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Thales of Miletus and philosophical application of mathematics

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Abstract

This paper aims to introduce the reader to the thought of Thales of Miletus about what the future would be called "Philosophy" and their interactions toward mathematical thinking. In this regard, the objective is to present the experience of field-empirical mathematician Thales, in Ionia and Egypt and the Near East, for the anthropological and cultural exchanges that took place in order to equip the Ionian thinker resources capable of promoting his fame as one of the seven Sages of Greece, but above all, his pedagogical innovation, and mathematicians made inherent in the exercise of Hellenic wisdom in preparation. Finally, the paper aims to highlight the process of interaction between mathematics and revisionist critical rationalism that was to develop a new view of the social character of Truth Master and certainly would mark the next step as Philosophy and consequent to mathematical knowledge.

Keywords: *Thales of Miletus; Revisionist critical rationalism; Ancient Mathematics; Archaic Philosophy; Psychological History.*

Resumo

Tiu artikolo celas enkonduki la leganton al la penso de Tales de Mileto pri kion la estonteco estus nomita "filozofion" kaj ĝia interagoj al Matematika pensado. Tiurilate, la objektivo estas prezenti la sperton de kampo-empiria matematikisto Tales, en Ionia kaj Egiptio kaj la Proksima Oriento, la antropologia kaj kultura interŝanĝoj kiu okazis por ekipi la Ionia pensulo rimedoj kapabla antaŭenigi lia famo kiel unu el la sep saĝuloj de Grekio, sed ĉefe, lia pedagogia novigado, kaj matematikistoj faris imanenta en la ekzerco de Helena saĝo en preparado. Fine, en la artikolo celas reliefigi la procezon de interago inter Matematiko kaj reviziisma kritika raciismo, kiu estis disvolvi novan vidon de la socia karaktero de Vero majstro kaj certe markus la sekva paŝo kiel Filozofio kaj konsekvenca al Matematika scio.

Ŝlosilvortoj: *Tales de Mileto; Reviziisma kritika raciismo; Antikva Matematiko; Arkaika Filozofio; Psikologia historio.*

Resumo

O presente texto objetiva apresentar ao leitor o pensamento de Tales de Mileto a respeito do que no futuro se chamaria "filosofia" e suas interações para com o pensamento matemático. Nesse particular, se objetiva apresentar o campo de vivência empírico-matemático de Tales, na Jônia e no Egito, bem como no Oriente Próximo, quanto às permutas antropológico-culturais que se deram, de maneira a munir o pensador jônio de recursos capazes de promover a sua fama como um dos sete sábios



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da Grécia, mas sobretudo, sua inovação pedagógica, e feitos matemáticos inerentes ao exercício da sabedoria helênica em elaboração. Por fim o texto objetiva ressaltar o processo de interação entre Matemática e Racionalismo crítico revisionista que viria a desenvolver uma nova face do personagem social do Mestre da Verdade e certamente viria a marcar a Filosofia como passo seguinte e consequente aos saberes matemáticos.

Palavras-chave: Tales de Mileto; Racionalismo crítico revisionista; Matemática Antiga; Filosofia Arcaica; História Psicológica.

Introduction

In the History of Philosophy, the Tales of Miletus *polis* is considered the first critical rationalist thinker and revisionist as shown in the traditional "Presocratic philosophers" (KIRK, RAVEN & SCHOFIELD, 1994, P. 73-98) and Popper (2002) the latter, the philosopher who adopts the theoretical framework of our investigations, based on the analysis of those historians of German philosophy.

In this article however, we try to emphasize the mathematical output of Tales and his interaction with its critical revisionist rationalist thought, breaking the historical and cultural context of Miletus in the centuries VII-VI. C. and trying to understand existing entanglements between apprehension that Thales held on Eastern mathematics, in particular the African Egyptian, empirical character, and how much this empirical form can be understood in the strong sense of the term, that is, as man old, particularly the Archaic Hellenic receive such mathematics.

Another issue that is intended to emphasize here is the supposed theory that the Hellenes would have begun in mathematics Afro-Oriental, about to understand the mathematics of a fairly distinct way of multimillenary applications of this science in relation to Greek mathematics.



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Thales of Miletus: life and work

Little is known of Thales of his life than through the doxography that states that possibly is of Hellenistic-Phoenician origin, because his father was of Greek origin and had married a native of Phoenicia. Other doxographers claim otherwise, ie, that it is purely Hellenic.

The fact is that Thales was born around the end of the seventh century. B. C. and his rationalist criticism revisionist activity would have started at the beginning of the sixth century B. C. His activity is divided into two basic aspects: Physics and Mathematics.

