Back to the origins: science and astronomy before history

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Abstract: "In Prologue, Of High and Far-off Times, the author traces back earlier roots of scientific thought, particularly in the astronomy of the Neolithic revolution (4000-6000 B.C.) and the technology of the Stone Age. But these were also times of religious conceptions, astrology, and the great myths" (Hinshaw 1963). Giorgio de Santillana (1902-1974) was an eclectic scholar, who studied history of science and its origins from a particular point of view. He graduated in Physics in Rome and after he collaborated with his professor Enriques. The collaboration will led to the publication of the book *History of scientific thought: the ancient world*, which should have represented the first tome of an impressive work on the progress of scientific thought throughout the ages of humanity. Santillana continued his studies on scientific thought. In 1961, he published *The Origins* explaining how the models of the ideas of science were born in ancient times. The hand of the beginning of scientific thought is moved further and further forward from the archaic societies. He thought that the astronomers of Babylon had unknown predecessors in prehistoric times: the myths and legends, from the world, can be deciphered as the technical language of archaic astronomers.

Keywords: Giorgio de Santillana, history of science, archeoastronomy

1. Introduction

> *Ἦ τοι μὲν πρώτιστα Χάος γένετ [...]* (Hesiod, *Theogony*, l. 116).
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> In the beginning God created the heavens and the earth. Now the earth was formless and empty, darkness was over the surface of the deep (*Genesis*, 1:1-1:2).

Man is a telling animal and since ancient times, stories that followed each other are several, some of them similar, other very peculiar, but all of them face the beginning of time, that is the cosmos origin. A cosmos very small for our ancestors that questioned themselves more about our world birth and at most with a sphere of fixed stars around it. After all time elapses and, as for contemporary science both for micro and macro world, levels add up and we realize that what we think to have in hands, the acquired certainties, run away just like sand.

> The theory about 'how the world began' seems to involve the breaking asunder of a harmony, a kind of cosmogonic 'original sin' whereby the circle of the ecliptic (with

> the zodiac) was tilted up at an angle with respect to the equator, and the cycles of change came into being (de Santillana 1983, p. 5).

We'll treat this cosmogonic original sin and tales coming from world's populations starting from an accurate historical and cultural context: the Twenties of the last century, and we'll particularly focus on the figure of Federigo Enriques.

2. Historical context, science-philosophy division, Enriques

> Fra Ottocento e Novecento, in concomitanza con gli eventi più significativi del pensiero scientifico, si è sviluppata una cospicua letteratura critica ad opera in primis di alcune eminenti figure di scienziati che hanno dato un significativo contributo alla nascita e allo sviluppo della filosofia della scienza, grazie a numerosi studi sui fondamenti delle varie discipline; anche una semplice lettura dei loro testi più noti testimonia il fatto che il loro obiettivo dichiarato era quello di riprendere su nuove basi il dialogo con la ricerca filosofica col prendere le distanze dall'unilateralismo metodologico propugnato a vario titolo dalla ricca e non omogenea letteratura positivistica (Castellana 2014, p. 43).

Whether science and humanistic culture were inevitably linked in the classic world, since the beginning of 20th-century science is getting specialized more and more and "physicist is getting technician" (de Santillana 1970, p. 20). Science began losing something on the path it was going along; in becoming big science, it has lost sight of the human, it has forgotten to collocate itself in a wider context. For this reason and in that socio-cultural situation that philosophic-scientific activity of Federigo Enriques is regarded.

The Enriques position in the academic and intellectual sphere was solid, but infiltration of his ideas remained scarce inside the philosophical community. Generated in the period between the two world wars, this dissymmetry has firstly its roots in the manner how the complex debate about education reform ended on May 6, 1923. Intellectuals such as Salvemini, Galletti, but also Croce and Gentile participated the debate on the reform that wanted to destroy Enriques idea of a unique Faculty, of a united vision of the knowledge, that would have gathered up all subjects of speculative interest. In this dichotomy, history and philosophy of science, born by the intersection of these two domains, don't find the right place.

In this way Enriques' *positivismo critico* emerged, it was based "*su un concetto di razionalità teso ad unificare ma non uniformare o a irrigidire i vari domini del sapere*" (Simili 1989, p. 16). We can find this critical positivism and this idea of unity inside the first volume of *Storia del Pensiero Scientifico* (1932) and in *Compendio* (1937).

