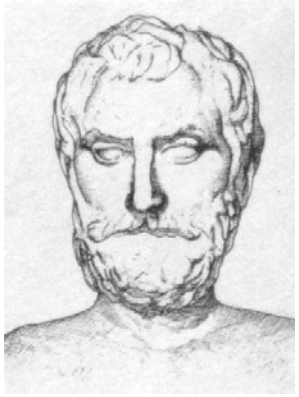
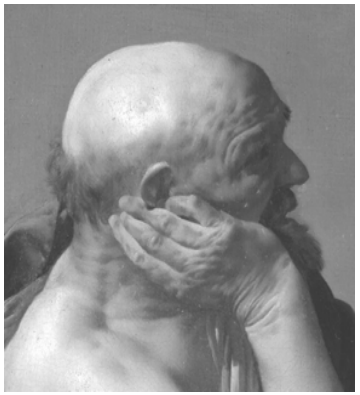
The cosmology of the pre-Socratic Greek philosophers

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From myth to reason

The views and the theories of the ancient pre-Socratic philosophers from Ionia indicate the relation of the ancient Greek world with the mother-Earth and the natural environment, Cosmos.

The pre-Socratic thought has much to reveal to us as a kind of travel back to the primal sources. The pre-Socratic philosophers of Ionia were carefully observing in the 6th Century B.C. the natural phenomena and their contribution to the challenging of myths was crucial. They attempted to extract conclusions from the observation of nature by using mainly their logic.


Abdera
Philippi
Amphipolis
PROPONTIS
Thassos
Samothrace
Imbros
Limnos
Troia
PHRYGIA
ILIUM
Methymna
Pergamus
Mytilene
Lesbos
AEGEAN SEA
MYSIA
Phokea
Chios
Smyrna
Sardis
Chalkis
Marathon
LYDIA
Laodicea
Ephesus
Samos
CARIA
Delos
Miletus
Naxos
Halicarnassus
Kos
Thyra
Rhodes
Ialyssos
Lindos
Kydon
Knossos
Phaestos
Gortys

Ancient Greek natural philosophers were preoccupied by the “cosmic riddle”, i.e. the questions of the origins, the structure and the construction of our Universe. At the same time, a sudden and rather unexpected shift took place, from mysticism and religious worldview towards reasoning thought, which was the greatness of the ancient philosophy; a switch with very deep consequences for humanity.

Of course, most pre-Socratics were natural “monist” philosophers, in the sense that they were interested in defining the ultimate substance or principle, the primal element from which all things of our world originated. So they created philosophical systems through which they would be able to explain in a rational way the relation between humans and nature. For the first time in the history of the world, with the pre-Socratic views it was expressed the total decoupling of myth from the rational intellect. Here it will be shown how from myth physical environmental thought appeared and was shaped during the first scientific revolution in Ionia, in the 6th Century B.C.. Then philosophers tried to answer two basic questions they were preoccupied with: the first on the origins of the world and the second on its structure or form. This was the reason they became the founders of philosophical thought and of science itself

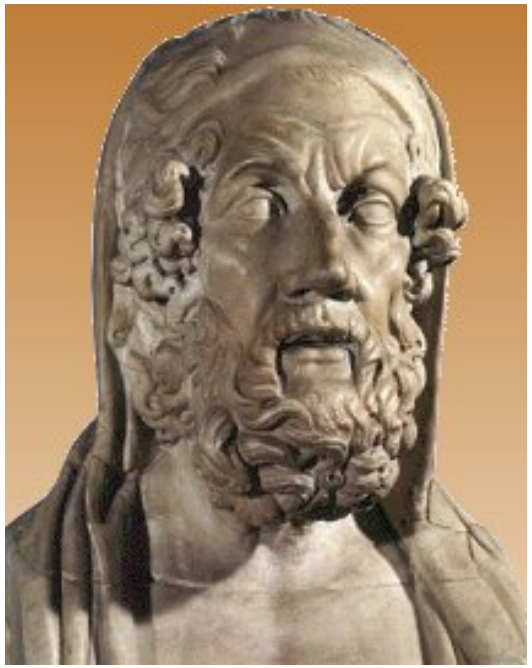
The place of Earth in the Cosmos

Earth in the Homeric Universe was considered as a circular flat disc surrounded by a vast circular "river", the Ocean. This model appears for the first time in the Homeric Hymn *"Incense to Pan - various"* (*Panos thymiama, poikila*): *"And the Ocean encircles the Earth in its waters"*.