However, before anything else, it is necessary to understand exactly what "physical being" at that time.

Unlike current physical, almost a mathematical extension applied to solving problems resulting from the kinematics studies, optics, thermometry, acoustics and electricity, middle school and wider issues, such as Physics of Elementary and Fields Particles, Nuclear Physics or Quantum Physics.

Be "physical" in the time of Thales refer to people who were devoted to attempts to understand the *phýsis*, ie, over nature, in the sense of all beings that make up the world and a broader vision, understanding of the cosmos, ie, the harmonic totality of everything that exists.

It notes that this time was not understood by the Hellenic idea of "universe" of "infinity" and "relativity". The cosmos was understood as a living, organic, and not as a clock, as the mechanistic theory Modern.

To the extent that the cosmos is an organism, necessarily it is understood by a corporeality, expressed by all existing beings and, as it were, by a soul,



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which the Hellenic mythical-religious tradition indicated by Brandão (1998), Burkert (1993) and Coulanges (1998), by human souls in the reincarnation cycles of metempsychosis.

In this sense, as shown by Popper (2002, p. 15), physicists former had a goal to understand the world as "our home", investigating its elements, structures and materials.

Added to all the above, it appends that the *phýsis* was understood to be made up of existential dimensions intimately and organically integrated, such as the human world, the gods, the Olympians, the dead, animals, vegetables and minerals. Since the so-called "world of men" was not understood apart from *phýsis*, since for Hellenic men and the gods had the same origin for cosmic engendering, and the gods are superior to men because of the nature of their body and soul, made of *aither* (ether); while men, having only made their soul the ether, their body engendered of earth, water, fire and air, and therefore mortal, transitory, like everything that exists in *phýsis*.

All these living, as the necessary nature of his cosmic role, and therefore their *arete*, that is, its excellence, in the sense of what is expected to be the highest possible degree of authenticity and *sophrosyne* (fair-measure).

To that extent, be "physical" in the time of Tales was not develop the ability to apply mathematical language to study and understand the particularities of natural phenomena to the existence, even if theoretical and theological grounds that there would be something "supernatural", that is, something that is outside of nature.

Since *phýsis* is part of the cosmos that unitary multiplicity manifests itself busy by reincarnations cycles of the human soul in metempsychosis, everything



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that exists, cosmically, is natural and therefore subject matter of the first critical rationalist thinkers.

So, when it indicates Tales as the first physicist, the meaning of this statement addresses the attempts to understand the *phýsis* and cosmos, from which arises the field of study called "cosmology"².

However, it is important to mention something about the distinction between the terms "critical revisionist rationalist" and "philosopher". The first term refer to the tradition possibly initiated by Thales and continued by his disciples, Anaximander and Anaximenes of Miletus, Xenophanes of Colophon, Heraclitus of Ephesus and Parmenides of Elea.

This philosophical tradition, there should be emphasized that the thinkers listed above, including Thales, were not known as "philosophers". Not that term was understood as currently read, that is, as a theoretical or intellectual given the discussions of reality through in metaphysicals systems more or less committed to certain scientific.³

Not least because, the term "philosopher", that is, "the lover or friend of wisdom" was a coined concept in the Pythagorean tradition and attributed to Pythagoras of Samos, a clear reference to the expertise of one of the dimensions of the Greek social character of the master og Truth, that is, the *sophos*, the wise. According to Cornford (1989, p. 3-19) and Detienne (1988), in Archaic Greece had the social

2. For a more in-depth and extensive study of the traditional way of the Hellenic man be understood in *phýsis* and cosmos invite the reader to watch the video-lecture on the cognitive markers, epistemological and cosmological Hellenic Archaic and Classical through link <http://www.grupodepesquisafilosofiacienciaetecnologiasifpr.com/#!vdeos-aula/c1tpp>

3. Prejudice arising from the vision of Medieval intellectuals and philosophers not given to experiments and applications of the scientific method, that confuses the vulgar think when the philosophers and its social activities.



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character of Truth master, which among other functions, played the shaman, rhapsode, soothsayer, medical / pharmaceutical and the time of Tales and operation of this and his disciples gradually added the critical revisionist rationalist thinker.

Tales, when he starts your rationalist activity is one of the pioneers who make the mythical-religious traditions of word-efficient, in verse, to be reviewed on a new mode of language, namely, reason, using the word-representation in prose, seeking the development of new readings of the tribe's stories, preserved by Homer and Hesiod, in addition to other theogonies and Hellenic and barbarian cosmogonies.

