spread throughout the sixteen or eighteen books of the Phys. Opin. had been grouped under the names of various thinkers. The account of doctrines has been abbreviated.....But no basic blunders mar these excerpts." Hippolytus is, along with Simplicius, our best surviving source for Anaximander.
b) Out from a conflict of opposites -- of hot and cold -- a sphere of flame was formed round the air surrounding the earth, like bark (phloios) around a tree (dendron), and when this was broken off and shut off in circles, the sun, moon, and stars were formed. Thus, the sun, moon, and stars are circles of fire, encased in air, like certain pipe-like passages; what we identify as the sun, moon, and stars is the fire showing itself through holes in these fiery pipes, as through the nozzle of a bellows (présteros aulos). Each of these fiery circles, are like the wheels of a chariot, with its felloe hollow.

c) The circle of the sun is 27 times that of the earth; the circle of the moon is [18] times the size, and [presumably] the circle of the stars is 9 times that of the earth.

Sambursky emphasized that the model of revolving wheels and the fire appearing at the mouth of a forge are "perfect examples of technical analogy." The use of technical analogy indicates the "tremendous revolution in thought which took place in sixth century Miletus." And this assessment seems just right. However, the striking feature of this description of the cosmos that has been neglected in scholarly discussions is the architectural structure of the column drum, and the particular technical analogy on which Anaximander may have been

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9DK 12A10. Ps. Plutarch, Strom. 2. Cf. Kirk-Raven, 1957, p. 134; Guthrie, 1962, I. p. 95. Cf. also the interesting article by O'Brien, 1967, esp. pp. 424-425, who points out the difficulty of the expression echein de (sc. tên gēn) tōsouton bathos hoson an eite triton pros to platos and suggests that its meaning might be that the height is three times the size of its diameter, not one-third. According to the more widely accepted interpretation, that the earth's diameter is three times its height, the earth would be more likely to float on air as a reasonably flat disk. However, if one accepts that the earth is held aloft dia tên homoian panton apostasin then it does not matter whether the earth is conceived as a longer cylinder rather than as a flatter disk.

10DK 12A10. Ps. Plutarch, Strom. 2. The proposed order that the wheel of the stars is closer than the moon and sun is unusual. Kahn, 1960, p. 90, proposed a completely "rational" explanation: where there is more fire, and hence brighter, the wheel is more distant; thus if the stars were brighter, they would be further, but they are not brighter, therefore they are not further. Burkert, 1963, suggested Zoroastrian influence by pointing to passages in the Avesta that offered precisely the same cosmic arrangement where the stars were closer than the sun and moon. West, 1971, p. 109, agreed with Burkert and concluded that there were two main components of Anaximander's vision: "...a native tradition of materialist meteorology and physics, and an oriental tradition of metaphysical speculation."

West's general conclusion was that, p. 97: "Anaximander's conceptions cannot be derived from Greek antecedents, and to suppose that they chanced to burgeon his mind without antecedents, at the very moment when the Persians were knocking at Ionian doors, would be as preposterous as it was pointless."

11DK 12A11. Hippolytus, Ref. 1,6, 4-5.


13DK 12A22, Aetius, II, 25, 1, and DK 12A21, Aetius, II 20, 1: hamarteiōi traxōi.

14Ibid. tên hapsida echonta koilen.

15DK 12A11. Hippolytus, Ref. 1, 6, 4-5; and DK 12A21, Aetius, II, 21, 1. I follow the discussions in Kirk-Raven, 1957, pp. 134-135, and West, 1972, ch. 3. But, cf. also O'Brien, 1967, pp. 423-432, who calculates differently and cannot be easily dismissed. He wonders about the diameters of the fiery wheels (not simply to be confused with the apertures that appear on the inside face of them) and whether the distances to the stars, moon, and sun are measured in terms of 9, 18, and 27 earth diameters or radii. The difference changes the numbers but not the proportions. The importance of O'Brien's article is to alert us to the question of what method of calculation was being employed in the measurement of distances or sizes of heavenly bodies: (i) calculations that were to some extent scientific, (ii) a pythagorean notion of notes on a musical scale, and (iii) simple non-musical numerical proportions.

16Sambursky, 1956, p. 15.
drawing. If a plausible case can be framed that Anaximander thought through the cosmic structure by reflecting upon features peculiar to innovative techniques in column drum preparation, originating in the 6th century monumental temples in Samos, Ephesus, and Didyma, we may have indication of unsuspected contributions from the community of architects/engineers to Anaximander’s philosophical conceptions.

Hippolytus’ testimony that Anaximander identified the earth as a κόλπος λίθων has not been an issue of contention, and the testimony is in accord with that offered by Pseudo-Plutarch. Further, column drum construction was a technical innovation in Ionia in the first half of the 6th century, the proportions of 3 x 1 would be broadly appropriate for the constructions themselves, and technical analogy, as Sambursky rightly observed, was characteristic of Anaximander’s thought. The striking feature, however, of the picture projected by Anaximander, on the authority of the doxagraphical tradition, is that the earth is shaped like a column drum, three times as wide as it is deep, a "ratio which is analogous to the distances of the heavenly bodies." The cosmos displays a structure analogous to the column-drum earth; that is, the structure of the cosmos is expressed in terms of the structure of the column drum earth.

The case I am trying to sketch rests on two central points: (i) Anaximander imagined the cosmos in terms of a column drum earth; this image invites us to investigate a possible connection with the technology and design of archaic temple architecture underway in his own backyard; and (ii) Anaximander may likely have imagined the cosmos from more than one point of view, and a possible source for inspiring these different imaginative perspectives might plausibly have been the architects.