The Sky rises upon Earth. In the Orphic Hymns the Sky is mentioned as the master of the World (Cosmos), encompassing the Earth as a sphere (our Celestial Sphere). The Sky is the abode of the blissful gods and it moves in rotations, spinning (Orphic Hymn 4: *Incense to Ouranos*).

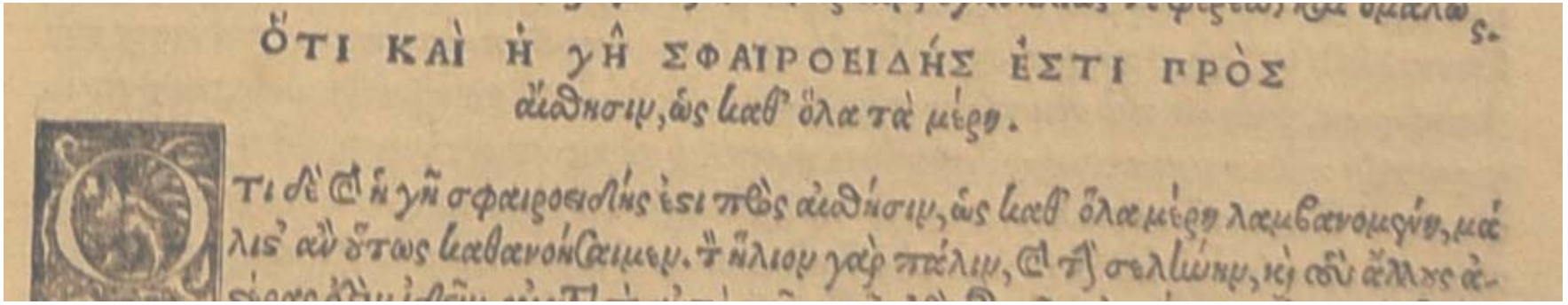
According to the ancient Greek traditions the Sky was a metallic canopy made of copper or iron, supported by very tall columns; in other traditions the Sky was a giant. Homer combines these two views by having Atlas supporting the columns himself (*Odyssey* 1:53-54). Hesiod adds (*Theogony* 517) that his fate of supporting the sky was assigned to him by Zeus. So in ancient Greece the Sky was thought to be made of a solid, metallic, material. For this reason, in the Homeric poems is referred as *chalcous* (of copper *Iliad* 17:424) and *polychalcus* (made of much copper, *Iliad* 5:504, *Odyssey* 2:458, 3:2, 16:364, 19:351), or as *siderous* (of iron, *Odyssey* 15:329, 17:565).

The space between the Sky and the Earth, according to the beliefs registered by Homer, was filled with the (comparatively dense) air in its part towards the Earth (*Iliad* 14:288). Towards the Sky this intermediate space was filled with the clean and transparent *aether* (the ether), a kind of "light air". Beyond the ether there was the starry Sky.



The Sky was not a bare metallic dome. It was, as Homer mentions, full of life, a "life" offered by the stars that decorate it. Because of this it was called *asteroeis*, i.e. full of stars (*Iliad* 6:108, 15:371, *Odyssey* 9:527). On this celestial dome travels the Sun (*Odyssey* 1:7-9), hence called *ouranodromos* (running on the sky).

Homer in his epic poems, dated *circa* 900 to 800 B.C., describes the Earth as flat and circular with the Ocean around it, while Hesiod in his *Theogony* describes the Universe as spherical, divided in two parts by the plane of the flat Earth.