It is in this sense that one must understand the distinction between the thinker "critical revisionist rationalist" and "philosopher" as much as it should distinguish the "philosopher" of the "scientist", although as link these functions to observe the rational language in prose.

When starting the application attempts of the new language resulting from mental practices of writing, reinserted in the Hellenic daily from the sixth century B. C., as shown in Haveloc (1996, p. 11-44;. 87-118; 186-217 and 233-271), Tales not demystifies the traditional stories of the Hellenistic peoples. Nor opposes religious traditions as a contemporary atheist.

He intends to present a rational version the effect of revisionist criticism of the origin myths that Homer and Hesiod brought in their poems. Especially Hesiod, in his "Theogony" (Hesiod, 1995), because it is a prerational approach to the source material and the cosmos as "history of the gods."

At this point it is new observation, essential to understand the role of Thales, both in philosophy and in Mathematics: when trying to criticize the myths and gods presented them, Tales was literally doing "physical", in that it is corrected what is



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understood by "physical" in his time. In this sense, when Tales read in Hesiod that *Gaia* (land) generated asexually Uranus (Heaven), both Thales as Hesiod were "physical", because it remitted necessarily the physical and cosmic elements represented by the gods in question.

Therefore, Tales, one Ionian Greek of the centuries VII-VI B. C., when trying to understand a sun's eclipse as predicted by him in the 585 B. C., was not talking about the sun and moon, nor day and night or of the darkness. It was traditionally seeking to adapt these stories to new language and therefore talking of their gods: Helios, Celene, Hemera, Nix or Erebus. Possibly as a fervent devotee of the gods, as one would expect from a man of his time and culture.

Of course, this revisionist activity and rationalization of traditional myths, which held itself was the search for an explanation that best sustain as credible, in order to better approach the Truth. I remind the reader that the Truth (*Altheia*) is also a Greece deity and as bail Popper (2002, p. 1-32), the Archaic Hellenic were to partially skeptical about the human ability to reach the Truth up until Aristotle of Stagira. For there was the belief that only the gods could such a feat. Men, they only can conjecture, never be possible to know if you talk about the truth, even if you are talking about her.

Moreover as stated Provetti Junior. (2011, p. 45) and Rodolfo (1968, p. 10-67), the Ancient Greek man, was not known as a "subject of knowledge", that is, their interiority, subjectivity was partially ignored in the sense that their gnosiological criteria were basically inherent in conceivability, ie, as long as possible, in the mind grasping for identity a mental picture of what is spoken without resorting to sensory experience, only by the mind, such a thing is conceivable, that is, real.



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Faced with such gnosiological criterion that stratifies the Greek cultural and cultic practices since the Dark Ages and that started some break from the mental practices from word-representation in prose, the reintroduction of writing in Greece, we can see that the *phýsis* and the cosmos were experienced and understood in an absurdly different way from the current way we view the universe, its infinite dimensions, matter, the cosmos and ourselves, in the philosophical-theological and scientific perspective of Judeo-Christian-Muslim background.

At that point, made the reservations and directions previously stated, will be analyzed, so that becomes the Tales of mathematical practice and its activities to the History of Ancient Philosophy usually calls "practical" made of talesianos.

These deeds gave the Tales one of the seven positions of so-called "Sages of Greece". The most significant of these achievements, which ensures the thinker able to be considered by all as excellent (*arete*), purchased a God and worthy of being immortalized as Popper defend (2002, p. 7-32) was the creation of a new pedagogy, based on the exercise of *sophrosyne* (nothing in excess), and track the use of reason, as language in prose, enabled the revisionist critical rationalism as a method directed by the partial skepticism and application reductionism the explanations on the *phýsis*.

Tales broke with the tradition of masters of Afro-Oriental Truth when proposing his explanation of nature and apply mathematics in solving other issues, invited his disciples to operate your vision and to propose, if possible, a better account the discussion approached by these theses, the Truth, through theories and hypotheses deductionists.



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The great influence of Tales in revisionist critical rationalism, which was able to implement a pedagogical procedural rupture between traditional teacher-pupil relationship was from the belief that only the gods can have with Truth, completely relativized the Master of value in this Score. By opening his theses for discussion and a frank attempt by his disciples, to cast down their placements and propose to discuss with him, the master, new hypothesis that most closely approaching the Truth, was founded from that attitude, what was to become the philosophical tradition of excellence. That is, the constant revisionist critique of philosophers to his predecessors, always in search of Truth, even believing that never reach it, even though it and it you're talking about.

