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The Historiographical Project of the Lyceum

The Peripatetic History of Science, Philosophy, and Medicine

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What I mean by the historiographical project of the Lyceum is a group of writings by three of Aristotle's students, Theophrastus, Eudemus, and Menon, which are related to the history of philosophical and scientific knowledge (in the Aristotelian sense). These writings, which survive only in fragments, include, first, three histories of science by Eudemus: *History of Geometry* (Γεωμετρικὴ ἱστορία, fr. 133-141 Wehrli), *History of Arithmetic* (Αριθμητικὴ ἱστορία, fr. 142), and *History of Astronomy* (Ἀστρολογικὴ ἱστορία, fr. 143-149). The next work is Eudemus' *History of Theology* (Περὶ τὸ θεῖον ἱστορία, fr. 150). Then comes the famous doxographical treatise by Theophrastus, *Opinions of the Natural Philosophers* (Φυσικῶν δόξαι).¹ The last work is Menon's *Medical Collection* (Ἱατρικὴ συναγωγή),² a medical doxography analogous to Theophrastus' physical doxography.

I shall try to demonstrate both common and individual features of these writings and to examine how they relate to Aristotle's theoretical and historical views. But first I have to admit that this 'historiographical project' is not something given in our sources. It is rather my reconstruction that relies on what can be inferred from the close interrelationship between the separate treatises of individual Peripatetics, the obvious coordination of their working plans, and the marked conformity of their writings with Aristotle's ideas on the development of various 'sciences' and on the boundaries between them. Taken together, these characteristics prompt me to consider all the aforementioned writings to be parts of the general project initiated by Aristotle and carried out by his students.

The Peripatetics viewed the then-contemporary configuration of the sciences through the prism of Aristotelian classification. The ancient classification of sciences originated with the Pythagoreans, who set apart geometry, arithmetic, astronomy, and harmonics as a specific group of μαθήματα.³ Following this scheme, Aristotle included in the μαθήματα not only astronomy and harmonics, but also optics and mechanics, although he regarded them as 'more physical' than pure mathematics.⁴ Generally, Greek 'mathematics' embraced a number of key disciplines that in the modern pe-

1 Hermann Diels, *Doxographi Graeci*, Berlin 1879.

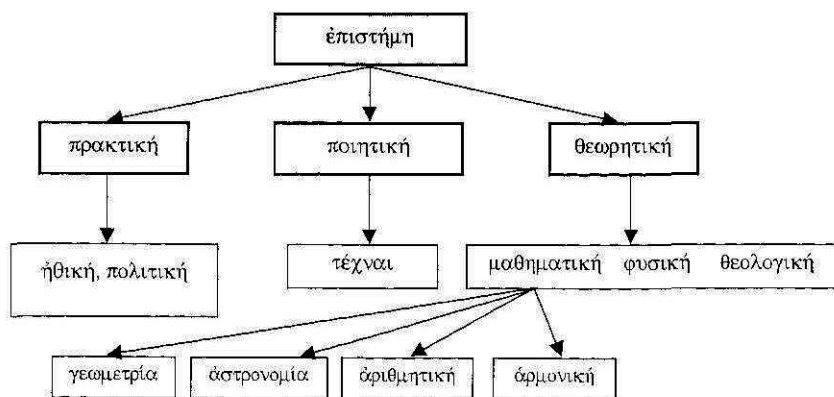
2 Anonymus Londinensis. Ex Aristotelis Iatrietis Menonitis et aliis medicis eclogae. Ed. by Hermann Diels. Berlin 1893.

3 Archytas (47 B 1).

4 *Phys.* 194 a 8-10; *Metaph.* 1078 a 14-17. Richard McKirahan, Aristotle's Subordinate Sciences, *British Journal for the History of Science* 11, 1978, 197-220; Joseph Owens, The Aristotelian Conception of the Sciences, in: *Collected Papers*, Ed. by J. R. Catan, Albany 1981, 23-34.

riod have been transferred to the sphere of physics,⁵ whereas ancient 'physics' included natural philosophy and those natural sciences that did not use mathematics.

In its most general form, Aristotle's classification of the sciences is presented in book E of the *Metaphysics* (1025 b – 1026 a), which can go back to his earlier work *Περὶ ἐπιστημῶν* (Diog. Laert. 5,26).⁶ Any science (ἐπιστήμη) is either practical, productive, or theoretical. πρακτική ἐπιστήμη includes practically oriented sciences that regulate nonproductive human activity, like ethics and politics; ποιητική ἐπιστήμη includes „productive sciences“, or arts (τέχναι); and θεωρητική embraces theoretical sciences. θεωρητικοὶ ἐπιστήμαι are further divided into μαθηματική, φυσική, and θεολογική (1026 a 6-19, cf. 1064 b 1-3; *Phys.* 193 b 22-36).



It has long been noted that Aristotle distributed the historiography of different branches of knowledge among his students.⁷ However, many important aspects of this project have not been sufficiently clarified. The project as a whole was primarily devoted to one of the three kinds of sciences, – the theoretical. Individual parts of the project correspond to the division of the theoretical sciences into mathematics, physics, and theology. These three sciences were distributed in such a way that Eudemus received the first and the third type, the histories of mathematics and theology, while Theophrastus dealt with the second, physical doxography. Menon's medical doxogra-

phy belongs to this type as well. All material was distributed in a way designed to avoid duplication as far as possible, e.g. between physics and medicine, physics and theology, mathematical and physical astronomy, etc.

Aristotle regarded the theoretical sciences as the most important, and it is only natural that theology, physics, and mathematics became the subject of a special historiographical project. Judging from the amount of material and the effort put into it, physical doxography was certainly the central part of the project. Φυσικῶν δόξαι consisted of 16 (or 18) books (Diog. Laert. 5,46, 48), whereas none of Eudemus' histories of the exact sciences exceeded four books. This can be explained by the amount of material in each science and by the methods of its selection. At the same time, this reflects Aristotle's own interests as a 'physicist', interests shared by Theophrastus and Eudemus. The subject matter of the Φυσικῶν δόξαι largely coincided with the subject matter of most pre-Socratic writings, but was already presented in Aristotelian terms. It included fundamental physical principles, notions, and categories (matter, „causes“, space, time, etc.), astronomy, meteorology, psychology, and physiology.

