TITLE: *World according to Anaximander and Anaximenes*
DATE: *6th century B.C.*
AUTHORS: *Anaximander and Anaximenes of Miletus*
DESCRIPTION: This monograph shows a reconstruction by Arthur Cavanagh of the world-view as conceived by the Ionian Anaximenes of Miletus. As the successor to Anaximander, and the third in the series of Ionic philosophers, Anaximenes is said (by Aristotle) to have held that the earth was of irregular quadrangular form, in consequence of its pressing it down like the lid of a vessel. This concept consists of a rectangular world supported by compressed air. Shown here in the modern reconstruction are the Mediterranean Sea and a circumfluent *Ocean Sea*. Anaximenes maintained also that the sun and stars did not descend beneath the earth, and rise again at its other extremity, which appears to have been the prevalent doctrine in his day, but that they were carried around the earth, at a great distance, and that the light of the sun was intercepted during the night by high mountains.

The age of Anaximenes has not been determined with certainty, but he was certainly intermediate between Anaximander of Miletus and Anaxagoras, and may be regarded as having flourished in the last half of the sixth century B.C.

Both Strabo *(#115)* and Agathemerus (later Greek geographers) claim that, according to the geographer Eratosthenes *(#112)*, Anaximander was the first to publish a map of the world. The map probably inspired the Greek historian Hecataeus of Miletus *(#108)* to draw a more accurate version. Strabo viewed both as the first geographers after Homer *(#105)*.

Local maps were produced in ancient times, notably in Egypt, Lydia, the Middle East, and Babylon. They indicated roads, towns, borders, and geological features. Anaximander's innovation was to represent the entire inhabited land known to the ancient Greeks. Such an accomplishment is more significant than it at first appears. Anaximander most likely drew this map for three reasons. First, it could be used to improve navigation and trade between Miletus' colonies and other colonies around the Mediterranean Sea and Black Sea. Second, Thales would probably have found it easier to convince the Ionian city-states to join in a federation in order to push the Median threat away if he possessed such a tool. Finally, the philosophical idea of a global representation of the world simply for the sake of knowledge was reason enough to design one.

Surely aware of the sea's convexity, he may have designed his map on a slightly rounded metal surface. The center or "navel" of the world (ὀμφαλός γῆς/omphalós gẽs) could have been Delphi, but is more likely in Anaximander's time to have been located near Miletus. The Aegean Sea was near the map's center and enclosed by three continents, themselves located in the middle of the ocean and isolated like islands by sea and rivers. Europe was bordered on the south by the Mediterranean Sea and was separated from Asia by the *Pontus Euxinus* [Black Sea], the Lake Maeotis, and, further east, either by the *Phasis River* (now called the Rioni) or the *Tanais*. The Nile flowed south into the ocean, separating Libya (which was the name for the part of the then-known African continent) from Asia.

Anaximander (ancient Greek: Ἀναξίμανδρος, born 610 B.C., Miletus—died 546/545 B.C.) was a pre-Socratic Greek philosopher who lived in Miletus, a city of Ionia. He belonged to the Milesian school and learned the teachings of his master Thales. Anaximander succeeded Thales and became the second master of that school where he counted Anaximenes and Pythagoras amongst his pupils. A Greek philosopher, often

called the founder of astronomy, he apparently wrote treatises on geography, astronomy, and cosmology that survived for several centuries and made a map of the known world. He was the first thinker to develop a cosmology. A rationalist, he prized symmetry and used geometry and mathematical proportions to help map the heavens; his theories thus departed from earlier, more mystical conceptions and foreshadowed the achievements of later astronomers. Whereas earlier theories had suggested that the earth was suspended or supported from elsewhere in the heavens, Anaximander asserted that the earth remained unsupported at the center of the universe because it had no reason to move in any direction.