As regards mathematics, the Ancient philosophical historiography is succinct to mention only the theses of the parallel line segments and height measuring the bodies based on its shadow, possibly in a similar manner outlined theoretical climate.

The historiography refers the passage of Tales by Egypt, which together with the priests of that country would be instructed for a few years. Furthermore, the fact that Miletus, in Asia Minor, was a major trading center, where possibly several caravans and ships arriving from all over the known world. It is this anthropological experience and comparativist which must have stimulated Tales and his disciples to seek review the Hellenic myths and try to put them in the new language, that is, the reason. Certainly, imbued with the same purpose, the same held with the mathematical knowledge for years rapidly use by Egyptians, Babylonians, Persians etc.



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What is interesting to point out that, with regard to applied mathematics, as it was this, among other feats, which gave prominence to Thales for inclusion of the group of "wise men of Greece" is that just like the other people in that the thinking he met, mathematics has been applied to actual problems, for example, the calculation of the pyramid height, the distance of ships on the high sea, both as astronomical predictions as the eclipse mentioned as the use of the navigation by Dipper, as practiced by the Phoenicians in your browsing history, then unknown to the Ionians.

In this sense, Tales would not have done anything more than was already practiced in Africa, by the Egyptians and in Asia Minor by the Babylonians and Persians, but to introduce the mathematical knowledge applied to solving empirical problems in Hellas Ionia.

What distinguishes the Greek mathematics of the african-eastern and context will be shown under the action of Tales?

From what can be seen in the History of Mathematics in Garnica & Souza (2012) and Eves (1995), the geometry is the arithmetic were already practiced by human populations long before the intervention of Thales, especially in countries like Egypt, surveying and contained the so-called "Fertile Crescent", between the Tigris and Euphrates rivers.

These cultures certainly Tales he met throughout his life, not only because the commercial position of Miletus and his Egyptian colony, Naucratis, but the trip that the thinker would have undertaken in these regions. Since the Fertile Crescent some doubt as to its passage and stay for these countries with regard to Egypt there is broad agreement about the historiography.



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Therefore, what is at stake when Tales applies its theorems to address issues referred to as "practice" as it was exactly the usual role of mathematics in the above mentioned areas?

This question that presents to the reader, it is necessary to return the History of Philosophy, in particular, Hellas Social and Psychological History to understand the differential Tales regarding african-eastern mathematical multi-millennial tradition.

As shown in Vernant (1977), Havelock (1996), Garbi (2009, p. 18) and Ronan (2001, p. 64-71), the Greeks have a history dating back to a subtle blurring between what today is called "East" and "West", with the Minoan and Mycenaean civilizations, dating back to the early twentieth century B. C. until the middle of the XI century B. C., and went through a period called the historiography specialized by "Hellenic Age of Darkness".

This period was characterized by the arrival to the Eastern Mediterranean so-called "Sea Peoples", Indo-European peoples who spoke a Hellenic dialect, the Dorians and by this name were also known.

According to records collected by the historiography, this event was a real tragedy for many realms of time, for the Dorians or "the children of Hercules" (Heraclids), given their warrior culture and already have the iron technology, overwhelmed by the ideal religious and existential young death in battle for that will reach their *arete* (excellence) and social immortality, destroyed almost all cultures of the region, even users of the Bronze Age technology.

They were responsible for the destruction of the Mycenaean kingdoms and cause a migratory wave of escape from continental Hellas and European



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island for the Asia Minor, that three centuries later would be known Ionia. Miletus came about because of this social phenomenon.

The latter fact the destruction of the Mycenaean kingdoms is what matters to this article, because the break in the Mycenaean palatial lifestyle and the constant conflicts filed by the Dorians against other Hellenic races over the three hundred years ended writing culture, Linear "B" and plunged all the peoples concerned, the Balkans, Aegean, Ionia and Cyprus in the mental practice of oral culture.

It is during the IX century B. C., for example, that there is the myth-poetic tradition of Homer, with his "Iliad" and "Odyssey", poems basic training of the Hellenic man of the Archaic and Classical Literary epic of the model periods for subsequent Western civilization later Alexander's domination of Macedonia.

Havelock (1996) ensures that the decline of the Mycenaean civilization created a cultural gap that was able to restart the Hellenic societies (Achaean, Minoan, Mycenaean, Aeolian, Attic, Boeotian, Thracians and Ionians) in relation to the previously existing cultural ties to with African-Eastern civilizations such as Hittite kingdoms (destroyed by the Dorian), the Hebrews and especially Egypt (almost destroyed by Heraclids), as evidenced also in Burkert (1993) Jaeger (1995) and Roque (2012, p. 92-149).