According to Aristotle, theoretical science deals with two kinds of phenomena and processes: the first kind are general and regular (τὰ καθόλου), the second occur „as a general rule“ (ὥς ἐπὶ τὸ πολὺ).⁸ This approach allowed him to consider the theoretical part of medicine, related to physics, along with physical theories, without changing medicine's status as a „productive science“ aiming to attain health (Eth. Eud. 1216 b 16-18). Aristotle notes several times that, in regard to the causes (αἰτίαι) of health and disease, „physicists“ and doctors have a common task, so that the former often complete their works with medical topics, whereas the latter start from a consideration of nature.⁹ Menon's medical doxography corresponded fully to Aristotle's views on this subject. It was built on the same principles as physical doxography, but was limited to a much narrower set of problems, namely to the causes of diseases.¹⁰ This again stressed its closeness to the investigation of the physical ἀρχαί and αἰτίαι. In contrast to this, Theophrastus' work did not contain a special section on the causes of diseases, although these were included in the later versions of this work, together with the opinions of some early doctors.¹¹

5 According to the classification of Posidonius' student Geminus, the μαθήματα include geometry, arithmetic, astronomy, harmonics, optics, mechanics, logistics, and geodesy (Gemin. ap. Procl. In Eucl., 38,4-42,8).

6 Paul Moraux, *Les listes anciennes des ouvrages d'Aristote*, Louvain 1951, 46.

7 Friedrich Leo, *Die griechisch-römische Biographie nach ihrer literarischen Form*, Leipzig 1901, 99f.; Werner Jaeger, *Aristotle: Fundamentals of the History of his Development*, Oxford 1948, 334ff.

8 *An. Pr.* 43 b 30-38, *An. Post.* 96 a 8-19; *Metaph.* 1027 a 20-24, 1064 b 32-36, 1065 a 1-6. G. E. M. De Ste. Croix, *Aristotle on History and Poetry*, in: *Essays on Aristotle's Poetics*, Ed. by A. O. Rorty, Princeton 1992, 23-32; Mario Mignucci, *ὥς ἐπὶ τὸ πολὺ et nécessaire dans la conception aristotélicienne de la science*, in: *Aristotle on Science. The Posterior Analytics*, Ed. by Enrico Berti, Padova 1981, 173-204.

9 *Sens.* 436 a 17 - b 2; *De vit.* 480 b 21-31. Medicine as ἐπιστήμη that investigates the causes of health: *Metaph.* 1026 a 1f., 1032 b 2-22, 1064 a 1f.

10 ἀρχαί (τῶν νόσων): 4.28, 18.31, 18.47; αἰτίαι (τῶν νόσων) 4.41, 5.35, 9.40, 33.8 Diels (n. 2).

11 Diels, *Doxographi* (n. 1), 232; David Runia, *The Placita Ascribed to Doctors in Aëtius' Doxography on Physics*, in: *Ancient Histories of Medicine. Essays in Medical Doxography and Historiography in Classical Antiquity*, Ed. by Philip J. van der Eijk, Leiden 1999, 189-250, esp. 248f. Cf.:

As for the composition of these treatises, the opinions of 'physicists' were organized according to two main principles – systematic and chronological. The first allowed Theophrastus to put together opinions of different philosophers in books and chapters devoted to individual topics and problems; the second, to place these opinions in the chapters according to their historical sequence. For example, the first chapter of the *Φυσικῶν δόξαι*, which deals with the *ἀρχαί* of philosophers, starts with Thales, the first 'physicist' according to Aristotle (*Metaph.* 983 b 20), and ends with Plato. Eudemus' *History of Geometry* and *History of Astronomy* also start with Thales, who was regarded as the progenitor of both sciences, and they finish with Eudemus' own contemporaries, the students of Eudoxus (fr. 133 Wehrli). In contrast to doxography, the history of science did not entail the application of systematic principles; Eudemus' exposition was purely chronological. Menon, following Theophrastus, divided doctors into two groups on the basis of similarities in their theories. Within each group, it seems they were placed in more or less chronological order.¹² Menon started with the most ancient doctors whose writings were available at the time – Euryphon and Herodicus of Selymbria¹³ – and probably finished with Plato.¹⁴ Earlier Croton doctors, like Calliphon and Democedes, either did not leave writing that corresponded to the topic of Menon's doxography, or like Alcmaeon were considered *φυσικοί* and correspondingly figured in Theophrastus' book.¹⁵

Primary 'causes' and principles (*τὰ πρῶτα αἷτια καὶ αἱ ἀρχαί*) that define Being as such became the subject of the *θεολογικὴ ἐπιστήμη*, or metaphysics. In a more narrow sense, the subject of Aristotle's theology, presented in book A of the *Metaphysics*, is the first principles of the divine (*τὸ θεῖον*) – eternal, immutable, and separable from matter (1026 a 15f., 1069 a 18ff.).¹⁶ Aristotle saw incipient forms of theology under-

stood in these terms in the early cosmogonies and cosmologies. Usually he called their authors *θεολόγοι*.¹⁷ The incomplete and even wrong answers these authors offered on questions concerning the principles of the divine became the subject of Eudemus' *History of Theology* (fr. 150 Wehrli).¹⁸ This book was a chronologically organized outline of the specific principles of the divine introduced by Greek and oriental 'theologians'. First came Orpheus, who introduced Night as *ἀρχή*, he was followed by Homer, Hesiod, Acusilaus, Epimenides, and Pherecydes.¹⁹ The *ἀρχαί* of the Babylonians, Magi, Sydonians, and Egyptians were treated separately.

Eudemus' choice of main personages for his *History of Theology* fits quite well with what the *Metaphysics* says about the *θεολόγοι*. Here they comprise a rather definite group of ancient poets (Orpheus, Homer, Hesiod) and the authors of mythical cosmogonies (Pherecydes),²⁰ who were to be treated separately from the philosophers, the *φυσικοί*.²¹ In the first place, *θεολόγοι* belong to a more ancient period;²² second, they reasoned not rationally but 'mythically': *μυθικῶς σοφιζόμενοι* (1000 a 18).²³ Accordingly, those philosophers whom Aristotle placed among the *φυσικοί* and whom we usually call the pre-Socratics do not figure in the *History of Theology*. And vice versa: none of Eudemus' *θεολόγοι* are mentioned in Theophrastus' compendium. The boundary between these groups coincides to a considerable degree with the contempo-

17 *Metaph.* 983 b 29, 1000 a 9, 1071 b 27, 1091 a 34. J. Palmer, Aristotle on the Ancient Theologians, *Apeiron* 33, 2000, 181-205.

