Towards Useful Tools for the Study of the History of Cosmology

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One of the important goals of the philosophy of cosmology is to study the meaningful historical works of Aristotle, Galileo, Copernicus, Kepler, and others. From viewpoint of the history of cosmology, these texts are important not only as examples of understandings of the universe but also because they can be considered as leading historical illustrations of original approaches to the question of scientific rationality and types of scientific controversies. Like many other classic scientifical texts, they are multidimensional works. It can be distinguished many focus points which the books may be explored (history, science, philosophy, literature, and others).

In this paper, I consider the possibility of reading the texts concerning the important cosmological issues from the point of argumentative view. In this regard, the key tasks of my research are (1) to explore the central characteristics of the argumentation dimension and (2) to consider some methodological tools that will be useful for scholars studying outstanding historical books from the field of philosophy of cosmology.

Keywords: philosophy of cosmology, history of cosmology, theory of argumentation, historical and empirical approach, tools for the study of scientific controversies

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Introduction

The philosophy of cosmology seeks to discern ways of knowing the universe. In this regard, the exploration of meaningful historical texts devoted to this issue has great importance. For example, books such as Aristotle's *On the Heaven* or Galileo's *Dialogue*

on the Two Chief World Systems, Ptolemaic and Copernican[1] reflect the main trends of understanding the universe in historical contexts.

Like many other classic scientific treatises, these books are multidimensional works. We can read them from different focuses: scientific, historical, philosophical, rhetorical, literary, etc. These are just the general points from which the book may be considered. Each of them, in turn, involves several more specific points of view. For example, a scientific reading of the book could focus on physical, astronomical, mathematical, and cosmological issues. A historical exploration could take the book as a document of some epochs, events, or episodes. The philosophical focus is based on a methodology that corresponds to some instruments and methods for analyzing and evaluating historical scientifical texts.

In this paper, I would like to consider the possibility of reading the texts concerning the important cosmological issues from the point of argumentative view. In this regard, the key tasks of my research are (1) to explore the key characteristics of the argumentation dimension and (2) to consider some methodological tools that will be useful for scholars studying outstanding historical books from the field of philosophy of cosmology.

What is the argumentation dimension?

To identify the preconditions of argumentative view on the reading of historical texts, I propose to focus on the epoch-making book "The Uses of Argument" by Steven Toulmin. In this work, a new approach to logic was proposed (Toulmin, 1958).

Stephen Toulmin emphasized that "a radical re-ordering of logical theory is needed in order to bring it more nearly into the line with critical practice" (Toulmin, 1958: 253; Toulmin, 2003: 234). It meant that his new logic had to work adequately in the various fields of argumentative reality. In this regard, Toulmin assumed that not only a theoretical component is relevant to the study of argumentation but also an empirical one is needed. Justifying this view, he claimed: "logic (…) may have to become less of an a priori subject than it has recently been (…) Accepting the need to begin by collecting for study the actual forms of argument current in any field, our starting point will be confessedly empirical" (Toulmin, 1958: 257; Toulmin, 2003: 236-238). In addition, it should be stressed that Stephen Toulmin connected the empirical component with the historical one.

He believed that "not only will logic have to become more empirical; it will inevitably tend to be more historical… In the natural science, for instance, men such as Kepler, Newton, Lavoisier, Darvin and Freud have transformed not only our beliefs but also our ways of arguing and our standards of relevance and proof (…) Grotius and Bentham, Euclid and Gauss, have performed the same double feat for us in other fields" (Toulmin, 1958: 257; Toulmin, 2003: 237). Here StephenToulmin bearded in mind that empirical database for scholars may be the history of thought in general and the history of science in particular.

Haim Perelman and Luci Olbrechts-Tyteca, who are among the co-founder of the modern theory of argumentation supported Toulmin's view. They claimed that their treatment, called new rhetoric, had to base on empirical observation (Perelman & Olbrechts-Tyteca, 1958).

[1] The full original title of the book Galileo published in 1632 may be translated as follows: "Dialogue by Galileo Galilei, Lincean Academician, Extraordinary Mathematician at the University of Pisa, and Philosopher and Chief Mathematician to the Most Serene Grand Duke of Tuscany; where in meetings over the course of four days one discusses the Two Chief World Systems, Ptolemaic and Copernican, proposing indeterminately the philosophical and natural reasons for the one as well as for the other side" (Finocchiaro, 2021: 39).

For understanding what is argumentation dimension it would be appropriate to give a perfect analogy: "Like Frege's theory of logic was founded upon a descriptive analysis of mathematical reasoning, they founded their argumentation theory on a descriptive analysis of reasoning with value judgments in the fields of law, history, philosophy, and literature" (Eemeren, 2015: 5-6).

