SE NON È VERO È BEN TROVATO: BENEFICIAL OR NOT IN THE DEVELOPMENT OF SCIENCE?

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Abstract

This article tackles the issue of truth as contrasted with convenience in scientific research based on the history of Copernicus' great astronomy discovery as reported by Arthur Koestler. The way this particular piece of truth was reached points to the conclusion that great scholars sometimes exceed the areas of research measurable with the instruments of their times, making it difficult to trust, let alone prove what they have really found.

Keywords: development of science, celestial bodies movement, gravity, vulnerability, controversy, conceptual construct

Introduction

*Se non è vero, è ben trovato***.** An Italian *adagium* which translates into something like: If it's not true, at least it's well invented. It's useful to properly justify those little deviations into the realms of poetic license, which make your tale / history / narrative sound better or more interesting. Use with caution, as abuse will end up giving you a credibility problem with your audience.
(cf. http://www.everything2.com/index.pl?node_id=1439661)

This study intends to look at the prevalence of *truth –convenience* in science evolution, as highlighted by Copernicus's "case" discussed by Artur Koestler in his book *The Sleepwalkers*. The hypothesis is that what seems untrue and just "well invented" is not really false but only impossible to validate as true, since the measuring instruments or the system of reference used to establish the degree of truthfulness fail to encompass it. In other words it might just be out of scale.

Like human beings, who, scientists say, regenerate totally in time, so as it would not be a mistake to say that in seven years' time nothing physical is left of the person from seven years ago, the human society changes too, and the inheritance of old times is also changed by the altered way in which it is considered and appreciated. What seem to be unchanged are people's curiosity and their wish to know more, to construct new instruments and systems allowing them to reach the ultimate truth.

Michel Foucault refers to such instruments, that he distinguishes as "partly inherited and partly of their own: models of economic growth, quantitative analyses of market movements, accounts of demographic expansion and contraction, the study of climate and its long term changes, the fixing of sociologic constants, the description of technological adjustments and of their spread and continuity" (Foucault, 1969: 3-6).

It is also inherent to human inquisitiveness to wonder how and why scientific breakthroughs and discoveries have happened. Foucault says that the instruments mentioned before have "enabled workers in the historical field to distinguish various sedimentary strata". Mentioning a change in the historians' traditional point of interest from *making links* and establishing a *causal succession* between disparate events and searching for their continuity or overall significance, towards finding "the odd one out", answering questions like: "which strata should be isolated from others? What types of series should be established?"…, turning "away from vast unities like 'periods' or 'centuries', to the phenomena of rupture, of discontinuity" (Foucault, 1969: 3-6). Copernicus' theory can be qualified as a

rupture, even if it only came to be noticed at a century's distance as it will be pointed out.

An odd perception of Copernicus' theory

In a compendium of commented texts for college of 1905, Copernicus' work is represented by two excerpts. The relevance of this fact for people interested in the development of science in the year 2007 is that education planners in 1905 considered that Copernicus was important enough for high school students to learn about him, and also to see what they thought important for the students to know about him:

1. The hypothesis of the movement of the Earth:

> ***« Hypothèse du mouvement de la terre***
> *Si on transforme la révolution annuelle du soleil en révolution de la terre, en accordant au soleil l'immobilité, le lever et le coucher des constellations et des étoiles fixes qui nous les présente, le matin et le soir, apparaîtront de la même façon; les arrêts des planètes, leur recul et leur mouvement en avant ne leur seront pas propres, mais paraîtront les mouvements de la terre avec des apparences empruntées. Enfin, le soleil lui-même sera jugé occuper le centre du monde. L'ordre nécessaire suivant lequel les corps célestes se succèdent réciproquement, et l'harmonie de l'univers tout entier nous enseigne, tout cela, si seulement nous regardons la chose elle-même, comme on dit, avec les deux yeux.* (Les Révolutions Célestes, 1. I, ch.IX.) 1543 (Laurent, 3)

Indeed, about five centuries after these assertions were written, we can say that this is how things are, even without relating them to the condition of the "transformation of the annual revolution movement of the Sun into the revolution of the Earth".