18 The only fragment of this work (fr. 150 Wehrli) does not contain a title, but Usener (Hermann Usener, *Analecta Theophrastea*, in: *Kleine Schriften*, Leipzig 1912, 64) rightly related it to *Τὸν περὶ τὸ θεῖον ἱστορίας* α'-ε', listed among Theophrastus' works (251 № 2 FHSG). Wehrli denied this (Fritz Wehrli, *Theophrast*, in: *Die Philosophie der Antike*. Ed. by Hellmut Flashar, Vol. 3, Basel 1983, 501, cf. 531), cf. Gábor Betegh, On Eudemus fr. 150 (Wehrli), in: *Eudemus of Rhodes*. Ed. by István Bodnár and William Fortenbaugh, New Brunswick 2002, 337-357.

19 Acusilaus (ca. 500 BC) is mentioned after Hesiod, but before Epimenides and Pherecydes, who are older than him. One reason for this might be that Acusilaus appears to follow Hesiod very closely in his *Genealogiai* (9 A 4). This was explicitly mentioned by Plato (*Symp.* 178 b = 9 B 2), on whom Eudemus could have relied. It could also be that Eudemus simply did not know the correct chronology of Acusilaus.

20 οἱ περὶ Ἡσίοδον (1000 a 9); οἱ ἀρχαῖοι ποιηταί (1091 b 3ff.), among them Orpheus (*ἀρχή* Night), Homer (*ἀρχή* Ocean, cf. 983 b 27), and Hesiod (*ἀρχή* Chaos, cf. 984 b 26-28); on Pherecydes and the Persian Magi, see 1091 b 9-10. Aristotle mentions the *ἀρχαί* of the Magi, Ormuzd and Ahriman, in his dialogue *On Philosophy* (fr. 6 Rose = fr. 23 Gigon). The same *ἀρχαί* are to be found in Eudemus (fr. 150 Wehrli).

21 These two groups are always set apart (*Metaph.* 1071 b 27, 1075 b 26, 1091 a 34).

22 οἱ παμπάλαιοι καὶ πρῶτοι θεολογήσαντες (*Metaph.* 983 b 28-29), οἱ νῦν – οἱ πρότερον (1000 a 5-6). To be sure, this boundary should not be taken too literally: Pherecydes was younger than Thales and Anaximander.

23 Cf.: Jaap Mansfeld, Aristotle, Plato, and the Preplatonic Doxography and Chronography, in: Jaap Mansfeld, *Studies in Historiography of Greek Philosophy*, Assen 1990, 41f.; Palmer (n. 17) 182ff.

Jaap Mansfeld, Doxography and Dialectic: The *Sitz im Leben* of the „Placita“, in: *ANRW II* 36,4, 1990, 3058f.

12 Hermann Diels, Über die Excerpte von Menons *Iatrika* in dem Londoner Papyrus 137, *Hermes* 28, 1893, 415. See, e.g. the second group, where the number of unknown names is limited: Philolaus, Polibus (Hippocrates' student), Menecrates (fourth century), Petron, Philistion of Locri (Plato's contemporary), Plato. Cf.: Daniela Manetti, „Aristotle“ and the Role of Doxography in the *Anonymus Londinensis*, in: *Ancient Histories of Medicine* (n. 11), 102.

13 According to Grensemann, Euryphon was born before 500 BC (Hermann Grensemann, *Knidische Medizin*. T. 1, Berlin 1975, 197ff.), but this seems to be too early (Leonid Zhmud, *Wissenschaft, Philosophie und Religion im frühen Pythagoreismus*, Berlin 1997, 243 n. 67).

14 In the papyrus text, the last person mentioned is Plato's contemporary Philistion, but according to a very plausible reconstruction, Plato came after him: Manetti (n. 12), 118f.

15 Although Alcmaeon did practice medicine (Zhmud (n. 13), 239-240), the content of his book corresponds generally to *περὶ φύσεως ἱστορία*, so he was rightly placed among the *φυσικοί*. On the other hand, the papyrus that preserved Menon's work is full of lacunae, so it is possible that Alcmaeon was also mentioned in this work, which includes the opinions of at least three other *φυσικοί*; see below, 114.

16 Aristotle's *Metaphysics*. Ed. by W. D. Ross, Oxford 1924, lxxvii; Leo Elders, *Aristotle's Theology. A Commentary on the Book A of the Metaphysics*, Assen 1972.

general and toward the history of knowledge in particular? What goals did he try to achieve by directing his students to the history of the theoretical sciences?

As with the natural sciences, when looking at history Aristotle revealed a keen interest in the empirical investigation of particular facts, without however forgetting his theoretical tasks: to explain the 'causes' of things. Being fully aware of the historical character of such human accomplishments as the state, art, philosophy, and science, Aristotle endeavored to reveal the inner logic of their development. Even if he does not entirely meet the *modern* requirements of history, Aristotle did much more for its development than any other ancient philosopher, both through his own studies and through the projects he initiated.³¹ Although we are not identifying Peripatetic historiography with modern historiography, we have every reason to compare them, particularly since we are dealing with the development of one and the same phenomenon.

According to Aristotle, history describes particular things, τὰ καθ' ἕκαστον, and therefore is not a science.³² None of the passages in which he discusses sciences includes history. A possible explanation for this is that little of what Aristotle said on history³³ refers to its „common“ type (συνήθης, *Poet.* 1459 a 21f.), and not to history, as it was practiced in the Lyceum. But even if this „common“ history does not explore general causes and is not a true science, it still produces knowledge that can be used as the foundation of such a science. We should bear in mind that Aristotle's theory of science stresses the empirical origin of any knowledge. The question of ὅτι (the collection and description of facts) precedes and predetermines the question of διότι (the explanation of general or particular causes).³⁴ Thus, even a purely descriptive work is a necessary part of scientific procedure, since it is the prerequisite for subsequent theoretical analysis; and the Peripatetics, as we know, wrote hundreds of such works. Many other ἱστορίαι were not purely descriptive. For example, two of Theophrastus' works, *Historia plantarum* and *De causis plantarum*, are devoted to the research of ὅτι and of διότι respectively. In *Historia plantarum*, however, we find not merely assembled data but botanical classification, morphology, and taxonomy.