D
Two Ways of Imagining: Plan vs Elevation Views

In the attempt to make plausible a connection between Anaximander and the efforts and productions of the architects who undertook the task of planning and executing the monumental temple constructions, my argument must make plausible some more specific claims. It seems quite possible that Anaximander imagined the cosmos from more than one perspective. And it might be that he did without ever having been impressed to do so by any acquaintance with the planning and construction of the architects. In the next section, I shall investigate the imaginative differences that become apparent when his cosmos is visualized in plan or elevation. And this argument can, I believe, stand separately in the absence of conclusive evidence. However, the case I want to sketch is the one that invites us to see a possible, and deeply interwoven, interaction within a social community that brought together phusioLOGos, like Anaximander, and architekTōn, like Rhoikos and Theodorus, Chersiphron and Metagenes. The


18 The names of the architects identified with the archaic Heraion, and the archaic Artemision, come to us from Vitruvius, c. 25 B.C. in his Ten Books on Architecture. He mentions that they wrote prose treatises, 7.12, p. 198. That these architects wrote prose treatises, no longer extant, is doubted by some, but important scholars have accepted Vitruvius’ assertion. If they did write prose treatises at roughly the same time that Anaximander wrote his philosophical book in prose, another possible connection between their communities would be suggested. Cf. Coulton, 1977, p. 24: “An important development in the middle of the sixth century was the writing of the first architectural treatises....These must have been among the earliest prose works in Greek, for the first philosophical work in prose was written by Anaximandros of Miletus at just about the same time. The Ionian school of philosophy in the sixth century had an interest in the practical as well as the abstract....It is presumably not merely coincidental, therefore, that the first Greeks to write about architecture were working in Ionian cities.” Cf. also Hurwit, “Rhoikos and Theodorus wrote a book about their limestone behemoth — another example of early prose and one probably far more prosaic than Anaximander’s book on nature....[sc. concerning the Artemision] Chersiphron of Knossos and his son Metagenes, wrote a book about their temple, too.” Cf. also Dinsmoor, 1902/1950, p. 124n1: “The book by
possible influence of the architects on the origins of early Greek philosophy has not been fully appreciated.

If Anaximander came to think of the cosmos from more than one perspective, he might have been inspired by the architects working in the second quarter of the sixth century. Is there any good reason to suppose that the archaic architects planned or executed their constructions in terms of plan and elevation perspectives? I believe there is reason to suppose that they distinguished between these two points of view; however, the degree to which these perspectives were regular features of their work is difficult to establish. To investigate this case, I first reflect on what we know about architectural drawings from Egypt, an important source of influence. I then focus on the more conjectural case for sixth century Ionia.

D.1

Plan and Elevation Views in Ancient Egyptian Architecture

Why investigate the Egypt connection? From the mid-seventh century and following, the Ionians would surely have seen the monumental works of pharaonic architecture in dressed masonry, and more importantly could have learned from the busy architectural endeavors of Psamtik I, and his successors, how such buildings were erected. Around 660 B.C. the Egyptian pharaoh known to the Greeks as Psammetichos gained control over his country from the Assyrians with the help of mercenaries from Ionia and Caria. From that point on, close contact between Ionia and Egypt is evidenced in many forms not least of which was the establishment of the Greek trading colony at Naucratis in the late seventh century.

The importance of Egyptian influence is part of the familiar discussion among historians of architecture. Egyptian and archaic Greek temple architecture both depend on accurate megalithic masonry, and in the absence of monumental buildings in Ionia, Egypt would have offered ready examples of techniques for quarrying, transporting, and dressing huge monoliths. None of the emphasis on “influence”, however, should undermine the equally strong case that Greek temple architecture developed in very different ways from that of the Egyptians. The relevant case here is that Ionian Greeks would have had the opportunity to see, first-hand, monumental temples, like the multi-columned temples at Karnak and Thebes, and Abydos and elsewhere. They would have been in a position to observe and marvel at the techniques of construction displayed in the on-going building programs of Psamtik and his successors. And those who would finally have been entrusted to plan and supervise the archaic Heraion, Artemision, and Didymaion, would have had a chance to reflect on how the Egyptian architects/engineers imagined and produced their buildings.

How did the ancient Egyptian architects plan and execute their buildings? It is not easy to say with great confidence. There is no doubt that tremendous planning would have been required, but just how that planning was carried out is far more open to doubt. What we do know about building plans is detailed in the classic work on ancient Egyptian architecture by Clarke and Engelbach, a work that is still generally regarded as the standard. According to their work, the following preparations seem to have been undertaken prior to building:

Theodorus (the earliest architectural treatise of which the title has come down to us)....* Cf. also Tomlinson, 1976, p. 127: “The architects of the temple [of Hera] were Rhoikos and Theodorus. Theodorus wrote a treatise about it, which was known to the Roman architect Vitruvius.”

19Cf. Herodotus, 2.152-4, and also 4.152.1.


21Clarke and Engelbach, 1930/1990, pp. 46-68.
a) "Plans -- perhaps models -- of the proposed building had to be submitted to the king...."
b) "Actual plans and models have been preserved...

c) "There were palace archives where plans of temples were preserved, since in one of the
crypts at Dendera an inscription states that the plan of the temple was found, written in ancient
characters, in the palace of King Pepi...."
d) "Another passage relates that a restoration had been made by King Tuthmosis III after a
plan had been found dating to the time of King Khufu."
e) "The Egyptians were able to draw an object from different aspects, showing side- and
end-elevations, for example, but only one drawing has been preserved as definite proof."
f) "A truly sectional representation of a house, showing the contents of each storey, is
known in the New Kingdom."