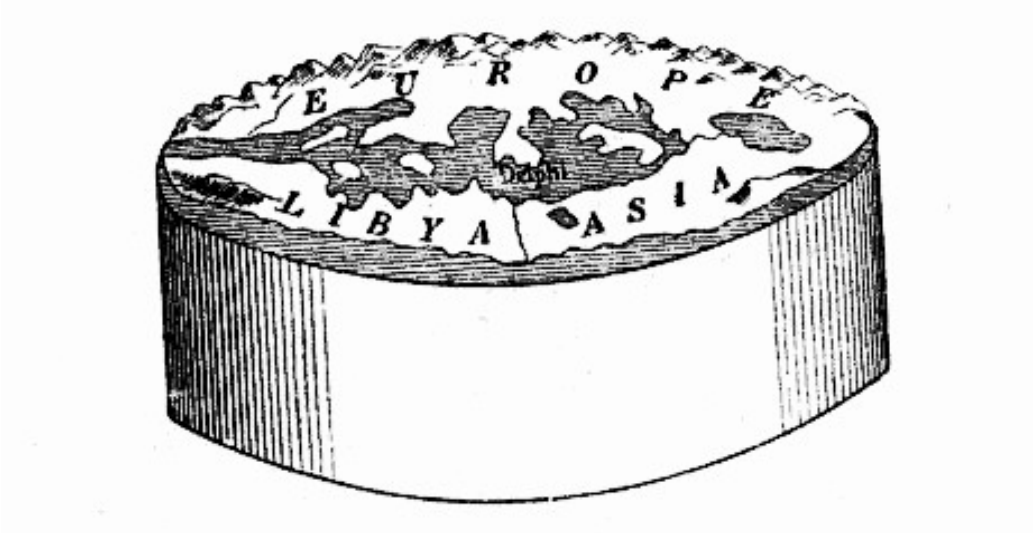
Anaximander of Miletus was not only the first Greek to be credited with drawing a map in the formal sense according to Eratosthenes, but he also engaged in broad intellectual pursuits and may even have founded a colony, perhaps on the Black Sea. Among the geographic titles attributed to him are *Circuit of the Earth, On Fixed Stars,* and *Celestial Globe*. We cannot be certain of the content of these works or even of their existence. It is also debated whether Anaximander wrote a commentary on his map or on the construction of his celestial globe. Even so, works with the titles cited, whether real or apocryphal, imply an informed preoccupation with both celestial and terrestrial cartography, and it seems credible that Anaximander was motivated to give a rational and critical account of the origin of the cosmos and the spread of human civilization. He believed that the same forces underlying the creation of the cosmos continued to guide it, and that these forces accounted for meteorological phenomena and climatic conditions.

Anaximander's terrestrial map comprised an outline (*perimetron*) of the earth and sea; the late antique Greek geographer Agathemerus (ca. 400 B.C.) adds that Anaximander "dared to draw" a map of the *oikoumene* [inhabited world] on a *pinax* (tablet), a Greek word used both of painted panels and of bronze tablets. It is impossible to reconstruct with any reliable accuracy either the map or even its shape and size, let alone Anaximander's written account. His treatise perhaps began with a cosmological introduction; then, by combining history, astronomy, and geography, it may well have proceeded in lecture format to discuss the arrangement of natural and man-made landmarks, cities, and climate as revealed in the pictorial map. His geographic successors followed this approach.

Anaximander envisioned the world as a shallow but broad cylinder, its depth one third of its width, "like a stone column," hanging freely in the air, equidistant from other celestial objects, the upper face of which alone is inhabited. This cylinder, he states, is one-third as high as its diameter, and it floats freely in the centre of the celestial vault, because there is no reason why it should move to one side rather than the other. Leucippus, Democritus, Heraclitus, and Anaxagoras all adopted this purely imaginary form. Europe made the northern half, and *Lybia* [Africa] and Asia the southern. All scholarly reconstructions of his map envision a flat circle of earth surrounded by the stream of Ocean. His *oikoumene* was seemingly divided into thirds, namely, Europe, Asia and Libya, separated by the Nile and *Phasis* rivers and the Mediterranean Sea and Black Sea. There is no consensus regarding the relative sizes of the landmasses, let alone the map's center: Delphi, Delos, and Miletus have all been proposed. The shape of the *oikoumene* is further disputed. His map may have incorporated a three-point coordinate system, corresponding to the rising and setting of the sun on the days of the equinoxes and solstices.

Anaximander is also said to have constructed a celestial globe, placing the earth at the center, following the pattern noted above on Achilles' shield. Anaximander devised ratios for relative distances between celestial bodies, placing the sun, equal in size to the earth, in a terrestrial orbit of twenty-seven times the diameter of the earth; the radius of the moon's orbit was eighteen times the earth's diameter, a progression of multiples of the number nine. The distance of the sphere of fixed stars, which he placed closest to the earth, was presumably nine times the earth's diameter. The ratios of this celestial map have been connected to architectural proportions, and, intriguingly, Anaximander's approach to drafting both celestial and terrestrial maps may have derived from architecture. Like an architect designing a temple, a cartographer would sketch a frame of the *oikoumene* on bronze or wood and build up his plan of the world from it. To both his cosmic and terrestrial plans Anaximander applied a tripartite division together with the rules of proportionality and symmetry which guided Mediterranean architecture, especially column drums; he is known to have compared the earth to a stone column. Clearly, his efforts were further guided by the practical applications of mathematics.