In the wake of the thoughts of his teacher, Giorgio de Santillana, who in the meantime emigrated to the USA and became professor at the MIT, he carried on studying the scientific thought. In 1961, he published *The Origins of Scientific Thought* in the USA, explaining how the ideas frameworks of science were born in ancient times. The needle

of the beginning of scientific thought is moved more forward, since archaic societies that, with the passing of time, completely catch de Santillana attention. How we can read in a review of the text:

> In a Prologue, *Of High and Far-off Times*, the author traces back earlier roots of scientific thought, particularly in the astronomy of the Neolithic revolution (4000-6000 B.C.) and the technology of the Stone Age. But these were also times of religious conceptions, astrology, and the great myths (Hinshaw 1963, p. 396).

3. Myths Analysis

Set the historical and cultural context, we focus on the analysis of that form of tale distinguishing what is considered the youth of human population.

> *Hamlet's Mill* was translated last year in Italy by Adelphi; if none wrote about on these columns then, it happened—as sometime happens—because of the great enthusiasm of us, reviewers, that made us dispute the book one each other first, then devour five hundred pages in a great hurry, and finally get us blocked facing the task of resume it (Calvino 1985).

As a matter of fact, the monumental work *Hamlet's Mill*, written by Giorgio de Santillana in collaboration with a German ethnologist (student of Frobenius), Herta von Dechend, is comparable with *The Golden Bough* (1915) by Frazer because of the infinite abundance of anthropological and literary sources he weaves in a thick net around a common theme. We know that for Frazer the key of all myths was the ritual sacrifice of the king and the vegetation cults; his description of rites and customs of the analysed populations and, more, his own way to tell the story is obviously partial. Beliefs are bitterly analysed and confuted, so that Wittgenstein wrote:

> Frazer is much more savage than most of his savages, for they are not as far removed from the understanding of spiritual matter as a twentieth-century Englishman. His explanations of primitive practices are much cruder than the meaning of these practices themselves (Wittgenstein 1979).

Both in *The Golden Bough* and in *Hamlet's Mill*, reader mustn't bring the compass with him during the reading. He must instead be patient. Because analysis and comparison with many tales seem tortuous, so that de Santillana inserts in the midst a *Guide to the Perplexed*, explaining how there's no sense in searching an exemplificative structure to all. That's why Calvino talked of a block in front of this monumental work. Analysis is complex, language and continuous reference to myths and traditions require a specialist knowledge, but the content fascinates every reader because there's a lot at stake and everyone feels called somehow to comprehend.

For a better comprehension, we explicate soon which are the reading keys of all myths: for Santillana-Dechend they are the regularity of zodiacal time and its irreversi-

ble changes on a very large scale (precession of the equinoxes) due to the ecliptic inclination towards the equator.

> ‘ Ἦ τοι μὲν πρώτιστα Χάος γένετ’ ’. What impresses us in the starting verse of the story of the cosmos in Hesiod is that the verb is translated in Italian as fu (was), but it should be more correct to translate it as nacque (was born), in fact γένετο and not ἦν presumes that it didn’t exist since the eternity (Jennings Rose 1981, p. 375).

> Va notato che il Caos esiodeo non esiste da sempre: si manifesta d'improvviso e perdura, anche dopo che si sono sviluppati gli esseri divini, come uno spazio di fondo, un buco nero dell'universo (Guidorizzi 2009, p. 1168).

As Guidorizzi says in *Il mito greco*, the Chaos is a primordial status of the vacuum, almost a dark whirlpool. Indeed, Greek word *Χάος* means “empty space, immense opening, abyss, chasm”. We’ll find again this abyss or whirlpool in many other stories. In these popular tales of various ethnic groups there are some constants, and some entities, episodes and characters repeat themselves even though with different names. Archetypes are always the same as Propp or Jung would say. We meet the abyss or whirlpool as Maelstrom and in some tales, it opened up as consequence of a mill break or of a tree felling. According to Finnish, it crosses the whole world. We can say the same thing about Socratic myth of Tartarus: “the earth is spherical in this myth and Tartarus, the bottomless well, is represented as a chasm that completely passes through the sphere” (Guthrie 1952, p. 168): an *ante litteram* hell. We said that in these tales the whirlpool creates after a mill or a tree destruction.