The front and side elevations of a shrine on papyrus, dating to the 18th dynasty -- the New
Kingdom (ca. 1580 - 1304 B.C.) -- is pictured below:22

22ibid. p. 47. Cf. also Coulton, 1977, p. 52: "The idea of an architectural ground plan had certainly been developed
in both Egypt and Mesopotamia, for examples have survived." In this context, he also mentions the statue of Gudea
of Lagash (c. 2200 B.C.) showing him seated with a drawing table on his knees, equipped with a stylus and ruler; on
one of these tables a plan is engraved.
Next, we can reflect on an ancient plan, on papyrus, from the tomb of Ramesses IV (ca. 1166-1160 B.C.).²³

The next plan, on limestone, is what is probably the tomb of Ramesses IX (ca. 1140-1123). According to Clarke and Engelbach "This plan should not be looked upon as the architect's original plan of the tomb, but rather a sketch-plan for the guidance of the workmen."²⁴

²³ibid. p. 49.
²⁴ibid. p. 51.
The diagrams just considered belong to the New Kingdom, but evidence can be produced
pre-dating these by more than a millenium. Below, an architect's diagram defining a curve, by
coordinates, probably dating to the third dynasty (ca. 2686 - 2613 B.C.) from Sakkara.25 "At
regular intervals (of 1 cubit each, though this is not stated explicitly) one should draw a
perpendicular line of a stated length. The lengths are given in the cubit notation....When the
points at the ends of the lines are joined a curve is produced."26

There are other important pieces of evidence, but for my purposes in this limited space
these will suffice. From this evidence not much can be concluded with certainty about how the
Egyptian architects worked. For there is nothing in this evidence or in the surviving models to
show that the planning might not have been done directly on site at full scale, and that the
 sketches that survive served more as an informal aid to reflect upon than as a working plan at
small scale.27 The precise procedure by which the architects built must remain open to doubt.
But, the argument that I am advancing does not require a definitive statement on the relation of
plans and models to building practice. What the argument must show, for my case, is that plan
and elevation perspectives were commonly imagined by the ancient Egyptian architects, and that
there is clear evidence that more than one perspective was regularly present in the minds of these
architects when imagining, discussing, or erecting their buildings.

25 ibid. pp. 52-53.

26 Kemp, 1991, p. 139.

27 ibid. p. 138, where he speculates about the building practices of the Egyptian architects. He places much greater
emphasis on planning and execution of the construction on-site rather than by mathematical plans.
A recent discovery by Haselberger at the temple of Apollo at Didyma revealed an entire archive of construction plans still in place on the temple walls themselves. Haselberger discovered, in finely etched lines, full-scale drawings for columns on the podium walls of the adytum. He discovered what he termed "geometrically pure paradigms" of the torus profile of a column base that proved that the architect began with such a model and then refined and re-worked the material to achieve the desired effect. He found floor plans on the floor, and wall plans on the wall, full-size. And he concluded that, in the floor plans for example, if the tentative plans were accepted, they were copied in turn from layer to layer, while earlier steps were erased -- polished over -- as they went. The only reason, he supposed, why the plans remained at all was that the building never even neared completion.28

And not only in Didyma do we have such evidence of plan and elevation drawings. In the temple of Athena at Priene, Koenigs discovered a scaled-down sketch of its pediment, incised in a block that was later fitted into the building itself. And Hoepfner uncovered evidence of plans for a burial chamber that were drawn in red chalk on a segment of the temple of Artemis in Sardis.29 These kinds of evidence indicate clearly that the architects/engineers relied on drawings, sometimes in plan and sometimes in elevation, in the process of their construction. Although the Ionian evidence by Haselberger, Koenigs, and Hoepfner belongs to the late classical and early Hellenistic periods, it has laid to rest the question of whether or not the architects made plans.30 But, the problem that still remains is what to make of the earlier constructions whose technological display would certainly have first amazed the Ionian populations.31

The evidence for architectural planning in the archaic period has become much clearer since Kienast's work on the so-called Temple 'D' at the Samian Heraion dating to the late sixth century. In earlier discussions, the evidence for architectural construction was less clear. Evidence for early clay models of temples and houses was known, but the architectural use of these models was and is still in doubt.32 The likeliness that models, in clay or other materials, exhibiting an elevation view of the proposed temple were presented as part of a strategy for securing patrons seems great. After all, it is difficult to accept that patrons would agree to fund a project at an exorbitant cost for so many years without a model exhibiting the finished temple. But, in the absence of evidence to the contrary, the supposition that "plans" preceded the constructions themselves was dismissed as fanciful.33

28 Haselberger, 1985, pp. 126-129.
29 Ibid, p. 132.
31 Cf. Coulton, 1977, p. 53, who argues that evidence found in the fifth and fourth centuries "...must be be applicable, if in a simpler form, to the sixth century." But, at the time of his writing, Haselberger’s evidence was unknown.
32 Cf. Coulton, 1977, p. 38, the example from Perachora (c. late 8th century); also the house models in the Samos museum in Vathi, from the 7th century.
33 Coulton, 1977, p. 53. Note: as recently as 1977, this was a broadly accepted opinion.
But, the understanding of how the Greek architects worked has become clearer in the last decade, although far from clear. Haselberger's discovery, of course, startled those who doubted extensive planning in the form of scale drawings. And then Kienast published his piece on the so-called Temple 'D'. Kienast knew that many of the buildings indicated, by scratching and other markings especially at corners and shafts, that planning had been undertaken at the site prior to construction. But, at the so-called Temple 'D', he discovered evidence of a complete groundplan (eine vollständige Grundrißzeichnung), marked out in red, transcribed directly to the construction foundation, 1:1. This proves, in his estimation, that the archaic architects in Ionia imagined their constructions in plan view, transcribed the plan to the construction site itself, and erected the building on just those lines in which the plan consisted. In the diagram below, after Kienast, the heavy black lines indicate the red lines found in the sixth century construction:

In another project, Kienast published a definitive work on the planning and execution of the tunnel of Eupalinos on Samos. Although the tunnel construction belongs to the period just after Anaximander's "publication" -- roughly between 540 and 522 B.C. -- Kienast's case is that it displays just the kind of techniques in planning that were available. To put the matter simply, the construction could not have been effected without a plan model. The tunnel is more or less

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34 Kienast, 1985, pp. 111: "Die Aufschnürung, jener entscheidende Vorgang, bei dem der Architekt seinen Entwurf am Bauplatz in wirkliche Maße überträgt, läßt sich bei fast allen griechischen Bauten nachweisen. Sichtbare Zeugen dieser Aufschnürung sind in der Regel kurze Anrizungen von bestimmten Achsen und Ecken, die die Gestalt des Baus charakterisieren. Im Gegensatz dazu handelt es sich beim Schatzhaus D um eine vollständige Grundrißzeichnung."