The other important point is that, when trying to understand why and how Aristotle and his students studied the history of knowledge, we should rely on their actual scholarly practice and not only on their theoretical views on ἱστορία. Let me start with some parallels. Some „practical“ and „productive“ sciences, like rhetoric and poetics,

also became a subject of historical and antiquarian studies. In his *Τεχνῶν συναγωγή*, Aristotle presented the history of rhetoric with special attention to the πρῶτοι εὑρεταί and their discoveries. He started with the founders of this science, Corax and Tysias, and probably ended with Isocrates.³⁵ His dialogue *On the Poets* belongs to those works exploring the history of poetry. Here much attention is given to the founders of various genres and their relative chronology.³⁶ Note that these outlines are devoted to those disciplines that Aristotle later studied in his theoretical treatises, *Rhetoric* and *Poetics*.³⁷ Following the first attempts made by Hippias and Hellanicus, Aristotle compiled lists of the Olympian and Pythian victors and of the dramatic victors at the Dionysia and Lenaea.³⁸ He also compiled (probably with help of his students) the so-called Διδασκαλία, an extensive list of all the tragedies, comedies, and satyr plays performed at these artistic festivals, and dated them by the names of the Athenian archons.³⁹ He used these lists in the study of the Attic tragedy in his *Poetics*.

Another, more extensive and difficult Peripatetic project, in the course of which the 158 polities of the various Greek cities were described, demonstrates an even stronger relationship between empirical and theoretical studies. Relying on this collected and arranged material, Aristotle later wrote his *Politics*. His own *Athenian Polity* consists of two parts: the first gives an outline of the development of the Athenian constitutional system; the second describes the main principles of its functioning. It should be stressed that *Athenian Polity* is a historical treatise of independent value, addressed to a broad audience, and not just a dossier. It is revealing that the preserved fragments of other polities show an obvious predominance of separate „Geschichten“, i.e. interesting stories.⁴⁰ Even if this correlation is accidental, there is no doubt that in recognizing an independent value and interest in these stories, Aristotle was ready to use them for further theoretical generalizations. Therefore, in a political project, historical subject matter does not exclude subsequent systematization, but rather presupposes it.

It is very likely that, by directing his students to the history of the theoretical sciences, Aristotle expected to discover in the process new knowledge that could be used later in his theoretical investigations. Also corresponding to this final goal were the immediate tasks of the project: collection, systematization, and preliminary analysis of the evidence related to historical development of the theoretical sciences. But whereas these immediate tasks are quite safely reconstructed on the basis of sources available to us, exactly how Aristotle and his students intended to apply the results of their studies

31 Kurt von Fritz, *Die Bedeutung des Aristoteles für die Geschichtsschreibung*, *Entretiens* 4, 1956, 91ff.; George L. Huxley, *On Aristotle's Historical Methods*, *GRBS* 13, 1972, 157-169; Raymond Weil, *Aristote et l'histoire*, Paris 1960; idem, *Aristotle's View of History*, in: *Articles on Aristotle* 2. *Ethics and Politics*. Ed. by Jonathan Barnes et al., London 1977, 202-217; R. Blum, *Kallimachos. The Alexandrian Library and the Origin of Bibliography*, Madison 1991, 20ff.

32 Pierre Louis, *Le mot ἱστορία chez Aristote*, *RPh* 29, 1955, 39-44; Weil, *Aristote* (n. 31), 90f.

33 *Rhet.* 1360 a 37; *Poet.* 1451 b 3, 6, 1459 a 17ff.

34 ὅτι μὲν γὰρ οὕτω ταῦτα συμβαίνει, δῆλον ἐκ τῆς ἱστορίας τῆς φυσικῆς, διότι δέ, νῦν σκεπτέον (Inc. an. 704 b 9-11). See also *An. Post.* 89 b 29, 93 a 16ff. and especially *Hist. an.* 491 a 7-14. Wolfgang Kullmann, *Wissenschaft und Methode*, Berlin 1974, 204ff.

35 Fr. 136-141 Rose = fr. 123-134 Gigon. Leo (n. 7), 49, 99f.; Blum (n. 31), 46. Cf. *Soph. El.* 183 b 15ff., where this history is presented in compressed form.

36 Fr. 70-77 Rose = fr. 14-22 Gigon; see πρῶτος εὑρετής in fr. 14, 15, 17 Gigon.

37 Blum (n. 31), 46; comm. on *Arist.* fr. 390 Gigon.

38 Diog. Laert. 5,26 № 130-131, fr. 615-617 Rose = fr. 408-414 Gigon; Diog. Laert. 5,26 № 134-135. Weil, *Aristote* (n. 31), 131f.; Blum (n. 31), 23ff.

39 Diog. Laert. 5,26 № 137 = fr. 415-462 Gigon. Weil, *Aristote* (n. 31), 137f.; Blum (n. 31), 24ff.

40 E.g., fr. 504, 512, 532, 549, 558, 583 Rose.

must remain a matter of speculation.⁴¹ The problem is that this project falls in the last decade of Aristotle's life, and what was to follow afterward remained unrealized. Neither his preserved works, nor fragments, nor even titles of the perished writings tell us what type of theoretical treatise or treatises was to crown the historiographical project the way the *Politics* crowned the corpus of the politics. Traces of works or theories based on this historiographical material are not to be found in the legacy of Aristotle's students, either. Strictly speaking, both the project as a whole and its separate parts possess a genuine value of their own, even if we do not postulate a general 'final goal'. Still, let us look for a plausible common goal of the project, while excluding the least plausible.