Just along from the VIII century B. C. that the incursions of the "Sea Peoples" are reduced, these are fixed in the territories of the Peloponnese, Southern Ionian (Halicarnassus), Cyprus and West Nile, the Hellas begins to reorganize with the progressive agglutination ancient Mycenaean villages in *polis* (Coulanges, 1998).

That's when the city-states reattach international relations via trade, and the political and legal life begin to be drawn as to ensure some stability material,

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stimulated these social, the religious of *sophrosyne* ideal (fair-measure, nothing in excess), which operates, to some extent, the negotiations towards the Phoenician traders and these, are processed adaptations of the Phoenician letters system.

The important thing in this appropriation made by the Hellenes, according to Havelock (1996), was the creation of symbols for vowels, some symbols for specific sounds of the Greek language, such as "psi", the "chi," but the vast cultural turn, after some time of exposure to the alphabet adapted to the Greek, was the introduction of new mental techniques, resulting necessarily from the use of writing and text tract, rather than the absolute memory usage, so deified in Greece for the goddess *Mnemosyne*.

With the text writing not total requirement of memorization, the reader could have the text as an object of enjoyment to be found many times as necessary and based on that, you can reflect, inspect it, compare it, unfold it in its consequences.

Now, like the writing, mathematics applied to empirical issues in the period of orality, becomes somewhat complex, because what is the number, but a relative proportion to the other? And its arrest is today considered "abstract", that is, as seen in Japiassu & Marcondes (1993, p. 12):

- (lat. *Abstractus*) 1. It is said of what is considered as a separate, independent of its concrete and accidental determinations. An abstract idea is one that applies to the essence considered in itself and is removed by abstraction of several subjects who possess it. (...)
2. Product of abstraction that is to examine the real but considering separately what is not separate or separable. Opposite the concrete.

Note the reader that the lexicographers philosophy asserting that something "abstract" is considered anything of himself as "independent of its concrete



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and accidental determinations", therefore something abstract it is essential, and what are the characteristics of something essential? Further, it is said that something "abstract" is something that is taken from the "real", "the various subjects that have". Moreover, this real analysis is "considering separately what is not separate or separable (...) in several subjects that have" ie, the essence though not separable subjects that have to be considered as such, is separable, intellectually, to be considered philosophical analysis object. All this, according to the authors, through the action of "abstraction." It's personal printing or defined something by itself without the right to say how this happens, procedurally speaking?

If the numbers and therefore mathematics is an abstraction of reality, held from determinations common to several concrete subjects, although it is effectively inseparable from these, they have to analyze the concept of "concrete" to understand what are the numbers and mathematics itself and, from that understanding, assessing what was mathematics and its application to a Greek of the VI century B. C. in the case, Thales of Miletus.

Finally, lexicographers indicate that the "abstract" is "opposed to concrete." See, therefore, what they say Japiassu and Marcondes (1993, p. 54) concerning the concept of "concrete"

(lat. *concretus*) 1. For common sense, concrete is all that is given to us by sensory experience, either external (the different sensations that qualify an object) or internal (fear of emotions, a dream, etc.) .

2. For the abstract opposition, concrete is what is actually real or determined in its entirety. So what is the synthesis of all determinations: 'The concrete is concrete because it is the synthesis of multiple determinations, hence the unity of diversity' (Marx).

3. In its logical sense, the concrete as regards the terms that designate real beings and objects (...).



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4. For the existentialist philosophy, the concrete designates the human existence, human achievement lived in society and history, making every living man always unique situation, "concrete is the man in this world" (Sartre). Opposed to abstract.

A little more substantial than the concept of "abstract" here, the lexicographers provide us with interesting elements to the understanding of what mathematics at the time of Thales and the Hellenic like it.

Note that unlike the definition of "abstract", the "concrete" has more meanings. In the popular imagination the lexicographers conceptualize the "concrete" is the result of what we are given by the experiences sensitive and subjective. Therefore, the "concrete" is the product of objective and subjective tensions, via bodily sensations and psychological / psychic of the subject's knowledge.

In this approach, the numbers and mathematics were from the sensory perceptions and qualified these more or less the psychological-psychic sensations that would establish the proportions between the real elements. But this way of understanding our research object brings another question, namely: but the numbers or proportions exist in themselves or are some kind of understanding of the reality of the subjects of knowledge?

The second meaning of "concrete" one sees that this is considered "opposed to abstract" for being "effectively real or determined in its entirety." Which brings us to question what is to be "determined on the whole"?