1040 meters long, driven separately from two sides; it runs some 400 meters in the south end and just over 600 meters in the north end. Kienast contends that the hill was staked out in order to determine the length of, and straight line for, the proposed tunnel. And he discovered at least five different marking systems in the tunnel — ancient survey markings — painted in red, one of which led him to speculate that Eupalinos invented his own tunnel-measure. But the great and unexpected difficulties for the architect, he discovered, arose in the north end when Eupalinos and Co. discovered loose rocks and the occurrence of a great amount of natural ground water. Eupalinos decided to leave the straight line in the north end and chose to turn northeast, that is, into rather than away from the hill towards the sea. When he abandoned the proposed straight line, the technique of staking-out the hill lost its effectiveness; then, Eupalinos would have had to rely on a variety of plans to insure that the tunnel halves would meet as initially intended. Kienast's reconstruction of the architect's technique claims that while the survey of the original plan centered on the straight line that was staked out across the mountain crest, a re-adjustment of this plan was necessary to handle unexpected deviations and yet still arrive at the anticipated meeting point. Without recourse to such plans, the architect would not be able to determine where he was in the hill and so not be able to control the project.

Although the Eupalinion post-dates Anaximander's prose writing, it does not do so by a margin of time that undermines our understanding of the architectural techniques that could have been known to Anaximander. Eupalinos' construction has no comparison in the archaic Greek world, let alone Ionia. The applied geometry illustrated in the construction techniques would have already been vindicated in other enterprises in order to encourage the Samians to undertake an unparalleled project lasting more than a decade. Eupalinos comes from Megara on the mainland; the architects — often comprising an itinerant community — provided one means for the collection and dissemination of building technologies throughout Greece. Kienast's work on the Eupalinion, and the so-called Temple 'D', helps us to understand more clearly how the architects faced up to serious difficulties in their constructions. His work offers us the archaic evidence that the architects working in Ionia imagined, and set out, their constructions in plan prior to the constructions themselves.

Before turning to try to sketch Anaximander's cosmos, one more set of illustrations is in order. Just in case the idea of plan vs elevation view is still not clear, these differing views are presented pictorially for the so-called Rhoikos/Theodorus temple to Hera in Samos (begun around 575 B.C.), and the so-called Chersiphron/Metagenes temple to Artemis in Ephesus (begun around 560 B.C.). The overall structure of archaic Ionic temples is the same; they are roughly 1 unit in height, by 2 units in width, by 3 units in length. In the reconstructions for the Samian Heraion proposed by the excavators, the plan is roughly 172.2 feet in width and 344.4

36 *ibid.* pp. 232-237. This idea that Eupalinos perhaps invented his own tunnel measure since the increment of measure is not in Samian ells, nor in any unit of construction known on the mainland, is interesting. In a not unrelated matter, Dilke, 1987, p. 13, and 1985, p. 81, had suggested that if Anaximander made a terrestrial map that included marked out distances, he would have needed some form of numeration, in abbreviated notation; Dilke then wondered if the Milesian form of numeration might not be traceable back to Anaximander. The architects and philosophers were both involved in activities that led to inventing their own measures?

37 According to a recent, and yet unpublished excavation by Kienast that revealed pottery just under the Rhoikan foundation dating to 575 B.C., the dating of the beginning of that construction can be reliably fixed. In addition, for a possible connection of "Rhoikos" with Egypt, cf. Boardman, 1980, p. 132, who wonders if a multiple eye cup dedicated by someone named Rhoikos to Aphrodite at Naucratis (c. 575-550 B.C.) might not be by the architect of the archaic Heraion. This consideration arises in the context of discussing Egyptian influence in Ionic temple building. It is also noteworthy, with regard to the Egyptian connection, that Pliny, *Natural History*, xxxvi, 90, refers to the Samian Heraion, identified with Rhoikos and Theodorus, as "The Labyrinth" indicating that the inspiration was probably the Egyptian temple by Lake Moeris referred to by Herodotus (II. 148) under that name. For the historical background in Samos, cf. Shipley, 1987.
feet in length. The reconstructed elevation view presents a building whose columns are more than 50 feet in height, and with the entablature, probably extended an additional 35 to 40 feet.\footnote{There is considerable disagreement over the exact measurements, or at least the way those measurements should be presented. Some have given the dimensions in terms of the rectangle formed by the stylobate while others have given them for the larger rectangle constituted by the inclusion of the two steps: Kyrieleis, 1981, p. 73, (and 1980, pp. 336-350) following Walter, 1976, gives the measurements 172.2 by 344.4 feet (52.5m x 105m = 100 x 200 Samian ells); Dinsmoor, 1902/1950, p. 124, and Tomlinson, 1976, both give the same measurements: 174 by 314 feet, or 171 by 311 feet depending upon the reference to steps. Robertson, 1929/1983, p. 331: 50.50m x 103m. The possible elevation reconstruction follows Tomlinson, 1976, p. 125.}
Along the same lines, according to the excavator, the archaic Artemision identified with the architects Chersiphron/Metagenes, was roughly 180 feet in width and 377 feet in length. The reconstructed elevation displays a building with 60 foot columns whose entablature extended an additional 30 to 40 feet.\(^\text{39}\)

Precisely how the archaic architects built must remain open to doubt. The tradition of ancient Egyptian architecture offers evidence that both plan and elevation views were part of the consciousness of its builders. The archaic Greek architects, on the contrary, were not the product of a long and impressive tradition. In fact, the evidence suggests that there were no quarries in operation in Greece from the period of the fall of Mycenae until roughly 700 B.C.,\(^\text{40}\) and hence no truly monumental architecture.\(^\text{41}\) With dozens of generations engaged in no monumental construction, the idea and techniques for monumental temple building had to be imported, and inspiration from Egypt is persuasive.