In my view, the chronological method of organizing the material – the method characteristic, although in varying degrees, of all parts of the project – can be regarded as an important indicator of its historical orientation. Other scholars are inclined to stress the systematic method of doxography, from which they postulate its systematic purposes.⁴² Meanwhile, from the point of view of Aristotelian *ιστορία*, a historical and a systematic approach hardly contradict each other; rather, they are different methods of systematizing facts. In the contemporary humanities, chronology and systematics often complement each other. It is easy to imagine a history of Greek culture consisting of chapters on religion, mythology, literature, etc., or an economic history of Rome with chapters on trade, agriculture, slavery, etc. The extent to which each chapter can be organized chronologically depends on the material and intentions of the author. Therefore, if Eudemus employs a strictly chronological approach, while Theophrastus and Menon combine it with a systematic approach, this does not undermine the historical orientation of doxography.

Both before and after Aristotle, scientists and philosophers described the opinions of their predecessors and disputed them without attaching to this procedure any independent value that might be described in terms of historical interest. The doxographical overview at the beginning of the *Metaphysics* (A 3-7) undoubtedly reveals such an interest. Aristotle's students demonstrate an even keener interest in historical studies. Significantly, these studies were much less related to the problems of their own theoretical works. Eudemus was neither a mathematician, nor an astronomer, nor a 'theologian', and could not regard the heroes of his histories as his predecessors. Theophrastus was a φυσικός, but his own *Physics*, judging by the preserved fragments, followed Aristotle's *Physics*, i.e., developed contemporary to him φυσική επιστήμη, leaving aside the Φυσικῶν δόξαι which he had collected.⁴³ It is revealing that Democritus is

nearly the only pre-Socratic mentioned in the fragments of Theophrastus' *Physics* (fr. 238 FHSG).⁴⁴ This is why I cannot subscribe to the thesis that Theophrastus systematized the opinions of the pre-Socratics in order to return to them once again in his theoretical discussion.

The following also testifies against this thesis: from the Peripatetic point of view, the problems presented in the Φυσικῶν δόξαι are among those already solved, including those solved by Aristotle himself. It is hard to imagine that Aristotle commissioned Theophrastus to collect the opinions of Anaximenes, Xenophanes, Heraclitus, Anaxagoras, and others on the moon's eclipses in order to rethink this question again. Most of his physical treatises were written before Theophrastus started to collect material for the Φυσικῶν δόξαι, and it is unlikely that Aristotle intended to rewrite them after his student had finished his work. Unlike in physics, Aristotle and his students could not claim to offer any independent solution of the problems in mathematics and mathematical astronomy; they could only register the problems that contemporary specialists regarded as solved. As for the ἀρχαί of the theologians, they were of purely historical interest for the Lyceum.

Another confirmation that Theophrastus' doxography deals mainly with already solved physical problems comes from Aristotle's treatise *De inundatione Nili*, known only in late Latin translation.⁴⁵ At the beginning of this work, he poses the problem, „Why do the Nile's floods, unlike those of all other rivers, come in the summer?“ Then he cites and criticizes his predecessors' opinions.⁴⁶ In contrast to doxography, the ending of this work contains a solution of the problem: οὐκέτι πρόβλεμιά ἐστιν, notes

mon 39, 1967, 20. Eudemus' *Physics*, although it contains many such passages, followed Aristotle's *Physics* even closer than Theophrastus', sometimes coming close to paraphrasing it. It is unlikely that Eudemus used Theophrastus' doxography.

41 Gigon's hypothesis that Aristotle relied on Theophrastus' Φυσικῶν δόξαι (Olof Gigon, *Die ἀρχαί der Vorsokratiker bei Theophrast und Aristoteles*, in: *Naturphilosophie bei Aristoteles und Theophrast*, Ed. by Ingemar Düring, Heidelberg 1969, 114ff.) did not find confirmation: Mansfeld, *Studies* (n. 23), 73 n. 29.

42 Runia, *What is Doxography* (n. 27), 51.

43 It is possible, of course, that the *Physics* was written before Φυσικῶν δόξαι, but doxographical passages in Theophrastus' systematic works are generally very rare: Hans Gottschalk, *Rec., Gno-*

44 According to Stobaeus, Theophrastus referred to Xenophanes ἐν τοῖς Φυσικοῖς (fr. 232 FHSG), but one can not be sure that this reference really comes from the *Physics* and not from Φυσικῶν δόξαι. Cf.: Peter Steinmetz, *Die Physik des Theophrastos von Eresos*, Berlin 1964, 334ff.; Richard W. Sharples, *Theophrastus on the Heavens*, in: *Aristoteles Werk und Wirkung*, Ed. by J. Wiesner, Bd. 1, Berlin 1985, 577-593; Mansfeld, *Studies* (n. 23), 147ff.; David Runia, *Xenophanes or Theophrastus? An Aëtian Doxographicum on the Sun*, in: *Theophrastus of Eresos: His Psychological, Doxographical and Scientific Writings*, Ed. by William Fortenbaugh/ Dimitri Gutas, New Brunswick 1992, 112-140.

45 Diels, *Doxographi* (n. 1), 226f.; Josef Partsch, *Des Aristoteles Buch „Über das Steigen des Nil“*, *Abhandlungen der Königlich-Sächsischen Gesellschaft der Wissenschaften*, philol.-hist. Kl. 27, 1909, 553-600; J. Balty-Fontaine, *Pour une édition nouvelle du „Liber Aristotelis de Inundatione Nili“*, *Chronique d'Égypte* 34, 1959, 95-102; D. Bonneau, *Liber Aristotelis De inundatione Nili*, *Études de Papyrologie* 9, 1971, 1-33; Mayotte Bollack, *La raison de Lucrèce*, Paris 1979, 539ff. Editions of the text: Arist. fr. 248 Rose; FGrH 646 F 1; Bonneau, 3-7; references by ancient authors to the Greek text of Aristotle: FGrH 646 T 1-2.

46 In particular, of Thales, Diogenes, Anaxagoras, Nicagoras of Cyprus, and Herodotus. The theories of Euthymeres of Massalia, Oenopides, and possibly Ephorus and Plato (from *Timaeus*) are presented anonymously.