A "determination" according Japiassu and Marcondes (1993, p. 68) is

(lat. *determinatio*) 1. Act by which one, after considering the reasons for and against, voluntarily take sides or decide. In this psychological sense, 'act decisively', 'I am determined to do this' expressions are more or less synonymous with 'decided' by 'decision'.



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2. appoint the fact that determining cause or necessary condition of something, directly causing their existence or occurrence.

Now, what is clear from the definition of lexicographers, the "determination" is a philosophical judgment that psychologically establishes the fact that something be the determining cause "or necessary condition of something." By end up causing "directly their existence or occurrence."

In this sense, something is real or determined because it is the cause/condition needed something, determining thus its existence. However, there is still the question, but that determining the real is existing in itself or it is a reading of the subject of knowledge, seizing given sensory phenomenon (external and/ or internal fund themselves) and psychologically the real judges and needed to be the direct cause of a given phenomenon?

In other words, targeted at the core of this reflection: the numbers and mathematics in and of itself, there are effective and actually or are possible readings foreign internally detectable sensory stimuli the subject of knowledge and structured given symbolic language to express themselves and communicate the objects of knowledge?

For the Ancient Hellenic period, i.e., between the ages VIII-VI B. C. and part of the Classic period (V-III century B. C.), what kind of sensory experience had about something "abstract", in the reign of oral culture, the word efficient in musicalized back and danced, sacred, divine, whose *Mnemosyne* goddess is the determiner source not from a psychological memory, personal, restricted to sensory and subjective experiences of a subject of particular knowledge, inserted in a given culture, but the timeless memory that uses the rhapsodes, owned by his daughters,



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the *Musai* as preservation mode of the tribe's stories and to the livelihoods of a people devoid of writing and its technologies for three hundred years?

The issue is controversial, as shown in Mondolfo (1968), however, seems consensus among the Hellenists as Jaeger (1995), Haveloc (1996), Cornford (1989), Vernant (1977), Burkert (1993) among others, that the Greek man Ancient, were almost unknown the / notions of interiority towards active and personal subjectivity in the process of knowledge and almost everyone, even those who favor some degree of subjectivity of perception in this period, and in all subject culture orality and their mental techniques, the Archaic Hellenic had a / open, ie a self that is structured not by self reflection due to a deliberate and conscious action to peer into the motivations and impulses that determine your actions and reactions to life and its peculiarities; but one / whose intentionality of its psychic forces as active-passive-interactive interior is unknown and attributed to natural forces themselves are divine, because as securing the Tales himself (1994, p 93.): "Everything is full of gods."

But if it is truthful, as evidenced Mondolfo (1968), the man is only able to know himself, to the extent that his deeds are sung and danced for social recognition by their peers. In this case, the poets inspired by the gods. By the way, as ensures Popper (2002, p. 1; 8-17), according to the partially skeptical belief of the presocratic Hellenic, or rather prearistotelian, the gods are the ones to access and effectively know the truth of cosmic reality.

That way, that / open to natural forces (divine), himself one of them, because according to Hesiod (1995) in his "Theogony", men and gods are engendered by cosmos at the same time and similar materials, with some constitutive distinction



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determines their differentiation in *aither-Hyle* compound (ether-water, earth, air and fire).

So there will be cultural, linguistic and psychological condition to read "number" and "Mathematics" itself, in its entirety, as something "abstract" in the sense of theoretical? The purpose of this concept, ie "theoretical", our contemporary ways would apply to understand it as being "opposed to concrete/ practical" because it is an "abstraction"?

In this sense, here agrees with Mondolfo (1968, p. 99) argues that when the Greek Ancient man has a distinct cognitive structure of our present. For the Italian philosopher, the usual procedure gnosiological the Archaic period was based on conceivability, which is defined to be "the truth as adequacy of reality to intelligence." To Provetti Jr. (2011, p. 45):

(...) The Hellenes did not give priority to objectively experienced reality, as today is, as a parameter and foundation of the reality of intellectual conception, but took as its starting and criterion of truth the intrinsic demands of reason, intellect and were based on these to state what it can and should be recognized as real. What do you mean that the truth criterion used by the ancients was not based on empirical experience but on the adequacy of the operating criteria of the mind, so that the determiner of truth to the Ancient epistemology, especially the presocratic, to the beginning of the sophist movement, it was the principle of identity with prevalence of conceivability on the data of sense experience.