The evidence from archaic Greece is less conclusive. But, it seems reasonable to suppose that both plan and elevation views were also part of the consciousness of the archaic architects.\(^\text{42}\)

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\(^{39}\) There is, again, disagreement over the precise measurement, perhaps as a result of measuring from the lowest stair or restricting the dimensions to the stylobate. Bammer, 1984, p. 183, and Akurgal, 1985, p. 148: 180.9 by 377.4 feet (55.10m x 115m); Dinsmoor, 1902/1950, in the Appendix, and Tomlinson, 1976, p. 129: 55.1m x 115.14m; Robertson, 1929/1983, p. 331: 55.10m x 109.20m. The possible elevation reconstruction follows Grant, 1987, the illustration after p. 204. For the measurements and dating of the archaic Didymaion, cf. Gruben, 1963.

\(^{40}\) Coulton, 1977, p. 45.

\(^{41}\) *ibid.* p. 31.

\(^{42}\) However, cf. the interesting work by Perotitis, 1972, who argues for the use of architectural drawings.
The elevation view or model would have been particularly important in securing patrons; otherwise, we must believe that a project requiring hundreds of men for thousands of days would have been funded blindly. The plan view, on the other hand, is always the view of the builder at the earliest stages of construction. The higher levels, of course, cannot be constructed without the lower levels in place, and once in place the lower levels cannot be modified at all in light of what follows. It is worth emphasizing that mistakes made from the start cannot be corrected and will be ruinously expensive. It is for these reasons that the architect building on monumental scale must have a technique of design that will allow him to visualize the completed building with sufficient accuracy so that the lower parts will be in accord with the upper parts and the finished building will achieve the desired appearance without collapsing under its own weight.43 To achieve this aim, the plan and elevation views must surely have been part of the consciousness of the archaic Greek architects/engineers.

We must also keep in mind the changing environment of sixth century Ionia. There were many ingredients that, no doubt, contributed to Anaximander's mentality but the drastic change in the landscape, announced by monumental temple building, should not be underestimated. A key architectural feature in the archaic temples to Hera in Samos, Artemis in Ephesus, and Apollo in Didyma, all underway prior to the "publication" of Anaximander's book,44 was the column construction.45 Unlike the earlier buildings which focused attention on a house in front of the altar, the profusion of columns consciously hid the inner cella. The Samian, Ephesian, or Milesian who approached these buildings found themselves overwhelmed by these _thaumata_, these sources of awe and wonder. Approaching the great temples, the Ionians met a veritable forest of columns; the experience must surely have been one of gazing into a petrified forest. The Ionian structure, unlike the Doric, is much livelier and more delicate. The columns spring upwards from a platform barely above the ground and reach upwards to the sky as if some vegetation flourishing in the marshy fields sacred to Hera and Artemis. In the earlier temples, the columns were made of tree trunks and reached toward the sky quite naturally; in the monumental innovations, stone columns replaced the tree trunks that limited the size of the building. The point of emphasis is that the double peristyle was central to the stunning outward appearance, that these enormous temples astonished the Ionians, and I am supposing that Anaximander was among those deeply impressed.

Is there any good reason to suppose that Anaximander envisioned his cosmos from more than one perspective? The case that he did, of course, rests on conjecture because no diagrams or models attributed to Anaximander survive. Learned scholars like Kahn and Sambursky

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43 ibid. Cf. p. 51, from which I have drawn on considerably in phrasing this paragraph.

44 The assignment of the date 548 B.C. is not controversial since many commentators accept c. 550 B.C. Nor is the argument for establishing the date an issue of contention. According to the tradition traced through Apollodorus (cf. Jacoby, 1902, pp. 210ff; also Kirk-Raven, 1971, pp. 101-102), Anaximander's book appeared one year before the conquest of Sardis by Cyrus. Anaximander's age is known not by his _floruit_ and not by his death (although close to it); it is established by something in his book, a book not identified with his flourishing at forty but with the publication of his thoughts precisely close to the end of his life. Burnet, 1945, p. 13, inferred from Diogenes' testimony that the chronographer Apollodorus found definite evidence, perhaps in a summary version of his book, that Anaximander was sixty-four in 547/6. Concerning "publication", I follow Burkert, 1985, p. 310; Heraclitus' dedication of his book in the temple of Artemis (cf. Diogenes Laertius, 9.6) was the act of making the book public, that is, publishing it. Whether Anaximander dedicated his book at the temple of Apollo in Didyma, or elsewhere, we cannot say, but this is how I make sense of a "publication" in the archaic period.


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supposed that he did make use of diagrams or models but *imagining* those pictures must always invite doubt.

According to a reliable tradition, traceable through Agathemerus and Strabo, Anaximander is credited with drawing the first Greek map of the inhabited world on a tablet. Such a map could have been attempted from the reports of seafaring people who passed through cosmopolitan Miletus. How much the map depended upon his reflections on the heavens cannot be determined. But, Anaximander is also credited with setting up a seasonal sundial in Sparta. If true, he would have focused on the rising and setting of the sun on the summer solstice, the winter solstice, and the equinox; these cosmical events, as Heidel pointed out, framed the three-point coordinate system of the Greek map. The seasonal sundial and the map of the inhabited earth would seem to have been connected. In any case, a map of the earth, given the fact that Anaximander believed the earth to be a flat cylinder, would have had to be a plan view. Below, is a possible rendition of Anaximander’s map, by Robinson. I have inscribed the map on a column-drum in accordance with the testimony.