Aristotle (FGrH 646 T 2a), „the problem does not exist anymore“, and gives a correct explanation of the Nile's floods. It is obvious that he did not turn to the history of this problem in order to solve it on the basis of earlier opinions. He addressed this issue after gaining access to the new empirical evidence that finally settled it.⁴⁷ The Φυσικῶν δόξαι do not contain 'correct answers', i.e., the solutions to the problems posed by the pre-Socratics, because these answers belong to the φυσικὴ ἐπιστήμη and are given in the respective theoretical works of Aristotle and Theophrastus. But the principal approach to the δόξαι remains the same: their collection does not open a discussion on the specific physical problem, but gives a *historical retrospective* of this discussion after the problem itself appears to have been solved.

The historiographical project presupposed a certain completeness of evidence, which indeed was achieved in most cases. Apart from the φυσικοὶ mentioned in Theophrastus, we do not know anyone else from the relevant period. The same is true for the μαθηματικοί: Eudemus gives the names of practically all the mathematicians up to his own time.⁴⁸ His list of Greek theologians⁴⁹ is indeed complete, and his account of the Oriental theogonies is highly valuable. Almost half of the names given by Menon not to be found in other sources, and there are other reasons to believe that he too was trying to achieve 'completeness'. Theophrastus and Menon missed neither those whom Aristotle obviously held in low regard (like Hippon), nor those whose names he preferred not to mention at all (like Philolaus).⁴⁹ As a result, the Peripatetics collected much more data than was needed for the most detailed analysis of every particular problem, which speaks to the significance of the facts *themselves*. For example, in Aëtius we find 15 different answers to the question concerning the nature of the sun (2,20); none of them concurs with the solution offered by Aristotle and Theophrastus.⁵⁰ What was the purpose of collecting them? It is very unlikely that they intended to turn to this problem again after enriching themselves with new – or rather with old – knowledge. This collection was mainly of historical interest, showing the difficult path to the truth that was finally revealed in Aristotle's physical teaching, i.e., outside of the Φυσικῶν δόξαι.

47 Apparently, Aristotle relied on the results of an expedition organized by Alexander to answer a question about the causes of the Nile's floods: Bonneau (n. 45), 21 ff.

48 There is reason to believe that Hippasus and Democritus were omitted not by Eudemus, but by his excerptors (Leonid Zhmud, Eudemus' History of Mathematics, in: Eudemus of Rhodes (n. 18), 275-276, 287-288).

49 On Hippon cf. 38 A 6 (= Arist. *Metaph.* 984 a 3) and A 3-4, 10, 13-14, etc. (from Theophrastus), A 11 (from Menon). Aristotle mentions Philolaus only once, referring to his oral dictum, whereas he ascribes Philolaus' astronomical views to certain anonymous Pythagoreans. Theophrastus and Menon attribute specific theories to Philolaus (44 A 16-23, 27).

50 Contrary to Steinmetz (Physik (n. 44), 116 ff., 161 ff.), Theophrastus hardly abandoned the idea of the heavenly αἰθήρ (Richard Sharples, Theophrastus of Eresus. Commentary. V. 3,1. Sources on Physics, Leiden 1998, 85 ff. and fr. 158, 161 A FHSG).

Aristotle attributed to facts an independent value. They acquire even greater significance when, properly selected and arranged, they help in the search for the 'causes' (διότι).⁵¹ But explaining the 'causes' was not among the tasks of the historiographical project; otherwise they would have been preserved even in our fragmentary material. In this sense, ἱστορίαι as practiced in the Lyceum differs from contemporary histories of science and philosophy, but neatly corresponds to the situation that existed until the end of the 18th century: descriptive history collects and arranges facts, philosophy analyses their 'causes'.⁵² What kind of 'causes' did Aristotle have in mind when the historiographical project was conceived? Most probably, those universal laws that underpin the growth of knowledge and the development of the sciences. The general character of the evidence collected by the Peripatetics and the parallels with Aristotle's other works and projects related to history bring me to the following hypothesis: Aristotle regarded this project of embracing all the θεωρητικοὶ ἐπιστήμαι as a preliminary stage in developing a *theory of science*. In any case, it is very likely that this was one of the original objectives of the project.

On the other hand, the discoveries of the scientists and the opinions of the philosophers, doctors, and theologians not only paved the way for conclusions of a universal character, they themselves had already been selected and arranged in accordance with Aristotle's theoretical views on science and its development.⁵³ This means that the conclusions, as so often happens, were to a certain extent known in advance. At the beginning of his *History of Geometry*, Eudemus states a general rule of cognitive evolution from αἰσθησις to λογισμός and further to νοῦς (fr. 133), and this is not the only case in which philosophical ideas are applied to historical material.⁵⁴ The Peripatetics regarded the history of knowledge as a development from a less to a more perfect state, as a progressive advance toward the truth. Even if they tried to limit their historical studies to particular facts and to avoid generalizations, they failed to apply this principle consistently.

Let us turn now from the general goal of the project to the various forms in which it was realized. Eudemus' history of science was the most historical part of the project. The history of theology can be placed somewhere between the history of science and a much more systematically organized doxography. What are the reasons for these differences?

The subject of Eudemus' works was the development of the exact sciences from their Oriental origins to the middle third of the fourth century. In the *History of Ge-*

51 Huxley (n. 31), 159.

52 As one of the founders of the modern history of philosophy repeated after Aristotle, *historia dicit, quod sit; scientia et philosophia, cur sit. Illa singularia, haec universalia considerat* (Johannes Jonsius, De scriptoribus historiae philosophicae, Frankfurt a.M. 1659, 2).

53 Zhmud, Eudemus' History (n. 48), 296-300.

54 Dicaearchus' Βίος Ἑλλάδος deals with the general stages of the development of civilization, apart from particular events and individuals (fr. 47-51 Wehrli).

ometry, all the names of the mathematicians are given in chronological order, often with indications of who was older and younger, who was whose student, etc. Eudemus focused his attention on mathematical discoveries,⁵⁵ whose variety did not allow him to subsume them in categories of the same type. With rare exceptions, he could not arrange them „problemgeschichtlich“.⁵⁶ In exactly the same way, the *History of Astronomy* was not organized in accordance with the problems, like the moon's eclipses or the order of the planets, but in accordance with the *πρῶτος εὑρετής* principle,⁵⁷ i.e., according to the chronology of those who made astronomical discoveries. Eudemus preferred the chronological approach even in the *History of Theology*, where much more limited material referred to the history of *one* problem, the *ἀρχαί* of the theologians, and where he could apply a systematic principle.