That is, the presocratic Hellenic man had as criterion of truth not the sensitivity data by themselves, but the last reference was conceivably, that is, the concepts were understood as a reference and ultimate truth about the objects of knowledge. It was the experience that was 'forced' to suit the demands of reason and not what is done today, that is exactly the opposite.

This is corroborated by Leibniz cited Mondolfo (1968, p 99.): *Nihil aliud quam cogitabilitas enim realitas*, that is, 'nothing is real indeed as conceivable'. Thus, the criterion of truth used by Hellenes of this period was, so to speak, 'a requirement of adequacy of thing to intelligence and not of intelligence to the thing' (ibid). Where does



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the position of Cornford (1989, p. 1-70) that the presocratic not followed properly, a research methodology and criteria of relative empirical truth, like doctors of his time, as seen in Hippocrates cited Cairus & Ribeiro (2005).

Thus, as stating that numbers and mathematics, even applied, were understood as we do today, since the terms "theory", "concrete", "abstract" and "determination" must be adjusted to the epistemological criteria Archaic Greek, so they are not anachrony object in the interpretation of the author in the study?

This means that what is now taken as opposed to "concrete" and "real" for being "determination" of something "concrete" to the Hellenic Tales of the time was pure, unique and simply "concrete". And it is precisely led to be conceivables, i.e., being receivable within mentally (imagetically speaking) are constituted as "ideatos" (logically) and being object "theory" (theoria), i.e. "descriptive knowledge purely rational, "which nominalized gives the following interpretation in Greek: "action behold, look, examine, speculate "(PEREIRA ISIDRO, 1990, p 267).

So the numbers and the mathematics itself, to Thales and the Hellenes of his time were notions as "concrete" as any external sensory stimulus to its subjectivity (which by the way was not known by them as something active and intentional).

Where we understand the permanence of the meaning of *phainomenon* and *phainesthai* Greek words that mean philosophically "(...) appears. 1. Since its Greek origin, the term 'phenomenon' is an ambiguous sense, ranging from the idea of 'appearing with brightness' and the idea of simply 'look'. So the phenomenon is something unsafe and, ultimately, an illusion. "(JAPIASSU & MARCONDES, 1993, p. 97).



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What can be established, in Portuguese, as we read in Ferreira (1975, p. 1045.):

The ordinary Latin *parescere* (...). 1. Have resemblance; give airs; 2. Have the appearance of (...); 3. Be apparently (...); 4. To be believable, credible, likely (...); 5. Represent in mind; it appears-; figure up (...); 9. physiognomic appearance (...); 10. Appearance, appearance (...); 11. Concept; opinion; judgment; (...)"

In these senses, present the questions: a) What Thales of Miletus "saw" the feet of the pyramids, when he was invited by the Egyptian priests to calculate your height? a.1) A particular problem, empirical, practical and therefore, actual or theoretical, abstract, essential problem in our contemporary terms? b) What a difference a solution and theoretical methodology established in relation to Mathematics african-eastern about to start a new mathematical tradition, ie the Hellenic-West?

It responds reflecting:

a) Tales at the foot of the pyramids, not only observe the pyramidal bodies carved in stone in the desert. Observed, intellectual and sensory, with conceptual prevalence of the truth of the phenomenon in sensory observation, ideato as a concrete foundation and from the analysis of this resolution established a strategy for the problem to know: how to calculate the height of that body? Where did his famous theorem.

a.1) There was no sensory-psychological distinction between the ideal and its physical counterpart, that is, the pyramids. Both experienced by Thales as concrete and real, as the phenomenon (pyramid) is, by identity, its concept (ideato of the pyramid). So Tales was not "abstract theory" or "abstraction," as opposed to



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"concrete thing", or "empirical" as now thought. He make a real and unique experience, founded from the conceivability as a criterion of epistemological truth.

Interestingly, the history of mathematics, in general, takes the view that Greek mathematics was instrumental in the emergence of a new mathematical dimension, the theoretical and conceptual, in that part of the empirical exercises of mathematics applied to concrete problems, as was seen in Egypt and Mesopotamia and enters under the influence of the Hellenes, the rational discursive mode, in prose, with the conceptualization and development of mathematical logical reasoning abstraction, as shown in Roque (2012, p. 92- 149), Garbi (2009), Fossa; Morey; Erickson et ali (2009, p. 117-154) and Ronan (2001, p. 64-70).

These considerations, introductory and in need of further study, it appears the connection proposed by Plato cited Reale (2004, p. 167-240) between mathematics and philosophy from the perspective of the new interpretation of Plato. To the extent that the theory of Hellenistic knowledge, derived the reason of mental technologies inherent in writing reintroduction (HAVELOC, 1996), we conclude that mathematics and its practical techniques ratios operations, the Hellenic Archaic culture becomes important preparatory tool philosophy under new gnosiological paradigm, namely the knowledgeability.