> The cosmic machine (mill, drill, or churn) produces periods of time, it brings about the ‘separation of heaven and earth’, […] the Mill ceases to be understood, while the memory sticks to an instrument for crushing foodstuff (de Santillana 1969, p. 389).

In the whole analysis made by de Santillana-Dechend, the tree and the mill simply are coordinates of celestial bodies, a sort of cosmic machine.

> The starting place is Greece. Cleomedes (c. A.D. 150), speaking of the northern latitudes, states (1.7): ‘The heavens there turn around in the way a millstone does.’ Al-Farghani in the East takes up the same idea, and his colleagues will supply the details. They call the star Kochab, beta Ursae Minoris, ‘mill peg’, and the stars of the Little Bear, surrounding the North Pole, and Fas al-rahha (the hole of the mill peg) ‘because they represent, as it were, a hole (the axle ring) in which the mill axle turns, since the axle of the equator (the polar axis) is to be found in this region, fairly close to the star Al-jadi (he-goat, Polaris: alpha Ursae Minoris)’ (de Santillana 1969, p. 138).

This is not the appropriate context for this long and complex analysis, hence our aim is to focus a peculiar attention on the synthesis of the comparison between various mythologies and all over the world tales: the underlying story is the same. In a former

world age the mill ground peace and opulence, the Golden Age called *Saturnia regna* by Latins. This figure is common in all world myths:

> In India it was Yama; in the Old Persian Avesta it was Yima Xsaeta a name which became in New Persian Jamshyd; in Latin Saeturnus, then Saturn's; Saturn or Kronos in many names had been known as the Ruler of the Golden Age, of that time when men knew no war and bloody sacrifices, not the inequality of classes—Lord of Justice and Measures, as Enki since Sumerian days, the Yellow Emperor and legislator in China (de Santillana 1969, p. 147).

Saturn is the "originator of times", and in the measure he took to accomplish the "separation of the parents of the world", which stands for the falling apart of the axes of equator and ecliptic. Before this separation time did not exist (de Santillana 1969, p. 186). For this he's called auctor temporum, whereas parents together represent the Chaos. The mythological eviration of Uranus represents the setting in of the obliquity of the ecliptic, the measurable time, and Saturn do this because it was assumed as the most external planet and the nearest to the fixed stars sphere, hence the planet that conveyed motion to the universe.

In the Finnish epic poem *Kaleva* too, the main sequence is constructed around a moulding and a conquest by a *deus faber* of a great mill called Sampo. This mill is the sky that is destroyed at a certain point of the story and it comes up the necessity to build another one. Why? Because the sky really goes out of place; this phenomenon is the precession of the equinoxes, and the rise and the disastrous fall of the world ages were put down to it. The cause is due to the earth axis that spins like a top around the northern pole of the ecliptic, the real "centre" of the planetary system; the time spent for this is about 26,000 years, during which its orientation passes from a star to another, hence the Polar Star goes out of place and it's necessary to choose another one after few thousand years. The Sun's position among the constellations at the vernal equinox was the pointer that indicated the "hours" of the precessional cycle.

> First, what was the 'earth'? In the most general sense, the 'earth' was the ideal plane laid through the ecliptic, […], was the ideal plane going through the celestial equator. The equator thus divided two halves of the zodiac which ran on the ecliptic, 23½ o inclined to the equator, one half being 'dry land' (the northern band of the zodiac, reaching from the vernal to the autumnal equinox), the other representing the 'waters below' the equinoctial plane (the southern arc of the zodiac, reaching from the autumnal equinox, via the winter solstice, to the vernal equinox). The terms 'vernal equinox', 'winter solstice', etc., are used intentionally because myth deals with time, periods of time which correspond to angular measures, and not with tracts in space (de Santillana 1969, p. 58).

De Santillana interest and studies about the ancient world, mythologies, considerations on the fate and on the mind-set we moderns irremediably loose, reach the climax in *Hamlet's Mill* but arise further back, evidences of this are lectures given over the years, translated in treatises and collected in the book *Reflection on men and ideas*. Also, de

Santillana interest about these topics is testified in manuscripts, lessons notes, tests he subjected to his pupils, articles he collected and mails found in the archive of MIT.