In the history of science, Eudemus could employ a historical approach much more consistently than his colleagues, mostly because of the character of his material. The discoveries of mathematicians necessarily depended on what had been achieved before them: Hippocrates and Theaetetus relied on Pythagorean mathematics, Archytas and Eudoxus developed the theories of Hippocrates. Progress in mathematics is all the more evident, because, according to Aristotle's concession, „it alone among human activities knows of proofs.“⁵⁸ That is why a mathematician could base his research on a solid foundation created by his predecessors and then move further in his quest for the truth. To be sure, Eudemus records some unsuccessful attempts to solve mathematical problems, e.g. Antiphon's attempt to square a circle (fr. 139–140 Wehrli). It is, however, in the nature of mathematics that its history includes many more victories than failures, especially in comparison with other sciences.

In the *History of Astronomy*, Eudemus also focused not on opinions, but on the most important discoveries, starting from Thales' prediction of the solar eclipse (fr. 143–144) and ending with Callippus' modification of Eudoxus' system (fr. 149). Unlike the astronomical part of Theophrastus' doxography, Eudemus' history was selective: he presented the development of astronomy by charting the figures of the „first discoverers“ in succession. From the earlier periods of astronomy, he selected those

ideas that his own time considered to be true, or at least those that appeared significant in the progressive development of this science. Eudemus' histories of geometry and astronomy are two generations longer than Theophrastus' doxography, which concludes with Plato. This means that Theophrastus' point of departure was Aristotle's physical teaching. It is from this position that he treated and criticized all the previous *δόξαι*, whereas Eudemus relied on the criteria shared by the community of contemporary mathematicians and astronomers.

Doxography aimed to describe *all* the (relevant) *δόξαι*, and this aim itself dictated another method of arranging the material, differing from that employed in the history of science. Apart from the true opinions, which could be qualified as *εὐρήματα* and presented in chronological order, Theophrastus had to register a great deal of 'wrong' opinions. Furthermore, he had to deal with many *identical* opinions on the same problem, e.g. whether the cosmos is eternal or not.⁵⁹ In the history of mathematics, such a situation could hardly have arisen: after a theorem that the sum of the interior angles of a triangle is equal to two right angles had been proven, no one would return to the problem again.⁶⁰ In the history of astronomy, Eudemus apparently registered only the *πρῶτος εὑρετής* of any important thesis, e.g. that the moon reflects the sun's light (fr. 145), but not the names of all those who shared this view. Finally, Peripatetic physics covered a much wider range of problems than any mathematical science.

As a result, the number of various opinions – opposite, similar or identical – that were included in the doxography, as well as the number of their authors, greatly exceeded the relatively limited material that Eudemus worked on. Together with the distinctive features of the physical opinions that had to be fitted to the Procrustean bed of the Peripatetic categories, this factor of excess largely predetermined the complicated structure of the *Φυσικῶν δόξαι*, which combined several principles of arranging material. Some of these principles were used in the earliest doxographical accounts,⁶¹ while others were developed by Aristotle. Particularly interesting from this point of view is the doxographical survey in the *Metaphysics* A 3–7, which can be regarded as one of the most important models for the *Φυσικῶν δόξαι*.⁶² In this survey, which traces the development of the notions connected with the four 'causes', the main prin-

55 τοῦτο τὸ θεώρημα εὐρημένον ὑπὸ Θαλῶς πρώτου (fr. 135 Wehrli), εὐρεσις (fr. 136), εὐρήματα τῶν Πυθαγορείων (fr. 137), Οἰνοπίδου εὐρημα (fr. 138), Ἰπποκράτης καὶ Ἀντιφῶν ζητήσαντες ... εὐρήκασιν (fr. 139), ὅφ' Ἰπποκράτους ἐγράφησαν πρώτου (fr. 140), Ἀρχύτου εὐρησις (fr. 141).

56 Cf.: „Der Stoff war nach Auftreten und Entwicklung der maßgebenden Gedanken, nicht nach Autoren geordnet“ (Fritz Wehrli, *Eudemos von Rhodos. Die Schule des Aristoteles*, H. 7, Basel 1969, 113); „problemgeschichtliche Anordnung“ (ibid., 119). Such a principle is suitable for the examination of how *different* mathematicians solved the *same* problem – e.g. the duplication of the cube – but it does not fit the historical study of whom a particular mathematical discovery belongs to.

57 Πρῶτος εὑρετής occurs in five of the seven fragments of the *History of Astronomy* (fr. 144–148).

58 Aristot. ap. Iamb. *De comm. math. sc.*, 78.8f. Walter Burkert, *Lore and Science in Ancient Pythagoreanism*, Cambridge (Mass.) 1972, 447f.

59 Anaximander, Anaximenes, Anaxagoras, Archelaus, Diogenes, Leucippus: the cosmos is perishable; Xenophanes, Parmenides, Melissus: the cosmos is eternal (Aët. 2.4).

60 Even in those cases where Eudemus gives several solutions of the same problem (as with the duplication of the cube by Archytas, Eudoxus, and Menaechmus), from the mathematical point of view, these solutions are in fact quite different.

61 Herodotus' doxographical overview (2.20–23) presupposes chronological order: Thales, Euthyphorus of Massalia, Anaxagoras (cf. FGrH I F 302; 647 F 1, 5 and 2, 1–3 (= Aët. 4.1, 1–3). Olof Gigon, *Der Ursprung der griechischen Philosophie*, Basel 1945, 48ff.; A. B. Lloyd, *Herodotus Book II. Commentary* 1–98, Leiden 1976, 91ff., 98ff.; Bollack (n. 45), 539f). Hippias put together similar *δόξαι*; Gorgias and Isocrates classified them along different principles, but also systematically (Mansfeld, *Studies* (n. 23), 55ff.).