However, in the 20th-century, investigations in the field of argumentation were mainly aimed at theoretical issues and their philosophical support. Only more recent studies of distinctive argumentative patterns have been identified in argumentative discourse in the scientifical, philosophical, political, educational, legal, medical, and other domains. Empiricalization has become one of the main trends of current argumentation research (Eemeren, 2015; 2017). Eemeren writes: "three major developments in the treatment of argumentation have begun to materialize that open new avenues for research. Although they differ in shape, these developments can be observed across a broad spectrum of theoretical approaches. The three developments I have in mind can be designated as empiricalization, contextualization, and formalization of the treatment of argumentation" (Eemeren, 2015: 5).

In my opinion, studying the texts by Aristotle, Galileo, Kepler, and other cosmologists from an argumentative dimension, on the one hand, reflects the process of empiricalization in modern argumentation theory. On the other hand, scholars in the field of the history of cosmology have an opportunity to improve their methodological tools by using instruments and methods from informal logic, pragma-dialectics, and other argumentative approaches.

Methodology. General Orientation

As you can see, the exploration of historical texts from the focus of the argumentative dimension could be considered an empirical project. Let us try to characterize its stages.

The first stage involves the selection of some important texts of the past, containing interesting argumentation and scientific controversies on some cosmological issues. For example, it could include the writings of Aristotle, Galileo, Copernicus, Kepler, and others.

In the second stage, scholars take attention to a precise reconstruction of the arguments involved in the select text of the past and the context in which they occur. In other words, they create a database consisting of reconstructed arguments from the selected texts. We can define arguments as a set of statements that seeks to justify a conclusion by supporting it with premises; defending it from objections; or both goals. Reconstruction means to find out all premises (expressed and unexpressed) and conclusions in the arguments consisting in the certain text. The reconstructed arguments are a true database of such an empirical project.

In the third stage, the reconstructed arguments can be explored from three argumentative tiers: logical, dialectical, and rhetorical. The logical tier focuses on the inferential structure of the reconstructed arguments. Here the key research questions could be, at least, the following.

(RQ1) How argument is expressed and stated?

(RQ2) What are its premises?

(RQ3) What is its conclusion?

(RQ4) What missing premises can be included in its reconstruction?

(RQ5) What is the logical structure of the argument?

(RQ6) What is its logical type (deduction, induction, analogy, abduction, etc.)?

(RQ7) What is the structure of the reconstructed argument (serial, linked, independent, etc.)?

(RQ8) How this structure may be pictured in a structure diagram?

The dialectical tier may be considered as a tier of argumentation, which relates to the interpretation and evaluation of a reconstructed argument with a standpoint as well as the argument's defense from possible criticism of other arguers. It can be objections, observations, counterarguments, refutations, etc. In this case, it can be proposed the following critical question.

(RQ1) What are objections, observations, counterarguments, and refutations regarding the reconstructed arguments which can be found in the history of cosmology?

(RQ2) What are objections, observations, counterarguments, and refutations regarding the reconstructed arguments we can find in the writings of modern authors?

The rhetorical tier of argumentation is devoted to analyzing the audience. It is an audience-oriented tier of argumentation, which includes arguments related to the audience's reception of the argumentation. Here the key research questions could be, at least, the following.

(RQ1) What was the reaction of contemporaries to the investigated text?

(RQ2) Did the author of the investigated text take into account the views of the contemporaries?

(RQ2) What is the rhetorical force of the reconstructed arguments?

(RQ4) What rhetorical devices did the participants in scientific controversies use?

The fourth stage is concerned with the evaluation of the reconstructed arguments, namely the assessment of their merits. Scholars suggested different criteria distinguish a good argument from a bad one. For instance, speaking of logical criteria we can talk about soundness and validity. In general, it could be expressed the following way: an argument is good if and only if it is formally valid and its premises are true. Here the key research questions could be the follows.

(RQ1) Is an argument sound?

(RQ2) Is an argument valid?

The fact that by following the validity criterion all good arguments are being reduced to deductive ones proves how strong it is. However, an argument is good not only if it is valid. We can see that some arguments which we take to be good are not sound by reflecting on examples of perfectly acceptable arguments whose premises are not all true, or whose inferential step is not deductively valid. This fact implies that we can use other criteria. For instance, informal logicians often are based on a triad of relevance, acceptability, and sufficiency (RAS criteria) as a popular set of criteria for evaluation. According to them: an argument is good if and only if its premises are acceptable, relevant to the conclusion, and sufficient to support it. Here, it can be proposed the following question.

(1) Are the premises relevant to the conclusion in the reconstructed argument?

(2) Are the premises acceptable in the reconstructed argument?

(3) Are the premises sufficient in the reconstructed argument?

(4) Do the reconstructed arguments contain fallacies?

