

## ***The human skin: A meeting ground for the ideas about macrocosm and microcosm in Ancient and Medieval Greek literature***

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### **Summary**

*We have been interested in the cleansing capacity of skin during the recent years. In a paper of ours (1) we presented a few references to Hippocrates' and Galen's ideas on the subject, while the main body of the article was based on the 17th-20th centuries' relative practices. In a second paper (2), we were mainly testing the ancient and Medieval Greek ideas on skin catharsis against some clinical work of ours. In this paper we now present the ideas of the pagan and Byzantine Greek authors (5th cent. BC -10th cent. AD) on the relationship of the human body to the natural and man-made world. Special emphasis is given to the relationship between purification through the skin and world purification. Based on the similarity of Empedokles' concept of the four elements and Hippocrates' thesis concerning the four humours, the Earth itself was personified and became a living organism that felt cold, perspired and became dry. Man started to seek a natural explanation for his diseases and alterations of his body functions. Hence, perspiration, fever, urination, headache, stroke, were explained in cosmological terms. Extracts from many medical and non-medical writers, like Empedocles, Hippocrates, Aristotle, Galen, the Fathers of the Church, Meletius Iatrosophista, Theophilus Protospatharius, Michael Psellus and other sources are presented, in order to show the close relationship between an abundance of diseases and an array of natural phenomena.*

### **Résumé**

*Ces dernières années nous nous sommes penchés sur l'étude des capacités purificatrices de la peau. Dans notre premier article à ce sujet nous avons présenté des références Hippocratiques et Galéniques alors que l'essentiel de cette communication était consacré aux pratiques médicales du XVIIe au XXe siècle qui y sont relatées. Dans un second article nous avons axé notre étude sur la comparaison entre les anciennes notions de «catharsis» de la peau et certains de nos travaux cliniques. Dans cette étude-ci nous développons le point de vue des auteurs païens et Gréco-Byzantins du Ve au Xe siècle après JC sur la relation entre le corps humain et les mondes naturel et artificiel. L'accent est mis sur le parallélisme entre la purification transcutanée et la purification du Monde. Se basant sur la similitude entre le concept Empédocléen des 4 éléments et la thèse Hippocratique des 4 humeurs, la Terre fut elle-même personnifiée et devint ainsi un organisme pouvant ressentir le froid, transpirer et sécher. L'Homme essaya de découvrir une explication naturelle à ses maladies et à l'altération de ses fonctions corporelles. Dès lors la transpiration, la fièvre, la miction, le mal de tête et l'attaque d'apoplexie furent explicités en termes cosmologiques. Des extraits de nombreux auteurs médicaux et non-médicaux tels qu'Empédocle, Hippocrate, Aristote, Galien, les Pères de l'Eglise, Meletrius Iatrosophista, Théophile Protospatharius, Michel Psellus et d'autres sources sont présentés, afin de démontrer le lien étroit entre une multitude de maladies et une série importante de phénomènes naturels.*

### **Introduction**

Western scientific thought was born about the 6th/5th century BC, on the Greek shores of Asia Minor and concurrently at the other end of

Hellenism, the southern Italian region of Magna Grecia. In the East, Thales of Miletus, Anaximandros, Anaximenes, Heracleitos of Ephesus were the main representatives of this important cultural event, while in the West, Xenophanes, Empedocles of Acragas and Parmenion were co-founders of pre-Socratic philosophy. The eastern philosophical line of thought was characterized by an Olympian and abstract attitude, and coolly set the scientific questions about the creation of the universe, justice and the principles of physics. The western attitude was more metaphysical and was occupied with dilemmas like the existence or not of the non-being. Between these two ends was the Pythagorean theory, which stood in the middle, chronically, geographically and - more important - philosophically. It combined mathematical philosophy with theology, and tried, based on that foundation, to explain the order of the world (3). The *physicist* investigates, for example, the ultimate constituents of matter, the modes of combination of the elements, and their natural movements. Besides astronomy, physics in Greece includes not only the sciences we would call dynamics, physics and chemistry, but also all the different branches of biology (4). Although the correlation made between phenomena of the external natural and man-made worlds (called here after *macrocosm*) and the internal body functions (called henceforth *microcosm*) wasn't always successful, it still represents a huge advance from the previous state of the human mind, when everything was explained by divine intervention. Now permanent rules were proposed to explain the bodily functions, and those rules applied also to the whole of Nature. Hence, man was not regarded as the center of universe, but rather as part of it. The idea was basically correct, and was enhanced with the establishment of Christianity. The new christian dogma was definitely not anthropocentric, but preached the all-embracing plan of the Almighty, which included macrocosm and microcosm alike. The extreme manifestation of this Greco-Christian doctrine was, unexpectedly, found in the anarchist iatrophilosopher of the 16th century, Paracelsus.