2. The beauty of the hypothesis:

> **Beauté de l'hypothèse**
> *Au milieu de toutes les planètes, siège, immobile, le Soleil. Qui, en effet, dans ce temple magnifique, pourrait placer ce flambeau en un endroit autre ou meilleur que celui d'où il peut éclairer tout en même temps? Aussi ce n'est pas sans raison que certains l'ont appelé le flambeau du monde, d'autres son âme, d'autres son conducteur. C'est ainsi sans doute qu'assis pour ainsi dire sur un trône royal, le Soleil gouverne la famille des Astres tournant autour de lui.* (Ibid., 1. ch. X)

The fact that the second excerpt sustains the idea of the prevalence of beauty as a selection criterion may seem strange to the 21 century reader, for whom science has a much more important role to play than to be beautiful. So the relevance of the commentary could only be to make the theory appealing to readers more inclined to react to beauty than to other criteria.

Commentariolus - Copernicus' first work

Copernicus's first work, in 1507, *Commentariolus – A Commentary on the Hypotheses of the Celestial Bodies Movement,* was never published. It included a critique of the universe architecture seen as crystal spheres by Calip and Eudox as well as of the followers' errors. (Rusinek, 1973: 56) Copernicus presented his system in seven axioms.

Koestler says that "What we call Copernicus' revolution was not achieved by the cleric Koppernigk. His book was not intended to start a revolution. He knew that a significant part of the book was weak and contrary to reality and that its fundamental hypotheses could not be proved. With his split spirit, typical for the Middle Ages, Copernicus only half believed his own work. Besides, he also lacked a prophet's essential qualities: awareness of mission, originality of vision and courage of convictions." (Koestler, 1995: 151-152).

The Book of the Celestial Sphere Revolution

Koestler describes the physical existence of Copernicus's work *The Book of the Celestial Sphere Revolution.* He says that it has had just four issues in four hundred years because it is illegible. Copernicus starts from his statement in *Commentariolus* that "all in all, thirty-four circles are enough to explain the entire structure of the universe and all the planets' ballet" only to increase their number to forty eight by the end. Koestler says that the manuscript has 212 pages of small *in folio* format, lacking the name of the author or a preface. The first printed issue includes Osiander's preface, the letter of Cardinal Schőnberg, Copernicus's dedication to Pope Paul III and the book itself, whose contents are divided into six sections called 'books': a summary of the theory plus two chapters of spherical trigonometrics, the mathematical principles of astronomy, the movements of the Earth, the movements of the Moon, and the movements of the planets in the last two sections..

Copernicus' system

Copernicus states that "the Universe occupies a finite space, limited by the sphere of the fixed stars. At the centre there is the Sun. Both the star sphere and the Sun are still. Planets Mercury, Venus, Earth, Mars, Jupiter and Saturn revolve around the Sun. The Moon revolves around the Earth. The daily apparent movement of the entire firmament is due to the rotation of the Earth around its own axis. The annual apparent movement of the Sun on the ecliptic is due to the annual revolution of the Earth on its orbit. The planets' stops and retroverse movements are due to the same causes. The slight irregularities of the seasons and other minor irregularities are due to the "librations" (oscillations, staggering) of the terrestrial axis" (Koestler, 1995: 151-152).

Koestler comments that the initial doctrine self-destroyed in the process, which explains the lack of a contents list, conclusions or of any kind of ending. He says that, according to Copernicus, at the beginning of the book, the Planets turn around the Sun while, in the Third Book or chapter, things change:

- the Earth does not turn around the Sun, but around a point in space situated at a distance three times the Solar diameter from the Sun (out of the need to reconcile the doctrine with the real observations);
- the planets do not move around the Sun but in epicycles of epicycles, centered not in the Sun but in the centre of the *terrestrial orbit* (Koestler's highlighting)

In conclusion we can speak of two "royal thrones": the Sun's and that of that imaginary point in space.

Koestler comments that the advantage of the system consists in its great geometric simplicity: the planets' retrograde movements disappear by transferring the centre of the universe from the Earth to the vicinity of the Sun. The planets' various spins create the effect of a retrograde movement.

What is important is that Copernicus stated that the Earth really moves. He exposed his system based on real, physical considerations, unfortunately unarguable from this point of view. The validity of Copernicus' statement would fit into Popper's ostensive definition: *a concept acquires empirical significance determined by its correlation with certain objects in the real world. The concept is considered then like a symbol for those objects.* (our translation) (Popper, 1981: 108)

Then Koestler mentions Copernicus's need for an artifice:

In order for the spheres not to clash or interfere, Mercury had to have an oscillation movement along a straight line. As Copernicus, like Aristotle, did not consider the straight line compatible with the celestial bodies, it had to be decomposed with the help of two more spheres, rotating one inside the other. The Earth acquires nine independent circular movements. Copernicus states that the movement of the Earth is real and so the nine circles are also real: where are they? (Koestler, 1995: 153)

Koestler mentions that an argument against the movement of the Earth would have been gravity: all heavy bodies gravitate towards the centre of the universe. If the Earth moves, it is no longer at the centre. What Copernicus states is that gravity represents the bodies' nostalgia to become spheres. He provides an explanation of the fact that the atmosphere does not lag behind: the bodies, falling because of their weight, need to participate in the nature of the whole they belong to, as a result of their maximum proportion of belonging to the Earth. The stones and the clouds keep in pace with the rotation of the Earth not because they have the same physical impulse but because they share the metaphysical feature of belonging to the Earth – the circular movement being "natural" (the author's quotation) to them.