Diogenes Laertius also tells us that Anaximander believed in a geocentric universe with a spherical earth. However, he is suspect, since the spherical concept was not devised early, and others attributed to Anaximander the different concept of a cylindrical earth. Nevertheless, he may indeed, as Diogenes Laertius claims, have been the first to construct a sphere, though, as mentioned above, more likely celestial than terrestrial. Anaximander of Miletus is said to have held that the earth was of cylindrical form, like a stone pillar; the inhabited part being apparently the circular upper surface. Some of his astronomical speculations were equally fanciful and unfounded.



A modern interpretation of Anaximander's world concept

The Homeric conception of the world represented as a flat, rectangular-shaped land surrounded by a continuous ocean-stream remained a popular notion in the Greek world even after many philosophers and scientists had accepted the theory of the sphericity of the earth enunciated by the Pythagoreans and subjected to theoretical proof by Aristotle (*see #104*). In this interpretation the world is like a plateau on the top of a mountain; inside this, close to the surface of the earth, lies the *House of Hades*, the *Realm*

of Death, and beneath it *Tartarus*, the *Realm of Eternal Darkness*. The plateau of the earth is surrounded by *Oceanus*, the world river, and from its periphery rises the fixed dome of the sky. The sun, the moon, and the stars rise from the waters at the edge of the dome, move in an arc above the earth, and then sink once again into the sea to complete their course beneath the *Oceanus*. The atmosphere above the mountain of the earth is thick with clouds and mist, but higher up is the clear *Æther* with its starry ceiling.

Anaximander's bold use of non-mythological explanatory hypotheses considerably distinguishes him from previous cosmology writers such as Hesiod. It confirms that pre-Socratic philosophers were making an early effort to demystify physical processes. His major contribution to history was writing the oldest prose document about the universe and the origins of life; for this he is often called the "Father of Cosmology" and founder of astronomy. However, pseudo-Plutarch states that he still viewed celestial bodies as deities.

Anaximander was the first to conceive a mechanical model of the world. In his model, the earth floats very still in the centre of the infinite, not supported by anything. It remains "in the same place because of its indifference", a point of view that Aristotle considered ingenious, but false, in *On the Heavens*. Its curious shape is that of a cylinder with a height one-third of its diameter. The flat top forms the inhabited world, which is surrounded by a circular oceanic mass.

Such a model allowed the concept that celestial bodies could pass under it. It goes further than Thales' claim of a world floating on water, for which Thales faced the problem of explaining what would contain this ocean, while Anaximander solved it by introducing his concept of "infinite" (*apeiron*).

At the origin, after the separation of hot and cold, a ball of flame appeared that surrounded the Earth like bark on a tree. This ball broke apart to form the rest of the universe. It resembled a system of hollow concentric wheels, filled with fire, with the rims pierced by holes like those of a flute. Consequently, the sun was the fire that one could see through a hole the same size as the earth on the farthest wheel, and an eclipse corresponded with the occlusion of that hole. The diameter of the solar wheel was twenty-seven times that of the earth (or twenty-eight, depending on the sources) and the lunar wheel, whose fire was less intense, eighteen (or nineteen) times. Its hole could change shape, thus explaining lunar phases. The stars and the planets, located closer, followed the same model.

Anaximander was the first astronomer to consider the sun as a huge mass, and consequently, to realize how far from earth it might be, and the first to present a system where the celestial bodies turned at different distances. Furthermore, according to Diogenes Laertius (II, 2), he built a celestial sphere. This invention undoubtedly made him the first to realize the obliquity of the Zodiac as the Roman philosopher Pliny the Elder reports in *Natural History* (II, 8).

He saw the sea as a remnant of the mass of humidity that once surrounded earth. A part of that mass evaporated under the sun's action, thus causing the winds and even the rotation of the celestial bodies, which he believed were attracted to places where water is more abundant. He explained rain as a product of the humidity pumped up from the earth by the sun. For him, the earth was slowly drying up and water only remained in the deepest regions, which someday would go dry as well. According to Aristotle's *Meteorology* (II, 3), Democritus also shared this opinion.

Both Strabo and Agathemerus (later Greek geographers) claim that, according to the geographer Eratosthenes, Anaximander was the first to publish a map of the world.