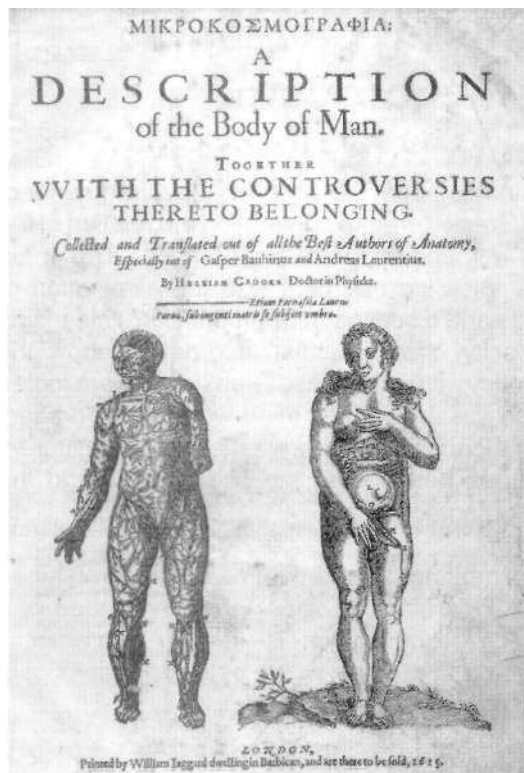
In this paper we present a few fragments of the Greek literature concerning the relation of the internal and external phenomena. The main examples we use deal with the elimination of fluids and diseases through the skin's cleansing capacity, the catharsis. In order to show the potency with which those Greek ideas were rooted in the western scientific mind, we shall also present some iconographic representations from different cultures dating from the Middle Ages and the Enlightenment.

A gross idea about this impact can be obtained from Figure 1, that shows the cover page of a book published in the 17th century, and which is devoted to the interaction between macrocosm and microcosm.

## Material

The first Greek codex we present is from the work of Empedocles (5), a famous philosopher, poet and physicist, who lived in Southern Italy in the 5th century BC. He wrote:

*«Furthermore, all (animals) inhale and exhale in the following way. All animals have flesh tubes that are full of blood and, in addition, these tubes are spread on the skin's surface. Onto the orifices of these tubes the body's uttermost surface has been cleaned through being furrowed with dense pores in such a way as to be able to contain the blood (in the body); a clean passage should be opened up for the air by means of the cuts and through the pores. Owing to this fact, when the thin blood rushes to an opposite direction in relation to the pores, the air dashes in them as an uncontrolled wave. When the air springs again through [the center of the body] to the surface, then the air is exhaled outwards. A similar event occurs when a young girl plays with a clepsydra made of glistening copper: When she supports the opening from the bottle's neck with her lovely hand and sinks the clepsydra into the silver-coloured water; the air can no more enter the vessel whereas the volume of air from within*



The front page of the Book: *Microcosmography* (The title is in Greek), Published in London, Printer Iaggard William, 1625.

We will illuminate better the relative cultural climate of antiquity with two other poets' views. During the 1st century AD, Ovid, in his poem «*Metamorphoses*» describes the ability of a humanized Earth to absorb and re-excrete liquids when he speaks of the killing of Marsya and the shedding of tears for his death: «*The fertile earth got soaked, and soaked it caught the tears and drank them deep into her veins. Transforming them into water, she sent them back out again to the open air (...)*». During the same period, in his poem «*On the Nature of Objects*», Lucretius presents another version of the entire body's pores, which corresponds to our topic more fully:

«*I will try now to remind [you] of how poriferous a body all things have, a fact that was also stated in my previous ode. Because, truly, although the fact that we realize this is important for many things, and at any event for those which I am going straightforward to speak of, it is more than necessary to be certain that here is nothing more than [the truth] that a body is perforated by pores. One first such complex [gives evidence for this]: in caves, the rocks above our heads discharge moisture and percolate muddy drippings. Likewise, sweat drips from our body (...)*».