References

- BRANDÃO, Junito de Souza . **Mitologia Grega** . Petrópolis: Vozes, v. I.
 BURKERT, Walter . **Religião Grega na época Clássica e Arcaica** . Lisboa: Fundação Calouste Gulbenkian, 1993.
 CORNFORD, F. M. . **Principium sapientiae: as origens do pensamento filosófico** . Lisboa: Fundação Calouste Gulbenkian, 1989.
 COULANGES, FUSTEL de . **A cidade Antiga** . São Paulo: Martins Fontes, 1998.



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Revista eletrônica de investigação filosófica, científica e tecnológica

- DETIENNE, Marcel . **Os mestres da Verdade na Grécia Arcaica** . Rio de Janeiro: Zahar, 1988.
- EVES, H. **Introdução à História da Matemática** . Campinas: UNICAMP, 1995.
- FERREIRA, Aurélio Buarque de Holanda . **Novo dicionário da língua portuguesa** . Rio de Janeiro: Nova Fronteira, 1975.
- FOSSA, John A.; MOREY, Bernardete Barbosa; ERICKSON, Glenn W. *et ali* . **Matemática e medida: três momentos históricos – História da Matemática para professores** . São Paulo: Livraria da Física, 2009.
- GARBI, Gilberto Geraldo . **A rainha das Ciências: um passeio histórico pelo maravilhoso mundo da Matemática** . São Paulo: Livraria da Física, 2009.
- GARNICA, Antônio Vicente Marafioti & SOUZA, Luzia Aparecida de . **Elementos de História da Educação Matemática** . São Paulo: Cultura Acadêmica, 2012.
- HAVELOC, Eric A. **A revolução da escrita na Grécia e suas consequências culturais** . São Paulo (UNESP) e Rio de Janeiro (Paz e Terra), 1996.
- HESÍODO, de Ascra . **Teogonia** . São Paulo: Iluminuras, 1995.
- HIPÓCRATES, de Cós . **Da natureza do homem; Ares, águas e lugares e Preceitos** . Rio de Janeiro: Fiocruz, 2005.
- ISIDRO-PEREIRA, S. J. **Dicionário Grego-Português e Português-Grego** . Braga: Livraria Apostolado da Imprensa, 1990.
- JAEGER, Werner . **Paideia: a formação do homem Grego** . São Paulo: martins Fontes, 1995.
- KIRK, G. S.; RAVEN, J. E. & SCHOFIELD, M. **Os filósofos pré-socráticos** . Lisboa: Fundação Calouste Gulbenkian, 1994.
- JAPIASSU, Hilton & MARCONDES, Danilo . **Dicionário básico de Filosofia** . Rio de Janeiro: Zahar, 1993.
- MONDOLFO, Rodolfo . **O homem na cultura Antiga: a compreensão do sujeito humano na cultura Antiga** . São Paulo: Mestre Jou, 1968.
- PADILHA, Alan Rodrigo; SILVA, Rafael Egídio Leal e & PROVETTI JR., José (Orgs.) . **Investigações Filosóficas-Sophia: Filosofia, Educação e Autonomia 2012 – Umuarama** . Assis Chateaubriand: JPJ Editor & Grupo de pesquisas Filosofia, Ciência e Tecnologia – IFPR, 2015.
- POPPER, Karl Raymund . **The world of Parmenides: essays on the presocratic enlightenment** . London and New York: Routledge, 2002.
- PROVETTI JR., José . **O dualismo em Platão** . Assis Chateaubriand: JPJ Editor, 2014.
- _____ . **A alma na Hélade: a origem da subjetividade Ocidental** . Umuarama: JPJ Editor, 2011.



$I\Phi$ -Sophia

Revista eletrônica de investigação filosófica, científica e tecnológica

REALE, Giovanni . **Para uma nova interpretação de Platão: releitura da metafísica dos grandes diálogos à luz das “Doutrinas não-escritas”** . São Paulo: Loyola, 2004.

RONAN, Colin A. **História ilustrada da Ciência: das origens à Grécia** . Rio de Janeiro: Zahar, 2001.

ROQUE, Tatiana . **História da Matemática: uma visão crítica, desfazendo mitos e lendas** . Rio de Janeiro: Zahar, 2012.

VERNANT, Jean-Pièrre . **As origens do pensamento grego** . São Paulo: Difel, 1977.