62 J. B. McDiarmid, *Theophrastus on Presocratic Causes*, HSPH 61, 1953, 91ff.

ciple for presenting the δόξαι is by the type of 'causes': first comes the material, then the cause of the motion, etc. But from the very beginning this is combined with historical characteristics,⁶³ the most important of which are the following. 1) Chronological sequence. Without being the only or even the main method of arranging the material, it is, nevertheless, constantly on the foreground of Aristotle's attention. 2) Frequent references to the πρώτος εὑρητής of the important ideas. 3) Direct references to the teacher-student relationship (Xenophanes and Parmenides, Leucippus and Democritus). 4) Where the principles held by two philosophers are identical, the earlier is mentioned first (Thales and Hippon, Anaximenes and Diogenes, Hippasus and Heraclitus); in controversial cases, Aristotle solves the problem of priority by resorting to chronological arguments (Alcmaeon and the Pythagoreans). 5) Attention is paid to the influence of earlier thinkers on the later (Pythagoreans and Plato). 6) There are some references to places of birth (Hippasus, Heraclitus, Anaxagoras, Hermotimus, Alcmaeon).

All these features and the systematic grouping of the δόξαι were developed by Theophrastus, especially in the first chapter of his work. As I mentioned, its material was arranged in books and chapters in accordance with the categories of Peripatetic physics. In the chapters devoted to specific problems, the main 'units' or 'blocks' consisted of the theories of individual philosophers, which were united in the groups according to their similarity – if this was relevant – and/or which often, but not necessarily, followed each other in chronological order. This reflects Theophrastus' attention not so much to the opinions as such (Φυσικοί δόξαι), but rather to the doctrines of concrete philosophers (Φυσικῶν δόξαι),⁶⁴ in which he tried to emphasize both what was held in common and what remained individual.

Theophrastus records the relative chronology of the φυσικοί much more consistently than Aristotle does. In the first chapter, chronological indications of various kinds are made for 13 philosophers. Four others (Hippasus, Heraclitus, Hippon and Melissus) do not have them, although it is very possible that they were given by Theophrastus but omitted by Simplicius, who quoted him. References to teacher-student relationships here are also more numerous and differentiated than in the *Metaphysics*. In a number of cases, they presuppose personal connection (Thales and Anaximander, Anaximander and Anaximenes); the others imply influence and the borrowing of ideas (Parmenides and Leucippus, Anaxagoras and Diogenes). The birthplaces of all the philosophers except Hippon are given. Apart from their birthplaces, Theophrastus gives the patronymics of the philosophers. Simplicius preserved these in five cases, but there are many reasons to believe that Theophrastus did so as a rule, rather than as an exception. Finally, the principle of the πρώτος εὑρητής was also applied to such figures as Thales, Anaximander, and Anaxagoras (fr. 1, 2, 4 Diels). References to the πρώτοι εὑρηταί are not confined to the first book: e.g. Parmenides' discoveries (fr. 6a,

17 Diels) do not belong to the principles, but to astronomy. It is no coincidence that the other references to the πρώτοι εὑρηταί in Aëtius are also related to astronomy.⁶⁵ In this science it was possible to speak about discoveries, i.e., about indisputable things and not just about true opinions, as e.g. in meteorology or psychology.

Thus, there is no doubt that the first chapter of the Φυσικῶν δόξαι was organized in such a way as to present a historical picture of the gradual perfection of philosophy from its first immature ideas to the present state, i.e., in accordance with Aristotle's „teleological progressivism“ (cf. *Metaph.* 993 a 15-17; fr. 53 Rose). Except for some biographical data (place of birth, patronymic, name of teacher), Theophrastus' entire attention is focused on the origin and reception of the new ideas, on specific forms of their development, on each thinker's individual contribution, and on their dependence on predecessors.⁶⁶

Any detailed reconstruction of the original sequence of the names in Theophrastus' first chapter is highly problematic. I am not sure if the relative chronology of the pre-Socratics was the only method of arranging their principles. We should bear in mind that no contemporary history of Greek philosophy is based solely on chronology. Usually the latter is combined with the history of schools, such as the Ionians, Pythagoreans, etc. Such an approach to the philosophical past was already widespread in Hellenistic historiography. Hence, von Kienle was probably right in assuming that Theophrastus, too, used an analogous method, arranging the pre-Socratics in „successions“.⁶⁷ It is very likely that after the first series: Thales – Anaximander – Anaximenes – Anaxagoras – Archelaus, he turned again to Xenophanes, who was followed by Parmenides – Leucippus – Democritus – Diogenes – Plato. Indeed, Theophrastus begins with Thales and ends with Plato, before whom comes Diogenes („perhaps the youngest of the physicists“, fr. 2 Diels). Further, each subsequent philosopher is connected with the previous one *in his own series*.⁶⁸ At the same time, the only reference connecting philosophers from one series with those in the other concerns Xenophanes (he is said to study with Anaximander), which implies that, soon after Archelaus, Theophrastus turns back to the 6th century. This arrangement is all the more probable because Aristotle, in his doxographical overview, also returns to Xenophanes, Parmenides, and Melissus after the Atomists and the (younger) Pythagoreans (*Metaph.* 986 b 8ff, 22f).

65 Pythagoras (DG 327,8; 340,21), Thales (353,20; 358,15), Parmenides (377,18; 345 b 14), Anaxagoras (562,26).

66 Kienle (n. 63), 38ff., 52ff., 58ff.; Mansfeld, *Studies* (n. 23), 28ff.

67 Kienle (n. 63), 61-62; cf. McDiarmid (n. 62), 89.

68 1) Anaximander studied with Thales, Anaximenes with Anaximander, Anaxagoras followed Anaximander and Anaximenes, Archelaus his teacher Anaxagoras.
2) Parmenides studied with Xenophanes, Leucippus developed Parmenides' ideas, Democritus was a student of Leucippus.

63 W. von Kienle, *Die Berichte über die Sukzessionen der Philosophen in der hellenistischen und spätantiken Literatur* (Diss.), Berlin 1961, 5 ff.; Gigon (n. 41), 121f.

64 It is almost certain that the title of Theophrastus' work was Φυσικῶν δόξαι, and not Φυσικοί δόξαι, as Mansfeld insists. See: Zhmud (n. 26), 227f.

Having presented in the first chapter a general genealogical schema of the development of philosophy, Theophrastus hardly felt compelled to reproduce it in exactly the same way in every chapter. Any reader interested in knowing who influenced whom could easily check his hypothesis against the schema presented at the beginning of the book.