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47DK 12A6.

48DK 12A6.

49Cf. the discussion in Dilke, 1985, pp. 22-23, and 56. These maps were either painted on wood or worked in bronze, like the bronze tablet that Aristagoras brought to Sparta, according to Herodotus (5.49), in order to win assistance for the Ionian revolt. No early Greek maps survive, but there is in the British Museum a clay tablet belonging to the neo-Babylonian or Persian date (roughly 600 B.C.). Cf. Kahn, 1960, who reprints the map, (Plate 1).


51Heidel, 1937, pp. 7-17. Cf. also the discussion of this point in H.D.P. Lee’s commentary, p. 103, to Aristotle’s *Meteorologica*. Loeb Series.

For my purposes here, I am not interested in entering into a debate about the details of the map. My only point is that such a conception lends itself readily to a plan view rather than an elevation.

Anaximander's cosmos is geometrical; this feature, as Kahn and Sambursky pointed out, makes it amenable to graphic representation. According to the cosmology, out from a conflict of opposites -- of hot and cold -- a sphere of flame was formed round the air surrounding the earth, like bark (phloios) around a tree (dendron), and when this was broken off and shut off in circles, the sun, moon, and stars were formed. Below, on the left is an attempt to render a picture of the flame of fire and the inner rings into which it is somehow broken off. On the right is a simple rendition of a cross-section of a tree that explicitly serves as the metaphor.

Now, according to the cosmology, these inner rings are made of fire, encased in air, and what we identify as the sun, moon, and stars is the fire showing itself through holes in these fiery pipes as through the nozzle of the blacksmith's bellows. Below, then, is an attempt to render Anaximander's geometrical cosmos in a plan view:

Some might prefer to call the illustration a "horizontal cross-section" rather than a "plan". This is because the term "plan" tends to connote absolute directions, let's say, of up and down, top and bottom. If one accepts the testimony, derived from Hippolytus and Aetius -- cf. Kahn, 1960, p. 56, and 84-85 -- that Anaximander claimed the existence of antipodes, creatures who lived on the other side of the earth (i.e. the horizontal surface parallel to the one on which we live), then the idea of absolute directions, up and down, left and right is discredited. Vernant, 1983, pp. 179ff. holds just this position on the issue that for Anaximander absolute value is no longer attached to directions in space as it was in Hesiod and others. Thus, if Anaximander abandons a view of absolute spatial
With these renditions in mind, it is now time to return to the architectural discussion. Anaximander, on the authority of Hippolytus, identified the shape of the earth with a column drum. So, it is appropriate to take a closer look at some drums that he might have seen in order to determine if there was anything else about the column drum that seemed to suggest itself as illustrative of the cosmic model. Column drum construction was new to Ionia in the sixth century B.C. and with it came a new architectural technique for preparing the drums that would constitute columns fifty feet, or more, in height. That technique is displayed on archaic drums from the Ionian temples; the technique is called anathyrösis.

The term anathyrösis is identified with a labor-saving device by which contact between two blocks was obtained by dressing only the edge around the tops and edges. The procedure was usually employed on the vertical faces between two blocks. In the usual masonry technique, the horizontal faces of the stone blocks were completely dressed to a plane, but the vertical faces could be fit well without having to dress the entire surface. In the development of monumental building, the fit gained from edge anathyrösis proved not sufficiently precise as the blocks became increasingly massive. The next step was to dress the vertical sides with a band around all the edges, not just the top and side, and this technique is sometimes referred to as band anathyrösis. The anathyrösis technique -- which derives its name because the effect is something like the frame of a door (thyra) -- in the case of edge anathyrösis, was a solution to the problem of precisely fitting one block to the next without mortar.

In column construction, band anathyrösis is already in evidence from the mid-seventh century. Column bases were prepared with a smooth band running around the circumference of the horizontal joint face. The inner part of the horizontal surface was left rough but slightly sunken creating a concave surface. In the sixth century, in addition to the band anathyrösis preparation of the column drums, another technique was employed for lowering the drum into place without chipping the sides. This device became known as the empolion; it consisted of a square hole in the center of the drum through which a wooden pivot would be fit. The drum relations then "plan" may prove to be misleading. However, a horizontal cross-section of the cosmos through the earth, from either our point of view or that of the antipodes, will produce the same picture.


56 For the Egyptian technique, cf. Clarke and Englebach, 1930/1990, pp. 99-109. Lawrence, 1962, p. 225, claims that the anathyrösis technique originates in Egypt. Coulton, 1977, denies the technique to Egyptian architecture, p. 47, but then modifies his position to note, p. 169 n. 73, that Egyptian masonry does present vertical joints prepared in this fashion but only on the outer face. His point is that since the blocks do not have their rear faces dressed, they do not exhibit true anathyrösis. For the argument here, it is sufficient to observe that the anathyrösis technique in some form is displayed in the Egyptian masonry that the Ionian Greeks could have observed.

57 Coulton, 1977, pp. 46-47.


could be lowered into place directly centered on the lower drum. Below is a diagram of drum *anathýrōsis*; in this case, the drum has been fluted.

It is apparent that the horizontal face of the column drum exhibiting *anathýrōsis* bears a striking resemblance to a plan model rendition of Anaximander's cosmos. The argument here is not that the drum face and Anaximander's cosmos display a one-to-one correspondence. Rather, Anaximander's identification of the earth with a column drum, whose 3 to 1 ratio is analogous to the distances of the heavenly bodies, seems more than fortuitous. In seeing a column drum perhaps he was inspired to imagine the cosmos, from one point of view. In the plan view, the fluting might be construed as a visual presentation of the ring of fire; the concentric bands effected by the *anathýrōsis* technique suggest the wheels of the heavenly bodies.