The map probably inspired the Greek historian Hecataeus of Miletus (#*108*) to draw a more accurate version. Strabo viewed both as the first geographers after Homer.

Local maps were produced in ancient times, notably in Egypt, Lydia, the Middle East, and Babylon. They indicated roads, towns, borders, and geological features. Anaximander's innovation was to represent the entire inhabited land known to the ancient Greeks.

The practical map-making which developed from Anaximander's map may be illustrated from a well-known story in Herodotus. In 499-8 B.C. Aristagoras, tyrant of Miletus, made a tour of important cities on mainland Greece looking for allies against Darius I, King of Persia. He took with him on this tour what Herodotus calls *"a bronze tablet [pinax] with an engraving of a map [periodos], literally 'going round' of the whole world with all its rivers and seas."* Aristagoras used it when he toured the Greek mainland in 499-498 in search of supporters for a revolt against Persian rule. Among his contacts was King Cleomenes of Sparta, and on it he showed him all the areas on the way from Ionia to Susa, capital of Persia. The last region of Asia Minor on the proposed march, *Cilicia*, is described as 'opposite Cyprus', implying that Cyprus too appeared; and the regions east of Asia Minor are given as *Armenia, Matiena,* and *Cissia* with the city of *Susa*. Herodotus represents Aristagoras showing it to the Spartan king Cleomenes with the following explanation:

> The lands in which the earth's peoples dwell lie next to each other, as I shall show you: here are the Ionians, and here the Lydians, who inhabit a good land and have a great store of silver. . . and next to the Lydians you see the Phrygians, to the east, men that of all those known to me are the richest in flocks and in the earth's fruits. Close by them are the Cappadocians, whom we call Syrians; and their neighbors are the Ciliciansi whose land reaches to the sea here, where you see the island of Cyprus located. The annual tribute which they pay to the king is 500 talents. Next to the Cilicians, here are the Armenians, another people rich in flocks, and after the Armenians, the Matieni, whose country is here; and you see the Cissians' land adjoining theirs; it is there, on this particular river the Choaspes, that Susa is situated, the residence of the Great King, where his treasure-stores are.

On this detailed and informative map Aristagoras was able to show a vast swath of territory spanning mainland Greece, Ionia, and Persia. Like many other maps in antiquity, however, this presumably had no scale; for Cleomenes, two days later, asked "How long would such a march take?" "Three months" (a standard but ambiguous measure of the distance between places far apart), was the reply where upon despite attractive offers of money he refused.

This portable map commissioned by the ruler of Miletus, Aristagoras, was probably developed from those of Anaximander and his contemporary Hecataeus. The map was engraved on a bronze *pinax* like Anaximander's. But we may presume that it also contained the course of the *Royal Road*, which Herodotus describes in some detail immediately after, giving the number of staging-posts and the distances. This road had been carefully measured for the Great King by road surveyors; and the general proportions of Aristagoras' map, particularly the section relating to Asia, may well have been guided by such survey work on it. A plausible theory is that the geographer and mythographer Hecatæus of Miletus was the indirect promoter of this map based on Anaximander and on his own travels in Asia and Egypt.

Herodotus' reference is important in showing that maps could be engraved on portable bronze tablets, that general maps of the inhabited world were frequently made

in Ionia, and that they were more informative than the simple geometric plans such as the Babylonian clay tablet of the same era. I have found no one who has attempted a "reconstruction" or interpretation of Aristagoras' lost map.

It is not certain that Anaximander wrote a commentary on his map or on the construction of his sphere. However, it is clear that Anaximander was the first recorded of that long line of Greek craftsmen-philosophers who tried to express concepts in graphic form. The construction of spheres and the drawing of maps were to become characteristic products of the mechanical mind of the Greeks and their regular occurrence reveals perhaps a more practical side to them than traditionally has been presented.

Anaximenes, without giving a precise opinion as to the form of the earth, made it out to be supported on compressed air (see below), though he gave no idea as to how the air was to be compressed. Plato thought to improve upon these ideas by making the earth cubical. The cube, which is bound by six equal faces, appeared to him the most perfect of solids, and therefore most suitable for the earth, which was to stand in the centre of the universe.

LOCATION: *(map only exists as reconstruction)*

REFERENCES:

Talbert, R.J.A., Georgia Irby, *Ancient Perspectives*, 2012, pp. 89-91.
Dilke, O.A.W., *Greek and Roman Maps*, pp. 21-24, 56, 81.