Hippocrates, the Father of Medicine, in the 5th cent. BC had elaborately commented on the relationship between human perspiration and global phenomena. We quote here only one passage:

«*Because, on the one hand, the salty (residue) is leaving it (the water) due to its thickness and heaviness, and hence, the salts are created. On the other hand the sun is lifting the lightest part (of the water) due to its lightness. And it rises not only from the lake- waters but also from the seawaters and from every where the wet element resides [...] and from the human being it (the sun) lifts the thinnest and lightest from their moisture (the perspiration) [...]*» (6).

obstructs it as it falls onto the little pores, until the girl [having withdrawn her hand] provides a free passage so that a dense stream of air comes out. Now then when the air has vacated the interior of the clepsydra, a proportional quantity of water comes into it. The same occurs when the water has occupied the deep interior of the vessel, and through the human skin [that is the habit] the pore and the neck [of the vessel] as well as the outside air have been obstructed due to the fact that the air has been obsessed with the idea of penetrating into the vessel. Holding the water at the neck's outlet, producing a deep sound, maintaining under its possession the edge of the neck, until the girl proves a way out by removing her hand. Then, after this and exactly in the opposite direction, compared to what occurred before, the air falls inside, and a proportional quantity of water is withdrawn. The same occurs with the blood that is moving with vehemence through the body's parts. When it rushes inwards by returning backwards then the stream of air penetrates with swift undulation. When the blood rushes upward from the body's depth, the air is exhaled outwards in equal proportion [s].».

Bartolomeus Anglicus, "On the Properties of Things", France, Le Mans, 15th cent, BNF, FR 135, The Four Elements and the Zodiac Circle, fol. 285.

Aristotle, the great philosopher and physicist wrote in the next century:

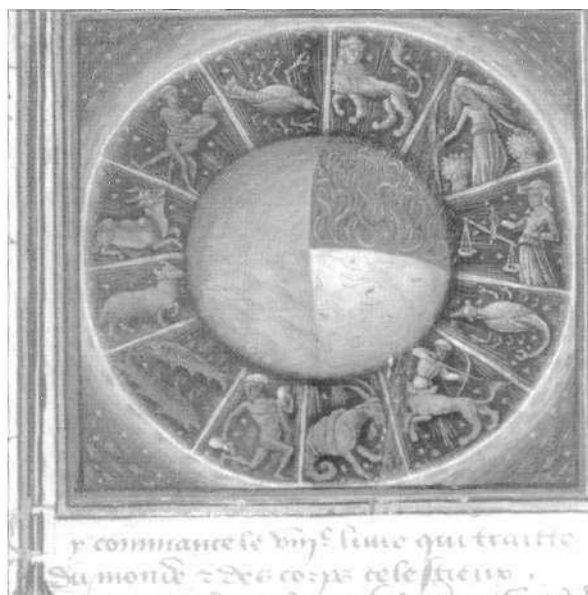
«[...] And some of them say, that the Earth becoming warm by the sun, it (the sea) becomes sweatwise, hence, it is salty, because the sweat is also salty. Some others say that the reason of saltiness is the soil. Exactly as the (water) sieved via a mass of ashes becomes salty, likewise the sea becomes salty after being mixed with this kind of soil. [...]» (7).

But further on, he produces a counter-argument, which we now know is closer to reality:

«Similarly, it is ridiculous for it to be said that the sea is the earth's perspiration [...] exactly as Empedocles said, because he may have said that adequately for poetry (because the metaphor is characteristic of poetry), but not adequately for understanding nature, as it doesn't become evident how perspiration turns salty (produced) by a sweet drink. [...] It seems that the same reason applies to the excrement collected in the bladder. As it also becomes bitter and salty, although the liquid swallowed by drink or contained in the food is sweet. Because, if exactly as the water sieved through ashes becomes salty, accordingly, the same happens, when, a similar salty substance that apparently exists in the vessels, is either decanted into the urine, or is excreted from the flesh mixed with the sweat, in a way, washing it (the saltiness) out from the body via the excreted water, it then evidently applies to the sea, that an earthy substance mixed with the liquid is the reason of its saltiness [...]» (8).