> The dust of centuries had settled upon the remains of this great world-wide archaic construction […] Yet its original themes could flash out again […]. But they are tantalizing fragments of a lost whole. […] Even when the code shall have yielded, when the techniques shall be known, we cannot expect to gauge the thought of those remote ancestors of ours, wrapped as it is in its symbols (de Santillana 1969, p. 5).

Einstein said that what is inconceivable about the universe, is that it should be at all conceivable. Man doesn't surrender. When he discovers millions over millions far-off galaxies and after billions light-years far quantum stellar radio sources overcome his mind, he's happy to be able to reach such deepness. But he pays a terrible price for his achievement. The astrophysical science leans forward size orders more and more wide without losing the mainstay; this is not possible for human being as he is: he loses himself and every sense of his importance in the space deepness. It's impossible to place himself within the concepts of the modern astrophysics but not in the schizophrenia. Modern man is facing the non-thinkable; on the contrary, archaic man maintained a strong grip on the thinkable, setting in his own cosmos a time order and an eschatology that had sense for him and reserved a future for his soul.

References

Calvino I. (1985). "Il cielo sono io". *La Repubblica*, 10 luglio. Also in Barenghi M. (2002). *Mondo scritto e mondo non scritto*. Milano: Mondadori.

Castellana M. (2014). *Federigo Enriques e la volontà del vero,* in Castellana M., Pompeo Faracovi O. (a cura di), *Filosofie scientifiche vecchie e nuove*. Lecce: Pensa Multimedia.

de Santillana G. (1961). *The Origins of Scientific Thought: from Anaximander to Proclus*, *600 B.C. to A.D. 500*. Londra: Weidenfeld & Nicolson. Italian edition (1966). *Le origini del pensiero scientifico da Anassimandro a Proclo: 600 a.C. - 500 d.C*. Firenze: Sansoni.

de Santillana G. (1963). *On forgotten sources in the history of science*, in Crombie A.C. (ed.), *Scientific Change; Historical Studies in the Intellectual, Social and Technical Conditions for Scientific Discovery and Technical Invention, from Antiquity to Present*. London: Heinemann, pp. 813-828. Italian edition (1971). *Su alcune fonti dimenticate nella storia della scienza* in *Prologo a Parmenide e altri saggi*. Firenze: Sansoni.

de Santillana G. (1968). *Reflections on Men and Ideas*. Cambridge: MIT Press.

de Santillana G. (1970). *Galileo tra l'arte e la scienza* in Branca V. (a cura di), *Rappresentazione artistica e rappresentazione scientifica nel "Secolo dei Lumi"*. Venezia: Sansoni.

de Santillana G., Von Dechend H. (1969). *Hamlet's Mill: An Essay on Myth and the Frame of Time*. Boston: Gambit. Italian edition (1983). *Il mulino di Amleto. Saggio sul mito e sulla struttura del tempo*. Milano: Adelphi.

Enriques F., de Santillana G. (1932). *Storia del pensiero scientifico. Vol. I. Il mondo antico*. Roma: Zanichelli.

Enriques F., de Santillana G. (1937). *Compendio di storia del pensiero scientifico: dall'antichità ai giorni nostri*. Roma: Zanichelli.

Frazer J. (1890). *The Golden Bough: A Study in Magic and Religion*. London: Macmillan Publishers. Italian edition (1925). *Il ramo d'oro. Studio sulla magia e la religione*. Roma: Alberto Stock Editore.

Guidorizzi G. (2009). *Il mito greco. Vol. 1 Gli dèi*. Milano: Mondadori.

Guthrie W.K. (1952). *Orpheus and Greek Religion*. London: Methuen.

Hinshaw V. Jr (1963). "*The Origins of Scientific Thought* by Giorgio de Santillana" (book review), *Philosophy of Science*, 30 (4), pp. 396-398.

Jennings Rose H. (1981). *Dizionario di Antichità Classiche di Oxford*, vol. 1. Milano: Paoline.

Simili R. (1989). *Federigo Enriques filosofo e scienziato*. Bologna: Nuova Universale Cappelli.

Wittgenstein L. (1979). *Remarks on Frazer Golden Bough*. Doncaster: Brynmill Pr./Humanities Pr.