Next, we turn to consider Anaximander's cosmos in an elevation view. Is there any reason to suppose that he would have thought it through from this perspective? Of course, we can ask how such a model would appear even if he had not done so. But, it is hard to make sense of even the outlines of Anaximander's picture without imagining it in elevation. This case is all the more compelling if we accept the attribution to him of inventing or setting up a seasonal sundial. No astronomical expertise is required to notice that, in Miletus, the sun is higher in the sky during the spring and summer months and lower in the sky during the late fall and winter months. Even the simplest picture of stellar regularities must account for the changing elevation of the sun in the course of a year.
Anaximander's account of the sun, moon, and stars requires that we imagine a series of revolving wheels, and consequently the mechanism that accounts for the change in their altitude. Heath attempted to grasp Anaximander's picture, and his illustrative drawing is a good place to start. In his picture, the wheels of the moon and stars are omitted.

A more promising rendition has been proposed by Couprie. His suggestion is as ingenious as it is conjectural. He invites us to imagine three concentric and telescoping cylinders. The holes out of which their fire shines turn around with their respective cylinders. The rings or wheels slide up and down on these invisible cylinders. The sun's wheel is a height of 47°, that is, two times the inclination of the ecliptic; this distance will suffice to account for the winter and summer solstices. In order to account for the monthly path of the moon through the zodiac, Couprie assigns a height to the moon's wheel of 57°. Inside these two cylinders is another cylinder of infinite length that contains the stars. And finally, inside the star cylinder is the flat cylindrical earth.

How shall we account for the mechanism that regulates the changing altitude of these wheels? No clear explanation is offered; Anaximander's picture describes rather than explains the phenomena. But, Couprie's ingenuity deserves our reflection. The picture he imagines, on Anaximander's behalf, follows through on the idea that the big cosmic structure is an expression of the small earthly structure. The ratio of the distances to the heavenly wheels is analogous to the ratio of the width and depth of the earthly cylinder. The cosmos is envisioned in terms of the earthly cylinder; the heavenly wheels are analogously interpreted as parts of cylinders.

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60 Cf. Diels, 1897, pp. 228-237 (esp. 231) for the earliest diagram I have been able to find.

61 Heath, 1913, pp. 35-36, who refines the diagram offered by Neuhauser, 1883, pp. 427-428. The only other Anaximander diagram in an English language publication that I know of is in Rescher, 1958, pp. 718-731.


63 However, the account of meteorological phenomena offers us some reason to suppose that changes in the sun's altitude, for example, may be due to the winds. Concerning mechanical explanation in Anaximander's meteorology, cf. Kahn, 1960, pp. 98-100, and more general discussions on mechanism in nature, cf. Heidel, 1909/1910, pp. 77-113; ; Reinhardt, 1926; pp. 161-176; pp. 387-395; Rescher, 1958, pp. 718-731; de Solla Price, 1974.
An important problem in understanding Anaximander's cosmos was recently resuscitated by Furley. The problem arises when we try to make sense of Aristotle's testimony in the *de Caelo*. In one of the very few passages in which Anaximander is identified by name, Aristotle singles him out among the ancients who held that the earth remains at rest because it is in equilibrium (*homoiotēta*). The earth, says Aristotle of Anaximander, is at rest in the center and does not move up or down, or to the sides, because it is equally related to the extremes (*homoios pros ta eschatē echōn*), and thereby has no reason to move one way or the other. Furley follows the problem raised by Heidel, and then explored in greater depth by Robinson. Only a spherical earth -- not a flat and cylindrical earth -- is equally related to the extremes. So, Aristotle, according to Furley, has somehow got it wrong. Instead, Furley defends the reasoning offered by Simplicius that the earth remains at rest in the center because it

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65 Aristotle, *de Caelo*, II.13 (295b10ff): "The majority of thinkers, then, debate over these causes [mentioned above]. But some say that it is because of 'equilibrium' (*homoiotēta*) that the earth remains at rest, as among the ancients, Anaximander. For that which is situated in the middle and is equally related to the extremes, is not obliged to move in one direction rather than another, either up or down, or sideways; and because it is impossible to move simultaneously in opposite directions, it necessarily remains at rest." For the translation of *homoiotēs*, various renditions have been adopted: "Similarly": Kahn, 1960, pp. 76, 79n3; Lloyd, 1978, p. 68; "Indifference": Guthrie, 1962, p. 98; Furley, 1989, p. 16; Robinson, 1972, p. 111, and 117n1; "Equilibrium": Vlastos, 1953/1970, p. 75; Kirk-Raven, 1957, p. 134; "Equal Distance": Cornford, 1952, p. 165; "Equiformity": Dicks, 1970, p. 44. Other renditions proposed include "likeness" and "uniformity". Despite the variations in translation, the meaning does not seem to be in doubt.


floats on air. In keeping with the Milesian tradition of a Thales who seems to have believed that the earth floats on water, and an Anaximenes who seems to have believed that the earth floats on air, so Anaximander, like Anaximenes, held that the earth floats on air. The reason Anaximander held the earth to be a flat disc, according to Furley, is so that it could remain aloft.

Aristotle, no doubt, may have gotten it wrong, as he has in other cases involving the presocratics. But suppose he didn't get it wrong, that he had in front of him a copy of Anaximander's book, or a summary from one of his students, when he wrote that passage in the de Caeelo. How could we reconcile Aristotle's testimony against the charge that only a spherical earth could be equidistant from all extremes? The approach I have proposed offers a resolution without having to suppose still another possibility, namely, that Aristotle is reporting accurately and it is Anaximander's image itself that was ill-conceived.