Tools for the study of scientific controversies

In line with the central aim of the paper, I would like to present here some instruments and methods for the interpretation and evaluation of scientific controversies that we can find in historical texts on cosmology. They were explored in the writings of Maurice Finocchiaro (Finocchiaro, 1980; 1994; 2010; 2013; 2021).

His views of arguments in scientific controversies can be defined as historical and empirical. In a collection of papers and books written over a period of three decades, he presented the historical-textual and meta-argumentation approaches. Maurice Finocchiaro wrote about his

first project: "I advocated a type of empirical approaches to the study of reasoning which may be called the historical-textual or informal logic approach" (Finocchiaro, 1994: 1). Its aim is the formulation of normative and evaluative principles besides descriptive, analytical and explanatory ones" (Finocchiaro, 1994: 1).

The second project Finocchiaro presented in the following way: "I elaborated an approach to logic and argumentation theory that studies arguments in a manner characterized as pragmatic, comparative, empirical, historical, naturalist, and both normative and descriptive. It corresponds to Toulmin's idea of an applied logic, as well as to the historical-textual approach which I have advocated previously" (Finocchiaro, 2013: 178).

Finocchiaro's methodology is based on four principles. His position can be identified as (i) historical-textual, (ii) dialectical, (iii) interpretative, and (iv) self-referential (Eemeren et al., 2014: 389). The historical-textual principle is associated with the object of research. The scholar takes attention to a precise reconstruction of the arguments involved in the select text of the past and the context in which they occur.

The dialectical principle concerns the argumentative side of the controversies from some historical texts. Reconstructing the arguments Maurice Finocchiaro tried "to stress counterarguments, objections, criticism, evaluation, potential (and not necessarily actual) dialogue, and the clarification (rather than resolution) of differences of opinion" (Finocchiaro, 2005: 14).

The interpretative principle is related to Finocchiaro's theoretical views on arguments in scientific controversies. He characterized the approach as interpretative because "it stresses the understanding and reconstruction of arguments (as distinct from their evaluation and criticism) to a far greater degree than is commonly the case" (Finocchiaro, 2005: 14).

The final methodological principle is self-referentiality. It points out the intention to apply the abovementioned methodological principles "not only to the analysis of the scientific controversies but also when dealing with contributions of his scholarly peers in informal logic and argumentation theory" (Eemeren et al., 2014: 389).

According to the historical-textual approach, the first step of research is the reconstruction of controversy in the texts of the past from different domains (philosophy, science, politics, jurisprudence, etc.), keeping in mind the relevant information about arguers involved in the dispute, historical context, and peculiarities of the controversy. As a result of such interpretation of the selected text, scholars can receive a database of reconstructed arguments.

The second step is the evaluation of the reconstructed arguments and the argumentative aspects of the controversy in general. What evaluation methods does Finocchiaro propose? What techniques can argumentation scholars use for determining whether a particular instance of reconstructed argument is good or bad?

As Finocchiaro (1994) stated, there are six relevant methods, namely "method of alternative conclusion, active evaluation, ad hominem argument, method of counterexample, principle of charity, and explanation of error in reasoning (…) The three most relevant methods are alternative conclusion, active evaluation, and ad hominem argument" (Finocchiaro, 1994: 11).

The method of alternative conclusion could be used to show that a conclusion of an argument does not follow from its premises because another different conclusion follows instead. The term alternative conclusion means that this conclusion and the original one conflict. Active evaluation is the procedure of testing inferential relationships among propositions within a reconstructed argument.

Ad hominem argument is not meant the present-day informal fallacy. It is meant in the 17th-century sense, "namely as reasoning where the arguer derives a conclusion not

acceptable to an opponent from premises accepted by the opponent, but not necessarily generally acceptable" (Finocchiaro, 1994: 11).

Later, Maurice Finocchiaro proposed the method of meta-argumentation based on the following principle of interpretation and evaluation: the former focus on describing the propositional structure of the reasoning under investigation and on justifying the accuracy of this description; the latter focus on criticizing the various explicitly stated propositions, their connections with each other, and their connections with other implicit propositions, and on justifying the tenability of these criticisms" (Finocchiaro, 2013: 242). This method Finocchiaro used within his meta-argumentation approach.

Conclusions

In this paper, I focus on studying the important original texts from the past where cosmological issues were considered. It is stressed that scholars can explore them from different focuses: scientific, historical, philosophical, rhetorical, literary, etc. Each of them in turn involves several more specific points of view.

It is proposed to consider the project of reading the texts concerning the important cosmological issues from the point of argumentative view. Such a project can be characterized as historical and empirical.

Currently, various types of instruments and methods for historical projects have been elaborated (Rudenko & Liashenko, 2020). In this regard, great attention in the paper is paid to the clarification, systematization, and classification of the useful argumentative tools which scholars could use to investigate the texts of the past.

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