The great philosopher Pythagoras (6th Century B.C.) is generally credited as the first supporter of the idea of the spherical Earth. He expressed the opinion that, since the Sun and the Moon are spherical in form, the same should be the case with the Earth, which was sitting motionless in the center of the Universe! Pythagoras was teaching that Earth was spherical & isolated; Empedocles stated that the Earth floats freely in space.

Thus, Pythagoras and the Pythagorean philosophers were supporting the spherical shape of the Earth mainly for symmetry reasons, since they regarded sphere as the most perfect form a solid body can take. The same views were upheld by Parmenides in the 5th Century B.C., who declared that the Earth was spherical.

fixarum sphaeram moveri: quibus ideo nonam sphaeram superiorem
placuit: quae dum non sufficeret, nunc recentiores decimam superaddunt
nequaquam tamen finem assecuti: quem speramus ex motu terrae nos
consecuturos. Quo tamquam principio et hypothesi utemur in
demonstrationibus aliorum. ~~Et si fateamur Solis Lunaeque cursum~~
~~in immobilitate quoque terrae demonstrari posse: in caeteris vero~~
~~errantibus minus congruit. Credibile est hisce similibusque~~
causis Philolaum mobilitatem terrae sensisse: quod etiam nonnulli
Aristarchum Samium ferunt in eadem fuisse sententia. non illa
ratione moti: quam allegat reprobatque Aristoteles. Sed cum
talia sint: quae nisi acri ingenio et diligentia diuturna com-
prehendi non possent: latuisse tunc plerosque philosophos: et fu-
isse admodum paucos: qui eo tempore syderearum motuum callerent
rationem, a Platone non tacetur. At si Philolao vel cuivis
Pythagorico intellecta fuerint: verisimile tamen est ad po-
steros non profudisse. Erat enim Pythagoreorum observantia
non tradere literis: neque pandere omnibus arcana philosophiae
Sed amicorum dumtaxat et propinquorum fidei committere
ac per manus tradere. Cuius rei monumentum extat

The pre-Socratic cosmological approach

In the 6th Century B.C., with the philosophers from Ionia, a real revolution took place in philosophy and science. The scientific philosophy was born, its theory, notions and objective physical-mathematical science.

Thales, the founder of the Ionian school and the first theoretician of geometry and astronomy, was the first to express the opinion that the polymorphic world of natural phenomena has single base, originating from one only creative common natural entity, the **water** according to him.

Water was for Thales the essential component of all things, beyond any divine interventions; all entities in nature were mutations of it. For Thales water was representing the primal essence from which all forms of matter were emerging and to which they were returning.

According to Thales beings have a common natural origin and reason, water, and all physical entities are created as transformations of that original element through “condensation” or diluting. Water (*hydor*) is the element that expanding through its evaporation creates the air, while with its contraction and condensation produces the earth; this can be verified, Thales believed, with the appearance of alluvial deposits from the rivers.

Not only our planet, but the whole Universe according to Thales was based on water and it had the form of a hemisphere. Its interior was full of air, while its surface was the sky, the celestial dome. On the plane of its base there was the stationary Earth, which he thought it was floating on water: “*floating as a piece of wood or something similar*”.

Anaximander believed that in the Universe there is a kind of natural law, a cosmic "justice" that keeps the balance among the 4 principal elements, which always are in a state of antagonism due to their different essence. Their natural relation should be eternal, so that no one of the 4 could subordinate the rest. Anaximander was rejecting the idea of his teacher Thales that the basic element was the water: if one of the elements had an advantage over the others, then it would have absorbed the rest. The primal essence for him was **infinity**.