If Anaximander had imagined the cosmos from plan and elevation perspectives, the way in which the earth would be situated would not be the same. In each view, like that of the temples, the harmony and order would be perceived differently. If one takes for granted that Anaximander's picture is strictly an elevation view, Furley's objection is hard to discount. But what requires us to suppose that Anaximander's model was exclusively an elevation? Had he envisioned the cosmos, as he might likely have drawn the map of the inhabited earth on a tablet, in a plan view, Aristotle's testimony could be preserved. For then, in plan view, the round earth is equally related to the extremes. In the plan view, the earth is in equilibrium in the cosmos; it is equidistant from the heavenly wheels that stand in geometric proportions to the column-drums earth. Thus, an additional consequence of accepting this multi-planned interpretation of Anaximander's imagination is to preserve the testimony of Aristotle. And this is not unimportant, for it is difficult to accept that in one of the four times that Aristotle singles out Anaximander by name, he has simply got it wrong.

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Finally, the idea that the community of architects influenced the philosophical conceptions of Anaximander is surprising to the degree that we have embraced, perhaps unconsciously, Barnes' supracelestial perspective. To the degree that we have come to suppose the western tradition of rationality consists in the triumph of the mind over the body and senses, to that degree the thesis that the architects, directly or indirectly through their productions, inspired Anaximander's cosmical imagination, will be surprising. To take the thesis seriously, we must be prepared to re-think what is relevant to an understanding of philosophy, and to re-think the role that the imagination contributes to it. We must ask, anew: Are images essential to thought and rationality?

Traditional studies on rationality routinely distinguished between concepts and images; whereas concepts were regarded as purely rational, images could claim a rational character only derivatively. This separation of images from rationality has been a consequence of traditional approaches to imagination that have proceeded either by regarding the imagination (i) as merely tied to the body, in a mechanistic way, generating images out of sense data, or (ii) as completely free, undisciplined and unfettered, and in this sense an expression of radical creativity. In the first case, the imagination is closely identified with the bodily aspect of experience, in the second case with mental activity that confounds rules; the familiar vision of rationality as the triumph of the rule-governed mind over the body and senses militates against treatments of the imagination as central to thought and rationality.


69 At an early stage of reflecting upon the organization and patterns exhibited by the temple columns, I focused exclusively on the number of columns and the patterns established by them. Only after it seemed that this approach was leading nowhere did I turn to focus on the number and variety of spaces rather than the columns. The spaces, opened and closed by the arrangement of the columns, seem to orchestrate the movement and feeling generated by the building. The symphony of feeling seemed to be a product of limiting and un-limiting the spaces.
In recent studies, however, the nature of rationality has undergone a re-appraisal and the role that imagination contributes to it has been vastly transformed. According to these new studies, imagination is now being seen in the cognitive patterns of all of our concepts; indeed, patterns of understanding are now being studied as patterns of imagination. Consequently, the new view that is emerging is one that envisages imagination to be inextricably bound to an understanding of rationality rather than as a separate dimension of experience. Imagination, then, does not come into play only in moments of whimsy and radical creativity, but rather imagination becomes the locus for meaning, understanding and reasoning.

Imagination is now being discussed in terms of patterns that are shared by people; that is, rather than being an idiosyncratic and private expression, the imagination is now being investigated in terms of the commonalities that are displayed in the structures of understanding and metaphor. Thus, according to the lead of recent studies, to say that we are rational animals is to say that we are imaginative animals. Along with this new perspective has come a re-appraisal of the traditional bifurcations between the rational and the bodily, between science and art. With the collapse of this strict dichotomy, the patterns of thought in science are being increasingly examined as expressions of the imaginative domain of lived experience. This new approach shows up clearly in studies in *Science, Technology, and Society* [STS] where science is investigated as a cultural practice.

Recent work in the history and philosophy of science and in STS has focused on investigations of scientific practices as embedded within a culture. Rejecting the positivistic approaches that supposed an ultimately objective model of how the world is, and the sweeping generalizations towards which positivism strives, the new approaches have emphasized case studies and pursued objectivity within a local, rather than global, framework. These ground-breaking, historically-based, case studies have not only helped us to understand better precisely what the practitioners of science believed they were doing but also have assisted in the general project of re-appraising the nature of rationality with which "science" has been familiarly aligned. One important consequence has been to open up the discussion of science and scientific practice to a consideration of its imaginative dimension.

The short study of Anaximander I have just presented tries to make sense of his cosmic imagination. But this study, as I have envisioned it, is not just about our ability to imagine ancient cosmological models but rather to see that the origins of Greek philosophical rationality cannot be properly understood independent of this cultural embeddedness. My project on Anaximander, of which this is a part, seeks to show that an understanding of western rationality requires us to think through the material world rather than abandon it, and any sense-knowledge of it. The material world, in all its cultural breadth, is indispensable to an understanding of ancient Greek philosophical rationality and to the rationality that we philosophers are seeking to grasp. Thus, the project is not just to understand cosmological models but to show a conception of philosophy in the context of model-making and the imagination it presupposes. For in the absence of adequate astronomical instruments or theories, Anaximander imagined a geometrically-modeled cosmos. The "rationality" that his model exhibited was one whose warp and woof were the fabric of his Ionian techno-culture.

Robert Hahn  
Department of Philosophy  
Southern Illinois University at Carbondale

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70 These projects follow from Kuhn's lead, 1962/1970, although not always in the particular ways he anticipated. The emphasis must be placed on the importance of case studies and away from broad and sweeping generalizations that characterized the positivist approach.


Neuhauser, I. *Anaximander Milesius sive vetustissima quaedam rerum universitatis conceptio restituita.* 1883.

Nylander, C. *Opuscula Atheniensi*, vol. 4, 1962, 47, figs. 56-60.


