

# Anaximander: The early way to neurosciences and neurophilosophy

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## Editorial

Anaximander from Miletus, in the sixth century BC, introduced the revolutionary issue that the universe was originated from the infinite, the boundless (*ἄπειρον*, *apeiron*)<sup>1</sup> in opposition to widely accepted mythological Hesiodian theories on cosmogony.

In that era the majority of the pre-Socratic philosophers, from Thales onward, searched for a reasonable explanation of the origin of the universe, introducing the concept that the roots (*ρίζωματα*)<sup>2</sup> of the creation of the Earth, as well as of the celestial bodies and all the living entities were simple natural elements, namely the air, the water, the fire and the earth.

Anaximander held the very original view that the infinite (*apeiron*) created everything on earth and it was the unique generating power of cosmogony, offering therefore a reasonable explanation of the existence of everything in the world.<sup>3</sup>

According to Anaximander the *apeiron* is a boundless lasting stuff, an eternal substance, infinite, unaltered, incorruptible, everlasting (*aidion*), indestructible, immortal (*athanaton*) and inexperienced, which acts as the unique generating energy, without any limitation of time and space, steering all the natural phenomena.<sup>4</sup>

The *apeiron* is therefore the source of creativity, it is the origin (*ἀρχή*) of each existent entity,<sup>5</sup> the real cause of the continuous evolution of the living world and of frequent alterations of the biological systems. Many centuries before Darwin (1859)<sup>6</sup> who suggested that species evolve, Anaximander claimed that the evolution affected all living beings and described the evolution of the animals, that arising in a water environment, being covered with spiny skin, crawled later onto land and survived under continuous transfiguration.

It is reasonable, that the contribution of Anaximander in Philosophy and Science by formulating the infinite (*apeiron*) and introducing the theory of the evolution of species is enormous<sup>7</sup> particularly in an Era that any theory on chemical reactors and prebiotic systems chemistry was in-existent.<sup>8,9</sup>

Anaximander son of Praxiades<sup>10</sup> was a member of the Ionian school of philosophy, on the western coast of Asia Minor, which included among others the three eminent Milesian physical philosophers Thales, Anaximenes and Anaximander, who were characterized as pathfinders of the modern science.<sup>11</sup>

According to Hippolytus Anaximander was a student and disciple of Thales, who was the first of the real philosophers, according to Nietzsche.<sup>12</sup> Thales searching for natural, empirical arguments for the creation of the universe, claimed, from a pragmatic point of view, that everything was originated from the water, which is the material cause of all things, being the main physical power with generating and revitalizing properties.<sup>10</sup>

Anaximander following the Milesian philosophical tradition

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wrote a book "On nature", from which only a fragment survived, through the centuries, which was characterized by Heidegger as the 'oldest fragment of Western thinking'.<sup>13</sup> However, his philosophical concepts and reflections exercised a marked influence upon Aristotle, Theophrastus, Eratosthenes and Apollodoros.

Many years later, in 530 AD, fragments from Anaximander's book on nature were copied from Theophrastus' dissertations by the Neoplatonic Simplicius and were incorporated in his commentary on the Aristotle's *Physics*,<sup>14</sup> continuing thus to contribute for years as rich sources of philosophical inspiration, since the role of Simplicius as doxographer in the transmission of Presocratic philosophy was crucial.<sup>15</sup>

In addition to philosophy, Anaximander wishing to describe the Earth and the physical environment drew a map of the world, which was the first map of the known world, been finalized later by Anaximander's 'pupil' Hecataeus (c.560-c.480 BC).<sup>16</sup>

In the field of modern philosophy Martin Heidegger characterized Anaximander as one of the first thinkers<sup>13,17</sup> who passed the borders of the concrete and perceptible and entered in the space of the immense, endless and undetermined *apeiron*.<sup>18</sup> According to Heidegger Anaximander's *apeiron* is an infinitive and indeterminate being.<sup>19</sup> It is also worth to mention that Karl Jaspers in the first volume of his *Philosophy*, based on Anaximander's concept of *apeiron* and his theory that the universe grounded in metaphysics, characterized him as the first real metaphysician.<sup>20</sup>

In the fields of Astronomy and Cosmology, Anaximander introduced the idea that the Earth, which was described as been round as a disk or a cylinder, like a segment of a stone column, is located in the center of the Universe,<sup>21</sup> being equidistant from all the points of the universal circumference and floats suspended over the void. That concept would be characterized as a portentous idea of substantial value in the history of natural philosophy and cosmology.<sup>22</sup>

It is clearly realized that Anaximander was the author of the model of geocentric universe<sup>23</sup> which was later on surpassed by Aristarchus' heliocentric model.<sup>24</sup> According to Anaximander the Universe and the Celestial bodies or spheres are in everlasting motion, "eternal motion", as wheels of fire, around the Earth, which remains stable and motionless in the center of Cosmos.<sup>25</sup> In addition, Anaximander

conceptualized that on earth there is a universal law of justice which establishes order and enables everything to go back in its initial condition.<sup>26</sup>

Trying to make a metaphor from the fields of Cosmology and Astronomy to the field of Neurosciences we would reasonably hypothesize that the geocentric theory by Anaximander symbolizes the encephalocentric theory in which the brain, the “hegemonicon”,<sup>27</sup> the source of being and becoming, the principal organ which rules and controls all the functions and the activities of the human body and soul<sup>28</sup> remains stable in the center of the human existence, giving the life force to the body,<sup>29</sup> motivating and controlling all the activities of the human being and adjusting properly the human behavior.

In addition, the functional capacities of the brain approach to Anaximander’s apeiron<sup>30</sup> not only from the quantitative viewpoint but mostly from the qualitative dimension, since the brain possess an infinite range of possibilities in mental activities, conscious and unconscious processes, as well as a wide spectrum of continuous psychological and behavioral evolutions.<sup>31</sup>

The enormous number of neurons in some areas of the brain, such as the granule cells in the cerebellar cortex and in the hippocampus and the utilization of a large number of neurotransmitters may induce enormous functional modulations in the multi-dynamic neuronal networks, which would be studied and verified in vivo mainly by functional magnetic resonance imaging (fMRI)<sup>32</sup> and functional nearinfrared spectroscopy (fNIRS). In addition neuronal and glial plasticity,<sup>33–35</sup> which is a substantial factor for homeostatic equilibrium<sup>36</sup> enlarges constantly the range of the functional capacities of the brain, which may be theoretically approaching to apeiron.

It is worth to underline that by studying Anaximander’s fragments in our epoch of quantum revolution and analyzing all his concepts on apeiron, cosmology, earth<sup>37</sup> and universe, we remind parallel recent theories on philosophy and science expressed by Pauli<sup>38</sup> Hawking.<sup>39</sup> In addition, Anaximander’s theory on biological evolution, which is similar to Darwin’s observations and evolutionary concepts,<sup>40</sup> advocates for the reasonable conclusion that Anaximander must be regarded, not only as physical philosopher, metaphysician, real scientist but also as a main theoretical pioneer in the field of Neuroscience and Neurophilosophy, clarifying that science is a continuous effort for unceasing thinking and theoretical quest for approaching the truth.<sup>41</sup>

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## Conflicts of interest

The authors declare no conflicts of interest.

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