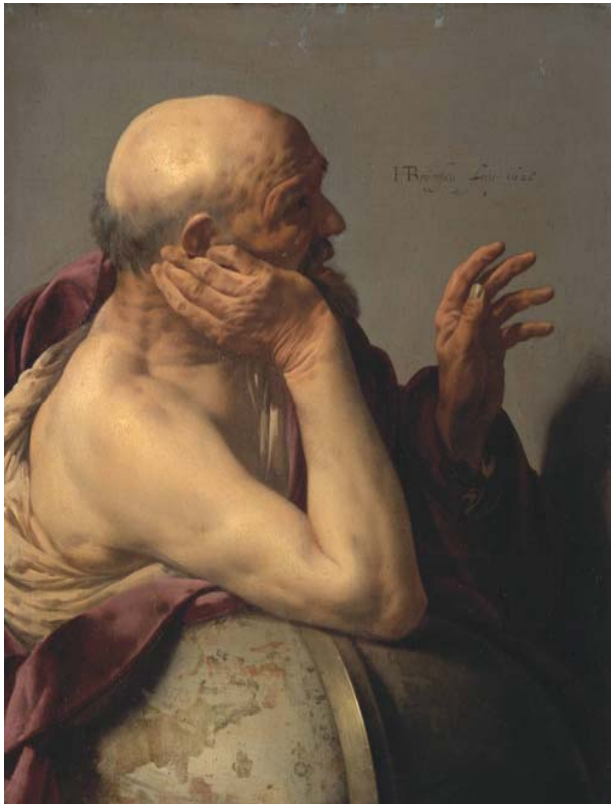
Anaximander was the first cartographer who dared to draw the known world. He also proposed a most intriguing origin for the human species; according to it the first humans were evolved from fish-like beings. These first attempts to formulate a theory of natural history and a reasonable explanation of the phenomenon of life were not agreeing with the creation of life by some Creator God.

So the idea that no life form is eternally unchanged but it evolves, did not originate with Charles Darwin, but with Anaximander.

Anaximenes also accepted (as the rest of the Ionian philosophers) the basic principle of monism common to the Ionian school that everything stems from one origin and finally goes back to it. According to his views, the origin of everything was the **air**, which for Anaximenes was infinite, that is indeterminate and eternal. The air was the vast material mass to which everything was or could be reduced.

The air of Anaximenes was constantly moving, exactly as Anaximander's infinity. Out of this perpetual motion of the air all the variety of things and phenomena was finally created. Fire originated from the air through thinning, while the condensation of the air created the waters and the Earth. The genesis and the decay of worlds succeed one another eternally. Anaximenes believed, like Anaximander, that our world was not the only one that existed; he also supported the idea that the vast mass of the air incorporated innumerable worlds that were being created and died all the time, emerging from and returning back to the initial infinity.

Heraclitus considered **fire** as the originating essence of our world. He believed that, of the richness of creation with its unpredictable changes, nothing remains stable, motionless. There is not constancy, but only an eternal flow, a perpetual motion. This is exactly what we accept today for the world of quantum physics; the apparent stability and immobility is an illusion and is due to our limited senses. According to Heraclitus, matter is constantly transformed, while in our finite Universe the elements “fire”, “air” and “earth” are just different states of one and only material.



All the ancient natural philosophers of Ionia distanced God the Creator from nature and history, keeping always a deep respect for the beliefs of their fellow people; most probably they, too, kept a form of God in some area of their minds and souls, in his spiritual and moral dimension .

In the year 2009 we celebrate the 400th anniversary from when Galileo Galilei and Johannes Kepler laid the foundations of contemporary astronomy. Galileo in 1609 directed for the first time in history a telescope towards the sky; while in the same year Kepler published *Astronomia nova*, where he describes, first of all astronomers, the elliptical motions of the planets. To honor and glorify these pioneers and founders of modern observational astronomy, the year 2009 was proclaimed International Year of Astronomy.

However, this year we also have a double Darwinian anniversary, with the completion of 200 years from the birth of Charles Darwin and 150 years from the first publication of his opus *On the Origin of Species*.
Thus, 2009 is a year dedicated to both Charles Darwin with the biological evolution he theorized, and to astronomy and the cosmic evolution.
We hope that this year will offer a golden opportunity for us to reflect on the deeper unity of the Universe, using as a starting point the parallel nature of the more recent terrestrail phenomenon of the biological evolution and the much older and wider phenomenon of the evolution of the Universe.