The next example comes from the renowned medical writer Galen (9), while he commented on Hippocrates' Aphorisms:

«He [Hippocrates] didn't say that water is never poured during the whole period after drought, but that [it does so] in extremely small quantities, with the exception of the first period after the autumn equinox till the Pleiades, all the rest of the year has a predo-



minance of lack of rain. He called <transitory> this condition of the environment, well, if it is really true that in accordance with the environment the animals' bodies are altered, then they become wetter during the rainy period and drier during the rainless, and during the hotter seasons the head becomes light, while during the colder it becomes drowsy, and the [body] parts around the thoracic cavity and the lungs will feel pain. Well, the bodies in resemblance to this condition, which we are intending to examine, and which has an intermittent nature between exactly the crystal-clear and the rainy, they [the bodies] have also an intermittent condition which, allow me to call cloudy, because being that the environment and the bodies being obliged to change and resemble it accordingly, and it isn't too bad for the sake of clarity to call this condition imposed on them somehow cloudy, because exactly when winter is caring for the familiar constitution, it is necessary the wet and cold humor to be generated, [i.e.] the phlegm, and again in summer the hot and dry, [i.e.] the yellow bile, hence, whenever the environment is cloudy, one of the humors predominates; in the phlegmatic natures and ages [the] foggy and cloudy, as someone can call phlegm, in the choleric [nature] again the foggy and cloudy bile, because always something vaporous is excreted from our body, but in dry [environmental] conditions a



Bartolomeus Anglicus, *On the Properties of Things?*, France, Le Mans, 15th cent, BNF, FR 135, *The Composition of the Human Body*, fol. 135.

lot of it, and on wet ones very little, which is then accumulated inside us similar to fog and mist it works on our implanted spirit.»

We continue with the work of an Early Byzantine writer, Alexander of Tralles (10). I quote: «But if tremor and rigor appears [...] and the temperature (in these fevers) makes many peaks and troughs mimicking the doves' dung which according to the succession of decomposition lights a fire that extinguishes again (and then again flares up). [On the contrary to other kinds of infections], as we can see to happen with tar and asphalt or with reeds and wicks and many other similar materials, and everything that is ready to succumb to fire and lit, hence, if a spark happens to appear, they are immeasurably inflamed, [...] something similar happens inside us, because the pneuma starts to be burned [...]»

(11) Palladius Medicus, while commenting on Hippocrates, wrote in the 5th century: «There is a sign during gymnastics, the perspiration pouring drop by drop, as if coming from sewage [...]».

During the 9th cent. AD, Meletius the Monk, was an ardent supporter of the relation between

macrocosm and microcosm. His whole theory about the three digestions and purification of the human body was based on the comparison of the macrocosmic phenomena to the biological microcosm. In the beginning of his work *"Essay on the nature of man"* he clearly states his aim which was to show «which of the world's elements [the nature] harmonizes with the body, and what part of the world equalizes with the body». He elaborated on Galen's and Hippocrates' relative ideas, writing that:

«Because man is made from body, and every body is composed from four elements, it is necessary to suffer from these kinds of diseases which are fit for the elements; and the elements [are these] by which the whole universe is made, i.e., earth and water and fire and air, [...] the blood, being warm and moist, corresponds to air, the yellow bile, being warm and dry, corresponds to fire, while the black bile, being cold and dry, to earth, and [lastly] the phlegm, being cold and wet, to water.»

We present the next two illustrations (Figure 2 and 3) from the medieval manuscript «*On the Properties of Things*» written in the 12th century by Bartolomeus Anglicus. They represent vividly Meletius' thesis that the human body and the Earth are made from the same four basic materials. Five centuries later, in an unpublished Greek manuscript on folk medicine, which is presented here for the first time, we read the same parallelism between the four elements of the body and the those of the universe, i.e., the earth, the water, the fire and the air.

Of particular interest is Meletius' parallelism between the body's and the city's drainage:

<<The creative or better yet the guardian nature, [...] in caring for the animal, it created channeling pores through which the waste and muddy substances of the body are purified. Because as it knew that food is on the one hand useful to the body but also has wasteful elements, for this reason it invented these (pores) just as they who care for the

*cities, build sewers and streams, so that whatever waste material is collected it can be eliminated into lakes, rivers or seas.» (12)*

A few years later, Theophilus Protospatharius, the famous Byzantine doctor wrote, in collaboration with others, two works emphasizing the same parallelism between human physiology and the natural and man-made world:

*«[Lefs say] that there is a pre-warmed, red hot and empty boiler, and [there is also] cold water; we pour that water into the boiler, and we then touch the water and we find that it becomes warm and piping hot not by conduct, because the boiler has the temperature by conduct and the water by relation, why, one thing is the conduct and another thing the relation, so we say that the boiler has the warmth by conduct, while the water by relation, keeping in mind that the transmission of heat to the water happens by convection. And from this example it is evident that it is possible first the solid [tissues] to be affected by fever, and then by transmission the liquids and the gases may be affected. Reversing this example we may apply it to the fever affecting the [body] liquids the reverse example. [Let's say that] the same boiler exists, but cold, let now someone fill it with warmed and piping hot water, we will find then again the water being warm by conduct, while the boiler relatively warmed. And what do we now gain [from this example]?, that when the liquids are suffering, and are in fever by conduct, the solid [tissues] remain unharmed and they are only warmed by relation. Look then, you have an example of both kinds of general fevers, [i.e.] of the hectic one affecting the solids and on the one affecting the liquids.» (13).*

In another work of his (14), we read:  
*«Apoplexy is the loss of sensitivity and motion from the whole body with damage of the overruling energy, whose cause is a phlegmatic moisture filling the brain and its whole mass. It*

*occurs exactly as a cloud racing around the Sun obstructs it and doesn't permit it to illuminate the Earth, likewise in this case the moisture, as a cloud, is covering the brain, and prevents it to send out powers to the whole body, and hence it stays still and senseless».*

Ioannes Apokavkos, the 13th century intellectual, who became bishop of Naupactos in Western Greece, was an ardent letter-writer. His epistles to friends and adversaries have been recently published. In one of them, sent in the year 1219, to the philosopher Niceta Choniates, Bishop of Athens, he thanks him for his gift of a parcel containing a kind of local caviar. Very modestly, he describes that costly food as suitable for poor hermits, because:

*«Those fish-eggs, embalmed, and on the one hand dry by the sun's rays, on the other hand hollowed from their naturally attached humidity [...] similarly, you have been dried up from every wordly flabbiness, by Christ, the spiritual sun, and thus you don't excite any humour. In a different way of speech, I call you a moist wood, permanently hydrated by the perspirations of virtues [...]» (15)*

Poetry didn't restrict itself into likening the Earth with a perspiring body, as Aristotle commented. It also endowed it with internal organs, which may suffer in resemblance to the human organism. John the Evangelist, wrote in his Apocalypse:

*«[...] But the face of Earth will be (flat) like a table and white like the snow, and the Earth's kidneys will be in flame, and it will cry loudly to me saying: I am a virgin in front of you, Lord, [...]» (16)*

Saint Athanasius followed the same line in the 4th? cent. AD:

*« There aren't many wills as you have thought, as it isn't necessary for them to be many wills because there are many creations. But exactly as, with a single will, he created man from several members and made him from different*



Tobias Kohan, *The plan of man*, 18th cent. A drawing likening the human body with the different compartments of a dwelling.

Eustathius of Salonica compared again the body with the universe and the city:

« That monarchy is a good [regime] is proved by the celestial order which is governed by one guardian, the Almighty, [...] one is the sun which is awarded to inspect the Earth during the whole day, and one is the moon that is the eye of the night, and the king of kings (God) established one king in our castle, the brain » (20).

From the last five texts we trace the tendency of the medieval intellectuals to use the various members of the human body as a mode of classification for scientific theories or abstract ideas. Later, Tobias Kohan, the Jewish doctor of the Sultan, the successor to the Byzantine Emperors, published a book in the beginning of the 18th century, named «The plan of man». In a drawing from it we can see (Figure 4) exactly the same likeness of the physiology of a human body and the architectural designs. Parthenogenesis is rare in Nature and very rare indeed in Science!

## Discussion

The mechanical theory with which Greeks, and afterwards the majority of Western thinkers - like Paracelsus- tried to explain the biological phenomena, cannot be rigidly applied to human physiology. The concept of a natural geometry is imperfect. Geometry would not work if it was at times as chaotic as the rules of nature can be. And nature could not function if its rules were so inflexible as those of geometry. Let's take for example the thermoregulator of a machine, and compare it with the thermoregulating function of the body, i.e. vasodilatation and perspiration. We are unable to take from the body its thermoregulating apparatus, to dismantle it or to re-insert it. We cannot either, based on mechanical models, predict the level of its function after a hormonal or a sentimental stimulus. Every human being is characterized by a given genetic code of four nucleotide chains. This code obeys mathematical laws. It is numerical and can be expressed with

parts, (like) eyes, ears, noses, hairs, bowels with their variant composition, spleen, liver, kidneys, and everything that is inside us, likewise (God) created the whole world with a single will.» (17)