Koestler concludes that Copernicus borrowed from the Renaissance only the idea of the movement of the Earth, brought into fashion by the Pythagorean conceptions, and spent the rest of his life trying to fit it in the Medieval framework based on Aristotle's physics and Plato's spheres (cf. Koestler, 1995: 156). He states Kepler's opinion:

Copernicus has tried to interpret Ptolemy rather than nature", commenting that "his absolute trust not only in the physical dogmas but also in the astronomical observations of the Ancient was the main cause of the errors and absurdities of his system. (Koestler, 1995: 157)

Disappointment with the Ancients

In 1524, Copernicus expressed a desperate need to cling to the trust in the Ancients. Ten years later, confessing to Rheticus, he admits that the Ancients have deceived him, "they did not prove integer, but arranged many observations so as to confirm their own theories on the movement of the planets." After he had made efforts for a lifetime to harmonise what he had inferred with the Ancients' principles, wherein he had strongly believed, Copernicus finally reaches the conclusion that the Ancient had been going by the principle "Se non è vero è ben trovato."

For fear of looking ridiculous, and being aware of the vulnerability of his bases, Copernicus is reluctant to publish his book. We may say that in his case the adagio is reversed: *Se non è ben trovato, è vero.* We refer here to the frailness of the arguments Copernicus brought in supporting his theory.

Another fact to be noted, mentioned by Koestler, is that Copernicus "finds the real shape of all planets' orbits using false reasoning and wrong deductions: in the chapter about the periodical change of the oscillation speed of the terrestrial axis – an inexistent phenomenon - Copernicus specifies: "It should be mentioned, among others, that if the two circles have different diameters, the other conditions remaining unchanged, the resulting movement will not be a straight line but – an ellipsis." Koestler qualifies the situation as a "failed opportunity". He comments that:"the great discoveries of science often consist in …. uncovering the truth buried under the debris of traditional preconceptions, in coming out of the *culs de sac* arrived at by formal, far from reality reasoning, in releasing the spirit from the steel toothed trap of the dogma." (Koestler, 1995: 157 -168)

Reactions to the theory

As to the reactions to Copernicus' theory, Koestler mentions that for half a century there was no controversy, the professional astronomers understanding that Copernicus' *Revolutions* did not withstand scientific analysis. In the seventeenth century the church classifies the book (1616) and one century later Copernicus' theory generates a new philosophy which will change the world.

Koestler points out that "the ideas that have the power to change the clichés of human thinking do not only act on the conscious level; they creep to the deeper strata, indifferent to logical contradictions. They do not influence one or another scientific concept, but the total vision of the spirit." (Koestler, 1995: 168). His estimation is that "the idea of the heliocentric universe crystallized by Copernicus and reformulated by Kepler in a modern way has changed the spiritual climate not by what it has stated openly but by what it has let to understand implicitly, …the implications were not made aware of in Copernicus' intellect; they acted on his successors in insidious ways (Koestler, 1995: 169). Thus, a "delayed effect" of Copernicus' theory can be mentioned. Koestler says that "the infinite space is not a part of Copernicus' system but is implied by it. The system pushed the thinking irresistibly in that direction." (Koestler, 1995: 169)

All the facts tempt to consider Copernicus' endeavour a conventional interpretation, according to Popper. In his view,

Conventionalism treats nature as being our own creation: it is not nature that is simple but the "laws of nature" that are our free creations. The theoretical science of nature is not an image (Bild) of nature but a purely conceptual construct. It is not the properties of the world that determine the construct but, on the contrary, the construct determines the properties of an artificial world, created by us. It is only about this world that science is talking about. (Popper, 1981: 112, our translation)

It is easy to say now, when Copernicus's theory underlies everything relying on the movement of the stars and planets, that he was right and what he had found was not only *ben trovato* but also *vero*. The more daring and inquisitive will also wonder: for how long?

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http://www.everything2.com/index.pl?node_id=1439661

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