Michael Psellus, the polymath of the 11th cent., wrote on the resemblance of the human mind with a house:

«[...]accordingly to a higher way of speaking, dismemberment may even be found in a single man. Because each one of us happens to be five-compartmental senses wise, hence, metaphorically (the man) is also called house, as the host of the (five) senses.» (18)

And in another work, the same poet draws a parallel between the human body and the religious establishment. The head resembles Christ, the body resembles the Church, the neck and feet stand for various Saints, the hands for the Apostles, the abdomen contains the souls of the innocent, etc. (19)

In the 12th century, the Bishop-intellectual

the laws of biology. According to the environment the nucleotide complex can be multiplied and produce facsimile offsprings. However, the environment, given casual external factors, can lead to different types of human beings. Hence, we observe two contrary processes. One stable and one based on chance and necessity (21). The human body may work in a parallel mode with the universe but does not slavishly copy it. Human physiology is the work of an artist and not of an engineer (22). Even so, the similarity between macrocosm and microcosm was, and still is, enthralling. It can be epitomized in Aristotle's teleology, which supports his thesis of the final cause of nature. Indeed, he expressed the view that one of the main purposes of studying animals is to reveal in them the order and the beauty of nature.

## Conclusion

Although the phenomena and processes of biology fall short of the regularity and uniformity of the heavenly bodies, the animal kingdom provides, nevertheless, evidence in abundance, as Aristotle put it: «of the absence of chance and the serving of ends of nature» (23).

## Bibliography

1. Diamandopoulos A. (1977), a History of Natural Membranes in Dialysis, *Am. J. Nephrol*; 17, 304-314.
2. Diamandopoulos A.A. and Goudas P.C. (in press), The substitution of renal function through skin catharsis, a clinicohistorical review. *Kidney International*.
3. Syllinas M. (197), *The pre-socratic philosophy and the modern natural sciences*, Dodoni (edt.), Athens, p. 13.
4. Lloyd D.E.R. (1993), *Aristotle : The growth and structure of his thought*, Cambridge University Press, Cambridge, p.133
5. Empedocles, *Fragmenta*, 100.
6. Hippocratis, *de aere et locis*, 8, 4.
7. Aristotelis, *meteorologica*, 35 b, 12.
8. *ibid*, 357a, 25
9. Galen, On the firsts book of Hippocrates

«Epidemics», ed. Helmreich, (*Corpus medicorum Graecorum*, Leipzig, Teubner, 1934,) vol. 17, p. 42.

10. Alexandre of Tralles, *DeFebribus*, ed. Puschmann, Vienna, Braumuller, 1878, repr. Hakkert, Amsterdam, 1963, vol. 1, p. 315, 1. 10.
11. Palladius Medicus, *Commentarii in Hippocratis librum sextum de morbis popularibus* 2, 78, 3.
12. Meletius the Monk, *Essay on the Nature of Man*, Hayduck ed., 1904, chap. 12.
13. Theophilus and Stephanus, *Defebriumdifferentia, Sicurus*, ed. Florence, Bengini, 1862, p. 17.
14. Theophilus and Damascene, «Comentarii in Hippocrates Aphorisms» vol. 2, p. 333.
15. Ieronymus Delemaris, Archideacon, Fathers of the Church and Ecclesiastical Writers from Western Greece, vol. 1, *Ioannes apocaurus' Oposcula*, Stamulis (publ.), Athens-Naupactos, 2000, p. 130.
16. *Apocalypsis Apocrypha Joannes*, 15,8.
17. Athanasius theol. *De Santa Trinitate* (Dialogi 1,3, 5, (sp).
18. Eustathius of Salonica, *Commentarii ad Homerii Iliadem*, M. van der Valkvol. 4. Leiden, Brill, 1987, vol. 1, p. 308.
19. Michael Psellus, *Theologica, Opusculum* 77, 1. 105.
20. Michael Psellus, *Theologica, Poemata*, 2, 1065, based on *Canticum Canticorum*, 5, 1415.
21. Xylinas M., 1997, *The pre-socratic Philosophy and the modern natural sciences*, Dodoni (edt.), Athens, p. 53.
22. Sachture E., (1989), *Gaea, Libanied.*, Athens, p. 274.
23. Aristotle, *de Partibus Animalium*, vol. 1, ref. in: Lloyd G.E.R., a.a. 93.

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